



No Exposure condition for InnoVets and 325 / 360 generators. A455 Motor Start Board Troubleshooting

The A455 has a quick visual indicator LED which lights when all is ok for exposure. This should light approx. 1.5 seconds after PREP begins. Does Anode energize? If yes, does LED light?

Included for you here are the collected documentation for the A455 Motor Start board, and we suggest you always consider these failure instances in the following logical sequence (slightly revised sequence from prior documents included in attachment).

1. Measure Mains voltage to generator and adjust Line Compensation if needed.
 - a. Confirmation measurement, Chassis F1 to F2 should measure 120VAC, when **Generator ON**.
 - b. Test DC volts measured on motor start board across C3 capacitor, typical 20 to 24volts (unregulated, only at boost/run).
2. Measure proper connection of anode motor windings with ohm Meter, generator OFF.
You do not need to disconnect the cable unless ohms measured are incorrect.
 - a. COM.09 to MAIN.07 should be lowest measured value = 25 to 30 ohms.
 - b. COM.09 to AUX.08 should be approx 2x main = 50 to 60 ohms.
 - c. AUX.08 to MAIN.07 should be the sum, both windings = 75 to 90 ohms.
 - d. ALL windings must be Open to chassis ground, >1MEG ohm.

(Past cases a reverse wired tube had run for 5 or 6 years, and eventually current sensing reduced to below allowable limit. In some cases correcting the wiring recovers operation without parts.)
3. The anode motor Auxilliary Capacitor (also known as Start cap or Shift cap), location C1 on generator chassis, Summit part number HAB18, 25 μ F 450 VAC.
 - a. Measure AC Volts COM09 to MAIN07, note both boost (240v) and run (50v).
Do not use Auto-Range option on voltmeter. Instead, pre-set meter range to 400V or higher.
 - b. C1: Rarely service personnel have a meter to accurately measure this as a capacitor, so we test this as AC Volts measured COM09 to AUX08, expected are 350v boost and 70v run.
 - c. In case of erroneous readings, double-check by measuring directly on C1 capacitor.
 - d. Consider measured values in relation to main motor winding (07 to 09) values. MAIN winding values need to be correct before expecting AUX winding values to be correct.
4. Define Failure mode after windings and capacitor have been confirmed.
 - a. Time delay for motor and filament boost:
Generally this is confirmed with test 3a, but should be duration 1.5 seconds.
Adjust R17 to fine tune. If R17 has no effect, check also R16, CR11, C4, IC2 (type LM358).
 - b. Current sensing protection to prevent exposure to a stationary anode.
Confirm Reference to IC1 pin6 by measuring dc volts across R7, typical 1.6vdc.
Confirm Main sensed current by measuring dc volts across R20, typical 5.4vdc.
Confirm Aux. sensed current by measuring dc volts across R3, typical 5.9vdc
5. Bypass current sensing options:
 - c1. Short across R7 (setting reference to 0v).
6. SWAP or replace IC1 and IC2 (type LM325) - and repeat 4a and 4b to test for chip failure.



NO Exposure & No LED light on A455 Motor Start Board

FIRST – Check your line voltage and re-tap auto transformer if needed.

For the Spectra, this is simple operator task: hold the "Line Check" switch and turn the "Line Adjust" Tap switch so that the needle of the kV Meter is at "V" position.

Second, find which of the 2 general functions are failing, and then swap IC chips U1 and U2 to see if failure remains consistent, or if failure mode changes with change of chips then get new IC chips LM358N or equivalent.

Function 1 failure: Time Delay, Boost to Run.

Function 2 failure: Current sensing of the Rotor windings.

Failure 3: IC Chip failure.

1. Measure voltage to the Anode motor main winding

Where?: AC volts 07 to 09, located at bottom of TB3)

Normally 0V in idle, 240 VAC Boost (start of PREP) After 1.5 seconds 50 VAC Run (R17)

If correct, continue on to #2 current sensing.

If NOT correct, try adjusting the potentiometer R17. Time delay is created by R16, R17 and C4, and charging "ramp" can be checked at anode of Diode CR11.

2. Check resistance Ω of Anode windings, to be sure nothing has changed.

Main (07 to 09) measures 25 to 30 Ohms.

Phase (08 to 09) measures 50 to 60 Ohms.

SUM both (07 to 08) measures 75 to 90 Ohms.

NOTE: ALL SHOULD BE OPEN TO GROUND.

2b. Use (-) negative side of C3 capacitor for common or ground reference. Measure the following voltages during Boost or Run mode (sometimes measure separate for both boost and run), because this board is not powered at other times.

Positive side of C3 = 20 to 24 vdc (unregulated DC supply).

check both sides of R7. measurements should be 0 vdc, and 1.6 vdc (approx), this is your reference.

Phase current sensing: Cathode of CR1 should be approx 5.9 vdc

Main current sensing: Cathode of CR2 should be approx 5.4 vdc

If Main is OK but Phase is lower, then maybe you need to replace the C1 Rotor Capacitor.

Please call if you need any additional help.

Roger Frueh

Technical Support

Summit Industries Inc.

Toll Free 1 (800) 729-9729 ext 4037



Troubleshooting the A455 Motor Start Board

FIRST – check your incoming line voltage and if needed re-tap your auto transformer.

Note that the K1 relay energizes at boost, putting 240 VAC between the "07" main and "09" common terminals on the tube stator cable. This voltage drops to 50 VAC during the run stage of PREP as K1 drops out and K2 is energized. Due to the stator capacitor, there should be about 360 VAC during boost and 70 VAC during run between "07" main and "08" phase terminals.

1. Throughout the PREP sequence (both boost and run) there must be 1.5 VDC across R7. Use the right side of R20 at top of board for ground reference. This sets the threshold voltage for minimum main and phase rotor current.
2. Throughout the PREP sequence there should be about 5 VDC on IC1 pin 3, and 8 VDC on IC1 pin 5. This is the sensed rotor current for main and phase windings respectively.
3. As a result of these voltages, IC1 pin 1 goes to 12 VDC, and IC1 pin 7 goes to 10 VDC.
4. Throughout the PREP sequence IC2 pins 2 and 6 each go to 6 VDC.
5. IC2 pin 5 charges to about 7 VDC during the PREP sequence. Once it charges to about 5 VDC, the output at IC2 pin 7 goes to 10 VDC. The time it takes to charge is controlled by R17 and C4, typically 1.5 seconds.
6. When IC2 pin 7 goes to 10 VDC, K1 drops out and K2 pulls in, the 240 VAC is removed and 50 VAC is applied to the stator as the board transitions from boost to run.
7. The 10 VDC output of IC2 pin 7 also changes the 3.4 VDC seen at IC2 pin 3 in boost to 7 VDC, making the output of IC1 pin 1 go to 10 VDC. This 10 VDC output turns on Q4, which energizes K4, turns on the LED, and closes the connection between J6 pins 7 and 11, passing 120 VAC hot to the timer to initiate the exposure.

Please call if you need any additional help.

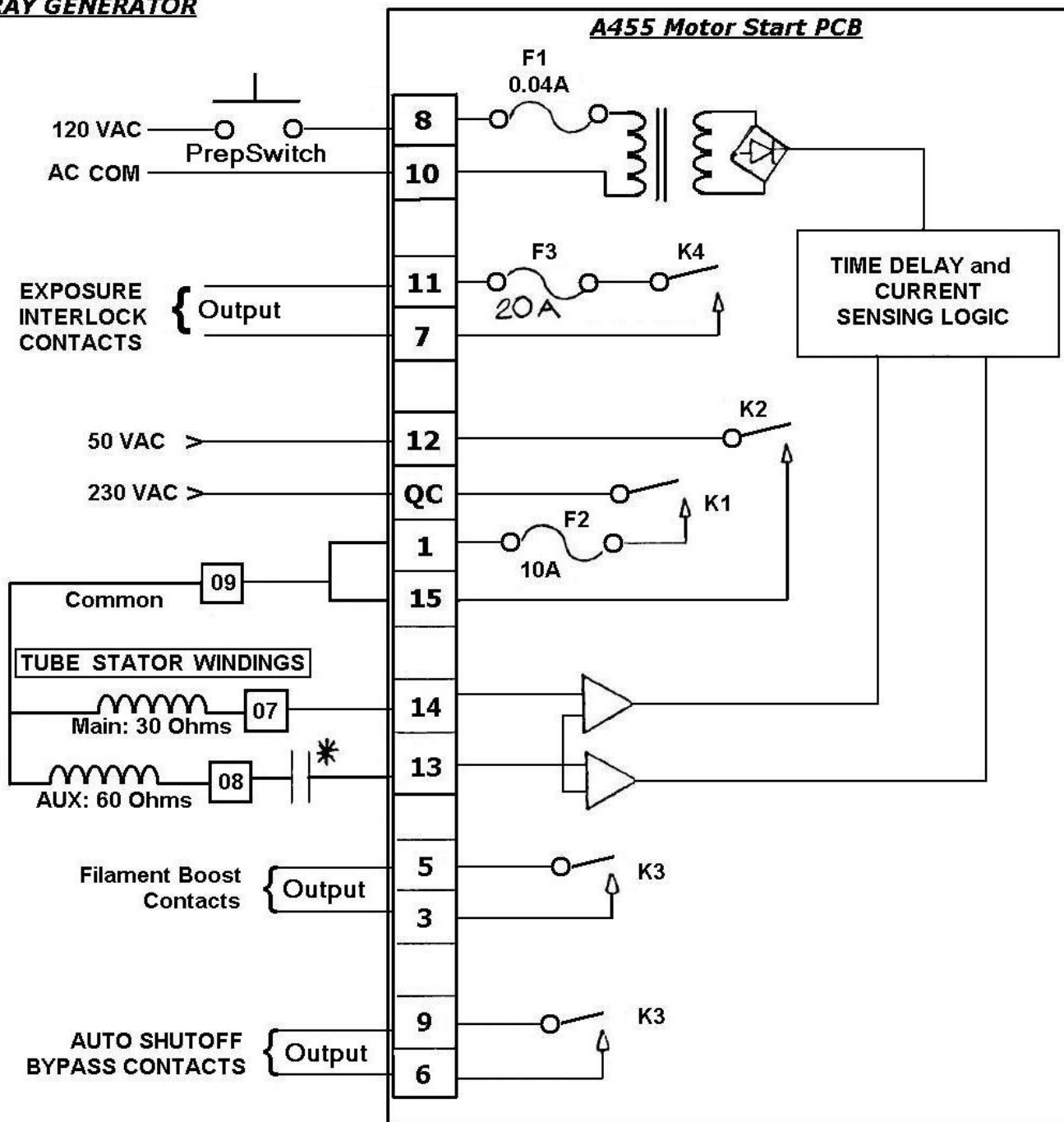
Best Regards,

Technical Support
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A455 Interfacing to the Generator

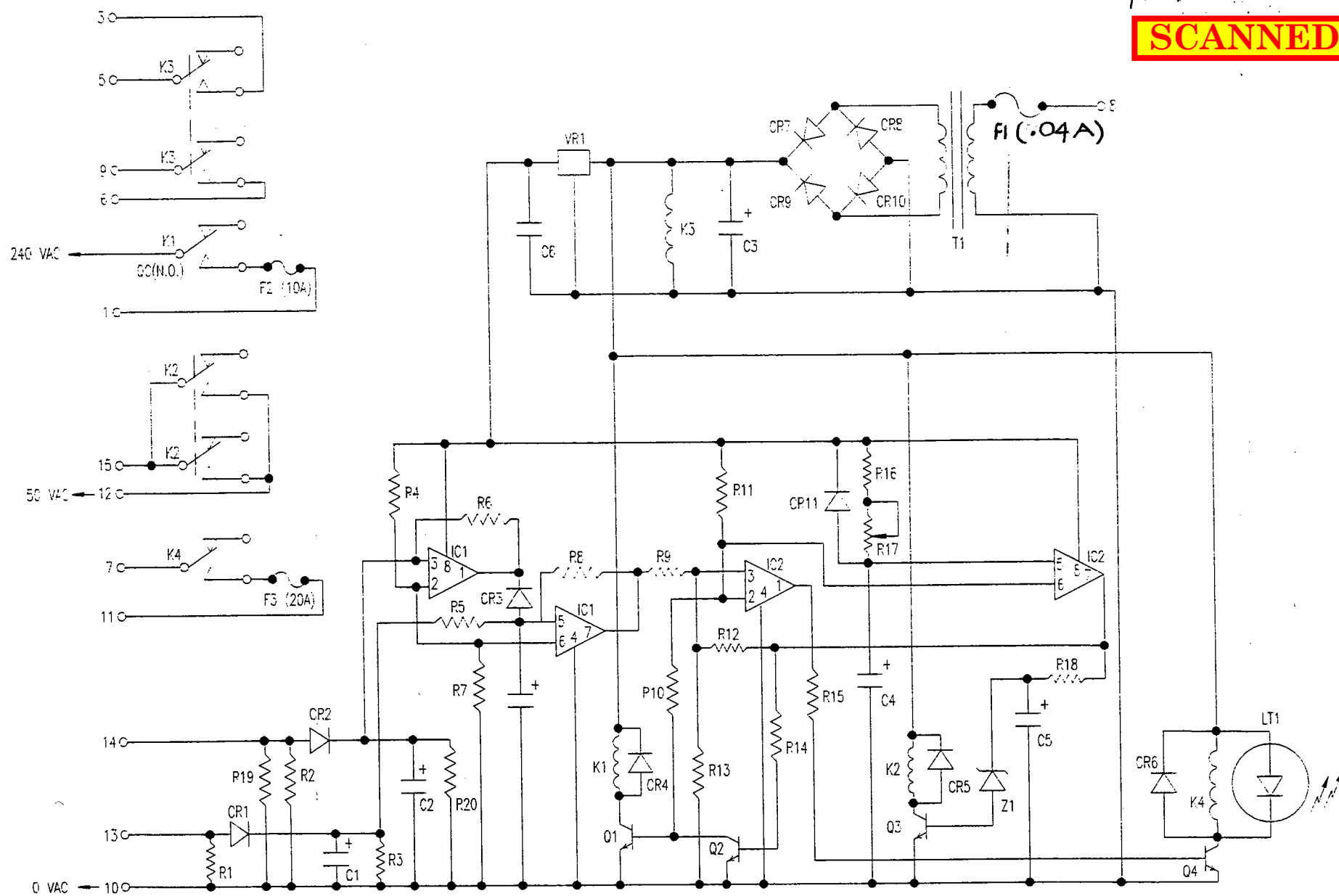
X-RAY GENERATOR



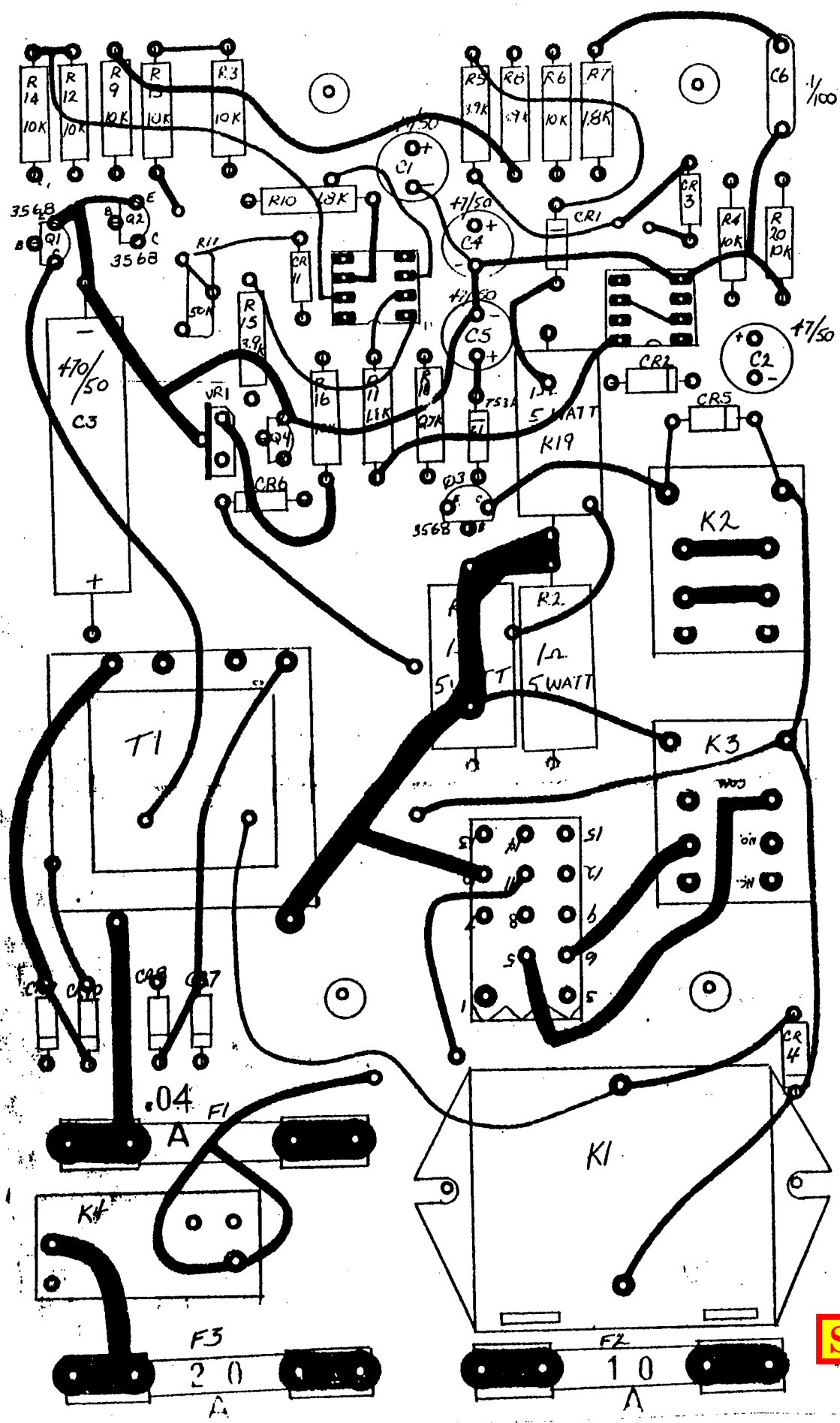
* PHASE SHIFT CAPACITOR: 25 μ F; Summit Part Number HAB18

A455 SHEET 4 OF 4
REV A

SCANNED



A455 SHEET 3 of 4
REV. A



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A455
REV. A

PARTS LAYOUT FOR MOTOR START CRCT (A455)