Operating Manual

Transmig Synergic 350

At the rear of this manual is a pull-out technical broadsheet and parts list. Please pass these documents to your Maintenance Department.

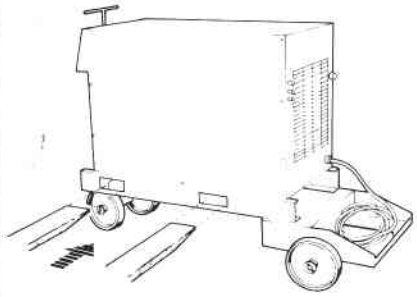
£1.50

SAFETY Operators of Electric arc welding equipment must always be aware of the inherent risks involved in the arc welding process. Your attention is therefore drawn to the Safety Leaflets available from the Welding Institute, particularly Publications 236 and 237.

Service

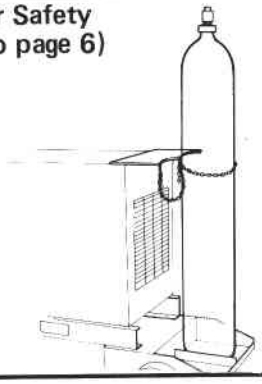
Call in the experts if you don't know what to do.

Handling



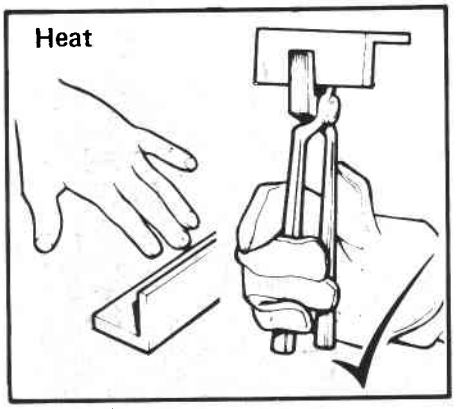
Lift the unit correctly.
Use correct size forklift.

Cylinder Safety
(See also page 6)



Secure the cylinder in position using the chain provided.

Heat

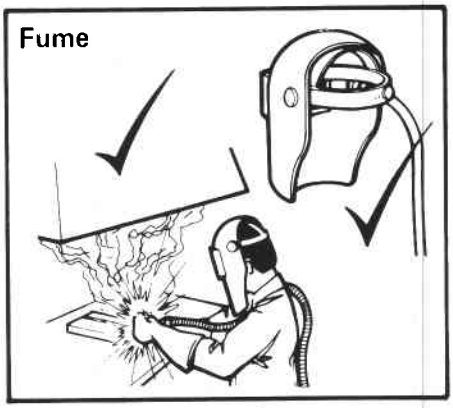


Don't burn yourself !
Wear gauntlets and use tongs.

Glare

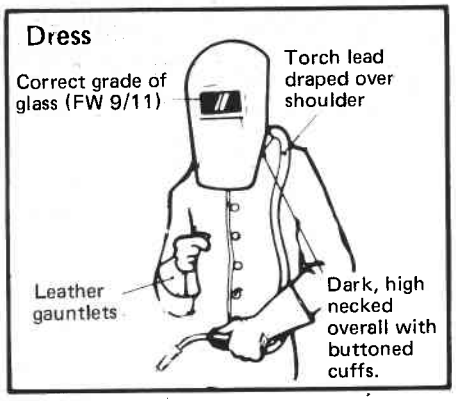
Wear your headshield (or face screen) and screen the welding area.

Fume



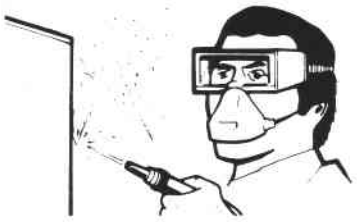
Ventilate the welding area to prevent a build-up of gas and fumes

Dress



Dress correctly when welding and preparing the weld.

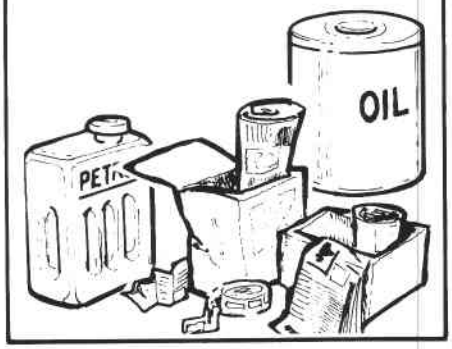
Dust



Note: *Use only DRY air.*

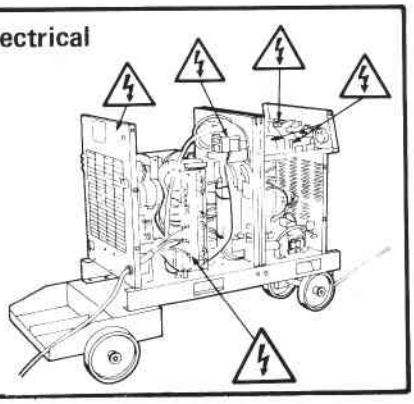
Wear goggles and mask when removing dust with an airline.

Fire



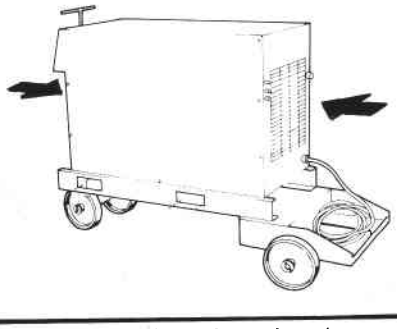
Before commencing welding, clear the area of flammable materials.

Electrical



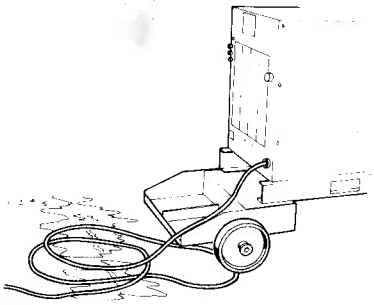
Don't work with the cover off.

Ventilation



Position the unit so that the Louvres are free from obstruction.

Electrical



Don't allow leads to lie in oil, water or corrosive liquid.

INTRODUCTION

The Transmig Synergic 350 Power Source is designed to be used in conjunction with the Transmatic 162M wire feed unit. It is designed for conventional or pulse welding of Mild or Stainless Steels, Aluminium and other materials.

Process set-up is extremely simple and once set the electronic control system maintains absolute accuracy

Once the process, material and current have been selected, welding current and voltage are automatically controlled. The unit employs an 'electronic' inductance therefore no inductance 'tappings' are required.

Soft Start and automatic wire 'burn-off' are also included in the wire feeder control circuitry.

Using the optional remote control unit, process selection, current and voltage trim controls are repeated allowing two independant welding conditions to be used, one local (main) and one remote.

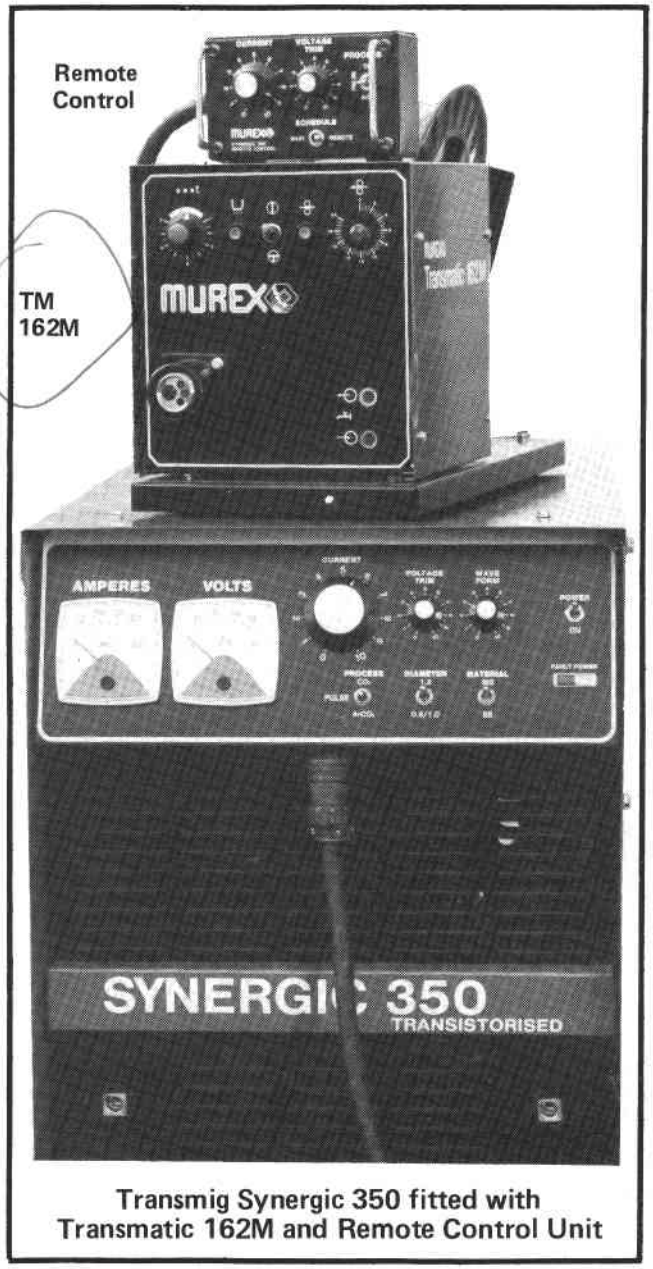
Typically —Dip Transfer set locally for root passes.
—Pulse selected on remote for fill passes.

The process selection charts provided give the data required for setting up process. Material, wire diameter and current values for a wide range of materials are given together with the relevant switch selections.

The Transmatic 162M is a standard wire feed unit modified for use with the TM Synergic 350. Details of the modifications are given in the Technical Notes.

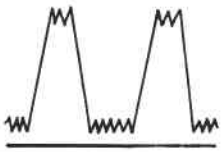
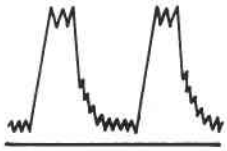
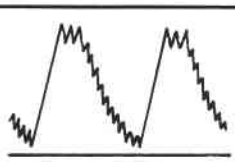
In the event of a thermal overload condition the 'fault' lamp lights and the machine shuts down. If this condition occurs, check the unit for good all round ventilation and leave the unit to cool. The most common cause of 'overload' is misuse of the duty cycle rating — See Specification in the Technical Notes.

220V and 42Vac outlets are provided on a terminal strip inside the rear panel to supply a water cooler or CO_2 heater.



Transmig Synergic 350 fitted with
Transmatic 162M and Remote Control Unit

Waveform Control Settings

Control Setting	Current Waveform	Remarks
0—2		Normal Setting. Full power spray, narrow forceful arc.
2—7		Less concentrated (less than 150A, Broader softer arc. Use less than 10% CO_2 for good transfer. Use these settings if 'arc blow' or 'pop-out' occurs.
7—10		These settings give softest arc, broadest arc column. Use above 200 Amps. Use less than 10% CO_2 for good transfer.

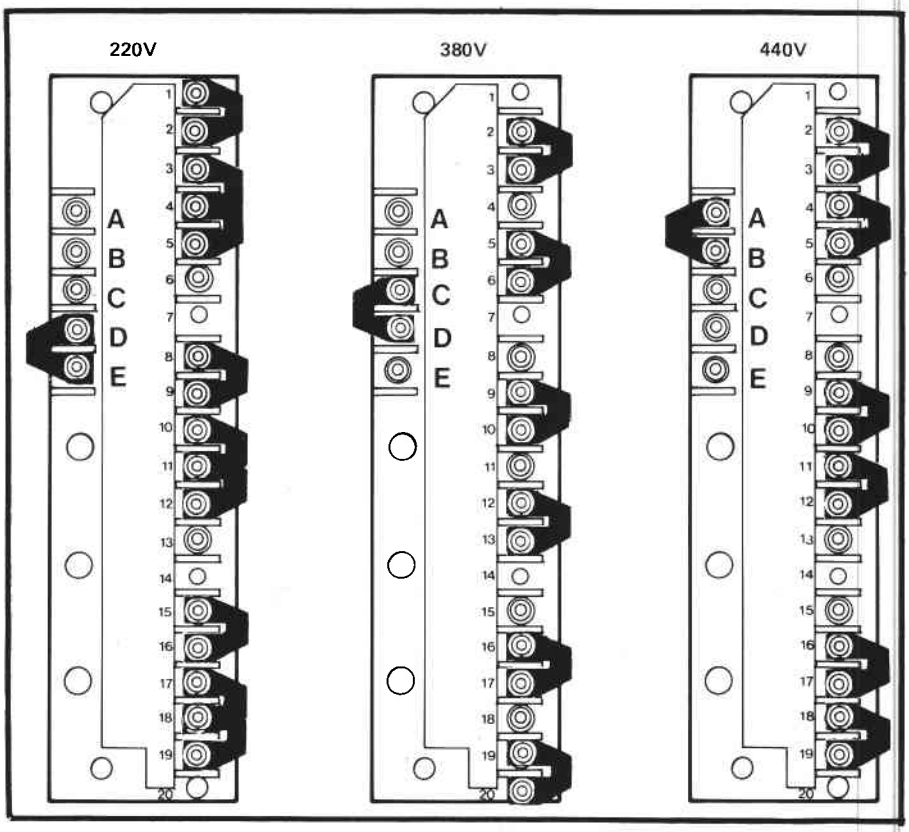
INSTALLATION

Installation must only be undertaken by a qualified electrician or suitably qualified person.

Mains Input Selection
Before connecting the unit to the mains supply, set the mains selection links to their appropriate positions as shown.

Note: *Store the 'unused' links by placing them in parallel with the selection links. Do not place them on 'spare' terminals.*

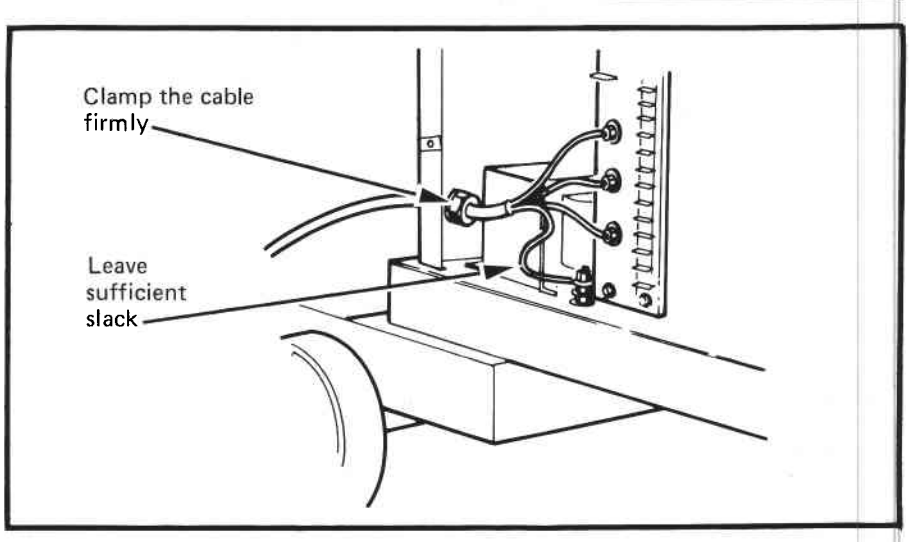
The mains selection terminal block is located behind the lift-up panel on the left hand side of the unit.



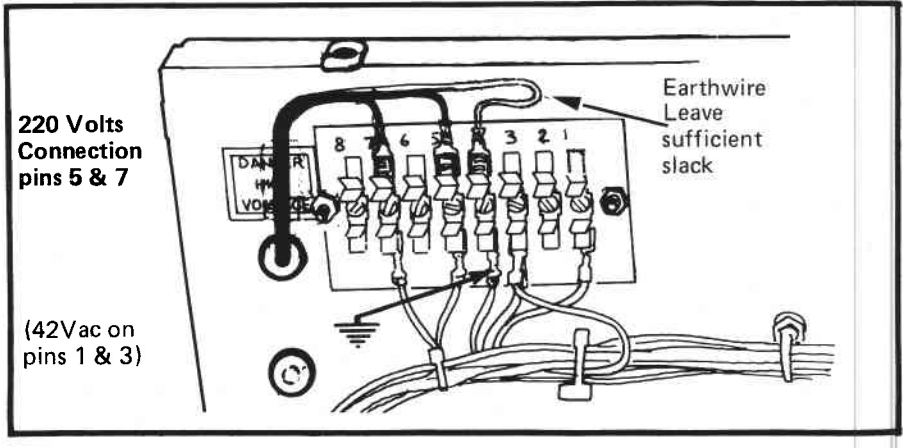
Mains Cable Connection
Connect the three 'phase' wires to terminals L1, L2 & L3 respectively as shown. Then connect the Green/ Yellow earth wire to the GRD terminal.

Note: *Leave sufficient slack in the earth wire so that, in the event of undue stress, the earth wire is last to come under strain.*

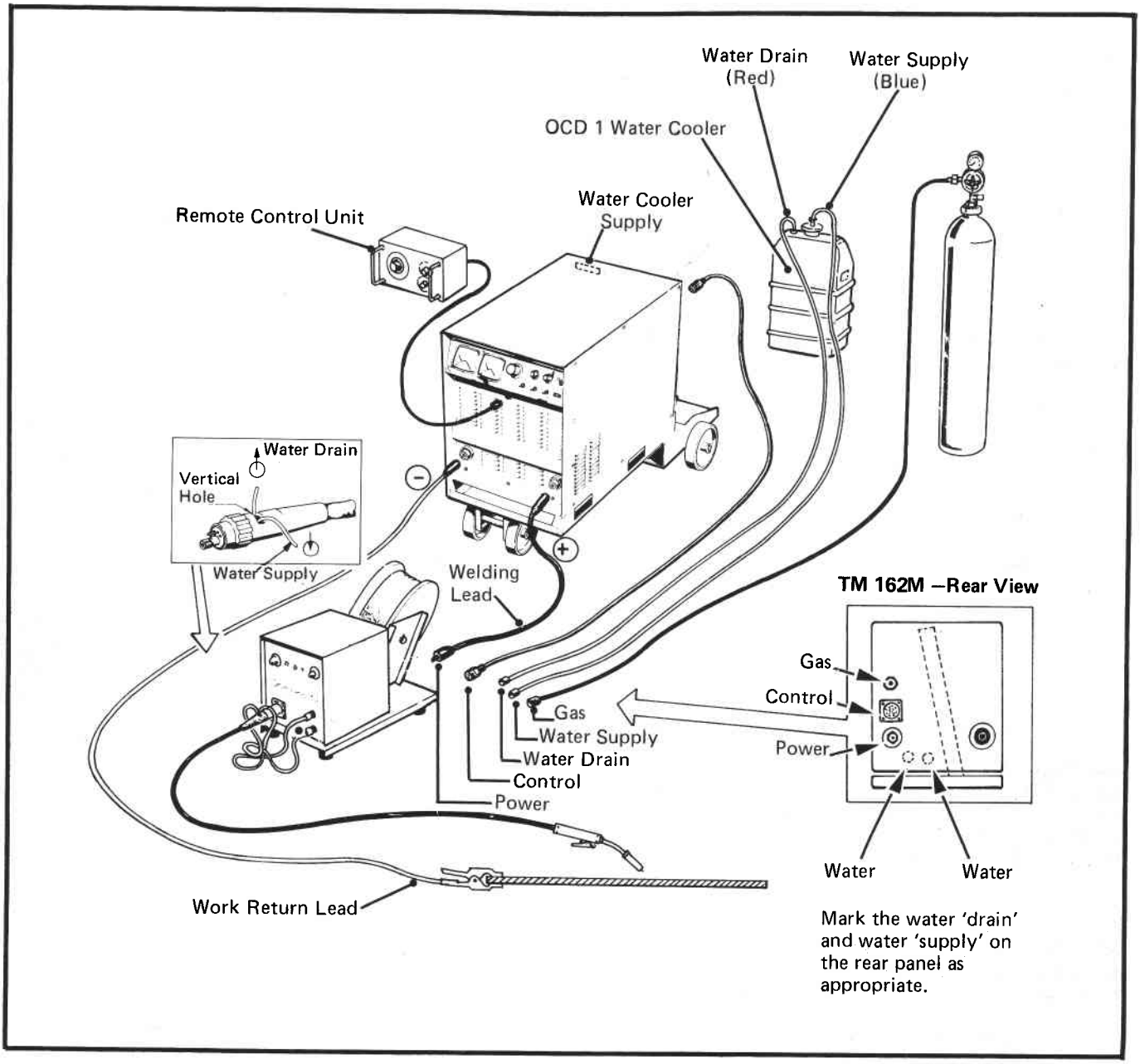
Clamp the cable firmly in the cable gland.



Water Cooler Connection
Feed the supply cable through the grommet provided in the back panel and, using crimp - on 'spade' connectors, connect the Live, Neutral and Earth wires to the terminal block as shown.



INSTALLATION (continued)



Interconnections
Refer to drawing

Gas (with optional undergear)
Mount the gas cylinder on the cylinder tray and secure in position using the chain provided.

Connect the gas hose and regulator to the cylinder as described overleaf.

Fit the gas hose to the 'gas in' connection on the rear of the TM162M.

Water (with optional undergear)
If a water cooler is to be fitted, mount it on the cylinder tray and secure it in position using the chain provided.

Note that the position of the cylinder support bracket may have to be adjusted to accept the 'neck' of the water cooler.

Connect the cooler to the auxiliary supply on the terminal block inside the back panel as previously described. The blue water hose (cold) is fitted to the 'water-in' connection on the back of the TM162M and the red water hose (hot) to the 'water-out' (return) connection.

Note: *When fitting a 'MW' torch, ensure that the hoses are correctly fitted to the water-in and water-out connections on the front of the TM 162M – see illustration.*

Control
Connect the control cable between the 8–pin socket on the power source and the reciprocal socket on the rear of the TM162M.

Power
Connect the power terminal on the back panel of the TM 162M to the positive output on the power source.

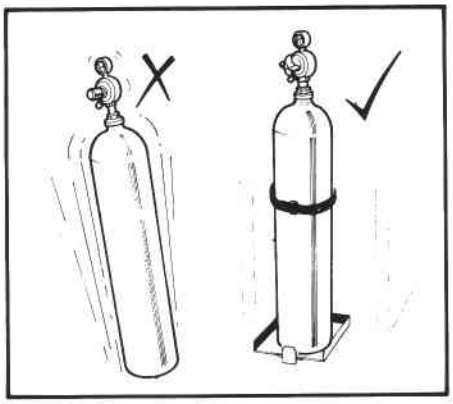
Work Return Cable
This cable is connected to the negative terminal of the power source and its clamp attached to the work piece of the clamp.

Poor electrical connection of the clamp will result in poor welding characteristics.

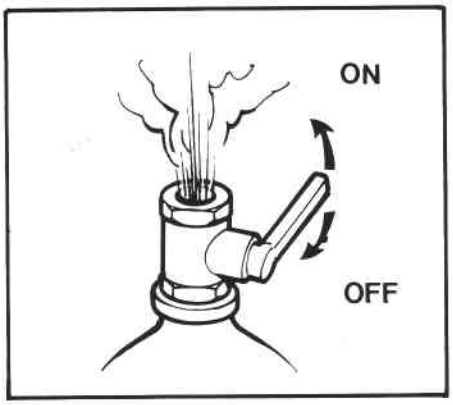
Remote Control Unit (optional)
Screw the connector into its socket on the front panel (centre).

INSTALLATION (continued)

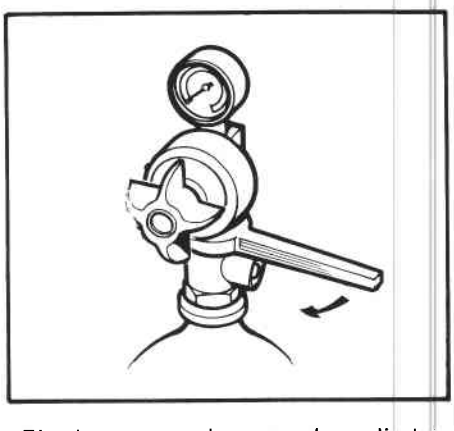
Gas Fitting



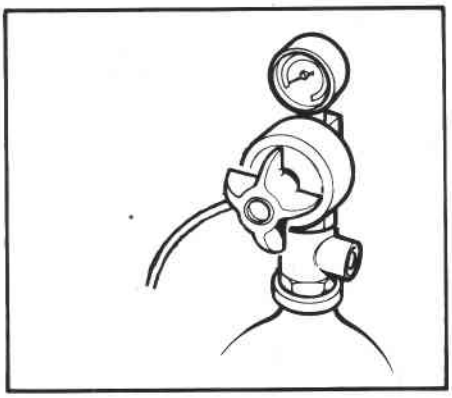
Support the gas cylinder with the retaining chain.



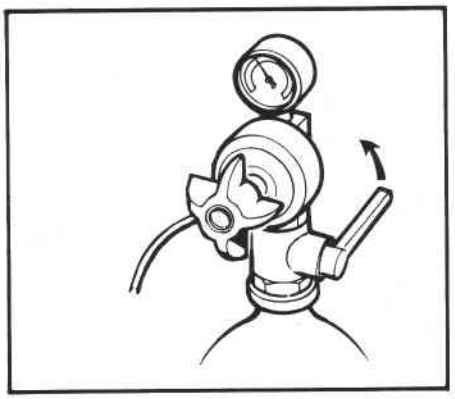
Protect the eyes and open the cylinder valve to remove any dirt in valve socket.



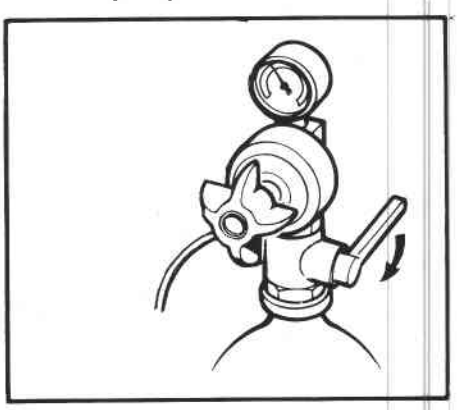
Fit the gas regulator to the cylinder and hand tighten using the correct size spanner. (A sharp blow with the hand at the end of the spanner will ensure a gas tight seal).



Fit the gas hose to the regulator.



Open the cylinder valve and check the cylinder pressure. (Must be greater than 10 bar (150 lb/in^2)).



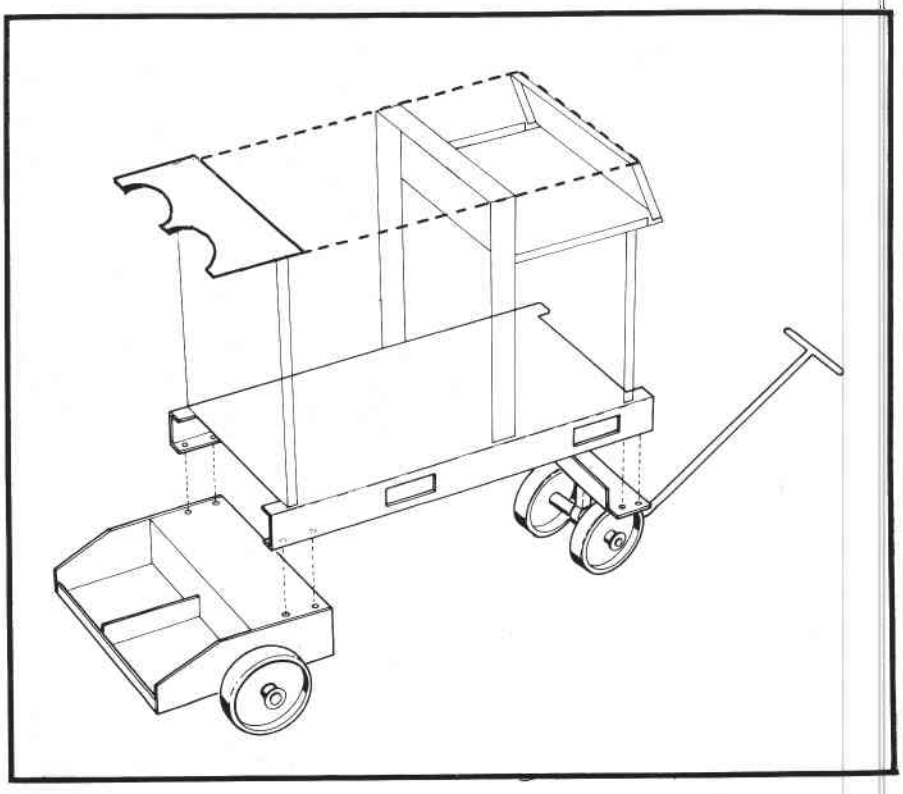
Ciose the cylinder valve.

UNDERGEAR FITTING

1. Assemble the undergear to the unit, using the fittings provided – See drawing.

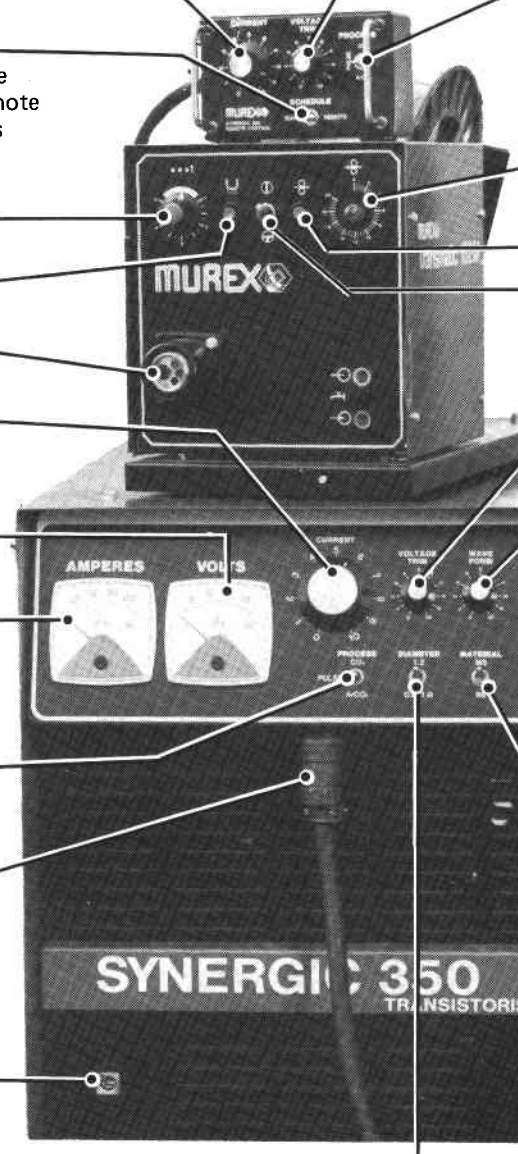
2. Mount the Cylinder support plate on top cover of the unit.

   Position the plate to fit up with cylinder.



OPERATION

1. Select the chart appropriate to the process mode, wire diameter and wire material.
2. Set the process Selector Switch according to the process – CO_2 dip transfer – Pulse transfer – or $ArCO_2$ dip/spray transfer.
3. Set the diameter switch according to the chart.
4. Set the material switch according to the chart.
5. Use the voltage trim and if required the waveform control (Pulse mode) to obtain optimum welding performance.



These controls may be set to provide a second program (gas must be common to both)

Current Control

Voltage Trim

Process Switch
CO_2 dip transfer/Pulse transfer/ Ar/CO_2 dip/spray transfer may be set to different process as main unit. **Note:** gas is common to both programs.

Schedule Switch
Main / Remote
per machine per remote
settings settings

Wire Feed Speed Control
Not fitted on TM162M

Spot Weld Time Control

Wire Inch Button

Gas Purge Button

Torch Latch/Unlatch Switch

Torch Connector

Voltage Trim
Trims arc volts or arc length

Current Control
Sets required output current
See Welding Charts

Waveform Control
In Pulsed MIG mode adjusts wave shape – See pulse waveforms on page 3.

Voltmeter
Indicates average welding voltage

ON/OFF Switch
Note: This switch does not isolate the unit from the mains supply. In the OFF position the unit is still 'Live'.

Ammeter
Indicates average welding current

Process Selection Switch
CO_2 dip transfer/Pulse transfer/ $ArCO_2$ dip/spray transfer

On/Off – Fault Lamp
White light indicates power on.
Red light indicates fault or overload condition.
WARNING: When White lamp is 'OFF' unit may still be 'LIVE'

Remote Control Unit Connection

Materials Switch
In 'Up' position Mild Steel (M.S.) selected.
In 'Down' position Stainless Steel (S.S.) selected.
See individual welding charts for other materials.

Negative Terminal
Usually connected to the work return clamp

Wire Diameter
'Up' for 1.2mm wires
'Down' for 0.8/1.0 wires
See individual welding charts for other wire types and diameters.

Positive Welding Output
Usually connected to the power terminal on the wire feed unit

APPLICATIONS

Mild Steel — In vertical welding 12.7mm (½in.) plate and over, the low heat input obtained with dip-transfer often results in poor fusion. Pulsed-arc welding overcomes this while remaining faster and more economical than manual-arc welding. It is also excellent for root runs where absolutely uniform penetration is required and the joint is accessible from one side only— for example, pipe butt welds. The ability to use lower currents with pulsed-arc welding is also of immense assistance in sheet metal work involving awkward shapes and unsupported butt welds. Pulsed-arc welding is particularly suitable for thicknesses between 2 and 6.3mm (14 swg and ¼in.), falling between the thickness ranges more suitably covered by dip- or spray-transfer. The recommended shielding gas for mild steel is an Argon mixture.

Alloy Steels — Pulsed-arc welding gives much better alloy recovery than welding with CO_2, and the carbon content remains at an acceptable level. This is vital for optimum low-temperature properties, particularly on quenched and tempered steels. The recommended shielding gas is an Argon mixture.

Stainless Steel — Pulsed-arc welding gives unequalled results in welding stainless steel. Using an Argon/Oxygen mixture, there is no increase at all in the carbon content of the weld, which can rise to an unacceptable level with CO_2.

Aluminium and its Alloys — Because heat input can be controlled with pulsed-arc welding, larger wire diameters can be used on thin sections. The risk of porosity is significantly reduced — particularly on vertical, overhead and horizontal welds.

In addition, the minimum thickness of alloy sheet which can be welded with push-type wire feed equipment is extended. One of the outstanding features of pulsed-arc welding that is of particular value in aluminium welding is the ability to make corner and unbacked butt joints which have a very good appearance. The recommended shielding gas is pure agron.

MAINTENANCE

Switch off and disconnect the unit from the mains supply before undertaking any maintenance tasks.

Daily (Operator task)

1. Check all welding and electrical cables for signs of cracking or general deterioration.
2. Check that all electrical connections are in good physical condition.
3. Check the welding torch for damage. Replace any suspect part(s).

ALWAYS CHECK THE WELDING AREA DAILY FOR POSSIBLE SAFETY HAZARDS. IF IN DOUBT CONSULT YOUR SAFETY OFFICER.

6 Monthly (Maintenance Department Task)

1. Switch off the unit and **disconnect from the mains electrical supply.**
2. Remove the cover (retain the fixing screws).
3. Using a soft brush, remove any dust or dirt from the interior of the unit. If compressed air is used to clean the unit the pressure must not exceed $2kg/cm^2$, ($30lbs/in^2$), and the air must be dry.

SUITABLE EYE AND MOUTH PROTECTION SHOULD BE WORN.

4. Replace the cover.
5. Reconnect the unit to the mains supply.

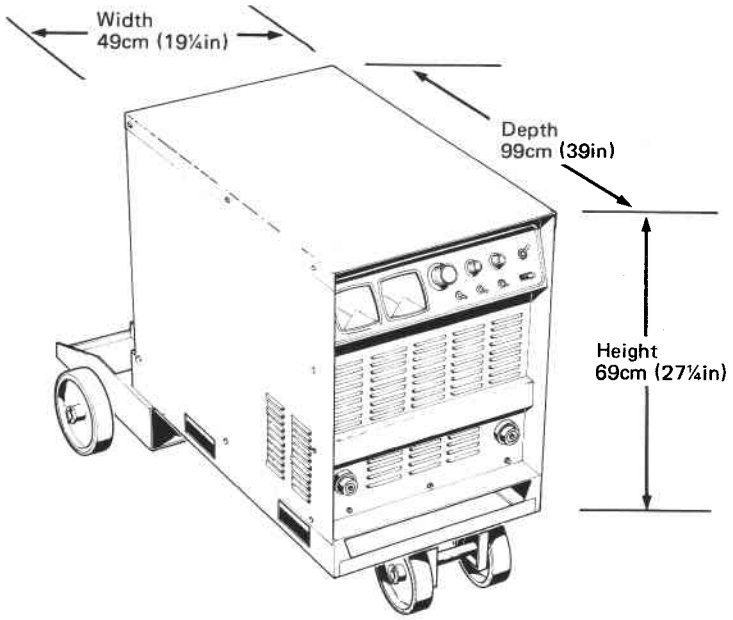
Murex Welding Products Limited
Hertford Road, Waltham Cross,
Herts. EN8 7RP England
Telephone: Lea Valley (0992) 710000
Telex: 25743

Pt.No. 100434
Issue 1

TPS/MKP/4/86/5C

Printed in United Kingdom

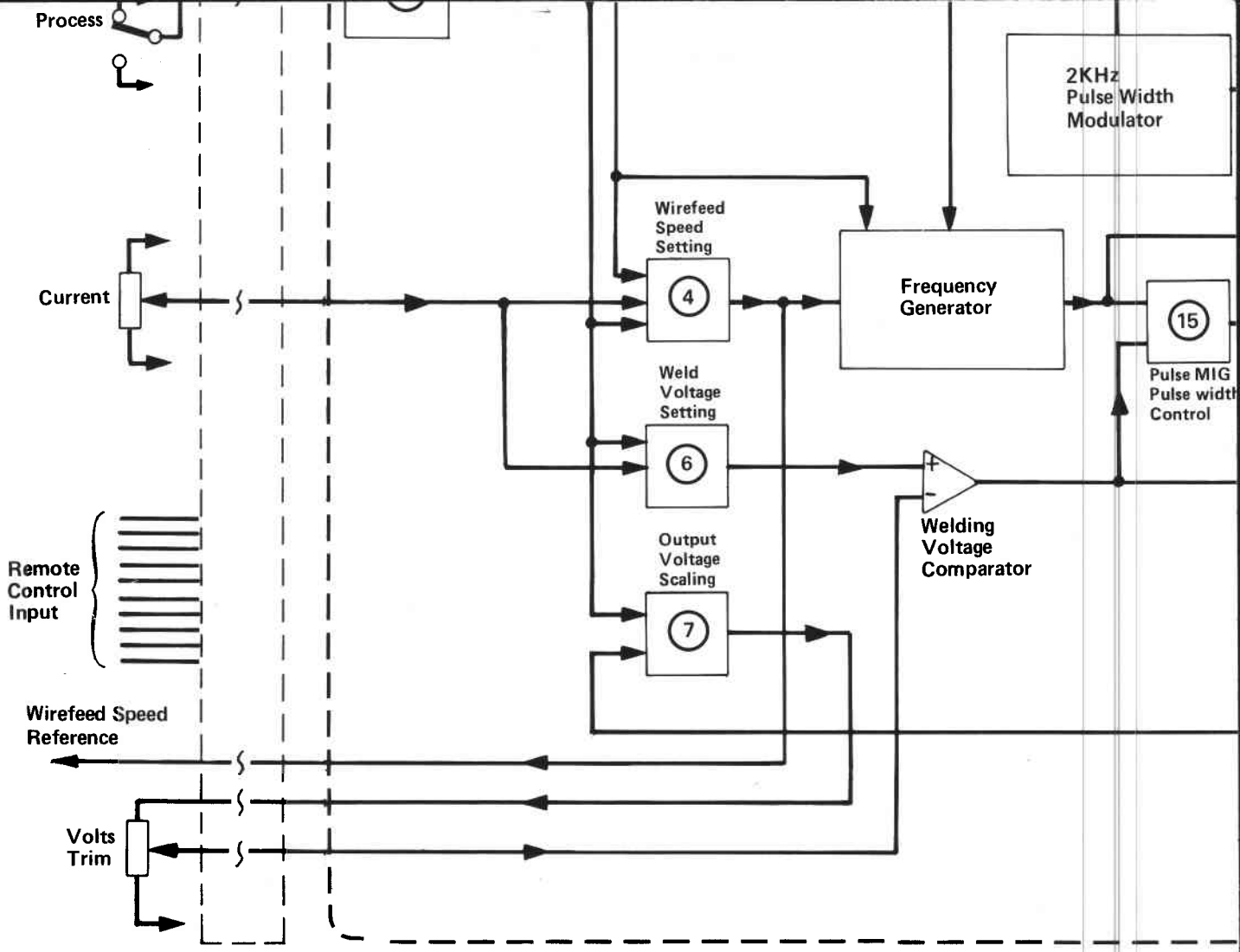
Transmig Synergic 350 Technical Notes



SPECIFICATION

	Pulse Spray Process	Dip Transfer Process
Rated Output	350 Amps @ 36Volts	280Amps @ 27.5Volts
Duty Cycle	60%	60%
Primary Input	3 Phase	3 Phase
Volts	220/380/420 50Hz	220/380/420 50Hz
Primary Input Amps.	52/30/26	42/24/21
KW – Input	18	14.4
KVA – Input	20	16
Maximum Open Circuit Volts	78	78
Auxiliary Power (KVA)	1A @ 220Vac : 4A @ 42Vac	
Weight (Nett)	189Kg (420lbs)	
Shipping Weight	201Kg (445 lbs)	

Due to variations which can occur in manufactured products, claimed performance, voltages, ratings, all capacities, measurements, dimensions and weights quoted are approximate only. Achievable capacities and ratings in use and operation will depend upon correct installation, use, applications, maintenance and service.



CIRCUIT D

Main Circuit
The 3 phase mains input is supplied to the main transformer T1 via the main contactor, MC1. The primary of the main transformer is tapped for 220, 380, and 420V supplies (shown overleaf). The mains input also supplies the fan and auxiliary control voltage transformer T2 via the power ON/OFF switch (S1).

Welding Supplies
The main secondary of T1 is full wave rectified by 3 phase diode bridge D1–D6 and the DC output (80V approx.) is smoothed by capacitor bank C1. High current parallel switching Transistors TR1/2, freewheeling diode D9 and inductor L1 form a high frequency DC chopping regulator including inductive smoothing and freewheeling circuit. A pilot arc (keep alive) circuit comprising diode D8, thyristor SCR1 and resistor bank R1–6 bypasses the main transistors and supplies a smooth D.C. pilot current (25A approx.) to the arc.

The auxiliary secondaries of T1 are used to generate positive and negative DC supplies for the driver transistor Tr10, via the Power Supply pcb. The main transistor drive circuit uses both forward and reverse bias base drive to ensure reliable and fast switching. Diode D10 is included as a path for reverse base drive current.

Output Control
The control system uses shunt feedback for both closed loop current control and also for current detection associated with the special starting feature. Further, voltage feedback is used for control of arc length/voltage and for detection of short circuits during the CO_2 and $ArCO_2$ dip transfer process modes.

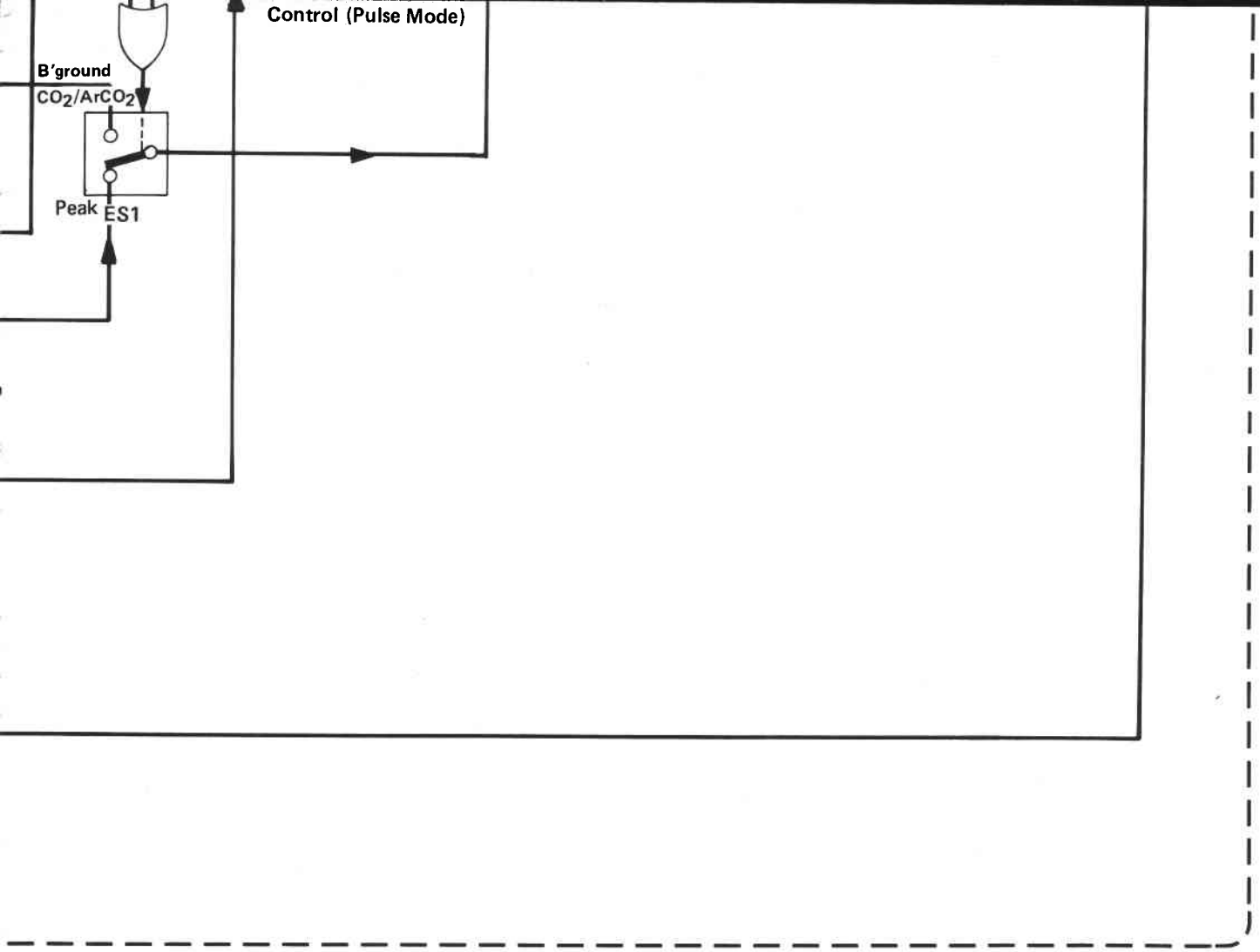
Interface/Switching Circuit
With the exception of Material, Diameter, Waveform control functions, all signals to and from the Main Control board (pcb 1) pass through the Interface/Switching pcb (pcb 2). Its function is firstly to permit selection of either local or remote process/condition settings, and secondly to match the wire speed reference signal generated on pcb 1 to the Transmatic 162M motor control system.

In the latter respect the Interface/Switching pcb also electrically isolates the power source and wire feeder electronics from each other.

Arc Starting
Depressing the torch switch energises the wire feeder circuitry, drive motor, gas valve and in turn energises isolation relay REL1. Relay REL1 turns on and holds on pilot supply SCR1 and signals the start/stop sequence control circuit (10) on pcb 1. Circuit (10) enables the drive control circuit (16) and closes MC–1 via isolating relay REL–4. Also circuit (10) signals the arc start control circuit (12) to reduce the wire speed and set power source output to maximum until the current detect signal is received from circuit (9).

Arc Stopping
Releasing the torch switch applies the wire feed motor brake and turns off the gas valve. Relay REL 1 releases and the pilot supply SCR1 is turned off by the switching action of the main transistors (Tr1 and 2). Circuit (10) also signals the wire tip conditioning circuit to apply a series of pulses (no background) during wire slow down. Approximately 2 seconds after gun trigger releases, MC–1 opens.

Pulse Mode Operation
The wire speed is set by the wire speed setting circuit depending on the current control setting and wire diameter selected.



ESCRIPTION

Pulse frequency is generated by the pulse frequency generator, whose output switches operation between peak and background periods. Note that pulse frequency depends on wire diameter, material and wire feed speed. As current/feed speed increases so also does pulse frequency.

An arc voltage reference is developed by the weld voltage setting circuit, again depending on current control setting etc: and this voltage reference is compared with the processed voltage feed back signal from the machine output. The Voltage trim control influences the amount of feedback from the machine output. The comparator output, (actually the difference between required and actual arc voltage), is used to control the pulse width. Hence if arc voltage (arc length) is less than that set by the weld voltage setting the circuit pulse width is increased and vice versa. During the pulse period this variable frequency, pulse width modulated signal is used to signal the drive control circuit via Electronic Switch ES1.

During the pulse period, peak current control is achieved by comparing a signal from the shunt amplifier circuit with the preset peak setting via switch ES2, the difference signal being used to control the drive to the main transistors.

Control of background current (when ES1 is switched over) is as follows:

Welding current, sensed by the shunt amplifier circuit, is compared with a preset background setting, the difference signal or a signal from the Waveform Control is inputted into a 2KHz pulse width modulator circuit via ES3 switch. The pulse width modulated signal is used to control the drive circuit and hence background welding current via switch ES1.

CO_2 /ArcO_2 Dip/Spray Transfer Mode Operation

Wire feed speed is set by the wire speed setting circuit depending on the current control setting and wire diameter selected. An arc voltage reference is developed by the weld voltage setting circuit whose value also depends on the current control cutting and on the actual mode CO_2 or ArcO_2 and wire diameter. This voltage reference is compared with the scaled voltage feedback signal from the machines output, the difference signal being input, into the 2Khz pulse width modulator circuit. The pulse width modulated signal is used to control the drive circuit via ES1.

During the 'arc' period, current limiting is achieved by comparing the amplified shunt output with the peak setting reference (via ES2), using the difference signal to control transistor drive should actual current exceed the 'peak' setting.

Control of current during dips or short circuits in order to create an electronic inductance is as follows:

Actual arc voltage is monitored by the short circuit detector and, when the arc voltage falls to near zero, the short circuit detector opens ES4 and sets ES2 to its 'short' position. Capacitor C_L in the inductance generator circuit carrying a charge proportional to actual welding current the instant prior to the short circuit, now starts to charge via resistor R_L. Note that the voltage across C_L rises exponentially with rate of rise dependant on the value of R_L (and C_L). This exponentially rising signal is now used as a reference signal to control welding current via ES2.

At the completion of the 'dip', arc voltage again goes high and the short circuit detector resets ES4 and ES2 is set back in the 'arc' position.

INSTALLATION

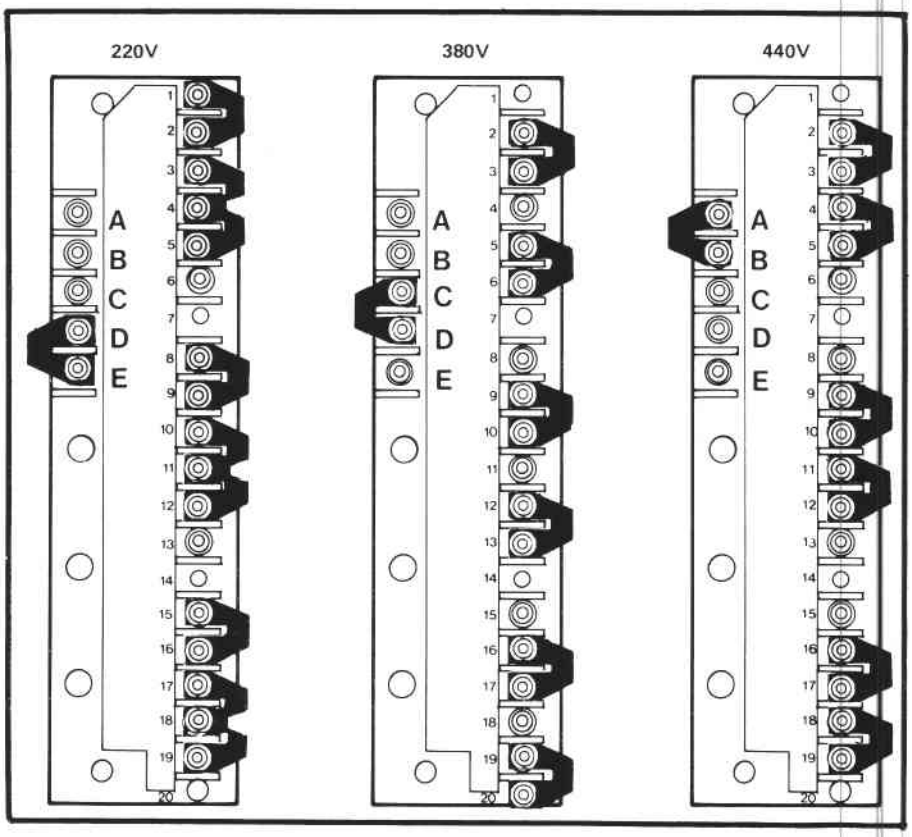
Installation must only be undertaken by a qualified electrician or suitably qualified person.

See also Page 4 of Operating Manual

Mains Input Selection
Before connecting the unit to the mains supply, set the mains selection links to their appropriate positions as shown.

Note: *Store the 'unused' links by placing them in parallel with the selection links. Do not place them on 'spare' terminals.*

The mains selection terminal block is located behind the lift-up panel on the left hand side of the unit.

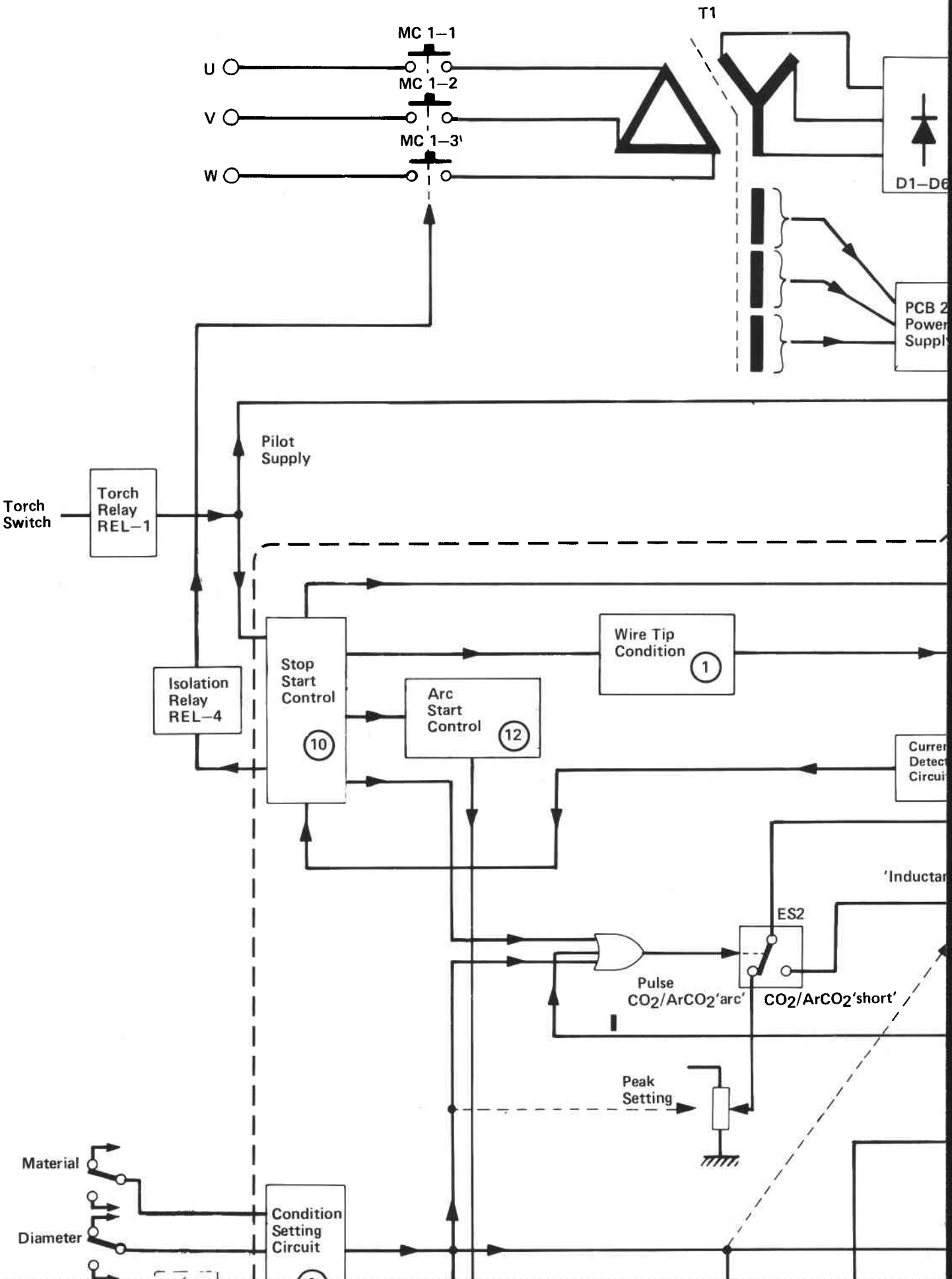


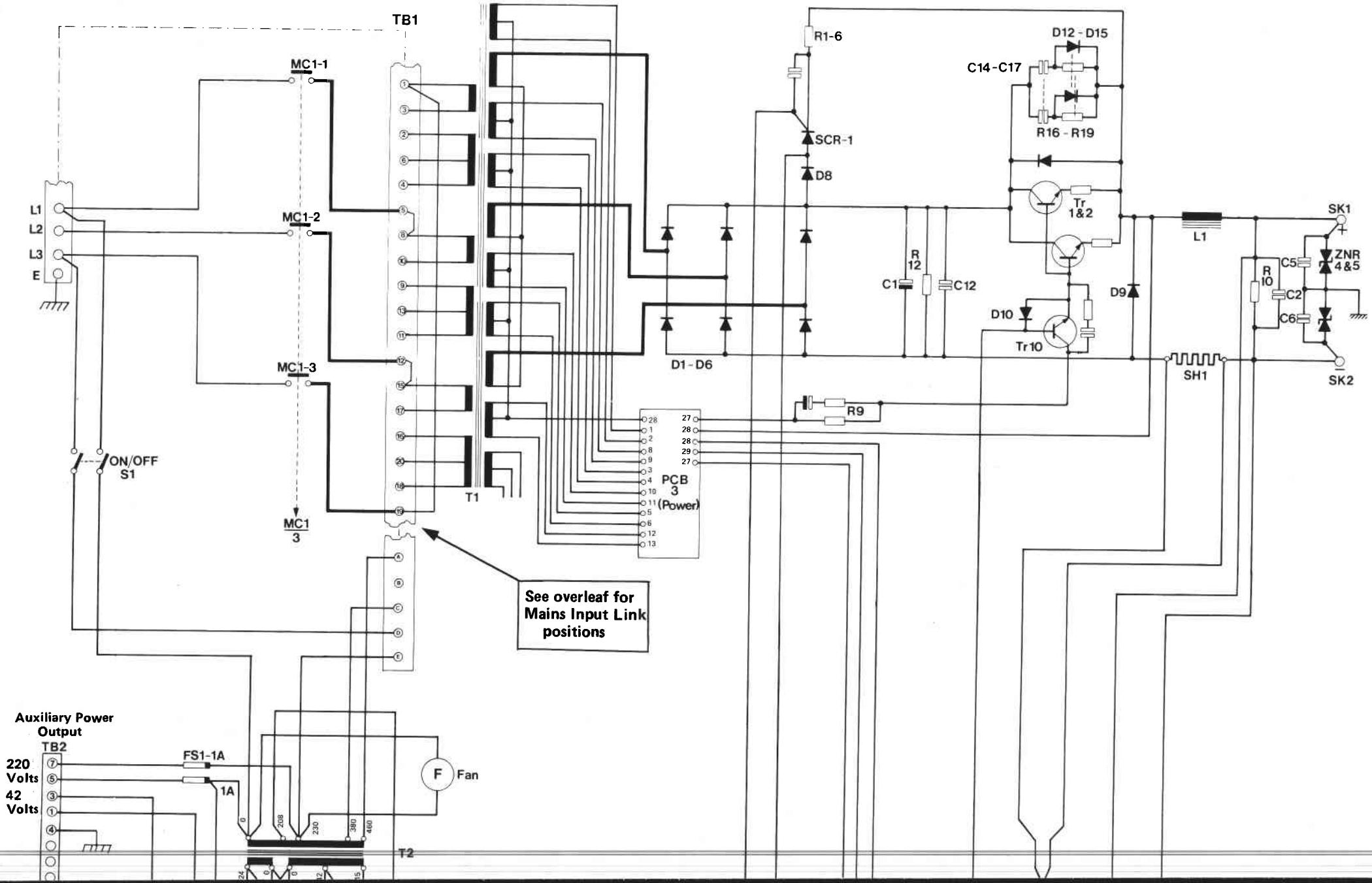
TM 162 Modifications (Convertion to TM 162M)

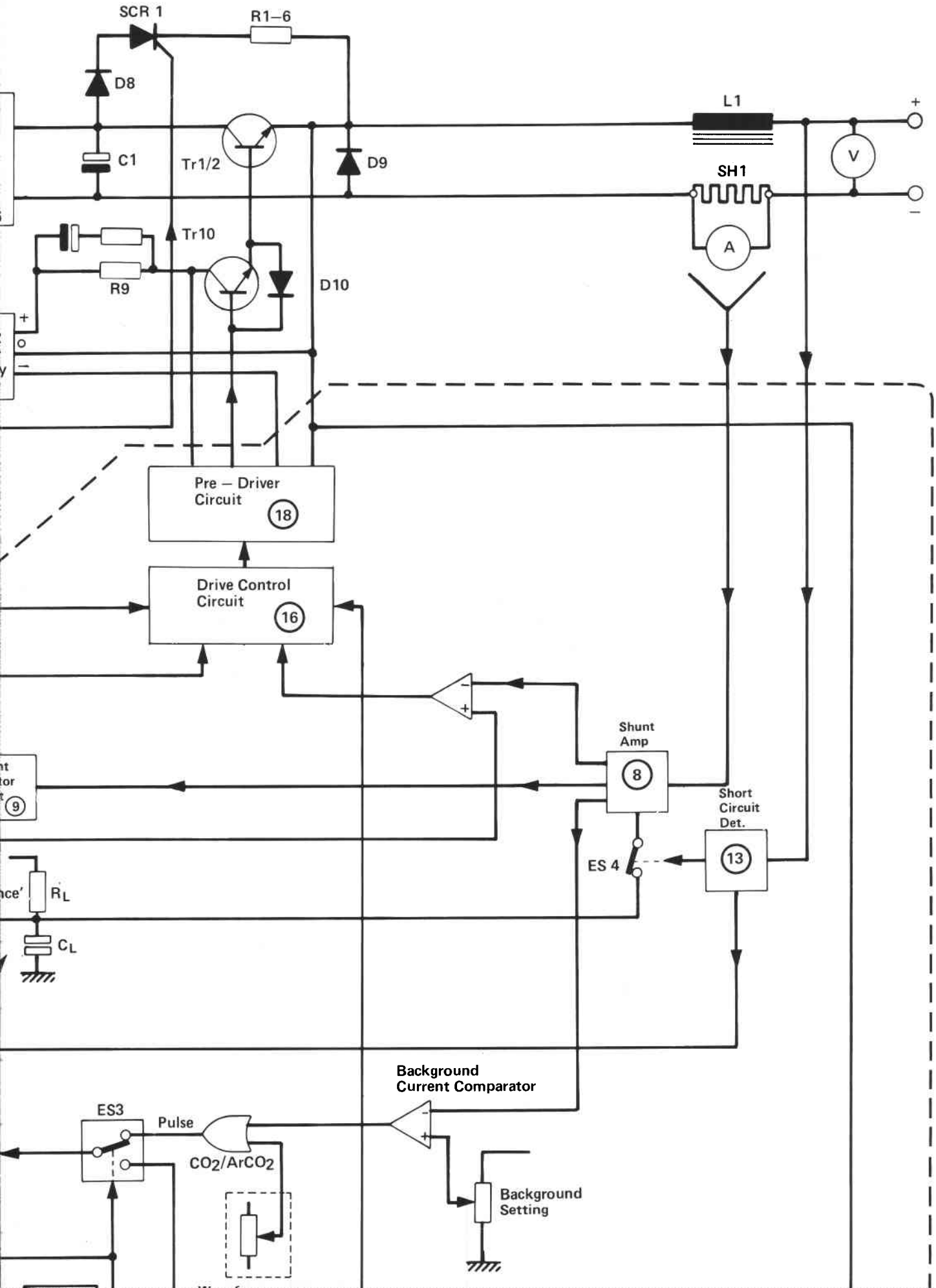
The TM162 has been specially adapted for use with the TM 350 Synergic. When changing the p.c.b. in the TM 162M both (Rampa' and 'RTS' controls must be set to 'Zero' (minimum setting).

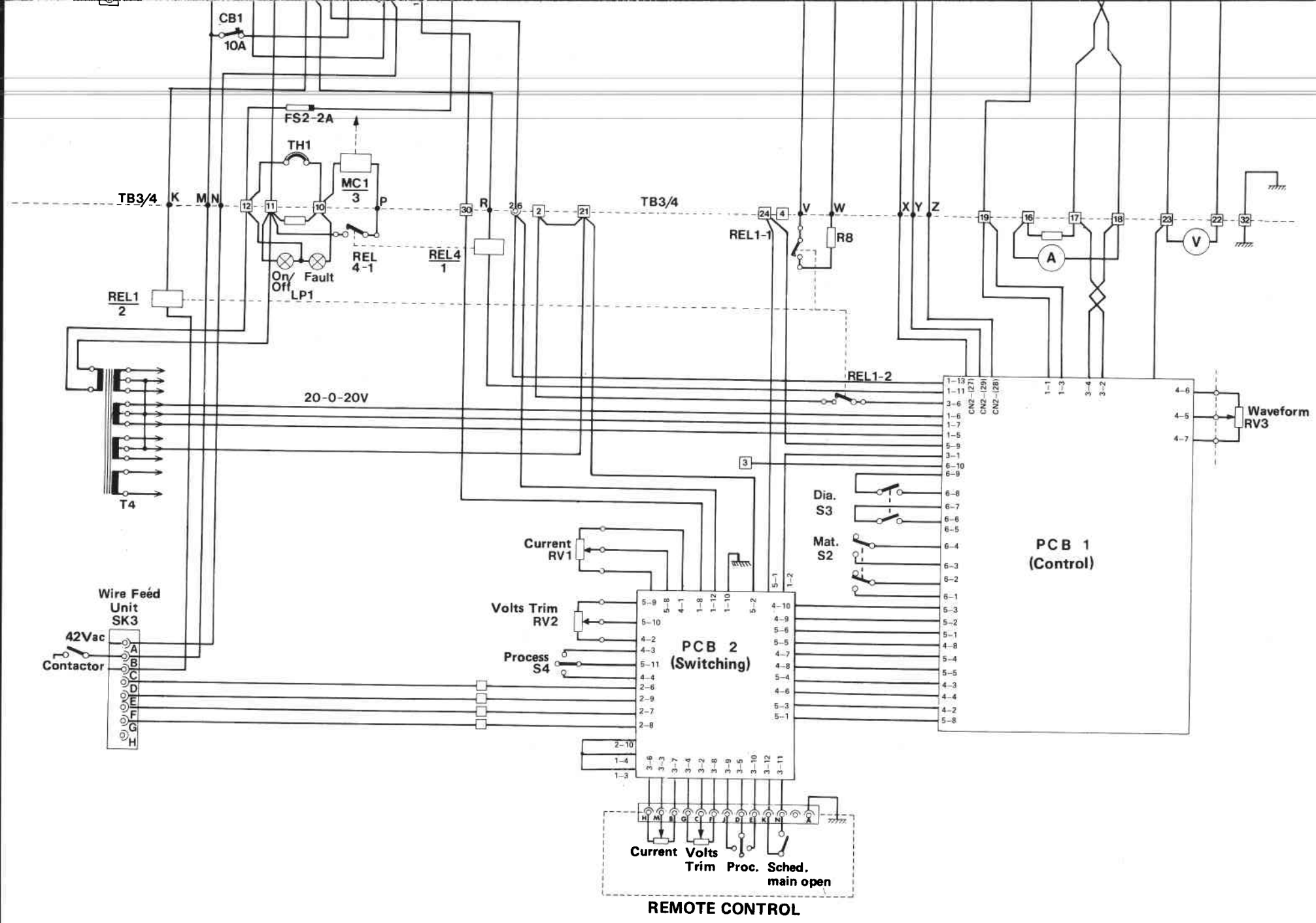
The wiring changes are as follows:

A	–	42Vac
B	–	42Vac
C	–	Contactor
D	–	Was top of feed speed pot now connected to pcb pin 9
E	–	Was wiper of feed speed pot now connected to pcb pin 6
F	–	Was bottom of feed speed pot now connected to pcb pin ⑦
G	–	Pcb 'OV' now connected to pcb pin ③ with existing wire
H		
I		


T1
MC 1–1
MC 1–2
MC 1–3
U
V
W
D1–D6
PCB 2
Power
Supply
Pilot
Supply
Torch
Switch
Torch
Relay
REL–1
Isolation
Relay
REL–4
Stop
Start
Control
10
Wire Tip
Condition
1
Arc
Start
Control
12
Curren
Detect
Circuit
'Inductan
ES2
Pulse
CO2/ArCO2'arc'
CO2/ArCO2'short'
Peak
Setting
Material
Diameter
Condition
Setting
Circuit


TB1
MC1-1
MC1-2
MC1-3
L1
L2
L3
E
ON/OFF
S1
MC1
3
T1
R1-6
SCR-1
D8
D1 - D6
D12 - D15
C14 - C17
R16 - R19
Tr
1&2
R
12
C1
C12
D9
D10
Tr10
L1
SK1
SK2
ZNR
4&5
R
10
C5
C2
C6
SH1
R9
PCB
3
(Power)
See overleaf for
Mains Input Link
positions
Auxiliary Power
Output
TB2
220
Volts
42
Volts
FS1-1A
1A
F
Fan
T2


SCR 1
R1–6
D8
C1
Tr1/2
D9
L1
+
V
SH1
–
A
Tr10
R9
D10
+
–
Pre – Driver Circuit
18
Drive Control Circuit
16
Shunt Amp
8
Short Circuit Det.
13
ES 4
9
R_L
C_L
Background Current Comparator
ES3
Pulse
$CO_2/ArCO_2$
Background Setting



Transmig Synergic 350 — Circuit Diagram

Transmig Synergic 350
Parts List

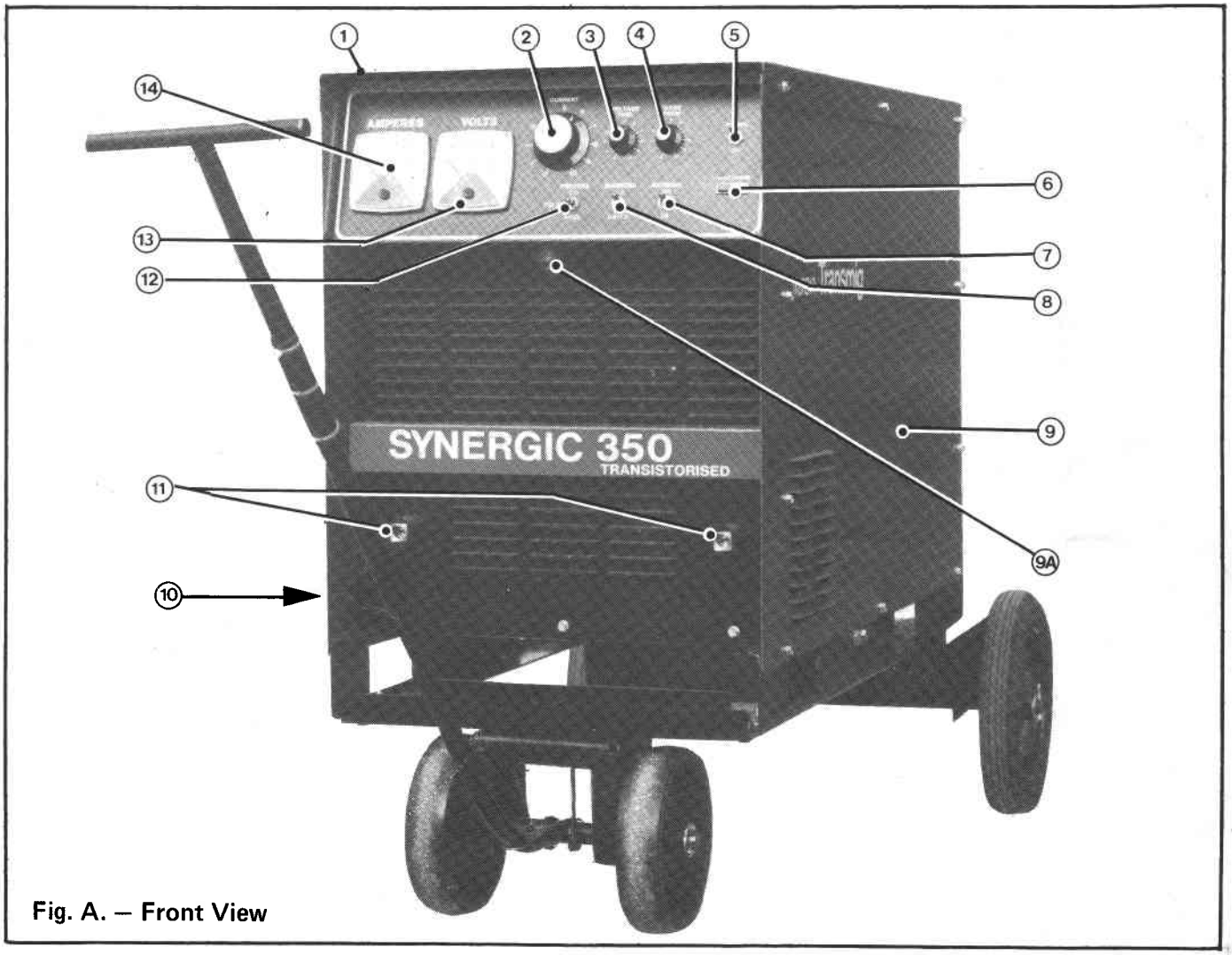


Fig. A. – Front View

Item	Pt.No.	Cct. Ref.	Description
1	1412197	–	Top Cover
2	1411862	RV1	Potentiometer–5K 2W Lin
–	1410926	–	Knob for item 2
3	1410927	RV2	Potentiometer 10K ohm 2W Lin (Trim)
–	1410925	–	Knob for item 3
4	1411862	RV3	Potentiometer 5K 2W Lin
–	1410925	–	Knob for item 4
5	1411868	S1	On/Off switch
6	1411869	LP1	On/Off Lamp
7	1411867	S2	Switch (Material)

Item	Pt. No.	Cct. Ref.	Description
8	1411867	S3	Switch (Diameter)
9	1412199	–	Side Panel Right
9A	1411864		Socket (13 pin)
–	1412198		13 pin plug for item 9a inc. cable clamp
10	1412196	–	Side Panel Left
11.	017242	SK1,2	Dinse Sockets
–	1400222	–	Plug for Item 11
12	~~1411866~~	S4	Switch (Process) 14070 14
13	1411861	A	Voltmeter
14	1411860	V	Ammeter