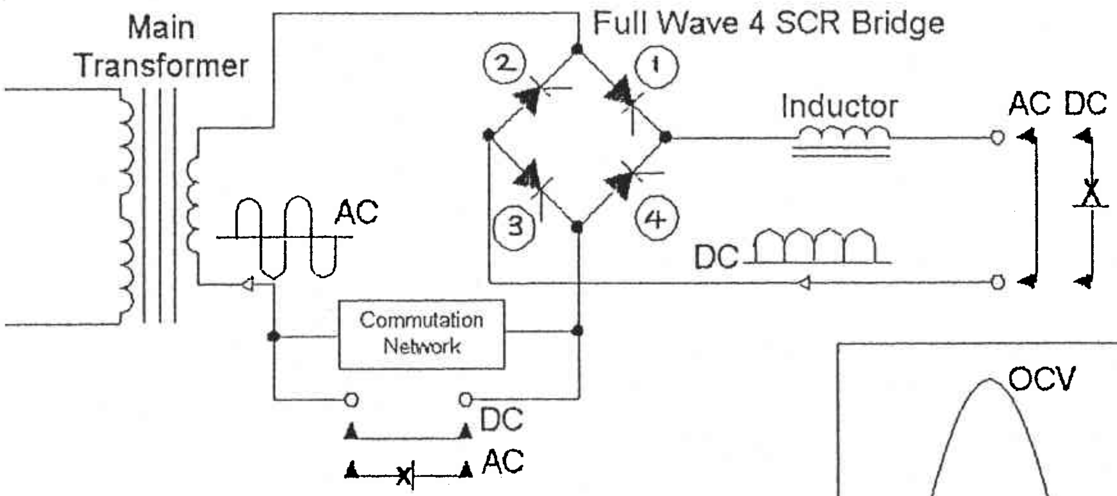
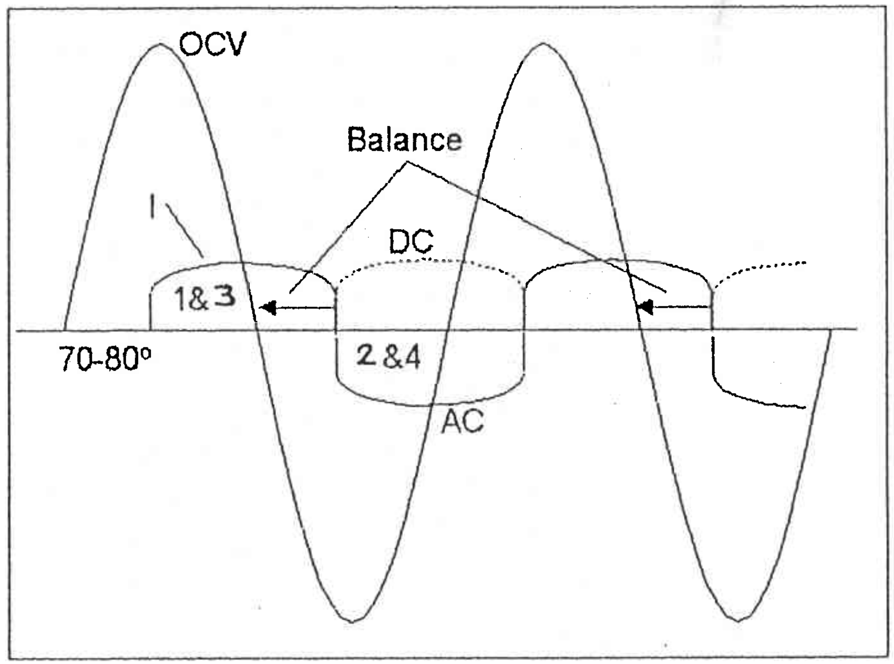
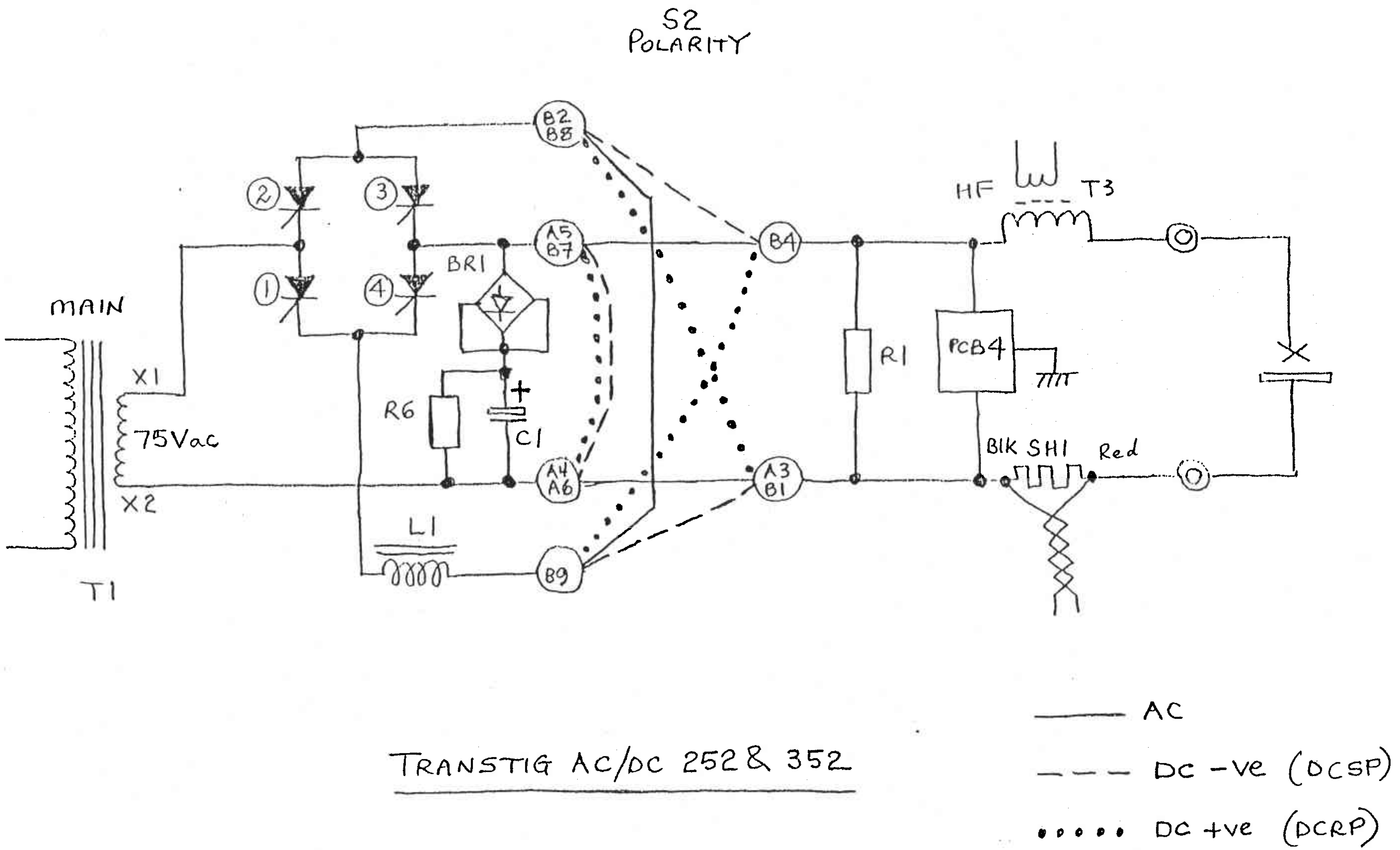
Transtig AC/DC 252 & 352

OPERATING PRINCIPLE







TRANSTIG AC/DC 252 & 352

Transtiq AC/DC 252 & 352

Main Control PCB

Notes

① The same pcb is fitted in both machines. A 4 section dip switch on the pcb "programs" the board to match the machine.

② The dip switch can be set (and the ribbon cable at P2 disconnected) so as to bypass the slope control (and digital meter functions). In other words the machine can be operated utilising the main control pcb alone.

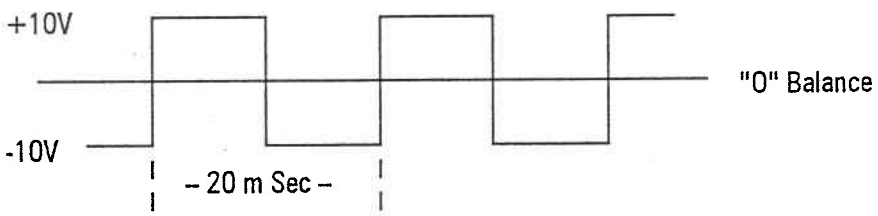
③ PCB "Ov" (TP1) is tied to the "work" terminal

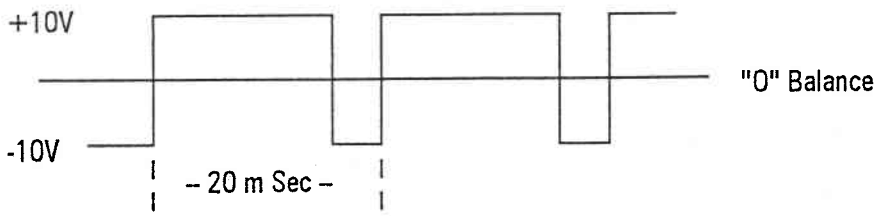
Operation

The 4 main SCR's are gated alternately in pairs via optocoupled SCR's IC8, 9, 10 & 11. Transistors Q7 and Q8 alternately enable each pair of optocouplers, IC8/9 and IC10/11, driven from the square wave (± 10v) at TP8.

± 12v dc supplies and an unregulated +24v dc are developed by IC1 & IC2 from a 17-0-17v ac auxiliary winding on the main transformer T1. These can be checked at TP2 (+12) and TP3 (-12). The white power on light is supplied by the 34v ac (17+17).

Synchronisation is achieved as follows. Comparator IC5D is supplied from one of the 17v ac auxiliaries & the AC Balance control via a 3 stage RC lag filter producing roughly 180° lag angle. The output of IC5D (TP8) is a square wave (± 10v) and is used to enable the alternate pairs of SCR's, see above, and to synchronise the ramp generator. As the AC Balance control is increased a signal between 0 & 10v dc is summed with the ac input signal to IC5D hence enabling the mark: space ratio of its square wave output to be altered from 50:50 to around 80:20.





In STICK mode the AC Balance control signal is held to zero via diode D20 by transistor Q3.

The variable mark: space square wave signal is differentiated by C30 and rectified by IC5C momentarily turning on transistor Q4 twice every 20ms coincident with the +ve and -ve edges of the square wave.

Resistor/capacitor network R68, R69 (preset) and C31 fed from +12v generate a rising ramp voltage at TP6 which is reset to 0v, see above, by transistor Q4. The rate of rise of the ramp is also influenced by the actual current reference (at TP4) via R96. The higher the current reference, the faster the ramp voltage initially increases.

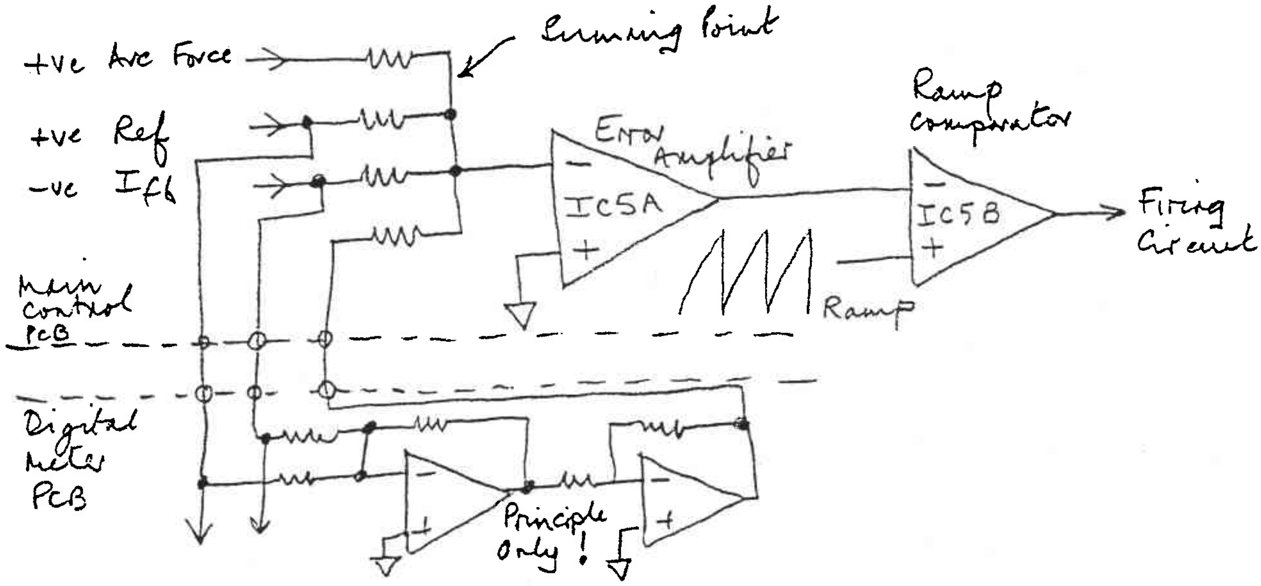
The ramp thus generated provides one input of the comparator IC5B. The other input, the so called "error" signal, is generated as follows.

The feedback signal from the shunt (50mV = 400A) is amplified and precision rectified by IC3A, B & C. Preset R11 enables offsets to be eliminated. The rectified shunt signal, which is negative going, can be monitored at TP5 and is scaled at 2V/100A exactly - the pick-up points on the shunt can be moved to achieve calibration. This signal is output to the digital meter unit (352 only) via IC3D and also to error amplifier IC5A via calibration preset R65.

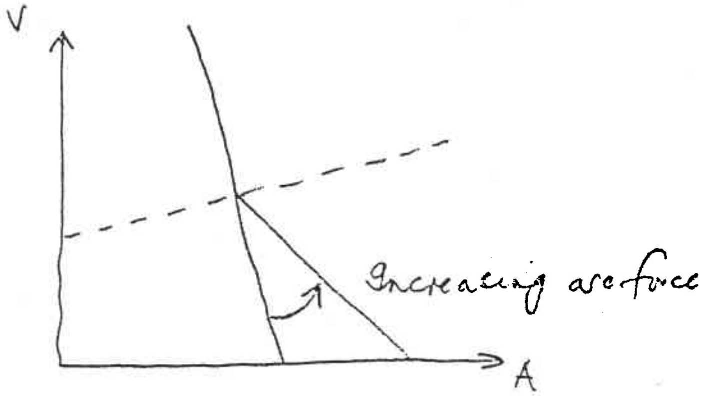
The current reference is circuitry around IC4A. This range of the main front panel current control depends on the setting of dip switches DS1-3 & DS1-4. The maximum current reference is buffered by IC4A and is output to the "option port" at P2-10. Dip switch DS1-1 is on and DS1-2 off in the 252 & 352 so the current reference from the "option port" (with slope up/down etc) is now fed to the local/remote control switch and remote foot control if used. So the current reference, which depends on the main current control setting and remote control settings is input at P1-7. Note in local, it also depends on start, slope and crater settings depending on where in the sequence we are. At idle, contactor off, it actually sits at the crater current setting.

The current reference, together with an offset reference set by preset R60 is buffered by IC4B and appears at TP4. This signal is passed to the option port (for the digital meter) and is summed with the current feedback signal at IC5A

Two further summing inputs to error amplifier IC5A are present providing an arc force control function and a second "accuracy improving" factor associated with the digital meter/preset circuit on the 352 (option on 252).



P3-3 of the control pcb is at electrode potential. IC4C rectifies the signal its output being +Varc/10. Amplifier IC4D uses this signal and the signal from the arc force control to generate a +ve reference which increases as arc voltage decreases. This reference is summed into error amplifier IC5A as arc force via diode D23.



To eliminate any arc force in TIG mode a positive signal is summed into IC4D via R83 & D19 when the "TIG contactor" is closed effectively disabling arc force.

IC5A is the "error" amplifier and compares the various +ve command and -ve feedback signals. Its output, -ve going to turn the machine "more on" is compared with the ramp signal by comparator IC5B. The square wave output TP7 drives the SCR firing circuits, the SCR's being gated when the signal transits negative to positive. If the error signal from IC 5A moves negatively, the SCR's are fired at an earlier angle and vice versa.

Transistor Q5 enables/disables SCR firing. If Q5 is on then the square wave at TP7 firing the SCR's is clamped to zero. Q5 can be turned off/on by the torch switch/contactor switch/sequence circuitry or on by the thermal switch/fault light circuit.

MMA Mode

Placing the contactor switch in the up (STICK) position grounds P1-20. Q5, which is held on by the output of IC6D (TP11) being high is now turned off via D14. The SCR's are fired turning on OCV etc. Also P2-16 is pulled low through D32 inhibiting the slope's etc on the slope pcb.

Note

Selecting Remote also disables the slopes etc via D33.

TIG Remote Mode - 2 Stroke

When the contactor switch is in the middle position the contactor etc are energised by a closure at the remote torch (or foot switch). When the torch switch is closed IC7 photo-transistor is energised by 24v ac from an auxiliary winding on the main transformer. The voltage at the collector of the photo-transistor is pulled to zero. Transistor Q3 is thus turned off which enables the balance function and disables the arc force function. Further the high ($\approx$ +12v) at Q3 collector causes C23 to begin charging via the preflow preset R37, and also drives comparator IC6B output low, which via D1 discharges post flow capacitor C2 and sets comparator IC6A output high, energising RL2 and hence the gas valve SOL1 from the 24v ac supply.

After any preflow time dependent on R37 and C23, IC6D output goes low (-10v) which turns off Q5, enabling the SCR's to be fired, and via comparator IC6C energises Q2 and RL1 and hence the HF. In this regard IC6C's +ve input is the I_{fb} signal which is -ve going (0 to -8v dependent on current). In start mode, fed from the output of IC6D the -ve input of IC6C is at approximately -0.1v dc ($\equiv$ 5A) so that when the arc is struck and current exceeds 5A (note the delay effect of R20/C11) the HF is turned off.

In continuos HF mode the -ve input of IC6C is at -10v dc so the current feedback is never enough to turn off the HF and it stays on continuously.

In HF OFF mode IC6C -ve input is held at approximately +12v so that Q2, RL1 and the HF are never energised.

When the torch switch is released photo-transistor IC7 immediately turns off (see also 4 stroke mode below), Q3 is turned on which via IC6D turns on Q5 and hence stops SCR firing. Also at this time, if HF is in the continuos mode, IC6C turns off Q2 and RL1 and hence the HF. IC6B output also goes high at this instant causing C2 to charge via the post flow potentiometer and when comparator IC6A -ve input exceeds 4V Q1, RL2 and the gas solenoid are turned off.

4 Stroke Mode

The 4 stroke circuitry is part of the slope module pcb. To this end the main board sends the torch switch signal to the slope board via P2-14 (this is actually the output of IC6B). Further P2-13 is held low by the slope pcb in 4 stroke mode from 1st torch switch press until 2nd torch switch release which means the "contactor" and gas valve remain energised throughout the operation.