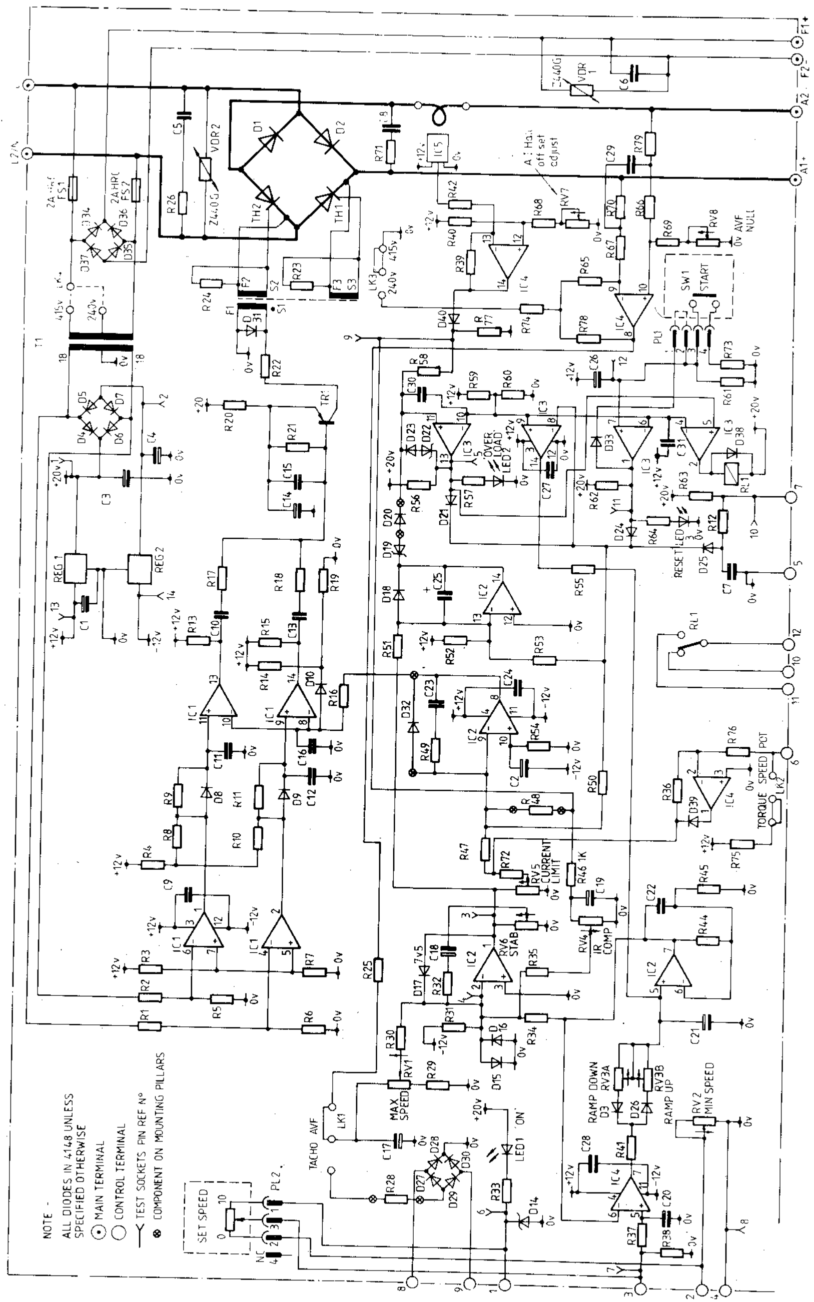
4. Circuit & Description

4.1 CIRCUIT SCHEMATIC



4.2 CIRCUIT DESCRIPTION

The LYNX combines conventional phase-controlled Thyristor technology with a comprehensive range of features to make a robust well-protected DC motor speed controller for use in drive systems. These features include control circuit isolation, torque control, status relay, high noise immunity and effective power circuit protection.

The circuit divides conveniently into 9 areas as follows:—

i) Main Power Stages — a full-wave half-controlled bridge is formed by Thyristors TH1, TH2 and rectifiers D1 & D2, D1 & D2 also form the freewheel path for commutated motor armature current. The incoming AC supply is effectively filtered by C5 & R26 which limit the dv/dt across the bridge. Overvoltage transient protection is given by varistor VDR2. The controlled DC output current to the motor passes through a pcb-mounted DC current transformer using Hall Effect monitoring, IC5, providing a fast, isolated, motor current monitor.

Armature voltage feedback is via an impedance isolated amplifier, IC4 pin 8, with programmable gain to ensure motor armature voltage matching. Pulse transformer PT1 gives gate trigger-pulse isolation.

Diodes D34-D37 form a separate full-wave, fused bridge for motor-field supply. Field circuitry is protected against high field-transients by capacitor C6 and varistor VDR1.

ii) Low-volt Power Supplies — Transformer T1 has a tapped primary and can be link selected — LK4 — to give operation on a 220/240 volt or 380/440 volt supply. The secondary supplies a 36 volt AC supply to rectifier bridge D4-D7. An unregulated +20 volt supply feeds the main thyristor trigger transistor TR1 and is also used to derive a +10 volt supply for the external speed potentiometer via zener D14 and R33. LED 1 indicates the 'ON' condition. Regulators 1 & 2 ensure stable + and − 12 volt control supplied for integrated circuits. Capacitor C2 ensures a logical power-up sequence by holding the output of the current amplifier, IC2 pin 8 negative until control status is achieved. The incoming supply to transformer T1 shares 2 Amp HRC fusing with the field supply rectifier circuits.

iii) Trigger Synchronisation — Transformer T1 also feeds AC signals, in anti-phase, to comparators IC1 pins 6 & 4. Comparator outputs on IC1 pin 1 & 2 show 50% duty-cycle square-waves swinging +/− 10 volt, again in anti-phase with positive edges, rounded as diodes D8 & D9 charge C11 & C12 respectively via R4, R8 & R10 forming a "ramp". IC1 pins 11 & 10 and 9 & 8 form 'ramp/pedestal' comparators for the anti-phase signals via D8 & D9. The pedestal signal — a DC level, is provided by the output of the current amplifier IC2 pin 8 via R16.

The ramp/pedestal comparator outputs are therefore square waves of variable duty-cycle but synchronised in time and phase with the AC supply zero cross-over points. R13/C10 and R15/C13 form differentiators, the resulting trigger edges being fed to trigger drive transistor TR1 via R17 & R18. Transistor TR1 feeds the gate pulse transformer PT1 via R22. Although each thyristor receives a trigger-pulse in both half cycles only the thyristor with forward volts across its anode-cathode will conduct. Because the trigger signal is synchronised in time (i.e. phase angle) good control of the DC output voltage is achieved.