

TESLA TECHNOLOGY RESEARCH

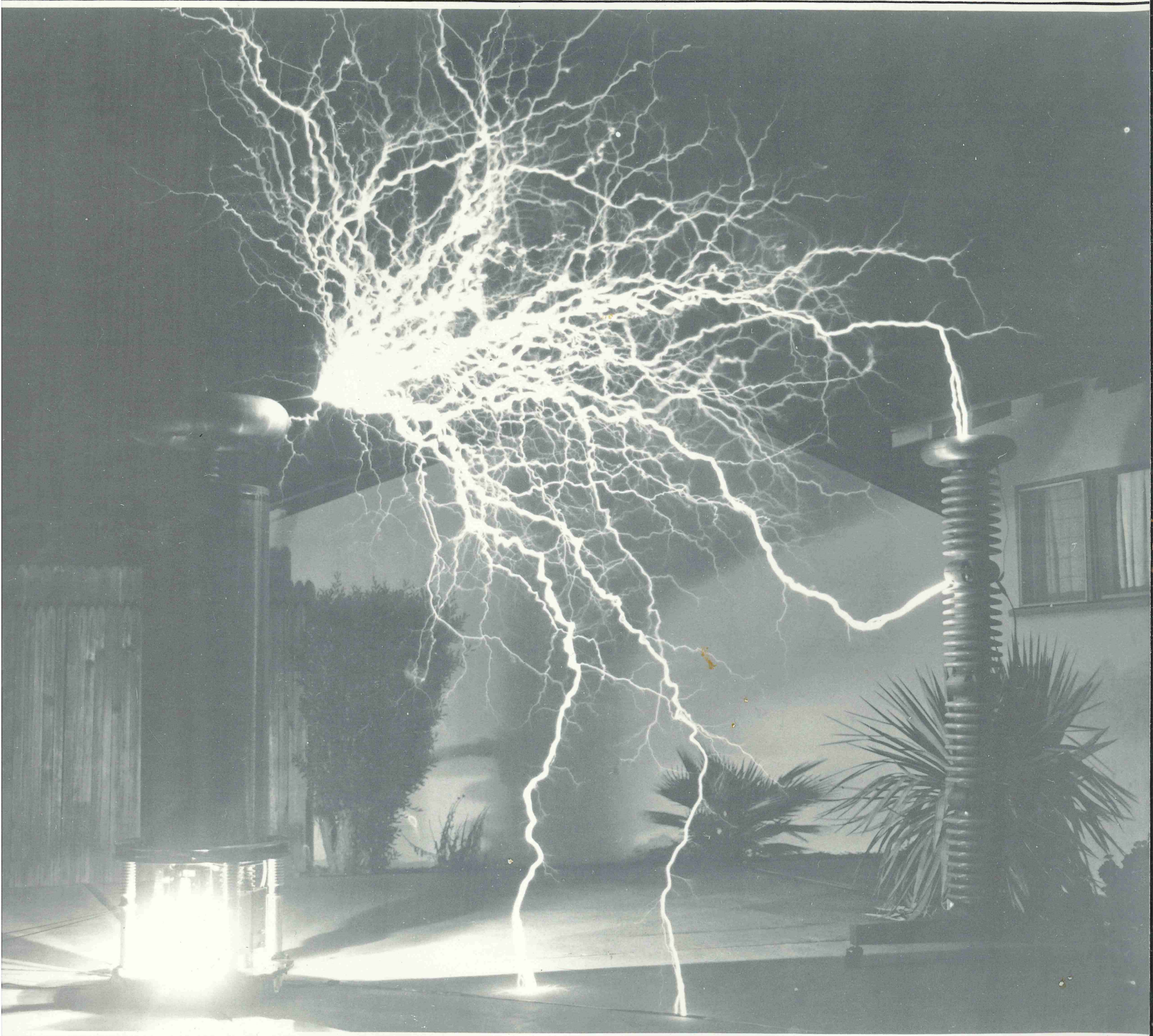
SUPER MODEL NINE TESLA COIL SYSTEM

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WARNING: READ ALL INSTRUCTIONS BEFORE ATTEMPTING ANY OPERATION OF THE SUPER MODEL NINE TESLA COIL SYSTEM. THIS EQUIPMENT IS EASILY CAPABLE OF DELIVERING A LETHAL ELECTRIC SHOCK.

SUPER MODEL NINE TESLA COIL SYSTEM



OWNER'S MANUAL

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— 2527 TREELANE AVE., MONROVIA, CA 91016 (818) 359-1373 —

file in
model 9 manual
original art



14720 ARROW HIGHWAY, BALDWIN PARK, CA 91706
(8 1 8) 9 6 2 - 6 9 8 5

DATE: 11-04-88

INVOICE #22453

• TELSA TECHNOLOGY RESEARCH

CUSTOMER #: 101

P.O. #:

ATTENTION:

OUR JOB #: 5382

JOB DESCRIPTION:

QUANTITY	ITEM	AMOUNT
4	HALFTONE/FINELINE	44.25
2	VELOX	14.50
SUBTOTAL:		58.75
6.5% SALES TAX:		3.82
TOTAL:		\$62.57

PAID
4153

PLEASE PAY FROM INVOICE - NO STATEMENT SENT UNLESS REQUESTED

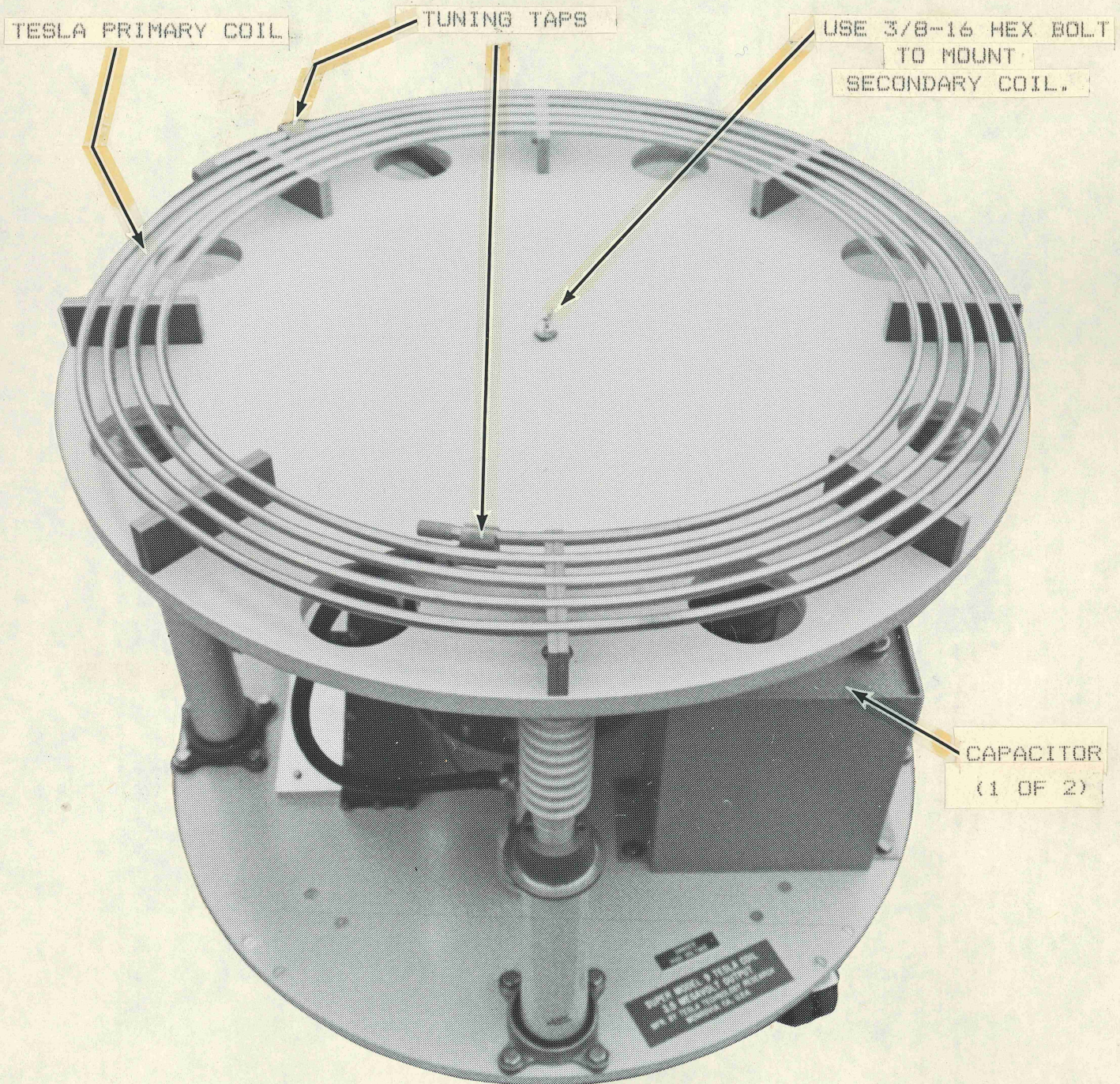
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1. PICTORIAL DESCRIPTION - TESLA SECONDARY COIL



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2. PICTORIAL DESCRIPTION - TESLA PRIMARY BASE UNIT



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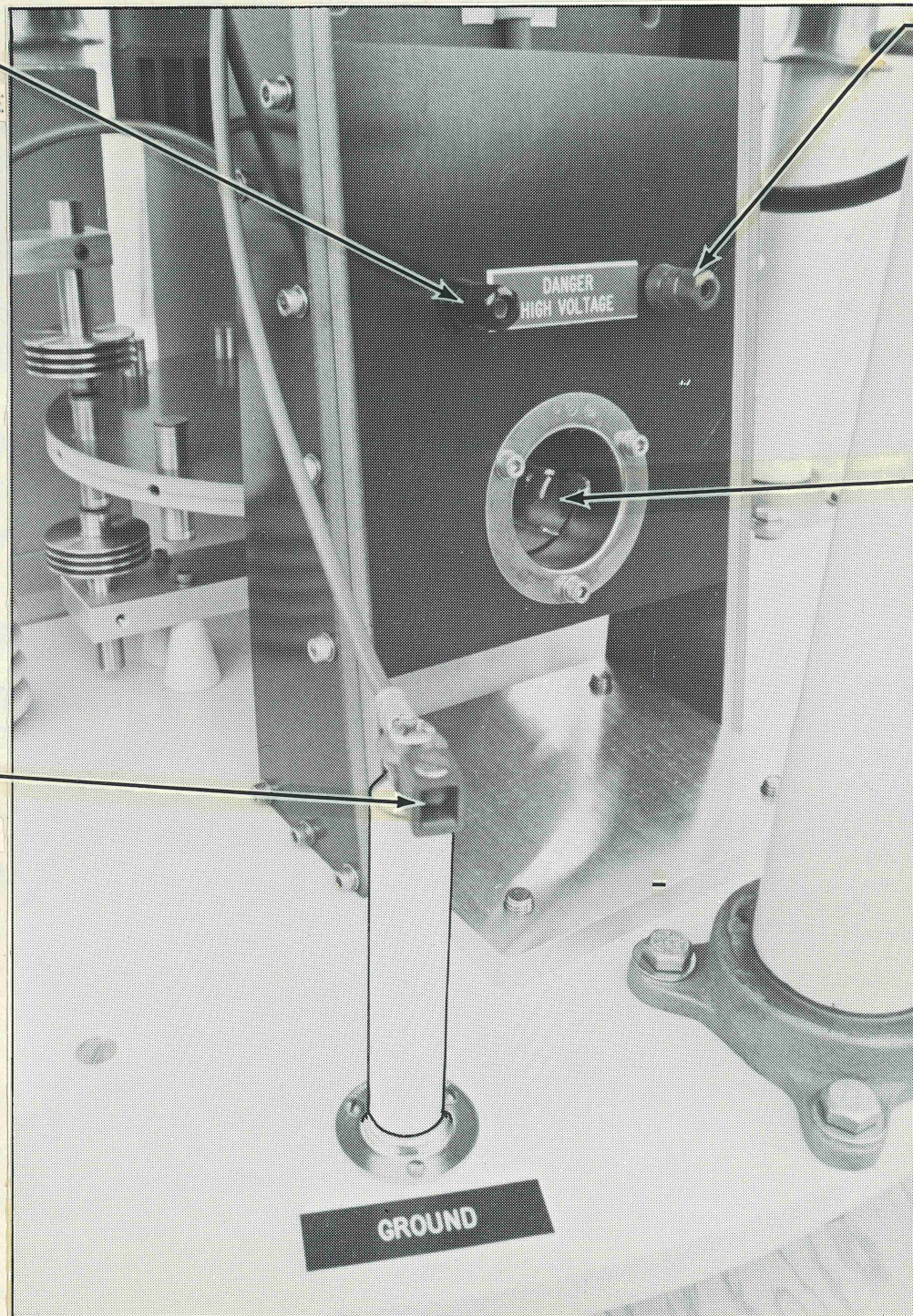
3. PICTORIAL DESCRIPTION - BASE UNIT CONNECTOR TERMINALS BASE UNIT SECONDARY GROUND

BLACK
TERMINAL:
(GROUND SIDE
OF H-V
XFORMER.)
SEE TEXT.

RED
TERMINAL:
(HIGH
VOLTAGE
SIDE OF
H-V
XFORMER.)
SEE TEXT.

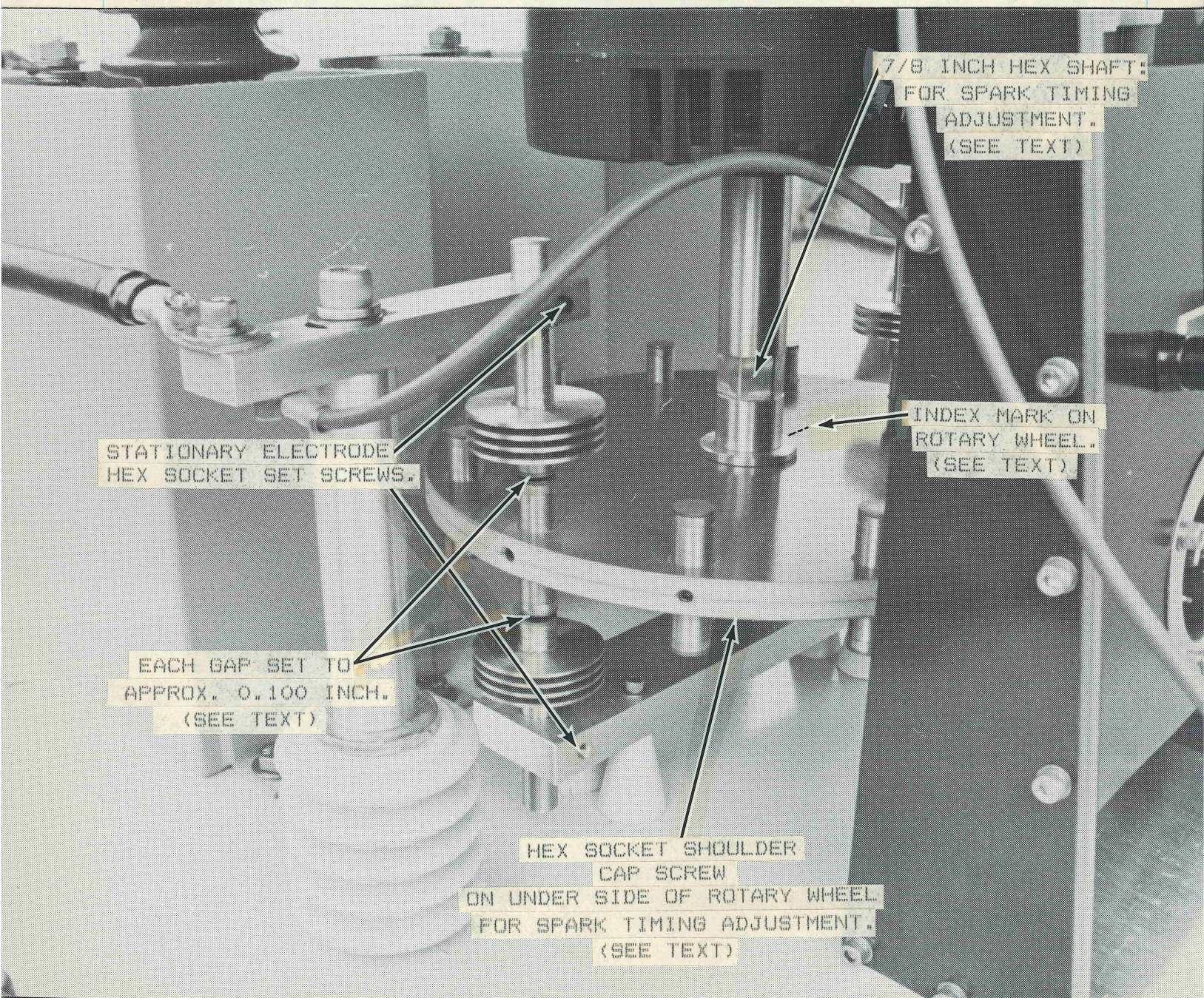
ROTARY GAP
MOTOR
POWER
INPUT.

THIS
TERMINAL
MUST GO TO
SEPERATE
EARTH
GROUND.
(SEE TEXT)



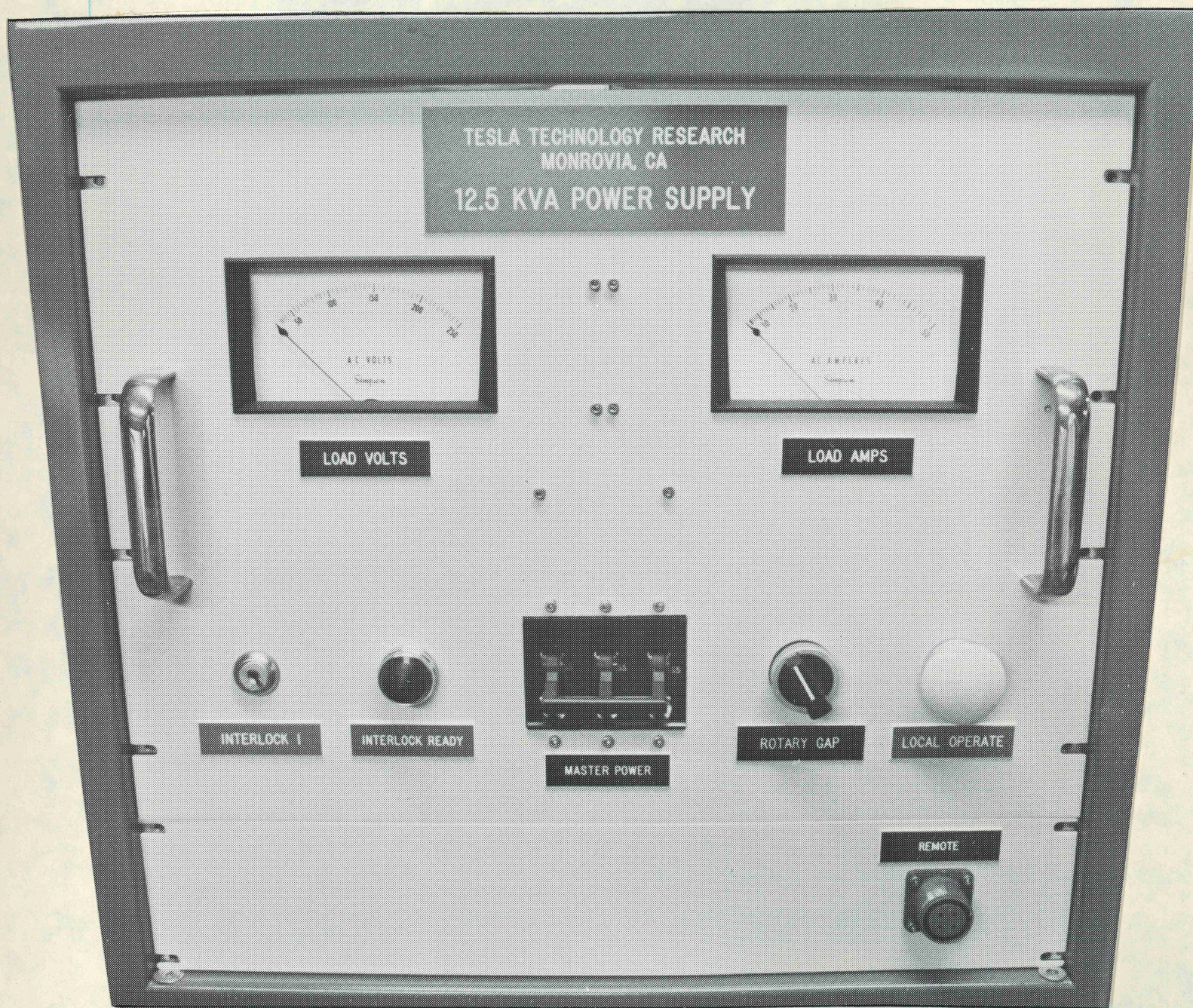
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4. PICTORIAL DESCRIPTION - BASE UNIT ROTARY GAP ASSEMBLY



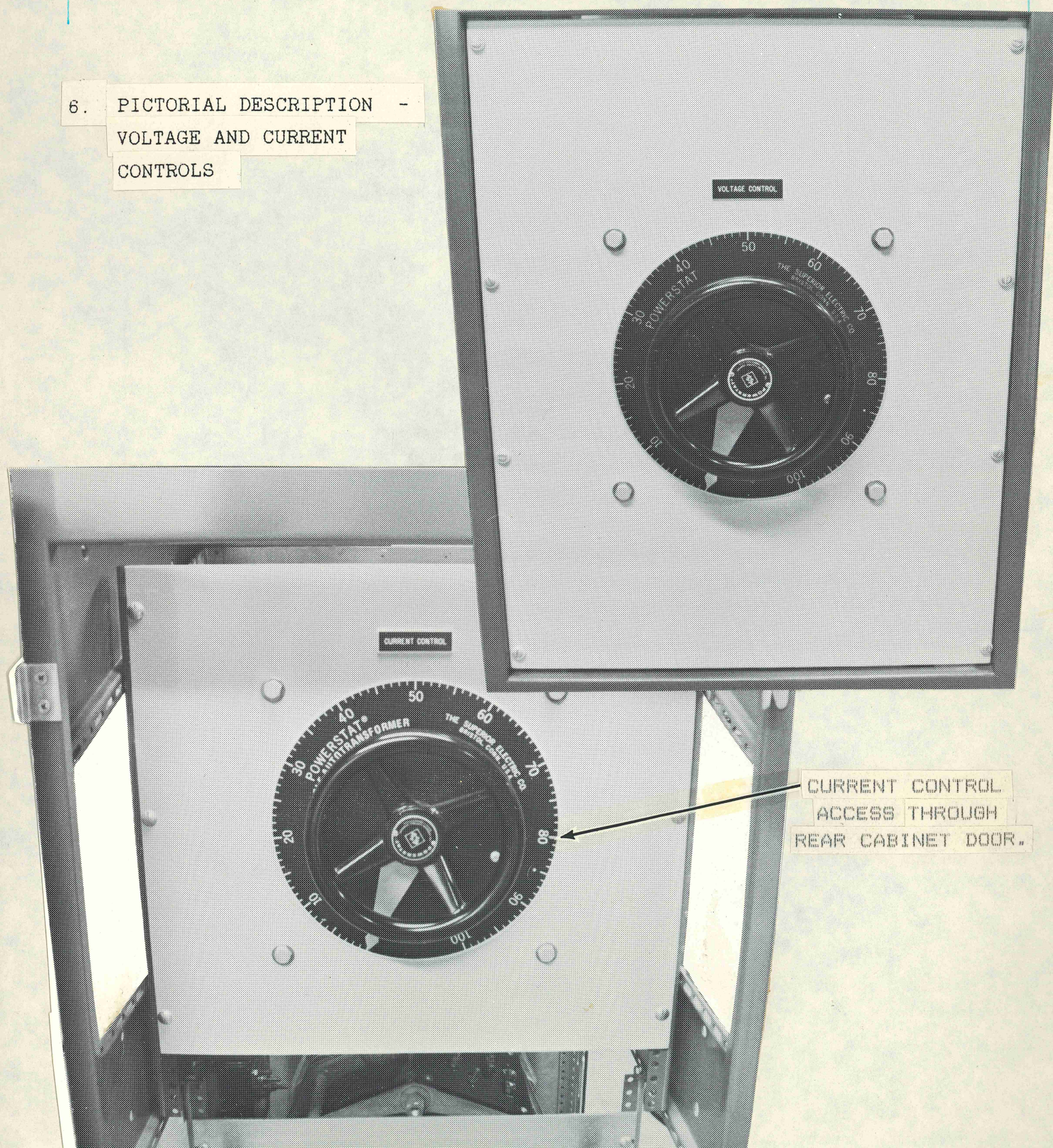
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5. PICTORIAL DESCRIPTION - CONTROL CONSOLE OPERATING PANEL



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6. PICTORIAL DESCRIPTION - VOLTAGE AND CURRENT CONTROLS



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7. UNPACKING INSTRUCTIONS - SUPER MODEL NINE TESLA COIL

The Super Model Nine Tesla Coil System is shipped in three separate 3/4 inch thick plywood wood crates. One crate contains the Tesla Coil Primary Base Unit, and the 30 inch aluminum toroid discharge electrode. The second crate contains the Tesla Secondary Coil, and the third crate, the Super Model Nine Control Console and interconnect cables. The base unit crate and the secondary coil crate are opened by removing the top crate covers first. These covers are fastened with flat head phillips wood screws. The console crate is opened by removing the side plate that is fastened with the flat head phillips wood screws. Visually inspect all viewable contents for any signs of damage before attempting further unpacking. If any items appear to have sustained shipping damage, do not unpack the item(s). Contact the insurance carrier retained by the shipping firm to file a damage report. Assuming all items initially appear to be in good condition, proceed as follows;

- 1.) Remove the 30 inch toroid discharge electrode. Be sure to always handle this aluminum spinning with great care, as it can be easily scratched or dented. Wear soft cloth gloves in handling the toroid to avoid placing oils and acids from the hands onto the surfaces of the metal spinning.
- 2.) Remove the cardboard spacers from all four corners around the base unit. Using two people, lift the base unit vertically out of the crate, and set the unit on the floor on the base unit castors. SPECIAL NOTE: REMOVE THE BLACK ELECTRICAL TAPE THAT IS WRAPPED AROUND ONE SIDE OF THE ROTARY GAP STATIONARY ELECTRODE ASSEMBLY. This tape is provided to prevent unwanted movement of the rotary gap wheel during shipping. Discard the tape, and gently turn the rotary gap wheel by hand, to make sure that it rotates freely and without obstruction. Inspect the rest of the components to make sure nothing is broken or loose from shipping.
- 3.) The Secondary Coil is removed by un-screwing the 3/8-16 hex head bolts on both ends of the crate. Carefully lift the coil out of the crate, and place the unit upright on the floor. The necessary hardware for attaching the secondary coil to the primary base unit is in the center of the upper base plate. Simply remove the wing nut and washer. Save all packing material and hardware. The hardware for attaching the toroid on top of the secondary coil feed-thru insulator will be found in a separate small plastic bag.
- 4.) For the control console, after removing the crate side panel, use this panel with some sort of support blocks to build a ramp, in order to roll the console out of the crate on its castors, down to the floor. Remove the plastic bags containing the interconnect cables, remove all foam packing blocks, and then remove the control console.

This completes all unpacking procedures. Proceed to the next section.

NOTE: REMEMBER TO SAVE THESE CRATES AND PACKAGING MATERIAL FOR ANY FUTURE POSSIBLE SHIPPING REQUIREMENTS.

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8. INSTALLATION PROCEDURE

The Super Model Nine Tesla Coil System has been designed and constructed for simple and effective installation. First, determine the exact location for the Tesla Coil Base unit. This base unit must be placed on a solid, flat surface, such as a concrete floor. This floor serves as an electrical ground plane, and is necessary for proper electrical resonance tuning of the Tesla Coil system. The base may be raised up off its swivel castors, to prevent any movement from the installed position, provided the raised distance does not exceed six inches. Re-enforcement steel bar, normally associated in all commercial concrete floor construction, serves as an electrical counter-poise, which will work effectively as a ground plane for this Tesla Coil system. The amount of floor space required for installation should include a minimum radius from the base unit center of twelve feet, horizontally measured. Depending on the desired corona discharge path(s), a vertical clearance of twenty-five feet, measured from the floor, will be required if this coil is to develop the maximum length discharge streamers possible. If corona points are arranged in a lateral manner about the equator of the toroid, this vertical height specification may be reduced to eighteen feet. Of course, smaller clearance dimensions are acceptable, provided the maximum possible arc length of fifteen feet is not a major requirement of the installation. In such cases, it is strongly recommended that deliberate grounded arc targets be arranged for the Tesla Coil to discharge to, in order to prevent any possibility of the arc causing physical damage to surrounding objects. If the Tesla Coil is to be placed inside of a Faraday Screen or Cage, the metal mesh or wire cloth should be uniformly spaced around the coil, without any physical obstructions.

Once the Base Unit has been placed, the Secondary Coil may be secured to the upper top plate, using the single 3/8"-16 hex head machine bolt provided. This bolt provides both mechanical and electrical connection for the lower end of the Secondary Coil, (refer to pictorial descriptions 2 and 3 for details.) The 30 inch aluminum discharge toroid may now be secured on top of the Tesla Secondary Coil feed-thru insulator, using the hardware provided.

The Control Console may be located in any convenient location away from the Base Unit, up to the full length of the Rotary Gap interconnect cable provided, a distance of approximately twenty-five feet. The High Voltage Power Supply Transformer should be located adjacent to the Control Console, using the prefabricated interconnect cable provided. Also utilize the High Voltage cable provided for connection between the supply transformer output, and the input of the Base Unit, (see schematic diagram and pictorial 3 for details.) When using an unbalanced high voltage output configuration, it is **ABSOLUTELY ESSENTIAL THAT THE GROUND SIDE OF THE HIGH VOLTAGE WINDING GO TO THE BLACK TERMINAL, AND THE HIGH VOLTAGE SIDE GO TO THE RED TERMINAL; FAILURE TO FOLLOW THIS INSTRUCTION COULD CAUSE SERIOUS DAMAGE TO THE EQUIPMENT.** Refer to the schematic diagram for this connection.

A dedicated A.C. power line should be run to an outlet that can be placed close to the Control Console. This feed should be rated for 60 amps, 208 to 240 volts, single phase. Connect the Control Console green lead to ground, the white wire to A.C. common (or neutral,) and the black lead to A.C. high, (hot.) Referring to Pictorial Description Three, note the location of the insulator labeled "GROUND." This terminal is the input for the Tesla Secondary Coil, and **MUST BE RUN AS A SEPERATE LINE TO A VERY GOOD EARTH GROUND.** The physical

TESLA TECHNOLOGY RESEARCH

INSTALLATION PROCEDURE, CONT'D

length of this line should be kept as short as possible, and should not exceed fifty feet in length. Use #1 A.W.G. (American Wire Gauge,) stranded copper wire for this connection. The grounding point can be made to the building steel framework, provided this framework also is solidly connected to a low resistance earth ground.

The high voltage cable, provided for connection between the high voltage power supply transformer and the Tesla Coil Base Unit input terminals, can be run inside metal conduit if desired, or may be run in an open metal cable tray. In either case, the tray or conduit should be bonded to electrical ground for safety. This cable is rated for 40,000 volt insulation and should give many years of service.

If the Tesla Coil is to be operated inside of a Faraday Cage, the cage and its associate metal framework should be bonded to the same #1 A.W.G. wire that is run for the Secondary Coil ground. The most desirable point of bonding the cage is at the Tesla Coil Base Unit grounding terminal.

Tuning of the Super Model Nine Tesla Coil System is affected by objects or surfaces around the Secondary Coil. In the case of a Faraday Cage, the effect is that of increased parallel capacitance in the Tesla Secondary circuit. System resonance can be adjusted by altering the location of the outermost Tesla Primary Coil tap location, thus increasing or decreasing the primary circuit series inductance. AS SHIPPED, THIS TAP HAS BEEN SET FOR THE CORRECT POSITION WHEN THE TESLA COIL IS LOCATED INSIDE A FARADY CAGE OF 20 FOOT INSIDE DIAMETER, AND SHOULD REQUIRE NO FURTHER ADJUSTMENT.

Tuning is additionally affected by the index of the Rotary Spark Gap wheel with respect to its brass motor arbor (DWELL ANGLE,) Voltage and Current control settings, and Rotary Gap individual gap setting. Initially, this gap is factory set at 0.100" per gap, giving a total for all four gaps of 0.400". This total gap spacing should not require any adjustment, except for rotation of the stationary electrodes, as discussed in the section on ROUTINE MAINTENENCE. Refer to the Pictorial Description on page four.

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9. OPERATING INSTRUCTIONS - PRECAUTIONS

Pictorial Description numbers five and six show the operation controls for the Super Model Nine Tesla Coil System. Looking at the illustration of the main control panel, note the remote connector, located at the lower right; this connector allows remote control of the Rotary Gap and Local Operate panel switches, (refer to the schematic diagram designation "J4".)

WARNING: UNDER NO CIRCUMSTANCES SHOULD POWER BE APPLIED TO THE SYSTEM UNTIL ALL GROUNDING AND WIRING INSTALLATION WORK HAS BEEN SATISFACTORILY COMPLETED. ANY PERSONS POSSESSING ANY FORM OF ELECTRO-CARDIAC DEVICES (PACEMAKERS) SHOULD LEAVE THE AREA BEFORE ANY ATTEMPT IS MADE TO OPERATE THE SUPER MODEL NINE TESLA COIL SYSTEM. THESE PRECAUTIONS ARE ABSOLUTELY NECESSARY FOR YOUR PROTECTION. WHEN THE SUPER MODEL NINE TESLA COIL SYSTEM IS INSTALLED INSIDE OF A PROPERLY DESIGNED FARADAY CAGE, THE PACEMAKER WARNING NEED NOT APPLY.

Initial operation should be with the current control knob set at about "70" on its dial face, and the voltage control knob set at "0". Turn on the Master Power multibraker switch. The two meters, A.C. VOLTS and A.C. AMPS should show dial face illumination. Next, insert the key on the switch marked "INTERLOCK 1." Turn this key to the right. The large red pilot light next to this switch marked "INTERLOCK READY," should light. Now turn the black knob marked "ROTARY GAP," to the right. You should hear a relay close, and the Rotary Gap Motor energized. This motor has had its armature ground to convert it from 1450 R.P.M. NON-SYNCHRONOUS, TO 1500 R.P.M. SALIENT-POLE SYNCHRONOUS OPERATION. A steady, even sound should be heard from the running of this motor, indicating synchronous rotor rotation with respect to the 50 Hertz line frequency. If for any reason the sound coming from this motor varies, as in the case of the rotor "hunting" or "surging," immediately turn off the power, and contact Tesla Technology Research, for further instructions. Assuming all is correct to this point, turn the VOLTAGE CONTROL clock-wise to the "50" position on its dial. The A.C. VOLTS meter should now show an indication of about 120-140 volts. Now momentarily push in the yellow push button marked "LOCAL OPERATE," and then release. A second relay should be heard to close, and a loud acoustic report of sparks from the Rotary Gap. If no sparking occurs at the Rotary Gap, or only some occasional sparking, increase the Voltage Control to read 180 volts on the voltmeter, and try again. When the point has been reached on the Voltage Control where a steady, continuous sound of sparking occurs at the Rotary Gap, take note of the current reading on the A.C. AMPS meter. It should read between 10 to 40 amps, and may vary somewhat while the Tesla Coil is energized. Place a piece of heavy guage wire on top of the 30" aluminum discharge toroid, such that one end protrudes horizontally out from the equator about 12 inches. Using an assistant as an observer, to watch the characteristics of the corona discharge issuing forth from the end of this wire (corona point,) again energize the Tesla Coil. Make a note of the length and intensity of the corona streamers issuing from the end of the corona point. Also note the voltage and current readings.

Try varying the voltage control to achieve the minimum setting where the Tesla Coil discharges in a steady manner. Once this point has been found, next try varying the current control knob, to further enhance the steadiness of the

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OPERATING INSTRUCTIONS CONT'D

discharge. Typically, you will notice that there is a certain "range," over which the coil operates, with one point where it will also be observed that the lowest current reading is obtained, while maintaining steady discharge output. This point is to be noted and maintained. Very little further adjustment of the current control will be required for further general tuning. What has been accomplished by this exercise, is power factor compensation of the characteristic impedance of the A.C. supply circuit to the high voltage supply transformer input, and its complex impedance load to the Tesla Primary resonant tank circuit. Further enhancement of the length and quality of the discharge may require re-positioning the index mark between the Rotary Gap wheel and its associate brass motor arbor mounting. To accomplish this, first turn off all power to the console, and allow the Rotary Gap wheel to slow to a stop. Using an open-end wrench on the hex-faced portion of the arbor, hold the motor shaft from turning, and use an allen hex key to loosen the cap screw on the underside of the Rotary Gap wheel. Change the index mark by about 3-5 degrees, and retighten. Refer to Pictorial #4. Now repeat the above testing procedure. After several combination of settings, the best possible discharge will be secured from the toroid corona point, for a minimum power input level.

SPECIAL NOTICE: THIS TUNING AND ADJUSTMENT PROCEDURE MUST BE CARRIED OUT BY QUALIFIED ELECTRICAL TECHNICIAN PERSONNEL. IF YOU ARE UNSURE IN FOLLOWING ANY OF THESE STEPS, DO NOT PROCEED TO OPERATE THIS SYSTEM. CONTACT TESLA TECHNOLOGY RESEARCH AT ONCE, FOR FURTHER ASSISTANCE.

Assuming all above steps have been satisfactorily completed, you are now ready to adjust the Super Model Nine Tesla Coil System for its maximum output. Energize the system in the prescribed manner, depress the local operate button, and hold it closed. Adjust the VOLTAGE CONTROL to a higher setting, watching the A.C. AMPS meter, so as to not exceed 50 amps on the meter. The observer should be at a distance at least 25 feet away from the Tesla Coil, and have a clear view of the toroid corona point. The primary job of the observer, is to watch for any possibility of any spark breakdown between the Tesla Primary and Secondary Coils. Should this occur, IMMEDIATELY STOP OPERATION OF THE TESLA COIL. Verify that all ground connections and other wiring is intact. It is possible that some slight re-adjustment of the Rotary Gap wheel index, the Console current control, or Rotary Gap gap spacing will have to be performed. The TOTAL GAP SPACING MUST NOT EXCEED 0.400" or 0.100" per gap. Likewise, the smallest individual gap setting should not be less than 0.050" per gap. Use a machinist's feeler gauge to set the gap spacing. When all adjustments have been properly made, the Tesla Coil will be capable of reliable streamer corona discharges up to fifteen feet in length, with no spark breakdown near the base of the Secondary Coil. This output represents approximately 3.5 million volt output potential. Keep a permanent written log of all the adjustments made to this system, including maintenance operations. By merely adjusting the VOLTAGE CONTROL between the minimum and maximum noted settings, the output of your Super Model Nine Tesla Coil System can be regulated for a spark length between several feet, up to about fifteen feet.

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OPERATING INSTRUCTIONS CONT'D

It is recommended that each period of operation of the Super Model Nine Tesla Coil System be limited to a maximum continuous "ON" state not to exceed 10 seconds, with a minimum intervening "OFF" state of one minute. This recommendation is made in order to allow for a maximum life-cycle of the system. Higher order duty cycles will impose more intensive wear on the Control Console autotransformers, the Rotary Gap stationary electrode faces, and eventual heating of the dielectric insulation in the Primary circuit oscillation capacitors. The REMOTE panel connector may be wired to a separate panel, to allow for more convenient demonstration applications, or it may be placed under automatic control from a computer, using external relays in place of manual switches. In any case, the system WILL NOT OPERATE when the KEY SWITCH is in the "OFF" position.

10. ROUTINE MAINTENANCE

After every hour of accumulated operation, under normal circumstances, the Rotary Gap stationary electrodes must be rotated in their mountings, to promote an even wear pattern of the tungsten electrode faces (refer to Pictorial #4.) Locate the hex-socket set screws for each of the stationary electrodes, and loosen so that the electrodes can be rotated approximately 20 degrees in rotation. Using a machinists' feeler gauge, re-gap each of the four stationary electrodes to the original gap settings previously used, and tighten the set screws. Caution: do not over-tighten these set screws; the brass rods are a relatively soft metal, and can easily be gouged, making future adjustments more difficult. Note these adjustments in a written maintenance log sheet, including date, operation performed, and initials of the person making the adjustments. Replacement parts, if required, are available from Tesla Technology Research. Under normal conditions, the rotary electrodes on the Rotary Gap wheel, will require no maintenance at all. The exposed surfaces of the Tesla Primary and Secondary Coils should be kept dry and clean from any dust or debris at all times.

WARNING: MAKE SURE ALL ELECTRICAL POWER TO THE CONTROL CONSOLE IS TURNED COMPLETELY OFF BEFORE ATTEMPTING ANY ADJUSTMENTS OR MAINTENANCE TO THE SUPER MODEL NINE TESLA COIL SYSTEM. A LETHAL ELECTRIC SHOCK HAZARD EXISTS IN THE COMPONENTS OF THIS SYSTEM. REMOVE THE KEY FROM THE CONTROL CONSOLE PANEL DURING MAINTENANCE PERIODS. YOU ARE RESPONSIBLE FOR YOUR OWN SAFETY AS WELL AS FOR OTHERS IN THE VICINITY OF THIS SYSTEM.

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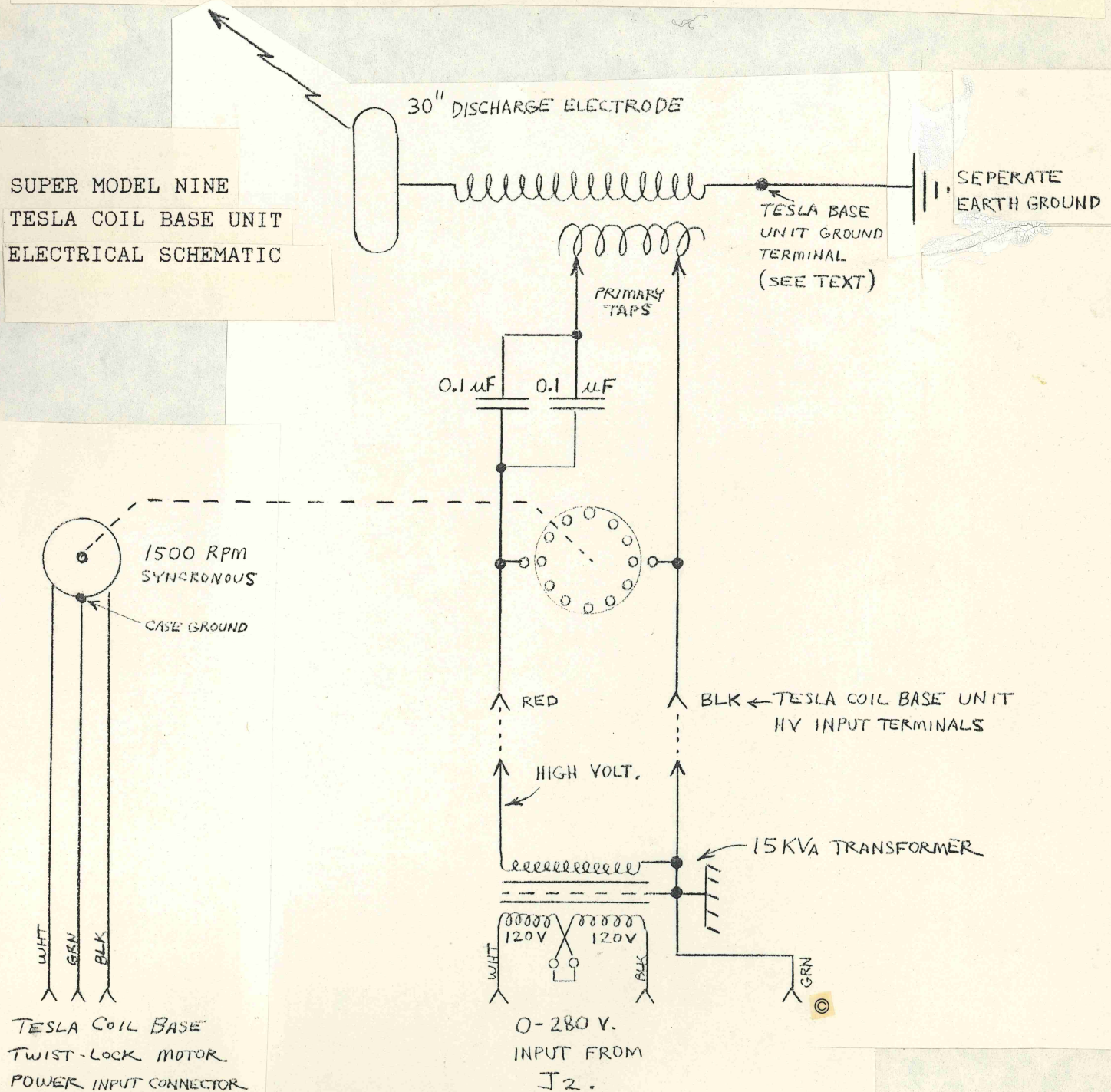
11. POWER REQUIREMENTS AND SCHEMATIC DIAGRAMS

The basic electrical parameters of the Super Model Nine Tesla Coil System are as follows:

Power input: 208-240 V.A.C., 50 Hz. single phase, 35-50 amps nominal.

Output: 3,500,000 volts (3.5 MV) maximum, 80-95 KHz.

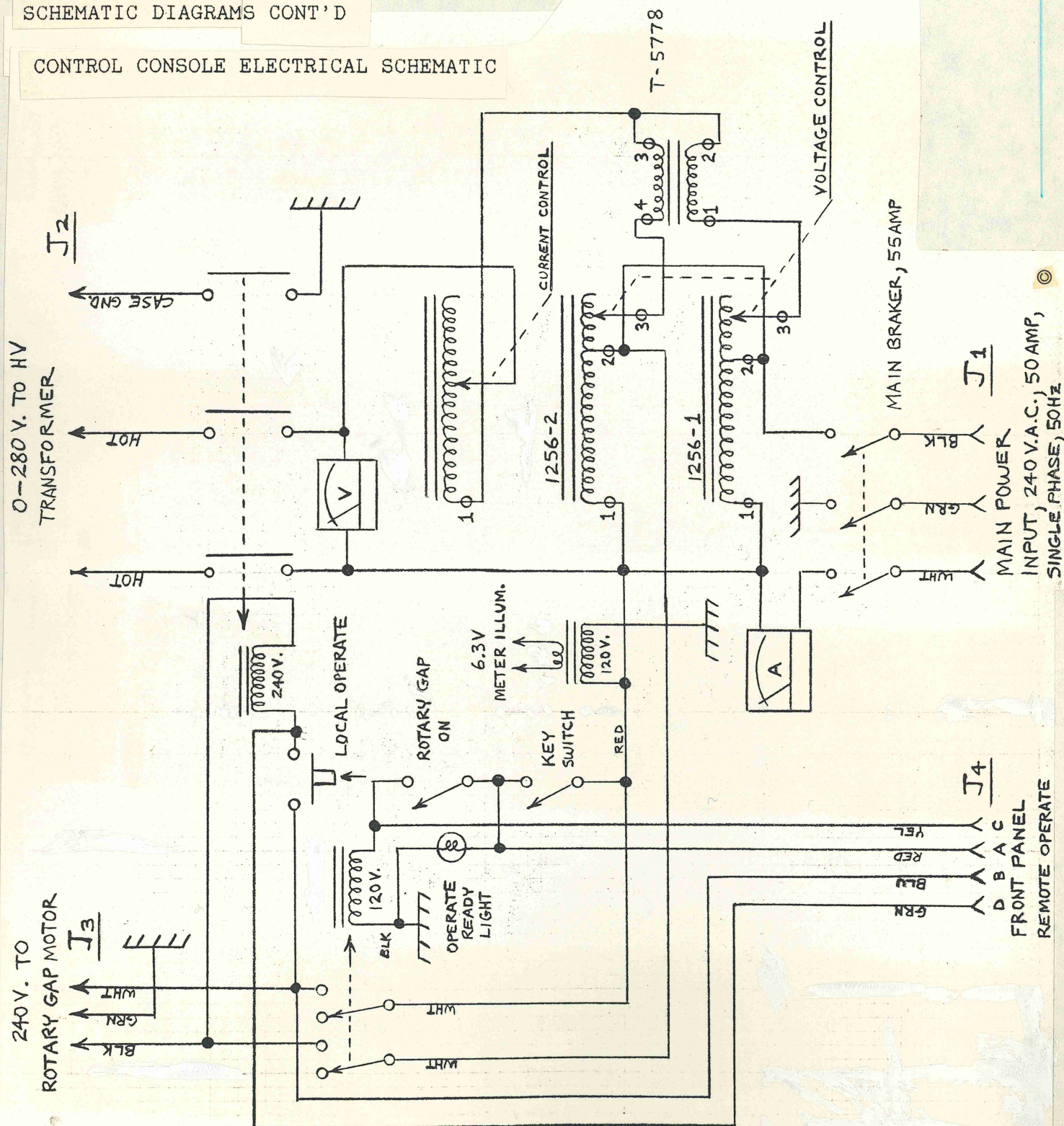
SUPER MODEL NINE
TESLA COIL BASE UNIT
ELECTRICAL SCHEMATIC



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SCHEMATIC DIAGRAMS CONT'D

CONTROL CONSOLE ELECTRICAL SCHEMATIC



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12. WARRANTY

PLEASE READ CAREFULLY - THIS IS A LIMITED WARRANTY

Tesla Technology Research warrants the complete Super Model Nine Tesla Coil System to be free of defects in workmanship and materials for a period of one year from the date of original purchase, and hereby certifies that this equipment functions as in accordance with its design parameters at the time of shipping. This warranty does not cover the customer's use of this equipment, as Tesla Technology Research has no control over the Super Model Nine Tesla Coil System after shipment to the customer.

Tesla Technology Research assumes no liability for the operational safety of the customer's installation of the Super Model Nine Tesla Coil System.

It is understood that a LETHAL ELECTRIC SHOCK HAZARD exists in the components of the Super Model Nine Tesla Coil System, and that the customer assumes all necessary installation and operation safety requirements of this system. Technical supervision assistance is available from Tesla Technology Research.

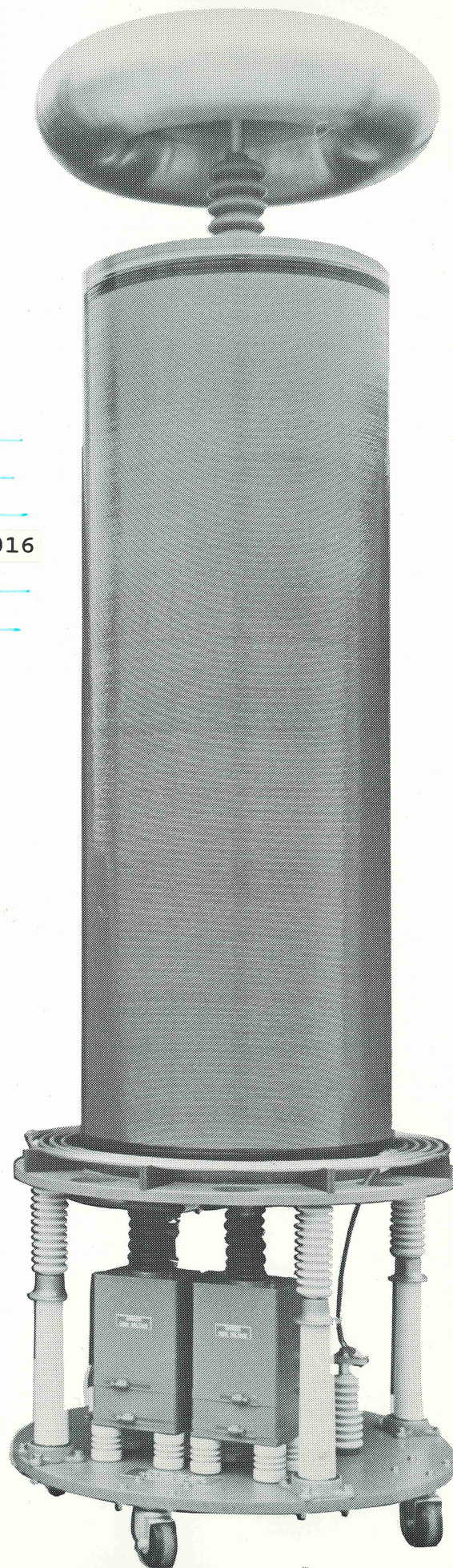
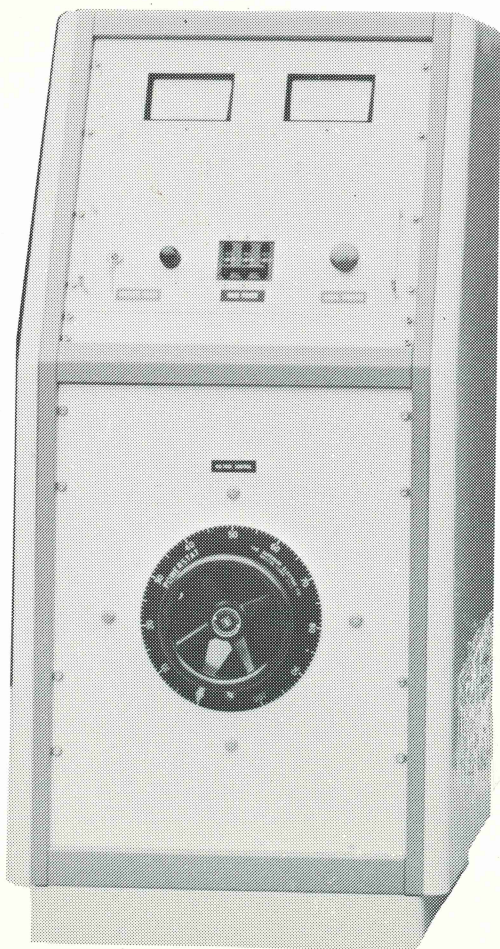
Components of the Super Model Nine Tesla Coil System returned by the customer, require prior written authorization, and will be evaluated by Tesla Technology Research. If these components are found to be faulty through no cause of the customer, they will be replaced at no charge, for a period of up to, but not exceeding, one year. No other warranty is expressed or implied.

SUPER MODEL NINE TESLA COIL SYSTEM

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2527 TREELANE AVE., MONROVIA, CA 91016
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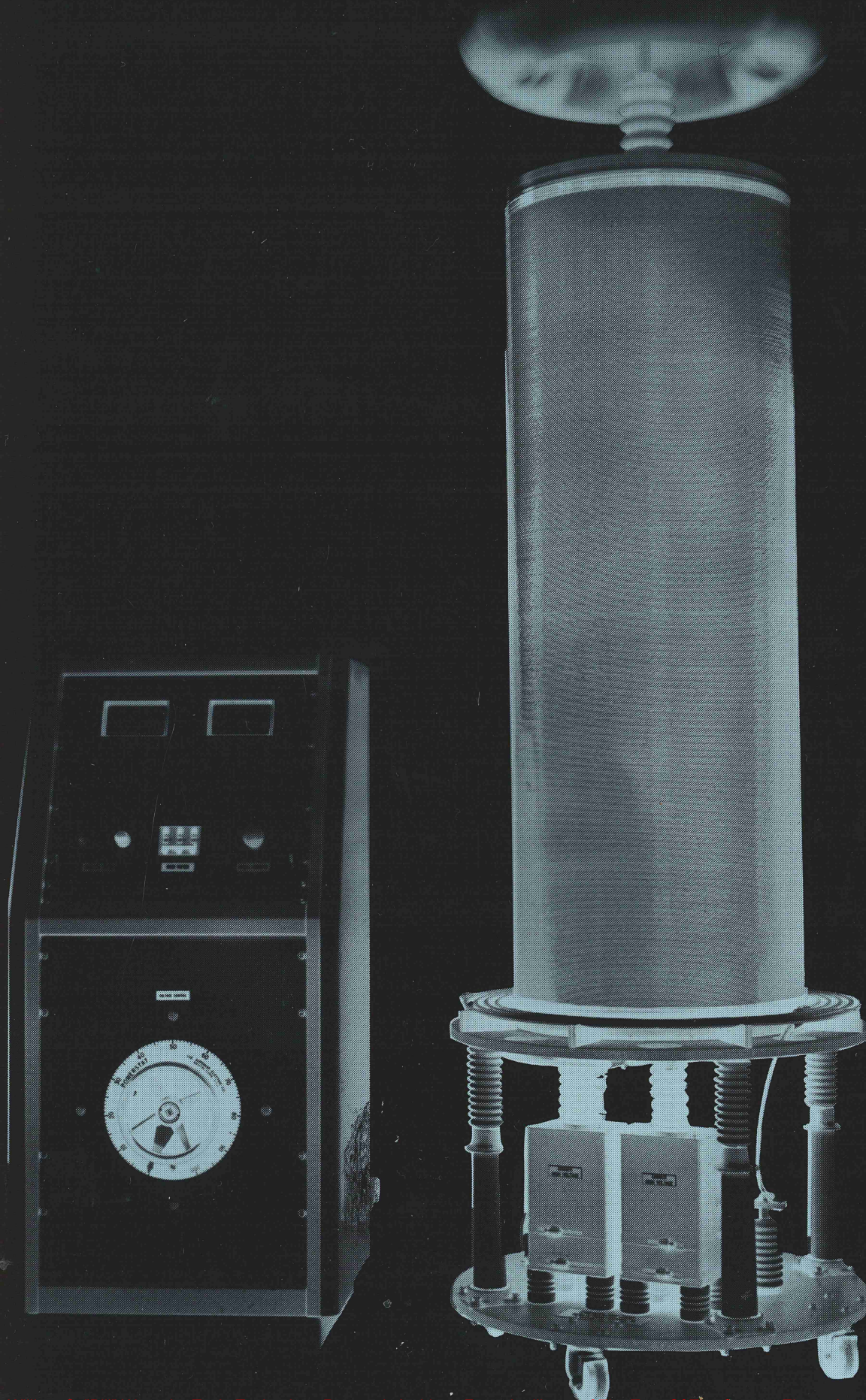


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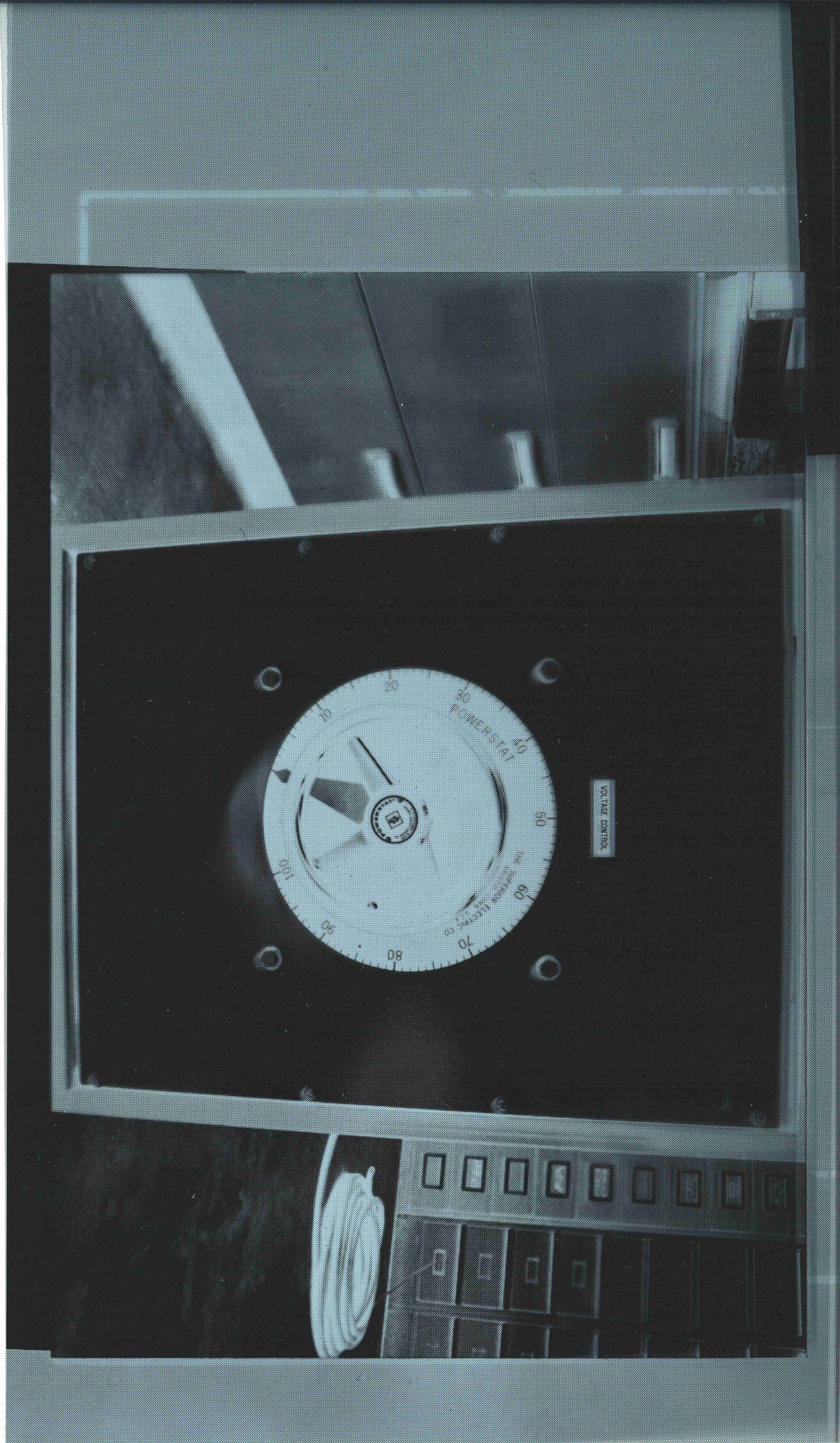
SUPER MODEL 9 COIL
FEB 82

PROFESSIONAL SOUND SYSTEMS
ULTRA HIGH VOLTAGE DIV.
2527 Treelane Ave.
Monrovia, Ca 91016

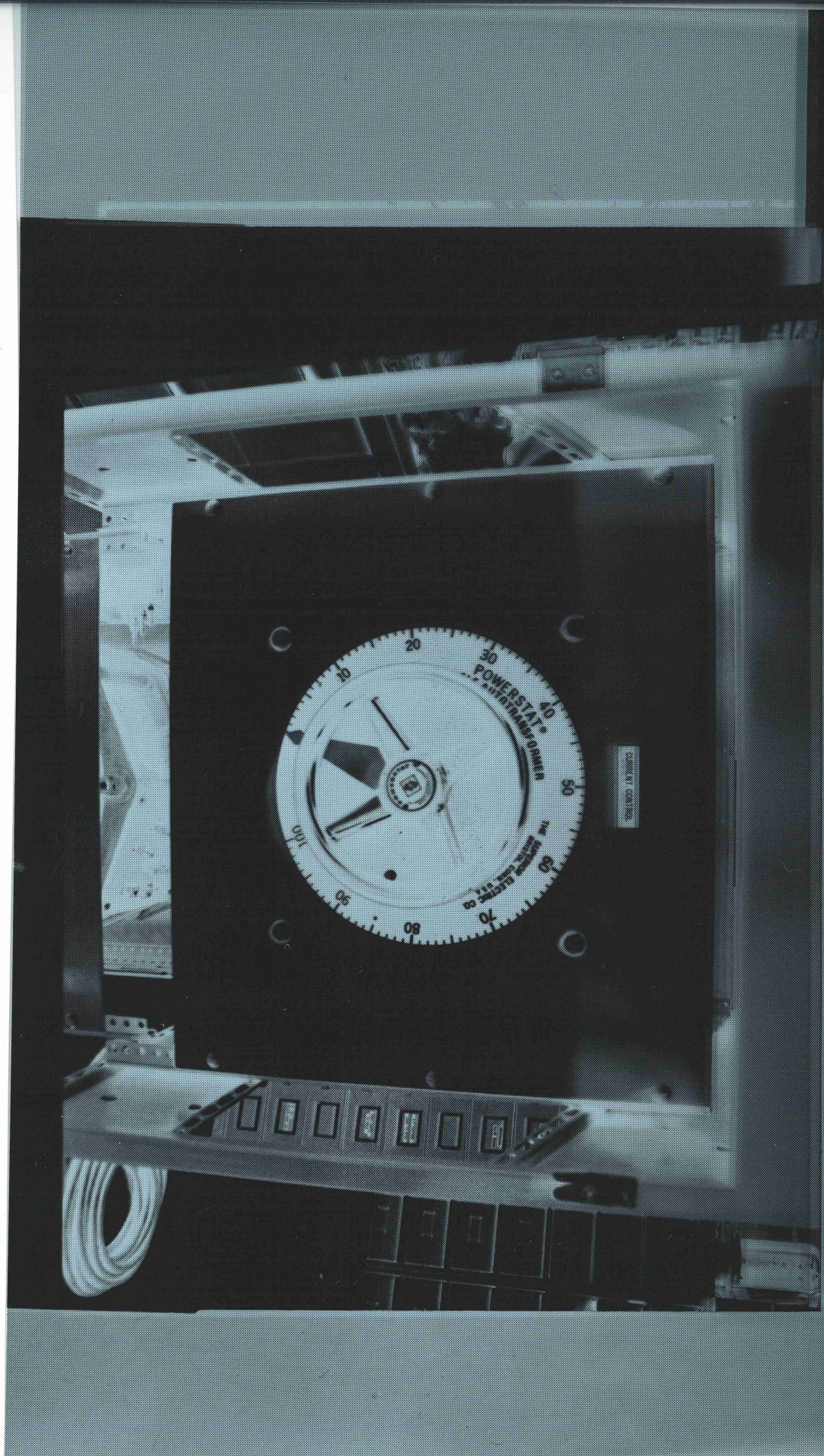
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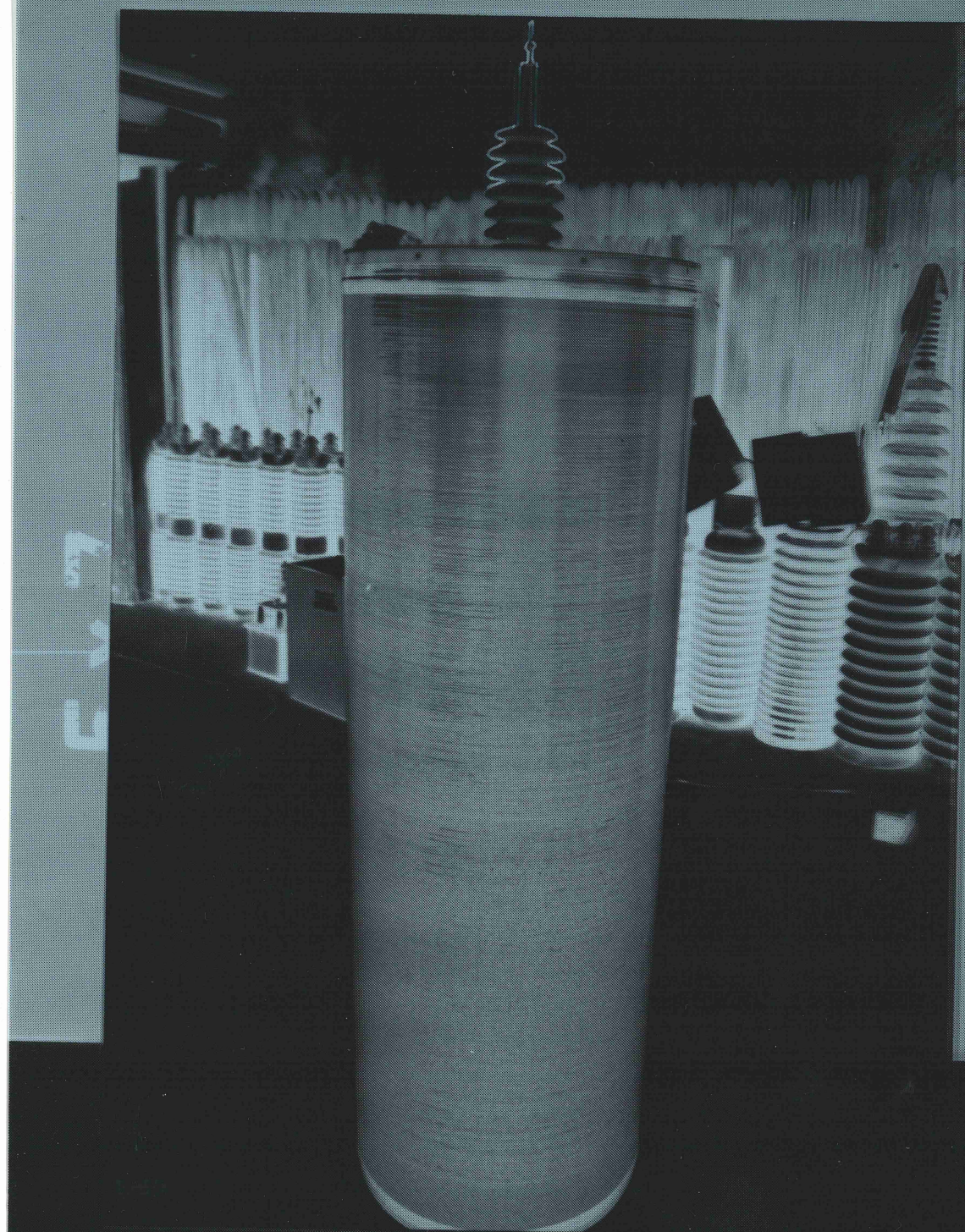


William C. "Bill" Wysock - Tesla Technology Research Archive - From the library of The Turn Of The Century Electrotherapy Museum

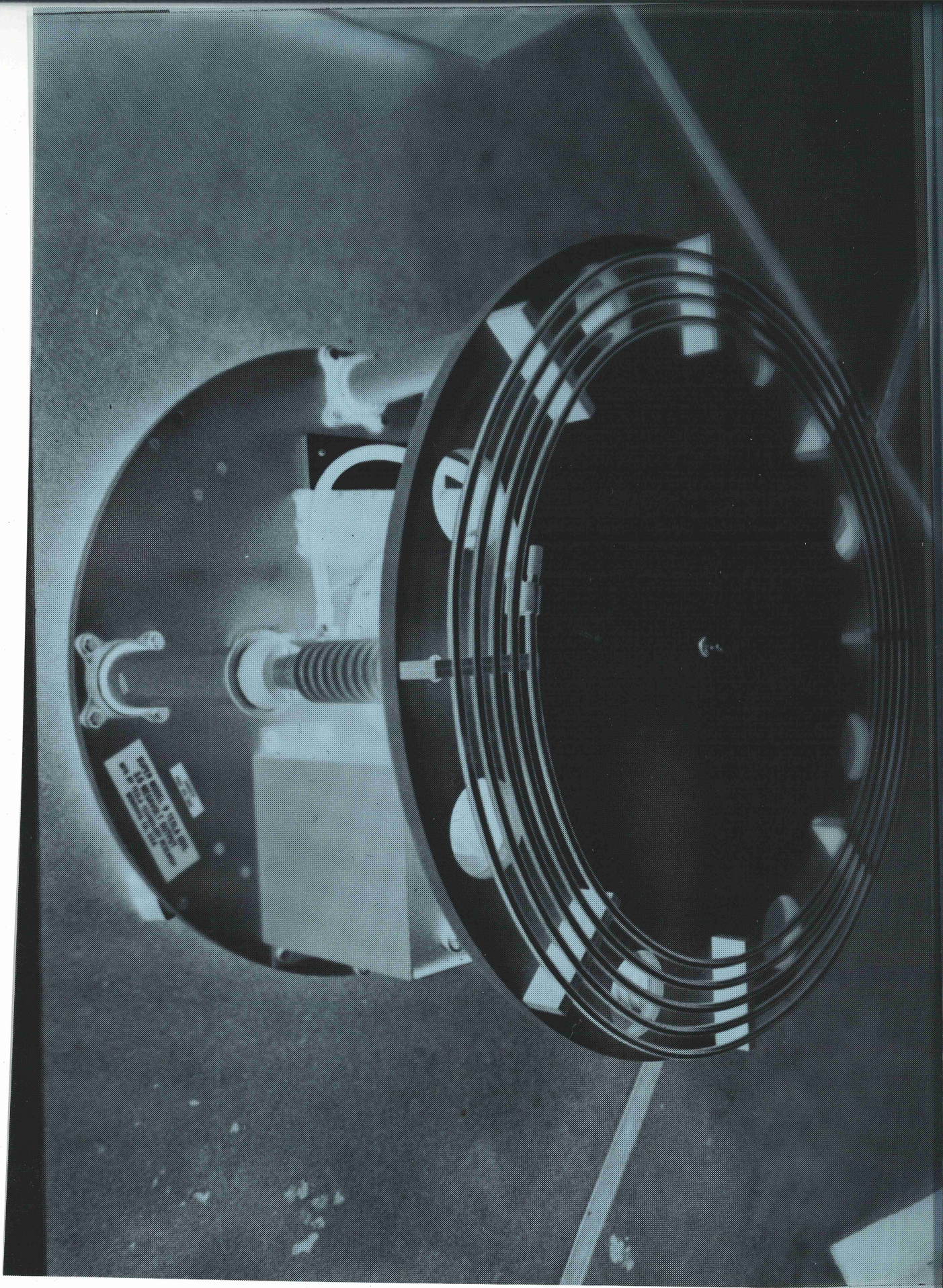


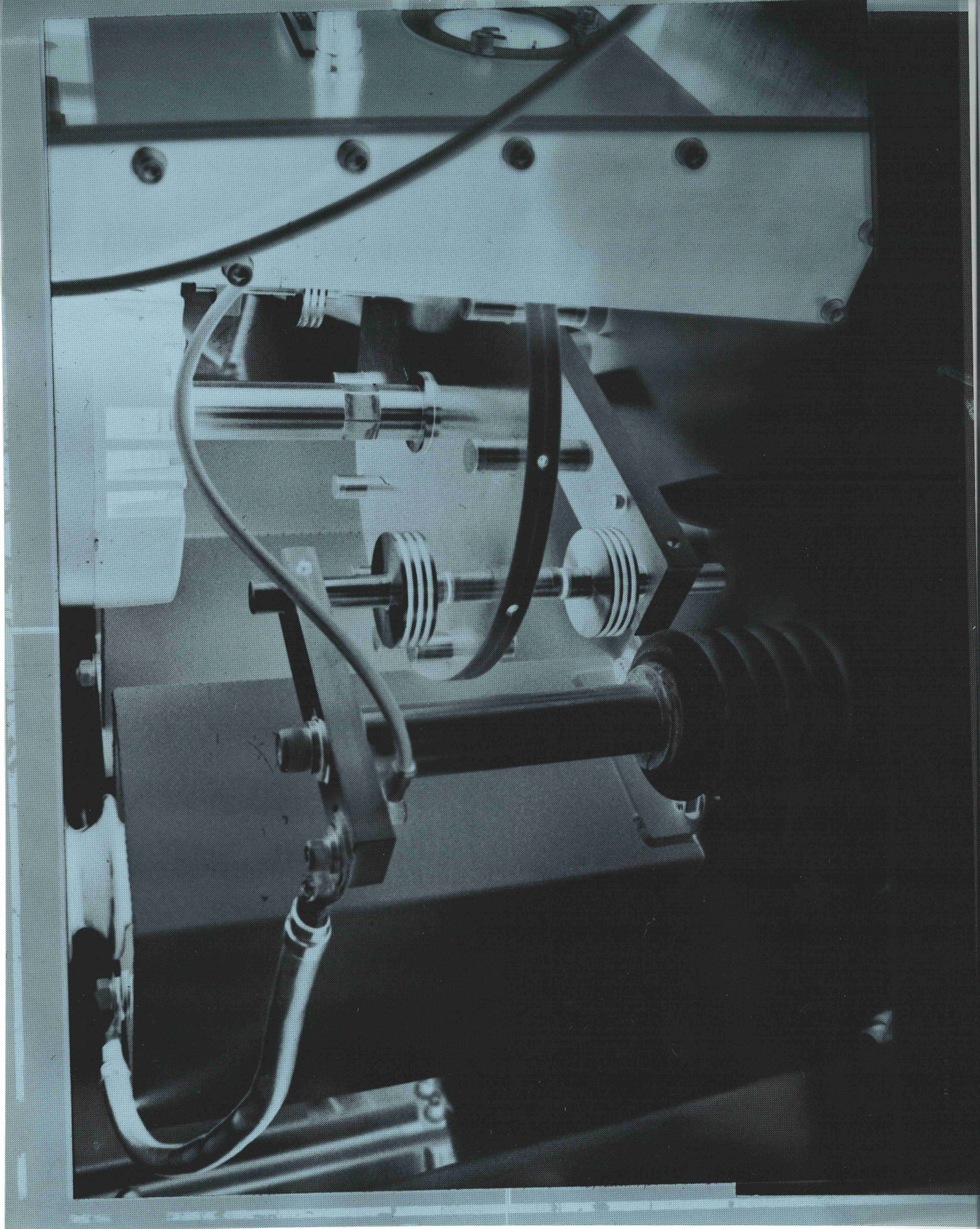




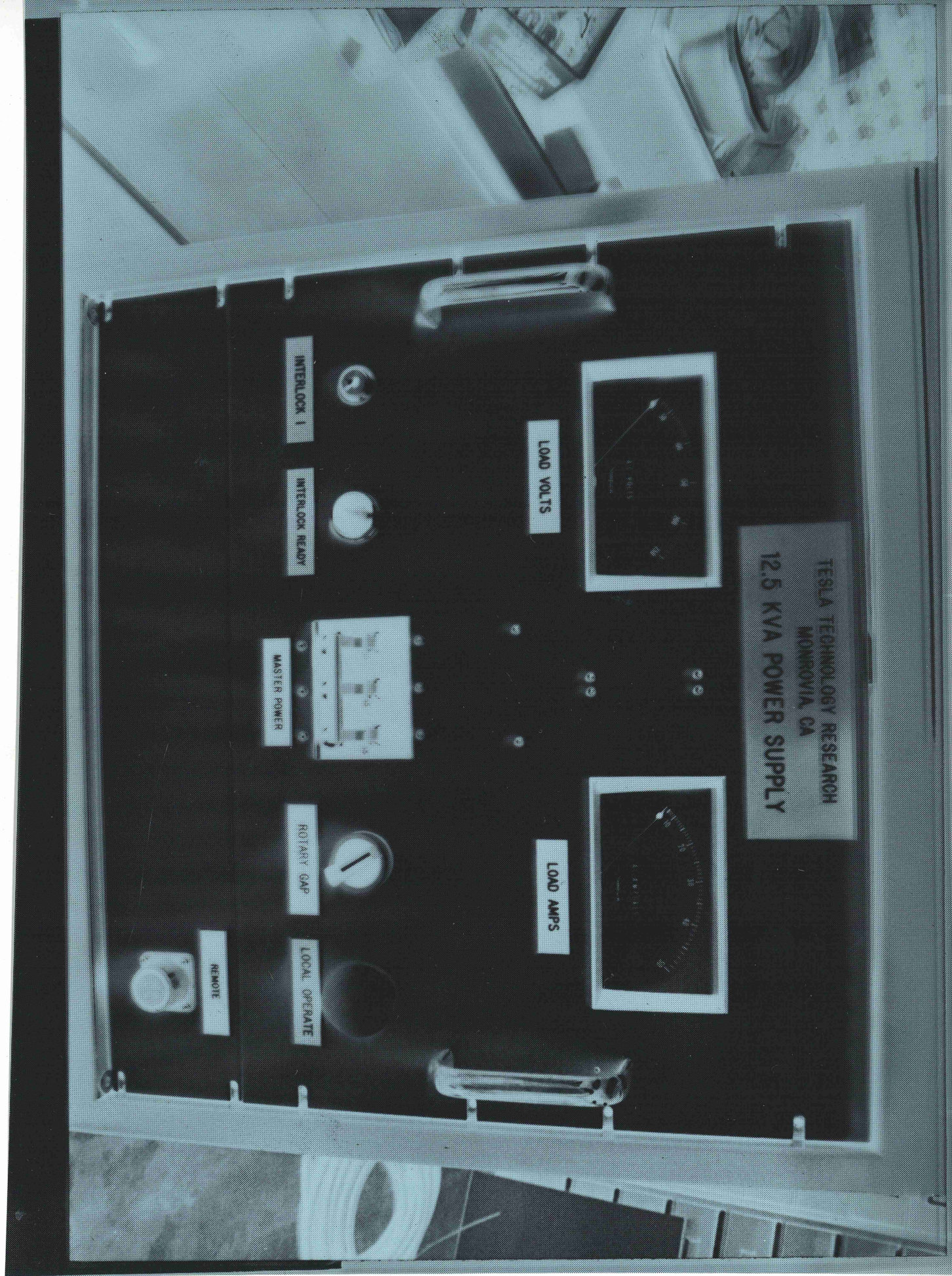


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WARNING: READ ALL INSTRUCTIONS BEFORE ATTEMPTING ANY OPERATION OF
THE SUPER MODEL NINE TESLA COIL SYSTEM. THIS EQUIPMENT
IS EASILY CAPABLE OF DELIVERING A LETHAL ELECTRIC SHOCK.

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UNPACKING INSTRUCTIONS

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- 1.) Remove the 30 inch toroid discharge electrode. Be sure to always handle this aluminum spinning with great care, as it can be easily scratched or dented. Wear soft cloth gloves in handling the toroid to avoid placing oils and acids from the hands onto the surfaces of the metal spinning.
- 2.) Remove the cardboard spacers from all four corners around the base unit. Using two people, lift the base unit vertically out of the crate, and set the unit on the floor on the base unit castors. SPECIAL NOTE: REMOVE THE BLACK ELECTRICAL TAPE THAT IS WRAPPED AROUND ONE SIDE OF THE ROTARY GAP STATIONARY ELECTRODE ASSEMBLY. This tape is provided to prevent unwanted movement of the rotary gap wheel during shipping. Discard the tape, and gently turn the rotary gap wheel by hand, to make sure that it rotates freely and without obstruction. Inspect the rest of the components to make sure nothing is broken or loose from shipping.
- 3.) The Secondary Coil is removed by un-screwing the 3/8-16 hex head bolts on both ends of the crate. Carefully lift the coil out of the crate, and place the unit upright on the floor. The necessary hardware for attaching the secondary coil to the primary base unit is in the center of the upper base plate. Simply remove the wing nut and washer. Save all packing material and hardware. The hardware for attaching the toroid on top of the secondary coil feed-thru insulator will be found in a separate small plastic bag.
- 4.) For the control console, after removing the crate side panel, use this panel with some sort of support blocks to build a ramp, in order to roll the console out of the crate on its castors, down to the floor. Remove the plastic bags containing the interconnect cables, remove all foam packing blocks, and then remove the control console.

This completes all unpacking procedures. Proceed to the next section.

NOTE: REMEMBER TO SAVE THESE CRATES AND PACKAGING MATERIAL FOR ANY FUTURE POSSIBLE SHIPPING REQUIREMENTS.

INSTALLATION PROCEDURE

The Super Model Nine Tesla Coil System has been designed and constructed for simple and effective installation. First, determine the exact location for the Tesla Coil Base unit. This base unit must be placed on a solid, flat surface, such as a concrete floor. This floor serves as an electrical ground plane, and is necessary for proper electrical resonance tuning of the Tesla Coil system. The base may be raised up off its swivel castors, to prevent any movement from the installed position, provided the raised distance does not exceed six inches. Re-enforcement steel bar, normally associated in all commercial concrete floor construction, serves as an electrical counter-poise, which will work effectively as a ground plane for this Tesla Coil system. The amount of floor space required for installation should include a minimum radius from the base unit center of twelve feet, horizontally measured. Depending on the desired corona discharge path(s), a vertical clearance of twenty-five feet, measured from the floor, will be required if this coil is to develop the maximum length discharge streamers possible. If corona points are arranged in a lateral manner about the equator of the toroid, this vertical height specification may be reduced to eighteen feet. Of course, smaller clearance dimensions are acceptable, provided the maximum possible arc length of fifteen feet is not a major requirement of the installation. In such cases, it is strongly recommended that deliberate grounded arc targets be arranged for the Tesla Coil to discharge to, in order to prevent any possibility of the arc causing physical damage to surrounding objects. If the Tesla Coil is to be placed inside of a Faraday Screen or Cage, the metal mesh or wire cloth should be uniformly spaced around the coil, without any physical obstructions.

Once the Base Unit has been placed, the Secondary Coil may be secured to the upper top plate, using the single 3/8"-16 hex head machine bolt provided. This bolt provides both mechanical and electrical connection for the lower end of the Secondary Coil, (refer to pictorial descriptions 2 and 3 for details.) The 30 inch aluminum discharge toroid may now be secured on top of the Tesla Secondary Coil feed-thru insulator, using the hardware provided.

The Control Console may be located in any convenient location away from the Base Unit, up to the full length of the Rotary Gap interconnect cable provided, a distance of approximately twenty-five feet. The High Voltage Power Supply Transformer should be located adjacent to the Control Console, using the prefabricated interconnect cable provided. Also utilize the High Voltage cable provided for connection between the supply transformer output, and the input of the Base Unit, (see schematic diagram and pictorial 3 for details.) When using an unbalanced high voltage output configuration, it is ABSOLUTELY ESSENTIAL THAT THE GROUND SIDE OF THE HIGH VOLTAGE WINDING GO TO THE BLACK TERMINAL, AND THE HIGH VOLTAGE SIDE GO TO THE RED TERMINAL; FAILURE TO FOLLOW THIS INSTRUCTION COULD CAUSE SERIOUS DAMAGE TO THE EQUIPMENT. Refer to the schematic diagram for this connection.

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INSTALLATION PROCEDURE, CONT'D

A dedicated A.C. power line should be run to an outlet that can be placed close to the Control Console. This feed should be rated for 60 amps, 208 to 240 volts, single phase. Connect the Control Console green lead to ground, the white wire to A.C. common (or neutral,) and the black lead to A.C. high, (hot.) Referring to Pictorial Description five, note the location of the insulator labeled "GROUND." This terminal is the input for the Tesla Secondary Coil, and MUST BE RUN AS A SEPERATE LINE TO A VERY GOOD EARTH GROUND. The physical length of this line should be kept as short as possible, and should not exceed fifty feet in length. Use #1 A.W.G. (American Wire Gauge,) stranded copper wire for this connection. The grounding point can be made to the building steel framework, provided this framework also is solidly connected to a low resistance earth ground.

The high voltage cable, provided for connection between the high voltage power supply transformer and the Tesla Coil Base Unit input terminals, can be run inside metal conduit if desired, or may be run in an open metal cable tray. In either case, the tray or conduit should be bonded to electrical ground for safety. This cable is rated for 40,000 volt insulation and should give many years of service.

If the Tesla Coil is to be operated inside of a Faraday Cage, the cage and its associate metal framework should be bonded to the same #1 A.W.G. wire that is run for the Secondary Coil ground. The most desirable point of bonding the cage is at the Tesla Coil Base Unit grounding terminal.

Tuning of the Super Model Nine Tesla Coil System is affected by objcets or surfaces around the Secondary Coil. In the case of a Faraday Cage, the effect is that of increased parallel capacitence in the Tesla Secondary circuit. System resonance can be adjusted by altering the location of the outermost Tesla Primary Coil tap location, thus increasing or decreasing the primary circuit series inductance. AS SHIPPED, THIS TAP HAS BEEN SET FOR THE CORRECT POSITION WHEN THE TESLA COIL IS LOCATED INSIDE A FARADY CAGE OF 20 FOOT INSIDE DIAMETER, AND SHOULD REQUIRE NO FURTHER ADJUSTMENT.

Tuning is additionally affected by the index of the Rotary Spark Gap wheel with respect to its brass motor arbor (DWELL ANGLE,) Voltage and Current control settings, and Rotary Gap individual gap setting. Initially, this gap is factory set at 0.100" per gap, giving a total for all four gaps of 0.400". This total gap spacing should not require any adjustment, except for rotation of the stationary electrodes, as discussed in the section on ROUTINE MAINTENENCE. Refer to the Pictorial Description on page four.

NOTE: MAINTAIN THESE CRATES AND PACKAGING MATERIAL FOR ANY FUTURE SHIPPING REQUIREMENTS.

objects
capacitance

OPERATING INSTRUCTIONS

Pictorial Description numbers six, seven and eight, show the operations controls for the Super Model Nine Tesla Coil System. Looking at the illustration of the main control panel, note the remote connector, located at the lower right; this connector allows remote control of the Rotary Gap and Local Operate panel switches, (refer to the schematic diagram designation "J4".)

WARNING: UNDER NO CIRCUMSTANCES SHOULD POWER BE APPLIED TO THE SYSTEM UNTIL ALL GROUNDING AND WIRING INSTALLATION WORK HAS BEEN SATISFACTORILY COMPLETED. ANY PERSONS POSSESSING ANY FORM OF ELECTRO-CARDIAC DEVICES (PACEMAKERS) SHOULD LEAVE THE AREA BEFORE ANY ATTEMPT IS MADE TO OPERATE THE SUPER MODEL NINE TESLA COIL SYSTEM. THESE PRECAUTIONS ARE ABSOLUTELY NECESSARY FOR YOUR PROTECTION. WHEN THE SUPER MODEL NINE TESLA COIL SYSTEM IS INSTALLED INSIDE OF A PROPERLY DESIGNED FARADAY CAGE, THE PACEMAKER WARNING NEED NOT APPLY.

Initial operation should be with the current control knob set at about "70" on its dial face, and the voltage control knob set at "0". Turn on the Master Power multibraker switch. The two meters, A.C. VOLTS and A.C. AMPS should show dial face illumination. Next, insert the key on the switch marked "INTERLOCK 1." Turn this key to the right. The large red pilot light next to this switch marked "INTERLOCK READY," should light. Now turn the black knob marked "ROTARY GAP," to the right. You should hear a relay close, and the Rotary Gap Motor energized. This motor has had its armature ground to convert it from 1450 R.P.M. NON-SYNCHRONOUS, TO 1500 R.P.M. SALIENT-POLE SYNCHRONOUS OPERATION. A steady, even sound should be heard from the running of this motor, indicating synchronous rotor rotation with respect to the 50 Hertz line frequency. If for any reason the sound coming from this motor varies, as in the case of the rotor "hunting" or "surging," immediately turn off the power, and contact Tesla Technology Research, for further instructions. Assuming all is correct to this point, turn the VOLTAGE CONTROL clock-wise to the "50" position on its dial. The A.C. VOLTS meter should now show an indication of about 120-140 volts. Now momentarily push in the yellow push button marked "LOCAL OPERATE," and then release. A second relay should be heard to close, and a loud acoustic report of sparks from the Rotary Gap. If no sparking occurs at the Rotary Gap, or only some occasional sparking, increase the Voltage Control to read 180 volts on the voltmeter, and try again. When the point has been reached on the Voltage Control where a steady, continuous sound of sparking occurs at the Rotary Gap, take note of the current reading on the A.C. AMPS meter. It should read between 10 to 40 amps, and may vary somewhat while the Tesla Coil is energized. Place a piece of heavy guage wire on top of the 30" aluminum dishcharge toroid, such that one end protrudes horizontally out from the equator about 12 inches. Using an assistant as an observer, to watch the characteristics of the corona discharge issuing forth from the end of this wire (corona point,) again energize the Tesla Coil. Make a note of the length and intensity of the corona streamers issuing from the end of the corona point. Also note the voltage and current readings.

OPERATING INSTRUCTIONS CONT'D

Try varying the voltage control to achieve the minimum setting where the Tesla Coil discharges in a steady manner. Once this point has been found, next try varying the current control knob, to further enhance the steadiness of the discharge. Typically, you will notice that there is a certain "range," over which the coil operates, with one point where it will also be observed that the lowest current reading is obtained, while maintaining steady discharge output. This point is to be noted and maintained. Very little further adjustment of the current control will be required for further general tuning. What has been accomplished by this exercise, is power factor compensation of the characteristic impedance of the A.C. supply circuit to the high voltage supply transformer input, and its complex impedance load to the Tesla Primary resonant tank circuit. Further enhancement of the length and quality of the discharge may require re-positioning the index mark between the Rotary Gap wheel and its associate brass motor arbor mounting. To accomplish this, first turn off all power to the console, and allow the Rotary Gap wheel to slow to a stop. Using an open-end wrench on the hex-faced portion of the arbor, hold the motor shaft from turning, and use an allen hex key to loosen the cap screw on the underside of the Rotary Gap wheel. Change the index mark by about 3-5 degrees, and retighten. Refer to Pictorial #4. Now repeat the above testing procedure. After several combination of settings, the best possible discharge will be secured from the toroid corona point, for a minimum power input level.

SPECIAL NOTICE: THIS TUNING AND ADJUSTMENT PROCEDURE MUST BE CARRIED OUT BY QUALIFIED ELECTRICAL TECHNICIAN PERSONNEL. IF YOU ARE UNSURE IN FOLLOWING ANY OF THESE STEPS, DO NOT PROCEED TO OPERATE THIS SYSTEM. CONTACT TESLA TECHNOLOGY RESEARCH AT ONCE, FOR FURTHER ASSISTANCE.

Assuming all above steps have been satisfactorily completed, you are now ready to adjust the Super Model Nine Tesla Coil System for its maximum output. Energize the system in the prescribed manner, depress the local operate button, and hold it closed. Adjust the VOLTAGE CONTROL to a higher setting, watching the A.C. AMPS meter, so as to not exceed 50 amps on the meter. The observer should be at a distance at least 25 feet away from the Tesla Coil, and have a clear view of the toroid coronapoint. The primary job of the observer, is to watch for any possibility of any spark breakdown between the Tesla Primary and Secondary Coils. Should this occur, IMMEDIATELY STOP OPERATION OF THE TESLA COIL. Verify that all ground connections and other wiring is intact. It is possible that some slight re-adjustment of the Rotary Gap wheel index, the Console current control, or Rotary Gap gap spacing will have to be performed. The TOTAL GAP SPACING MUST NOT EXCEED 0.400" or 0.100" per gap. Likewise, the smallest individual gap setting should not be less than 0.050" per gap. Use a machinists' feeler guage to set the gap spacing. When all adjustments have been properly made, the Tesla Coil will be capable of reliable streamer corona discharges up to fifteen feet in length, with no spark breakdown near the base of the Secondary Coil. This output represents approximately 3.5 million volt output potential. Keep a permanent written log of all the adjustments made to this system, including maintenance operations. By nearly adjusting the VOLTAGE CONTROL between the minimum and maximum noted settings, the output of your Super Model Nine Tesla Coil System can be regulated for a spark length between several feet, up to about fifteen feet.

OPERATING INSTRUCTIONS CONT'D

It is recommended that each period of operation of the Super Model Nine Tesla Coil System be limited to a maximum continuous "ON" state not to exceed 10 seconds, with a minimum intervening "OFF" state of one minute. This recommendation is made in order to allow for a maximum life-cycle of the system. Higher order duty cycles will impose more intensive wear on the Control Console autotransformers, the Rotary Gap stationary electrode faces, and eventual heating of the dielectric insulation in the Primary circuit oscillation capacitors. The REMOTE panel connector may be wired to a separate panel, to allow for more convenient demonstration applications, or it may be placed under automatic control from a computer, using external relays in place of manual switches. In any case, the system WILL NOT OPERATE when the KEY SWITCH is in the "OFF" position.

ROUTINE MAINTENANCE

After every hour of accumulated operation, under normal circumstances, the Rotary Gap stationary electrodes must be rotated in their mountings, to promote an even wear pattern of the tungsten electrode faces (refer to Pictorial #4.) Locate the hex-socket set screws for each of the stationary electrodes, and loosen so that the electrodes can be rotated approximately 20 degrees in rotation. Using a machinists' feeler guage, re-gap each of the four stationary electrodes to the original gap settings previously used, and tighten the set screws. Caution: do not over-tighten these set screws; the brass rods are a relatively soft metal, and can easily be gouged, making future adjustments more difficult. Note these adjustments in a written maintenance log sheet, including date, operation performed, and initials of the person making the adjustments. Replacement parts, if required, are available from Tesla Technology Research. Under normal conditions, the rotary electrodes on the Rotary Gap wheel, will require no maintenance at all. The exposed surfaces of the Tesla Primary and Secondary Coils should be kept dry and clean from any dust or debris at all times.

WARNING: MAKE SURE ALL ELECTRICAL POWER TO THE CONTROL CONSOLE IS TURNED COMPLETELY OFF BEFORE ATTEMPTING ANY ADJUSTMENTS OR MAINTENANCE TO THE SUPER MODEL NINE TESLA COIL SYSTEM. A LETHAL ELECTRIC SHOCK HAZARD EXISTS IN THE COMPONENTS OF THIS SYSTEM. REMOVE THE KEY FROM THE CONTROL CONSOLE PANEL DURING MAINTENANCE PERIODS. YOU ARE RESPONSIBLE FOR YOUR OWN SAFETY AS WELL AS FOR OTHERS IN THE VICINITY OF THIS SYSTEM.

WARRENTY

PLEASE READ CAREFULLY - THIS IS A LIMITED WARRENTY

Tesla Technology Research warrants the complete Super Model Nine Tesla Coil System to be free of defects in workmanship and materials for a period of one year from the date of original purchase, and hereby certifies that this equipment functions as in accordance with its design parameters at the time of shipping. This warranty does not cover the customer's use of this equipment, as Tesla Technology Research has no control over the Super Model Nine Tesla Coil System after shipment to the customer.

Tesla Technology Research assumes no liability for the operational safety of the customer's installation of the Super Model Nine Tesla Coil System.

It is understood that a LETHAL ELECTRIC SHOCK HAZARD exists in the components of the Super Model Nine Tesla Coil System, and that the customer assumes all necessary installation and operation safety requirements of this system. Technical supervision assistance is available from Tesla Technology Research.

Components of the Super Model Nine Tesla Coil System returned by the customer, require prior written authorization, and will be evaluated by Tesla Technology Research. If these components are found to be faulty through no cause of the customer, they will be replaced at no charge, for a period of up to, but not exceeding, one year. No other warrenty is expressed or implied.

multibreaker

operating on
1st line operation

warranty
warrants
3-line
original

Several ?

streamer
permanent
merely

OPERATING INSTRUCTIONS, CONT. 9

POWER REQUIREMENTS AND SCHEMATIC DIAGRAMS

It is recommended that the Super Model Nine Tesla Coil System be limited to a maximum continuous "ON" state not to exceed 10 seconds with a minimum intervening "OFF" state of one minute. This recommendation is based on the duty cycle of the system.

The basic electrical parameters of the Super Model Nine Tesla Coil System are as follows:

Power input: 208-240 V.A.C., 50 Hz. single phase, 35-50 amps nominal.
Output: 3,500,000 volts (3.5 MV) maximum, 80-95 KHz.

The REMOTE panel connector may be wired to a separate power source. In any case, the system will NOT OPERATE when the KEY switch is in the "OFF" position.

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ROUTINE MAINTENANCE

CONTROL CONSOLE ELECTRICAL SCHEMATIC

After every hour of accumulated operation, under normal circumstances, the Rotary Gap stationary electrodes must be rotated in their mountings, to promote an even wear pattern of the tungsten electrode faces (refer to Editorial #4). Locate the hex-socket set screws for each of the stationary electrodes, and loosen so that the electrodes can be rotated approximately 1/4 degree in rotation. Using a machinist's feeler gauge, re-gap each of the four stationary electrodes to the original gap settings previously used, and tighten the set screws. Caution: do not over-tighten these set screws; the brass rods are a relatively soft metal, and can easily be gauged, making future adjustments more difficult. Note these adjustments in a written maintenance log sheet, including date, operation performed, and initials of the person making the adjustments. Replacement parts, if required, are available from Tesla Technology Research. Under normal conditions, the rotary electrodes on the Rotary Gap wheel, will require no maintenance at all. The exposed surfaces of the Tesla Primary and Secondary Coils should be kept dry and clean from any dust or debris at all times.

SUPER MODEL NINE TESLA COIL BASE UNIT ELECTRICAL SCHEMATIC

WARNING: MAKE SURE ALL ELECTRICAL POWER TO THE CONTROL CONSOLE IS TURNED COMPLETELY OFF BEFORE ATTEMPTING ANY ADJUSTMENTS OR MAINTENANCE TO THE

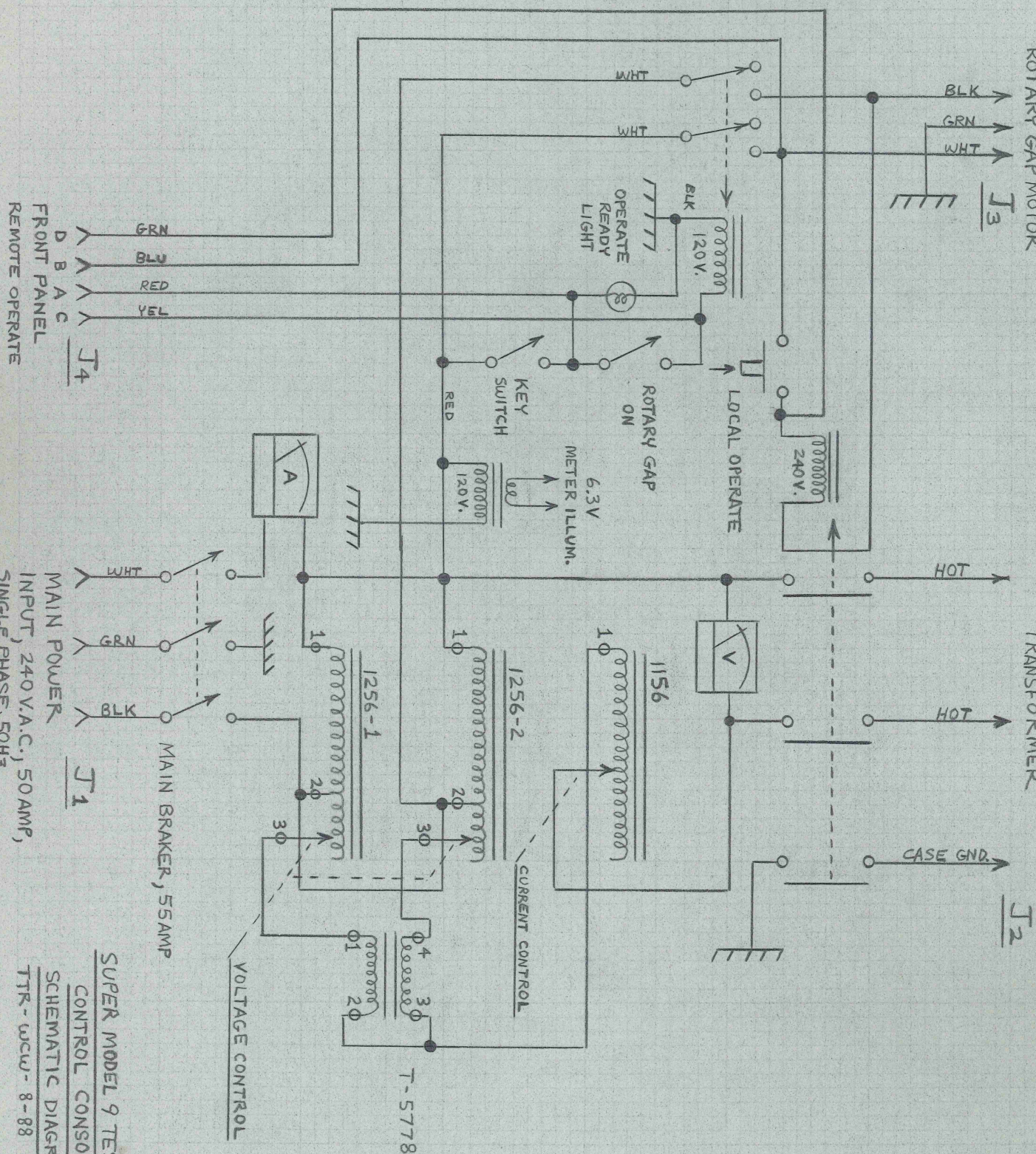
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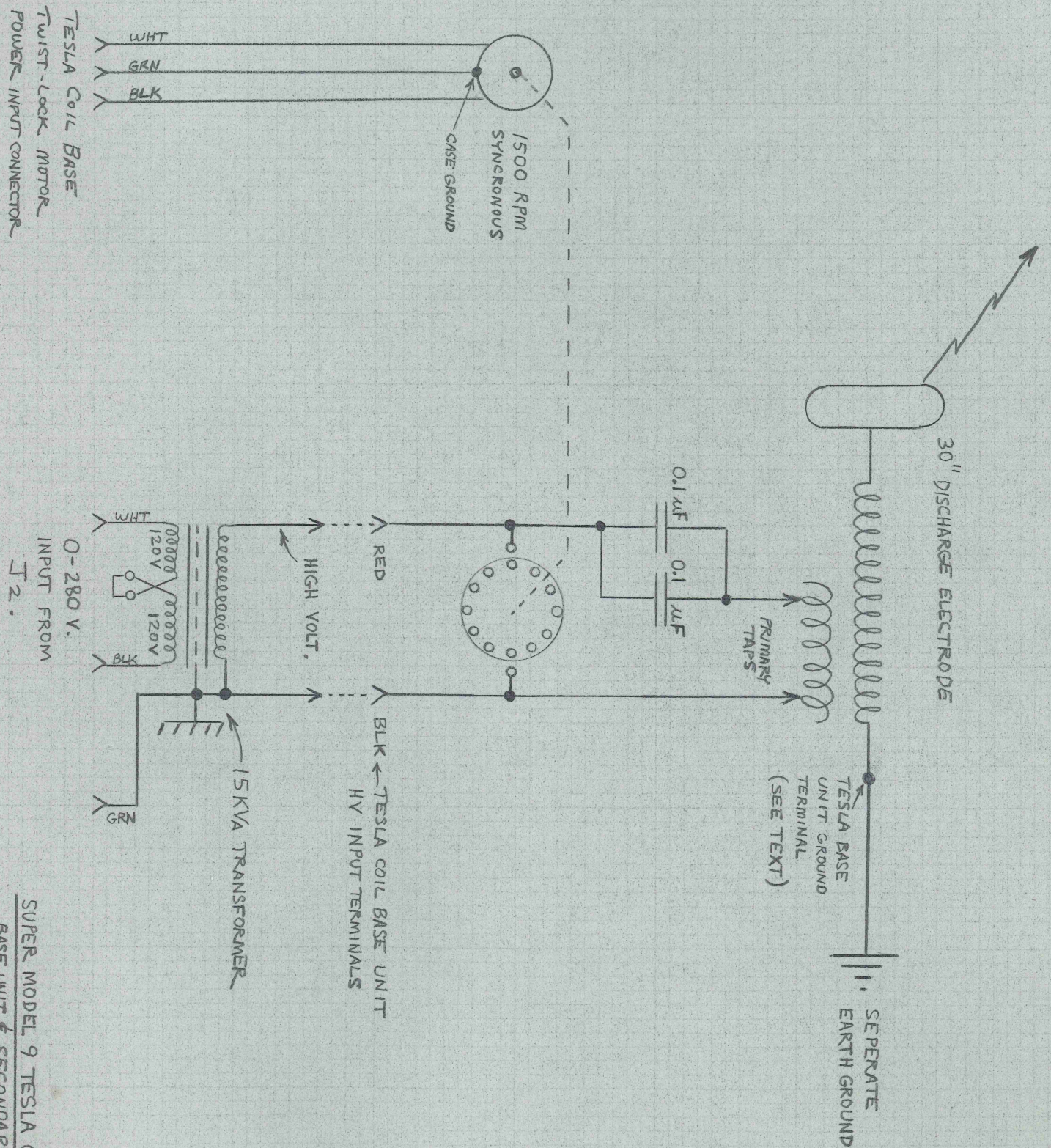
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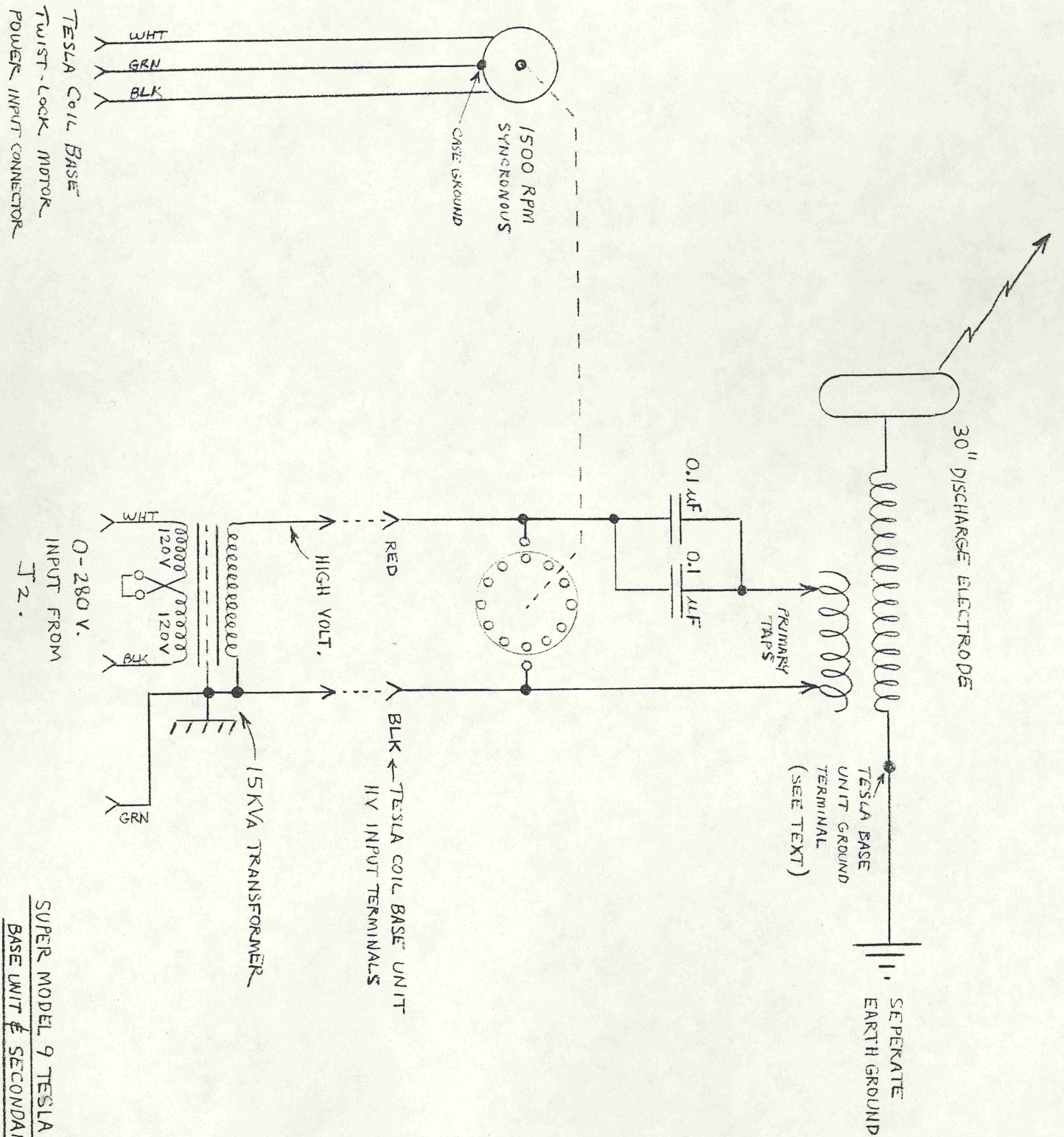
240 V. TO
ROTARY GAP MOTOR

0-280 V. TO HV
TRANSFORMER

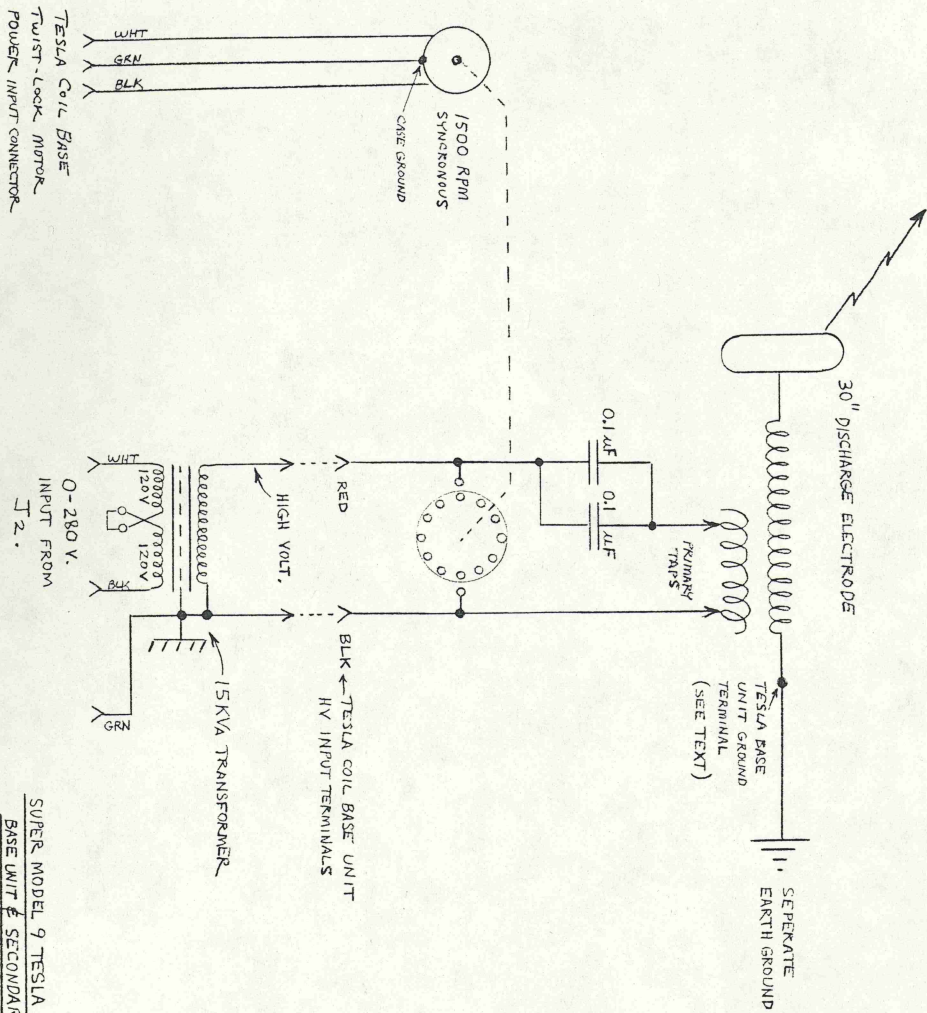




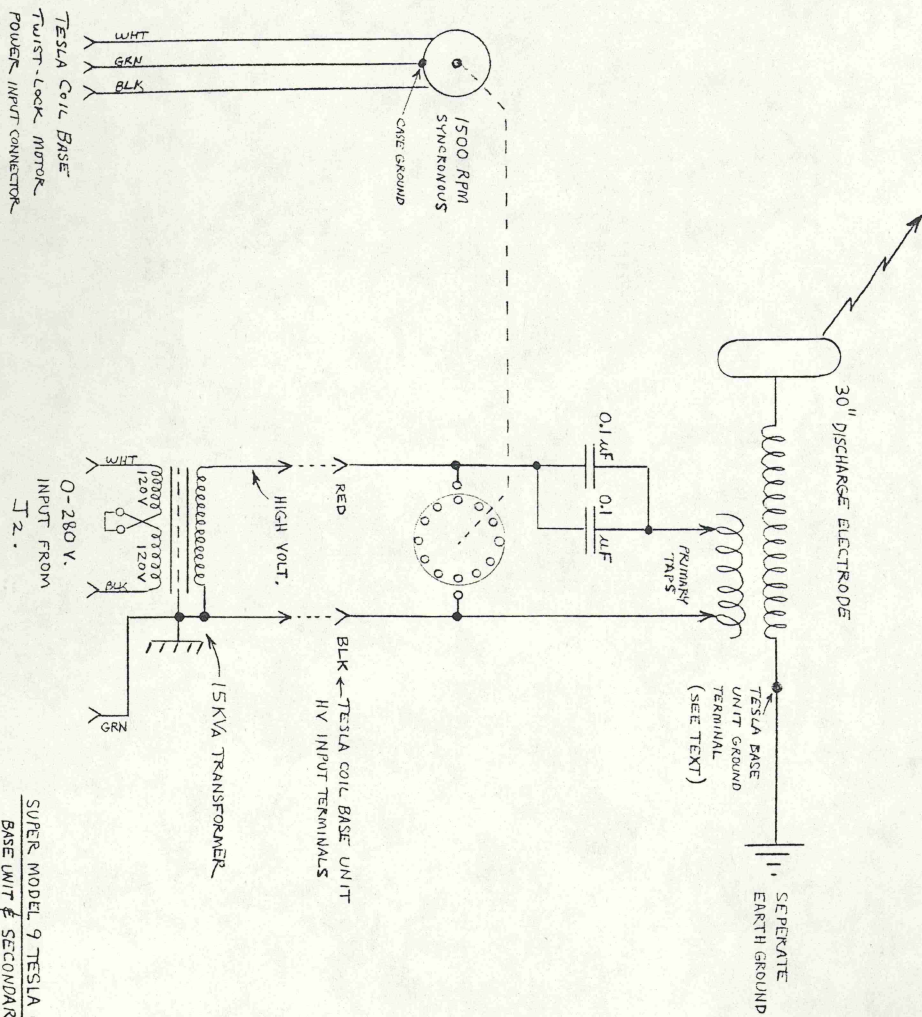
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 BASE UNIT & SECONDARY COIL
 SCHEMATIC DIAGRAM
 TTR-wcw-8-88



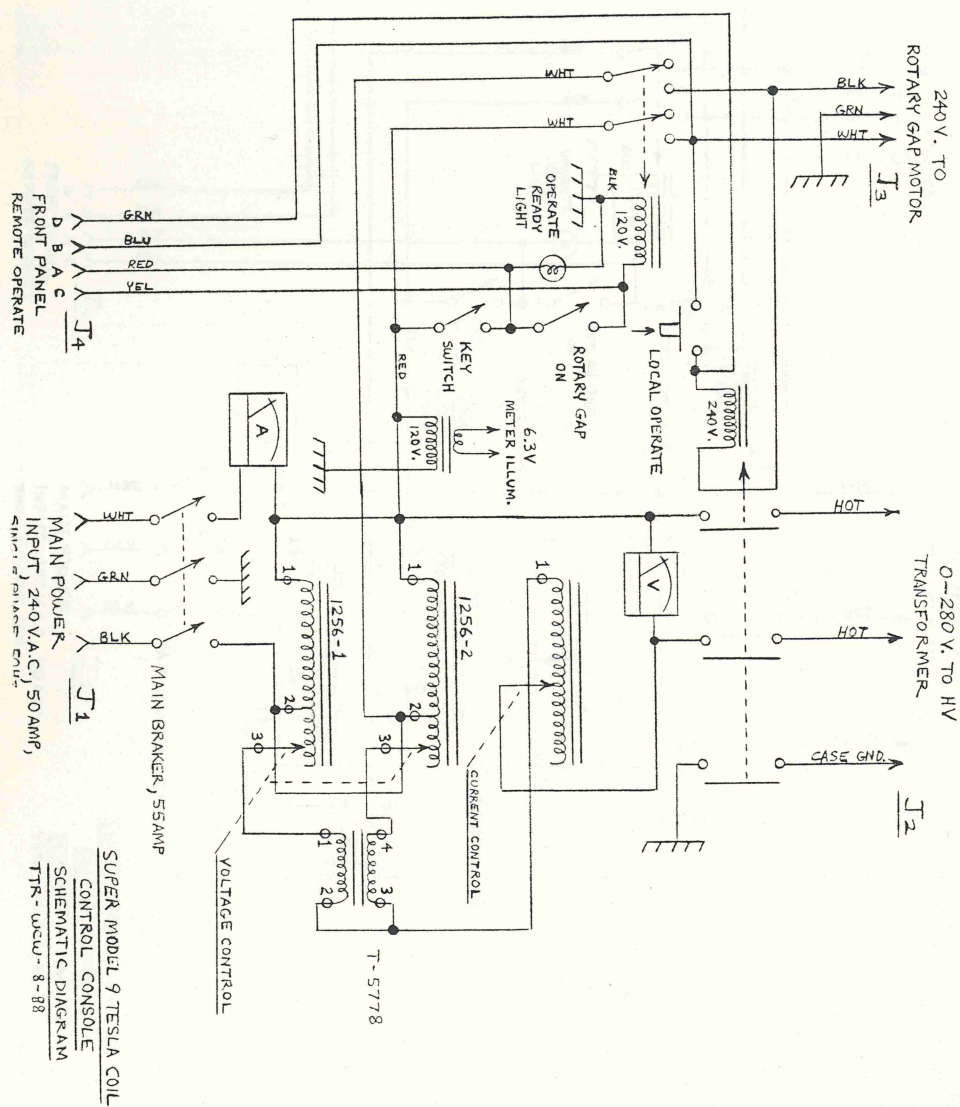
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BASE UNIT & SECONDARY COIL
SCHEMATIC DIAGRAM
TTR-wcm - 8-88

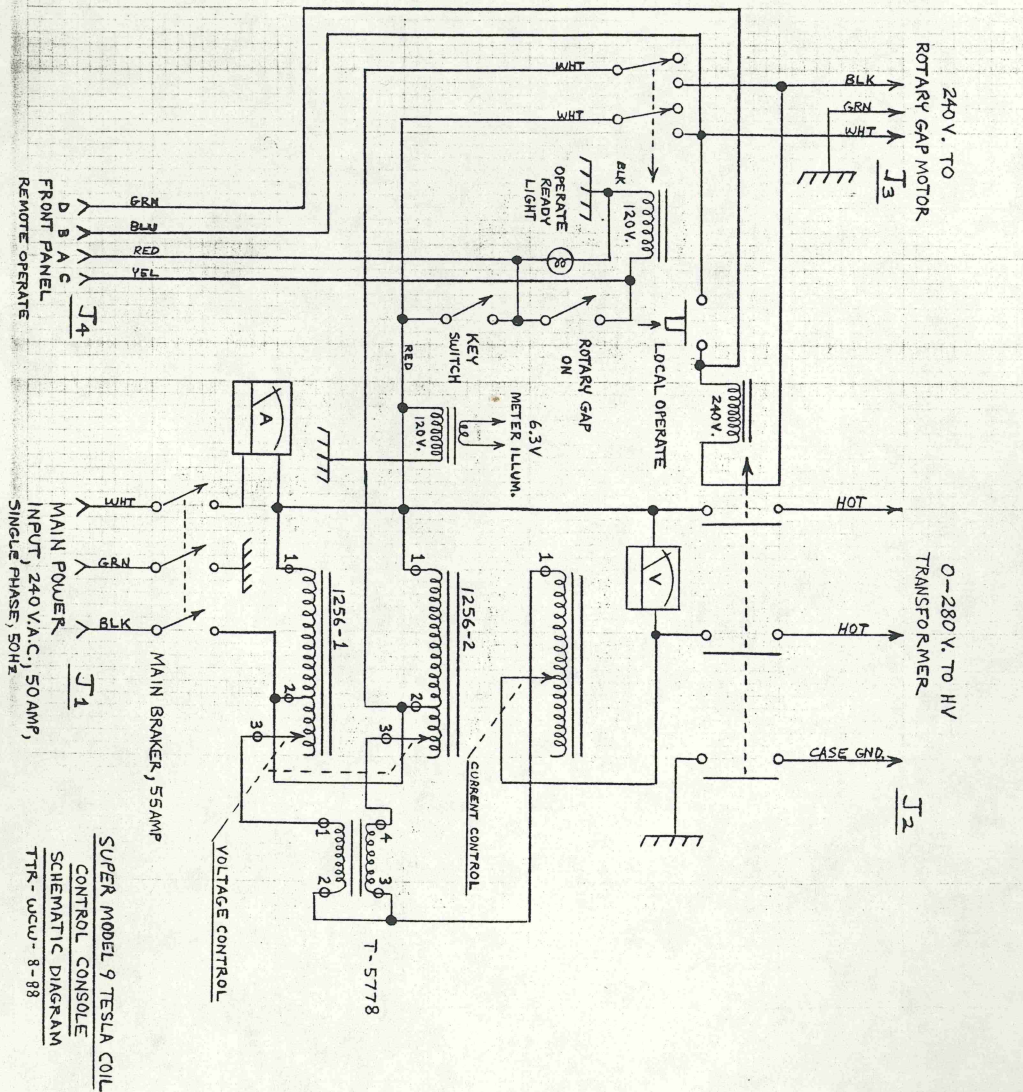


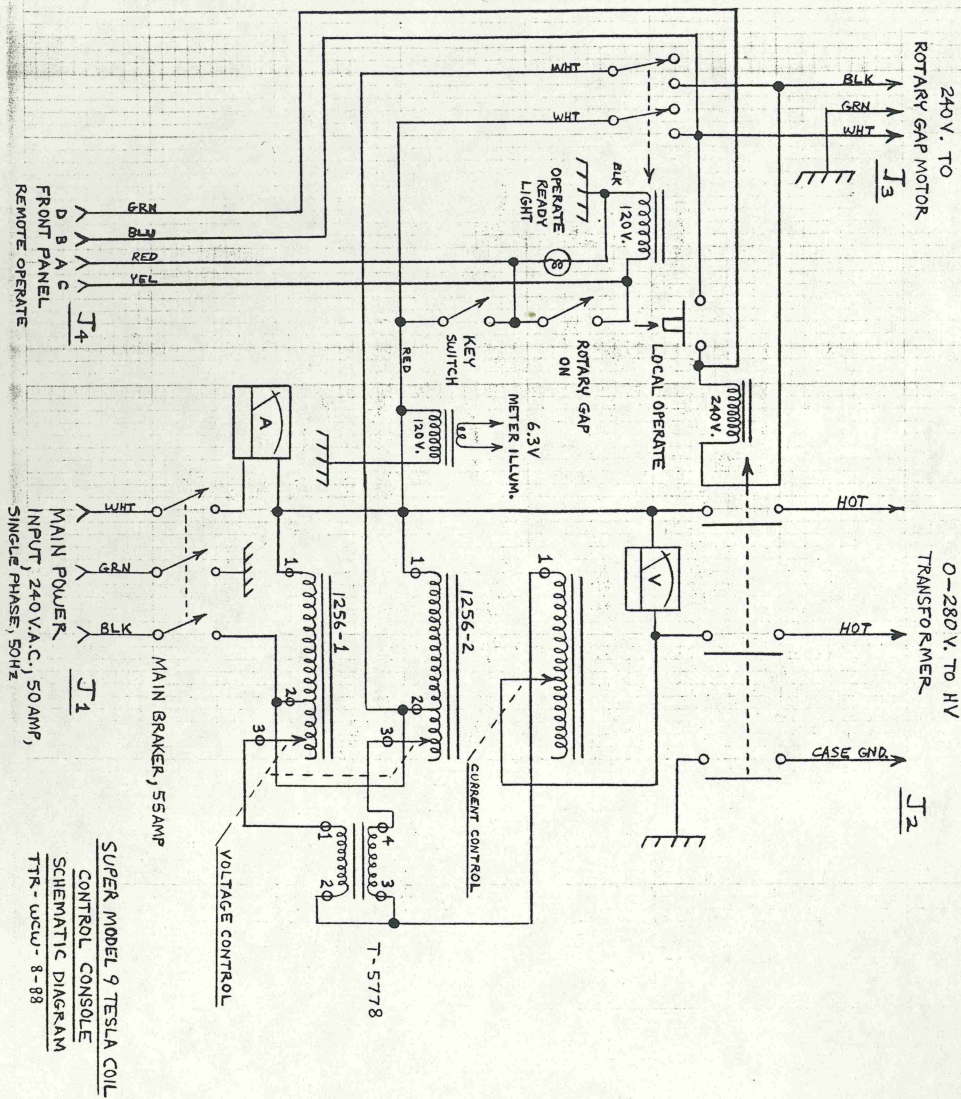
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BASE UNIT & SECONDARY COIL
SCHEMATIC DIAGRAM
TTR-WCU-8-88

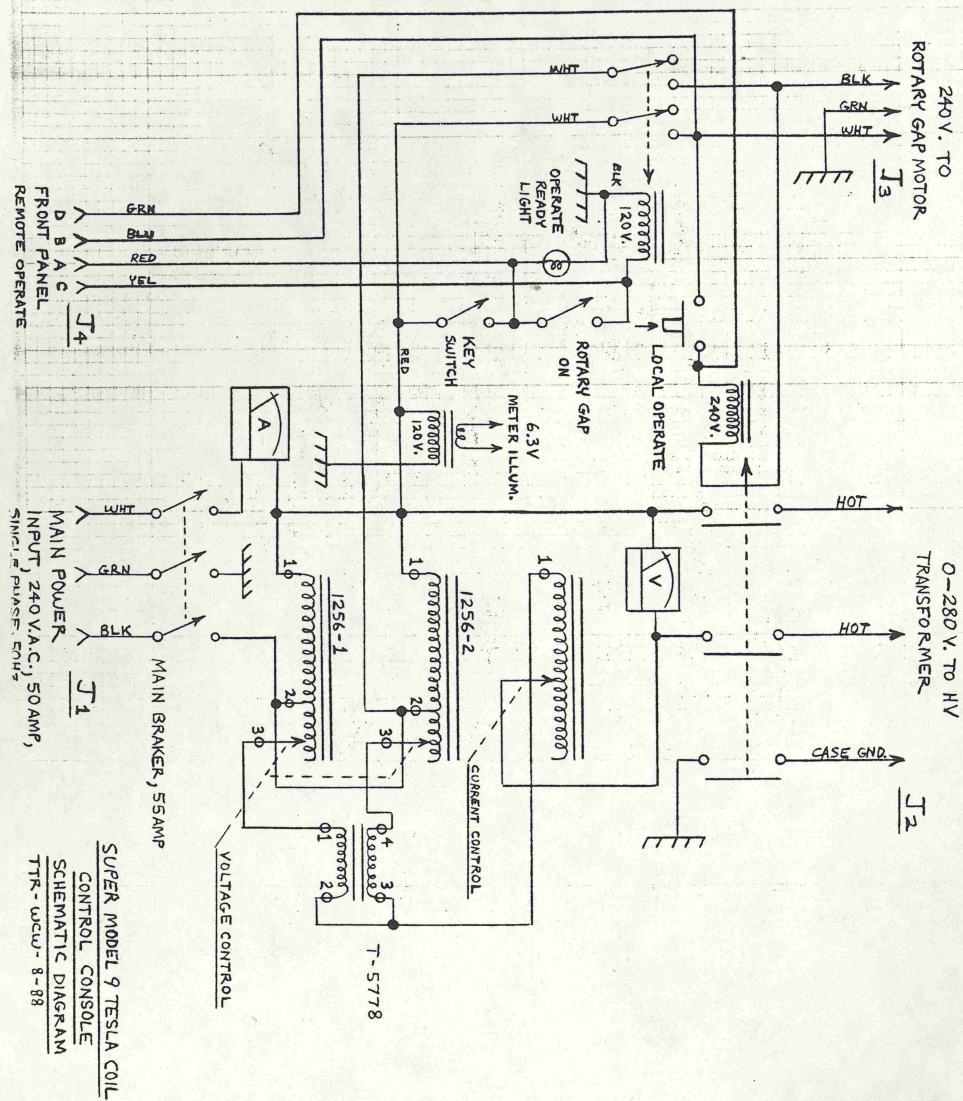


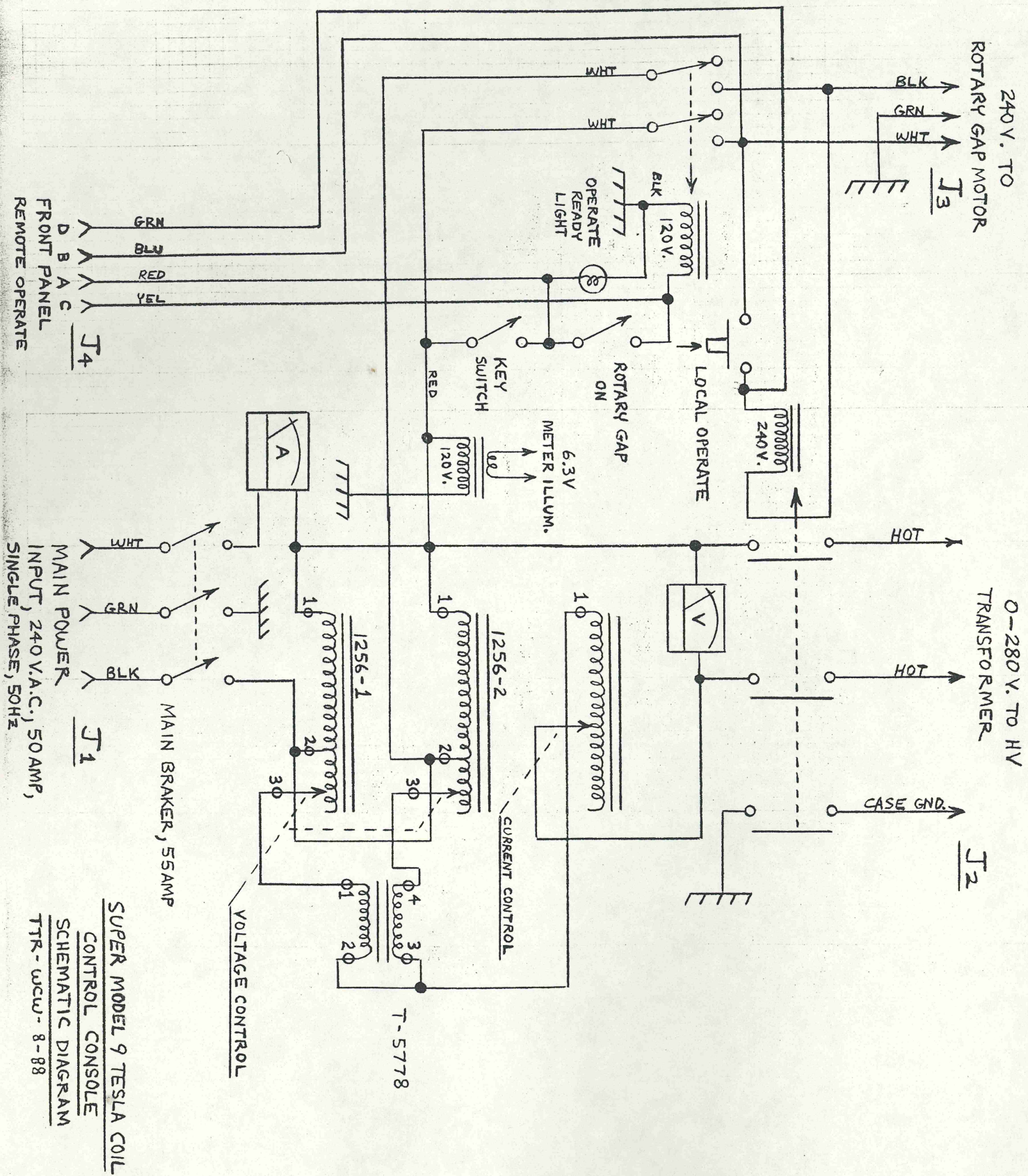
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BASE UNIT & SECONDARY COIL
SCHEMATIC DIAGRAM
TTR-WCU-8-88

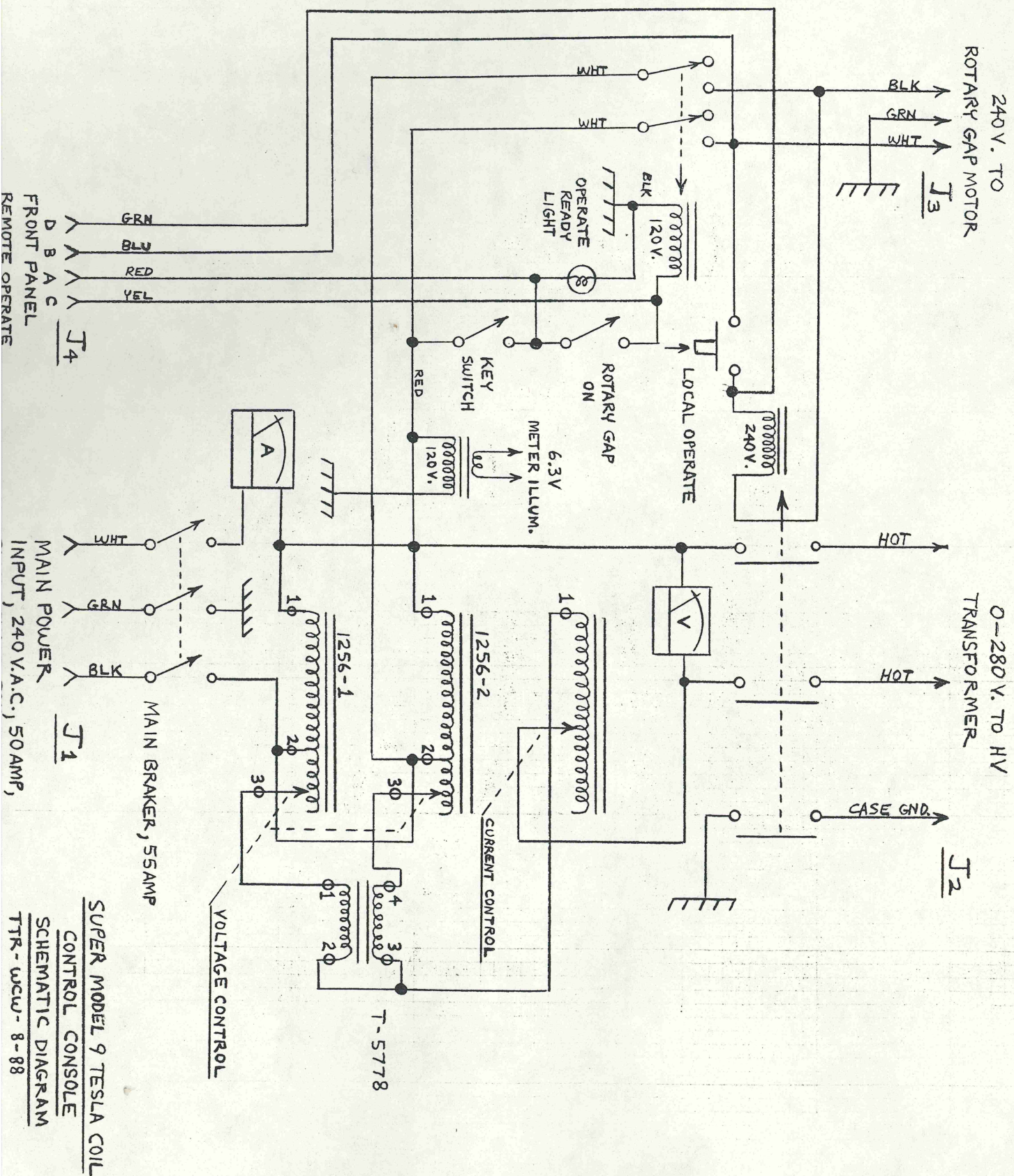


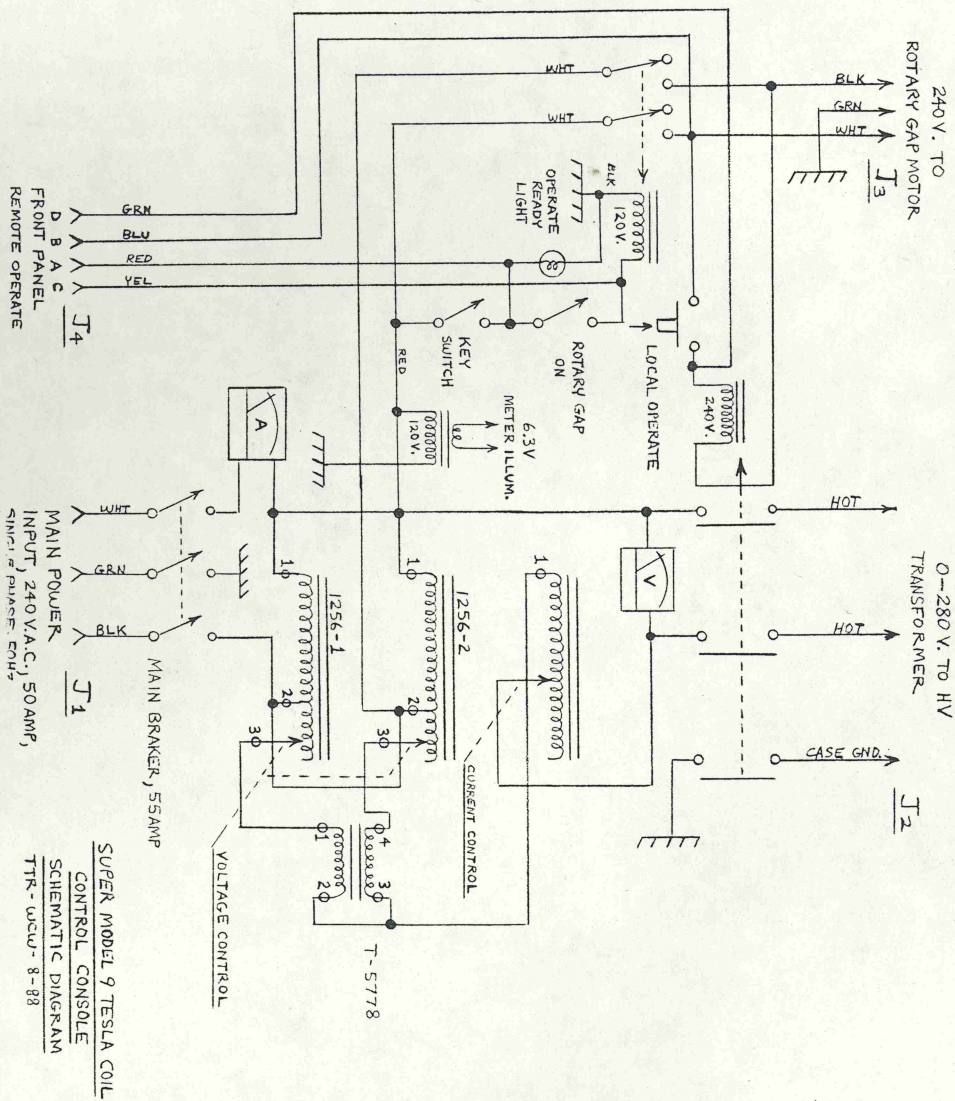




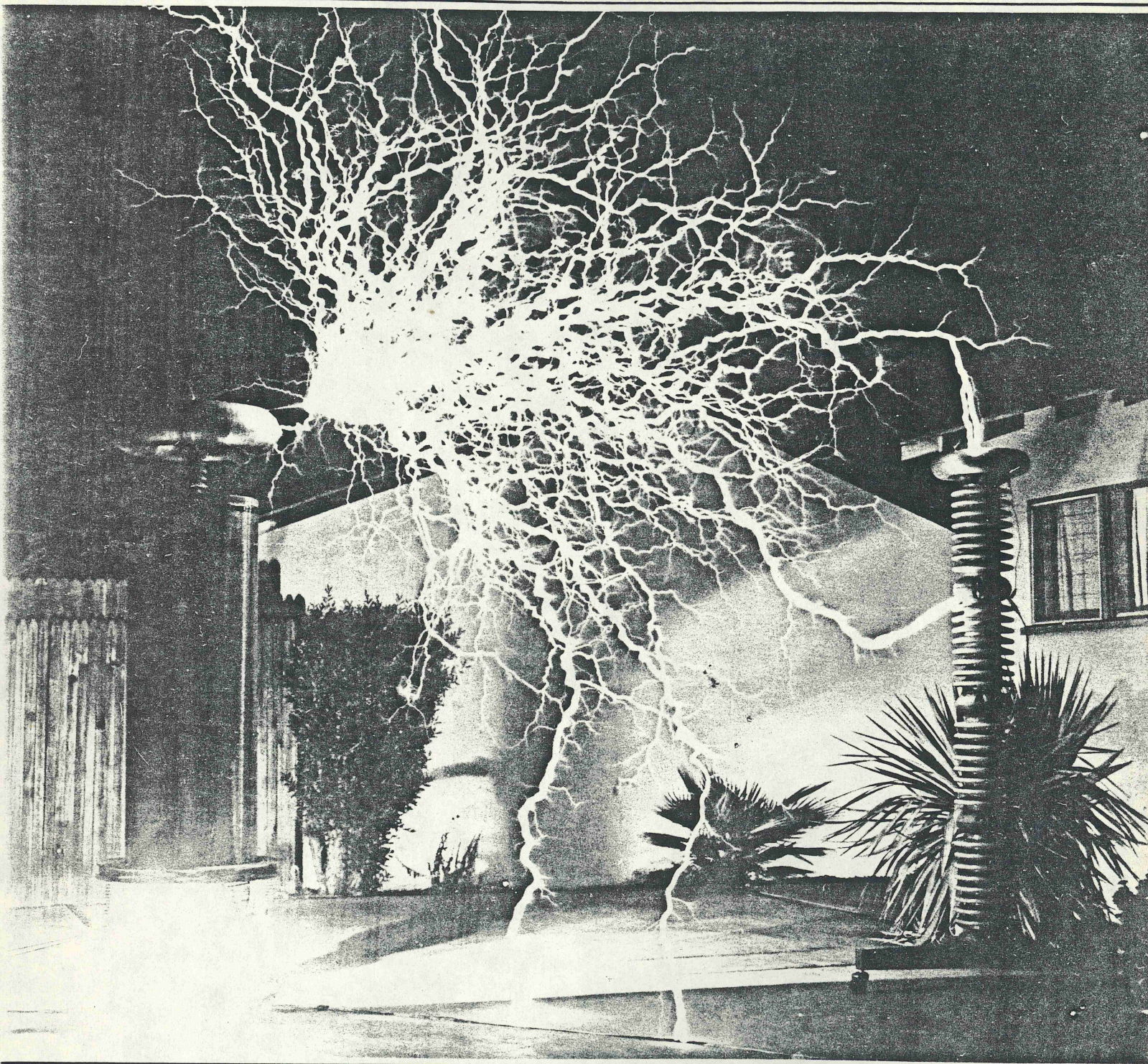








SUPER MODEL NINE TESLA COIL SYSTEM



OWNER'S MANUAL

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William C. "Bill" Wysock - Tesla Technology Research Archive - From the library of The Turn Of The Century Electrotherapy Museum

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SUPER MODEL NINE TESLA COIL SYSTEM

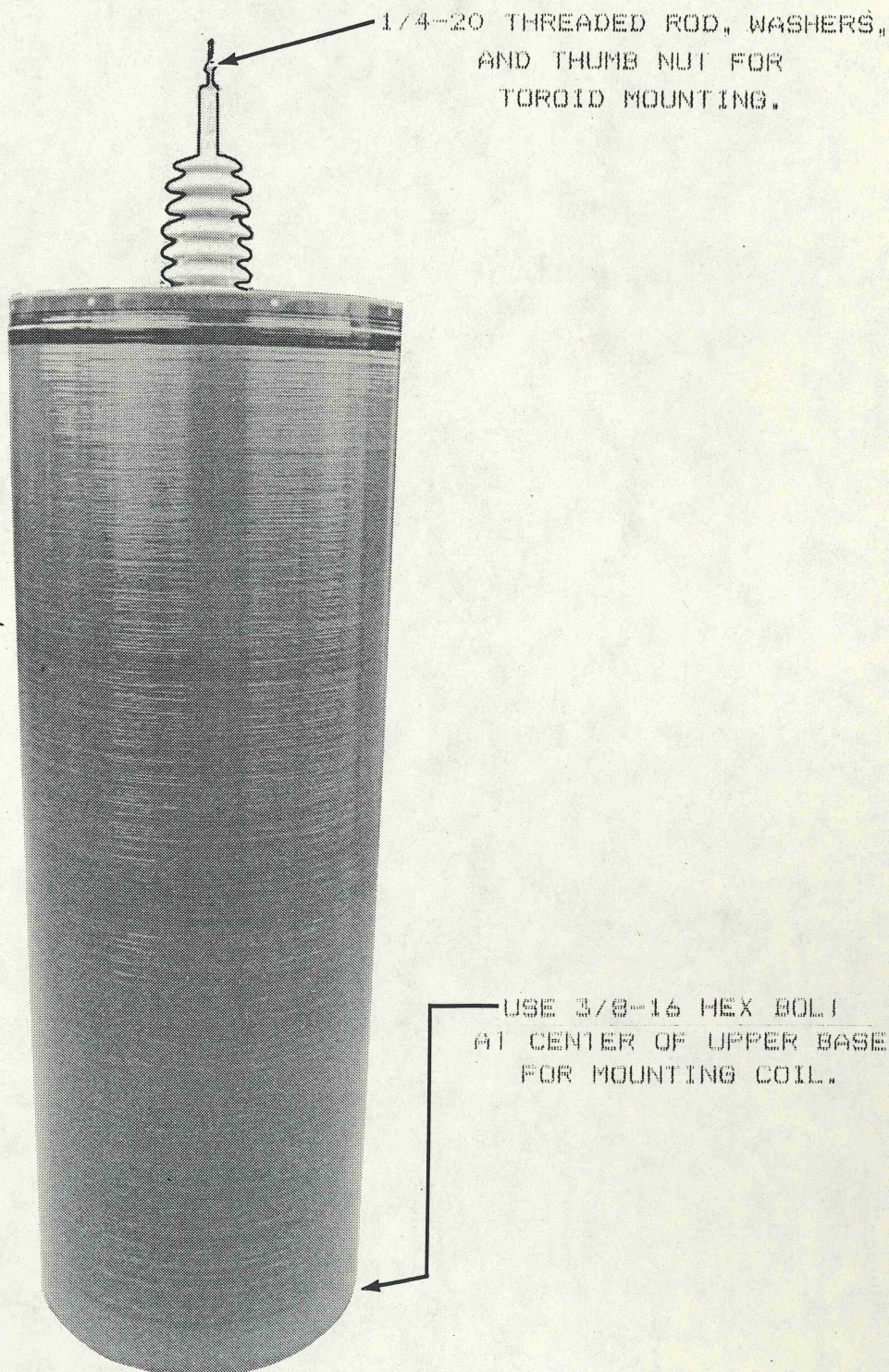
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WARNING: READ ALL INSTRUCTIONS BEFORE ATTEMPTING ANY OPERATION OF
THE SUPER MODEL NINE TESLA COIL SYSTEM. THIS EQUIPMENT
IS EASILY CAPABLE OF DELIVERING A LETHAL ELECTRIC SHOCK.

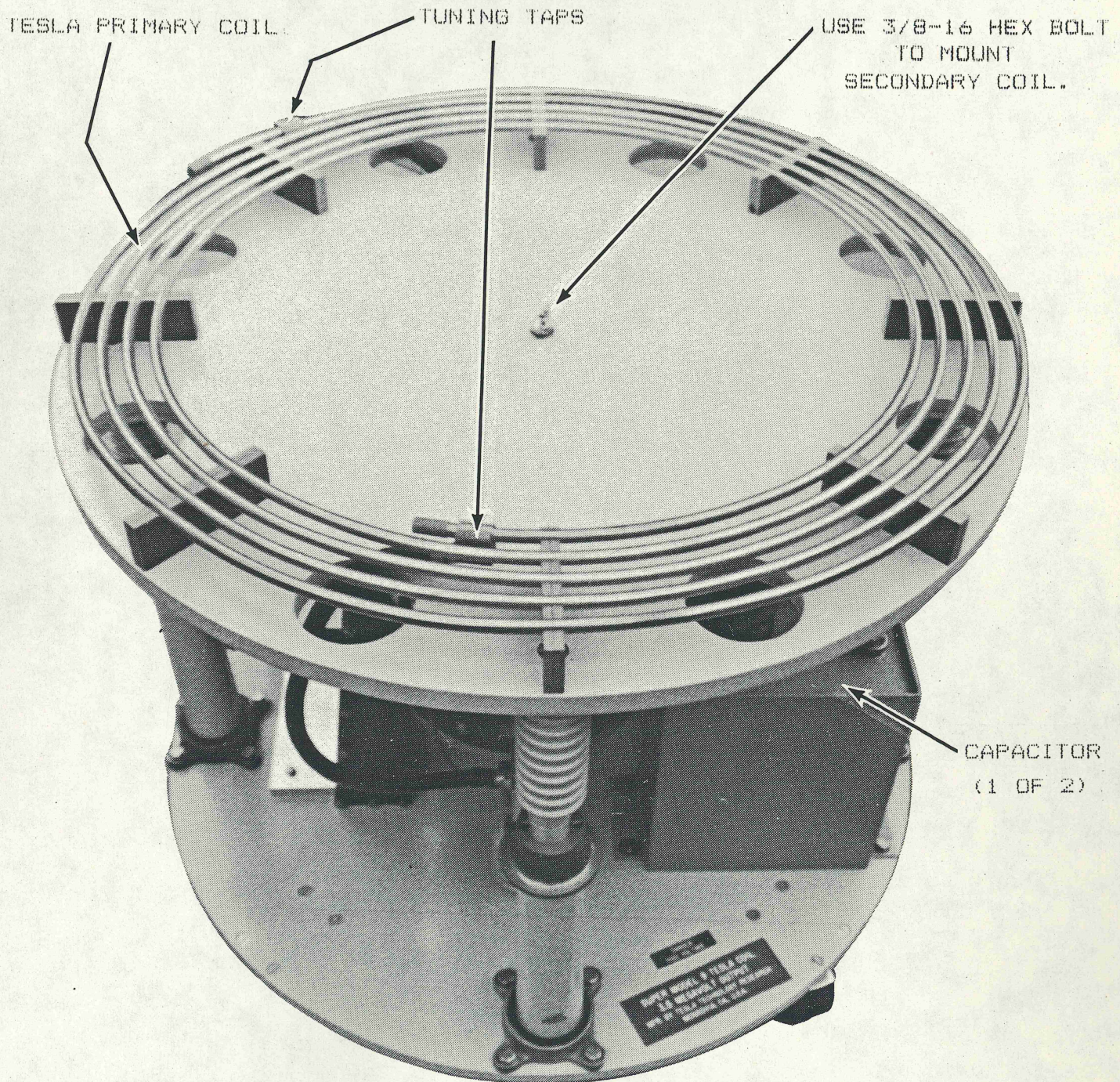
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1. PICTORIAL DESCRIPTION - TESLA SECONDARY COIL



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2. PICTORIAL DESCRIPTION - TESLA PRIMARY BASE UNIT



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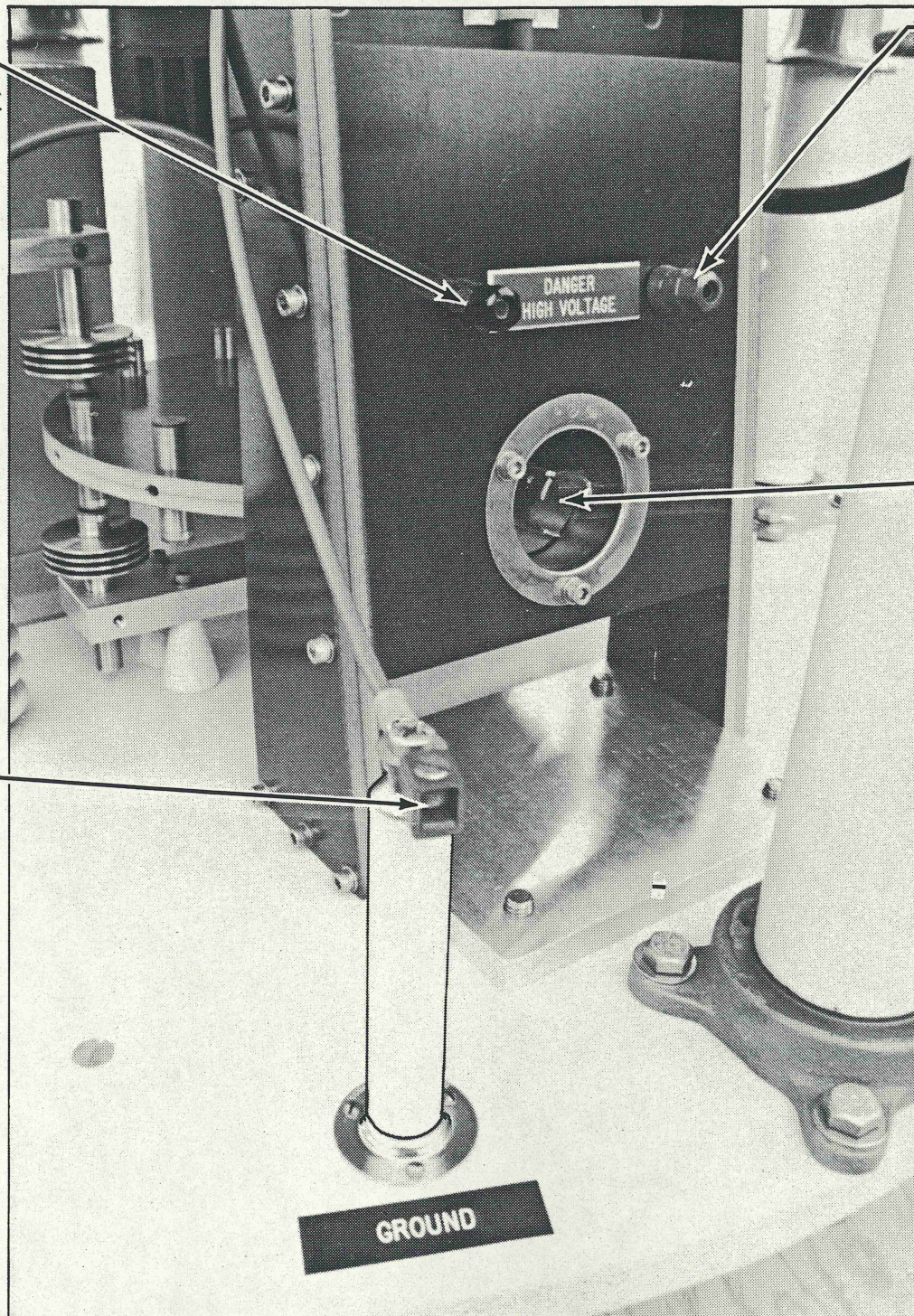
3. PICTORIAL DESCRIPTION - BASE UNIT CONNECTOR TERMINALS BASE UNIT SECONDARY GROUND

BLACK
TERMINAL:
(GROUND SIDE
OF H-V
XFORMER.)
SEE TEXT.

RED
TERMINAL:
(HIGH
VOLTAGE
SIDE OF
H-V
XFORMER.)
SEE TEXT.

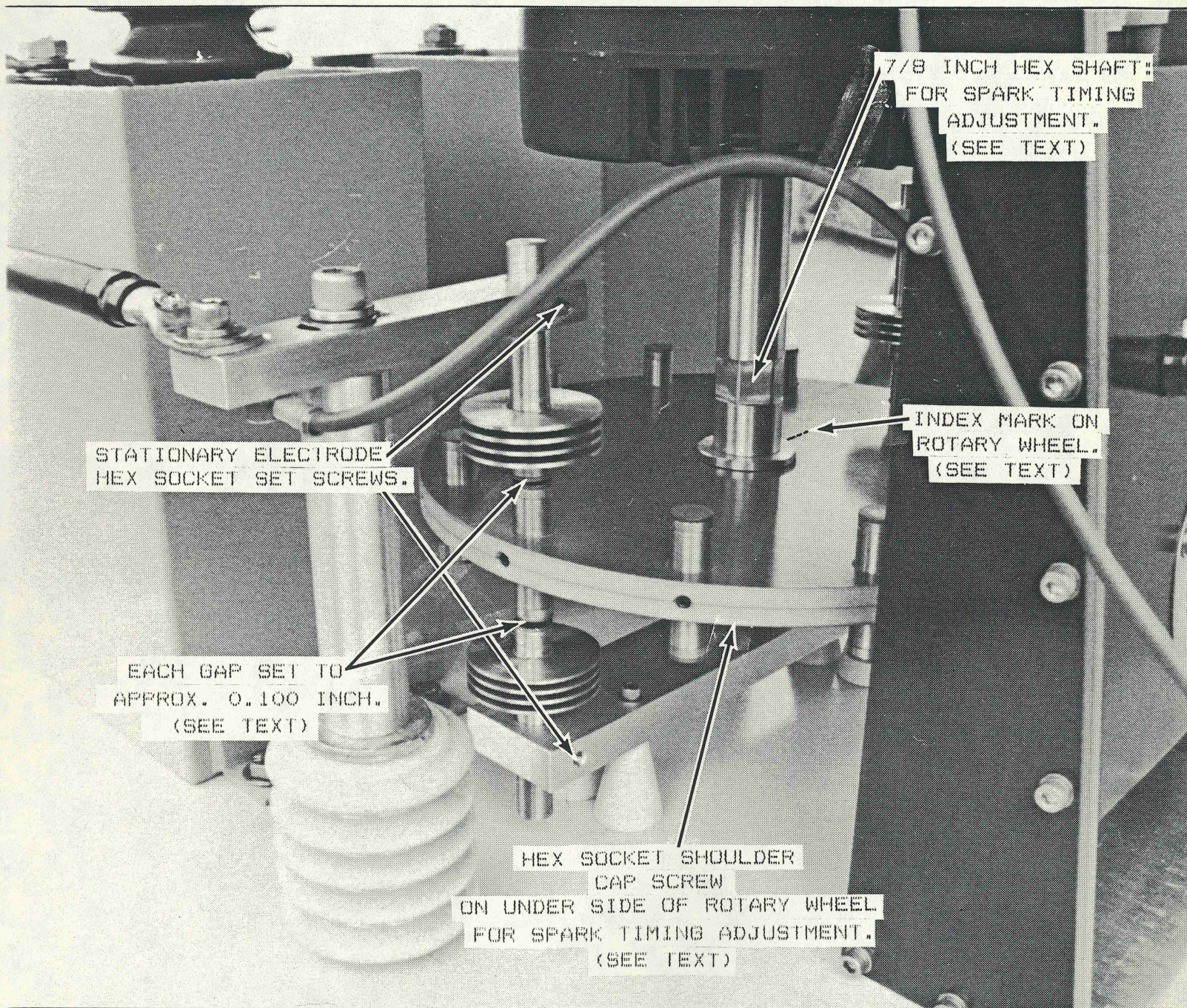
ROTARY GAP
MOTOR
POWER
INPUT.

THIS
TERMINAL
MUST GO TO
SEPERATE
EARTH
GROUND.
(SEE TEXT)



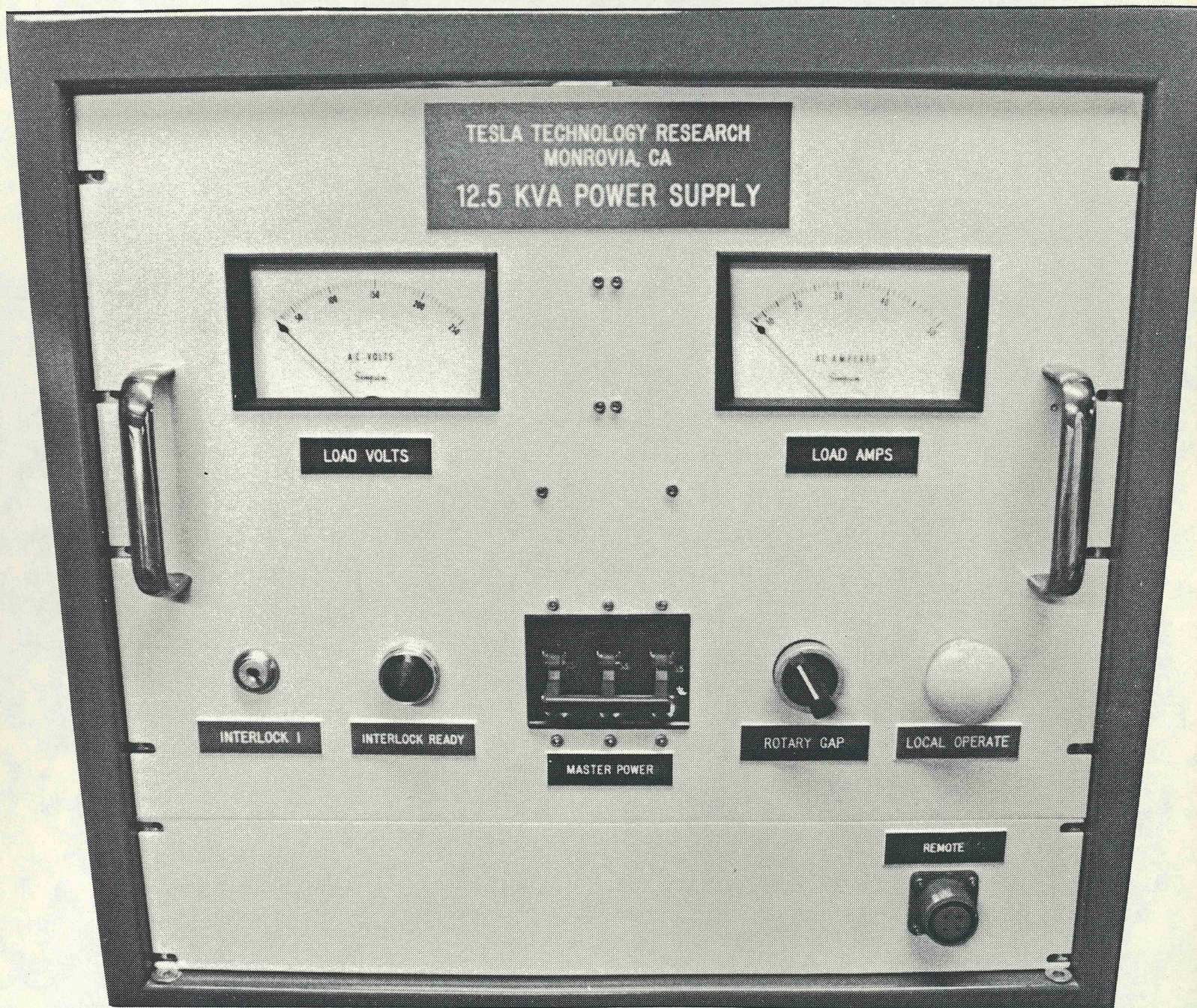
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4. PICTORIAL DESCRIPTION - BASE UNIT ROTARY GAP ASSEMBLY



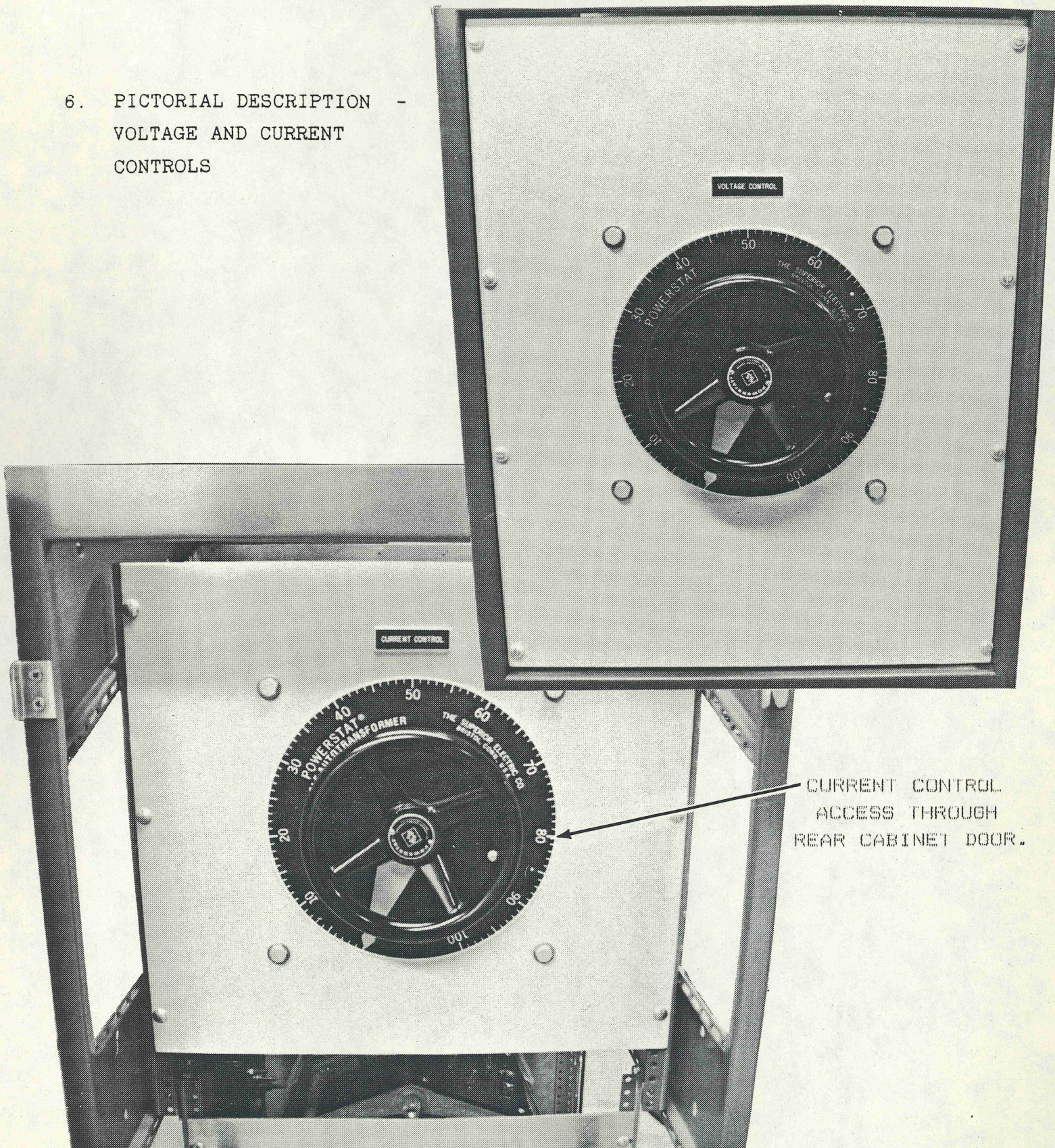
TESLA TECHNOLOGY RESEARCH

5. PICTORIAL DESCRIPTION - CONTROL CONSOLE OPERATING PANEL



TESLA TECHNOLOGY RESEARCH

6. PICTORIAL DESCRIPTION - VOLTAGE AND CURRENT CONTROLS



TESLA TECHNOLOGY RESEARCH

7. UNPACKING INSTRUCTIONS - SUPER MODEL NINE TESLA COIL

The Super Model Nine Tesla Coil System is shipped in three separate 3/4 inch thick plywood wood crates. One crate contains the Tesla Coil Primary Base Unit, and the 30 inch aluminum toroid discharge electrode. The second crate contains the Tesla Secondary Coil, and the third crate, the Super Model Nine Control Console and interconnect cables. The base unit crate and the secondary coil crate are opened by removing the top crate covers first. These covers are fastened with flat head phillips wood screws. The console crate is opened by removing the side plate that is fastened with the flat head phillips wood screws. Visually inspect all viewable contents for any signs of damage before attempting further unpacking. If any items appear to have sustained shipping damage, do not unpack the item(s). Contact the insurance carrier retained by the shipping firm to file a damage report. Assuming all items initially appear to be in good condition, proceed as follows;

- 1.) Remove the 30 inch toroid discharge electrode. Be sure to always handle this aluminum spinning with great care, as it can be easily scratched or dented. Wear soft cloth gloves in handling the toroid to avoid placing oils and acids from the hands onto the surfaces of the metal spinning.
- 2.) Remove the cardboard spacers from all four corners around the base unit. Using two people, lift the base unit vertically out of the crate, and set the unit on the floor on the base unit castors. SPECIAL NOTE: REMOVE THE BLACK ELECTRICAL TAPE THAT IS WRAPPED AROUND ONE SIDE OF THE ROTARY GAP STATIONARY ELECTRODE ASSEMBLY. This tape is provided to prevent unwanted movement of the rotary gap wheel during shipping. Discard the tape, and gently turn the rotary gap wheel by hand, to make sure that it rotates freely and without obstruction. Inspect the rest of the components to make sure nothing is broken or loose from shipping.
- 3.) The Secondary Coil is removed by un-screwing the 3/8-16 hex head bolts on both ends of the crate. Carefully lift the coil out of the crate, and place the unit upright on the floor. The necessary hardware for attaching the secondary coil to the primary base unit is in the center of the upper base plate. Simply remove the wing nut and washer. Save all packing material and hardware. The hardware for attaching the toroid on top of the secondary coil feed-thru insulator will be found in a separate small plastic bag.
- 4.) For the control console, after removing the crate side panel, use this panel with some sort of support blocks to build a ramp, in order to roll the console out of the crate on its castors, down to the floor. Remove the plastic bags containing the interconnect cables, remove all foam packing blocks, and then remove the control console.

This completes all unpacking procedures. Proceed to the next section.

NOTE: REMEMBER TO SAVE THESE CRATES AND PACKAGING MATERIAL FOR ANY FUTURE POSSIBLE SHIPPING REQUIREMENTS.

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8. INSTALLATION PROCEDURE

The Super Model Nine Tesla Coil System has been designed and constructed for simple and effective installation. First, determine the exact location for the Tesla Coil Base unit. This base unit must be placed on a solid, flat surface, such as a concrete floor. This floor serves as an electrical ground plane, and is necessary for proper electrical resonance tuning of the Tesla Coil system. The base may be raised up off its swivel castors, to prevent any movement from the installed position, provided the raised distance does not exceed six inches. Re-enforcement steel bar, normally associated in all commercial concrete floor construction, serves as an electrical counter-poise, which will work effectively as a ground plane for this Tesla Coil system. The amount of floor space required for installation should include a minimum radius from the base unit center of twelve feet, horizontally measured. Depending on the desired corona discharge path(s), a vertical clearance of twenty-five feet, measured from the floor, will be required if this coil is to develop the maximum length discharge streamers possible. If corona points are arranged in a lateral manner about the equator of the toroid, this vertical height specification may be reduced to eighteen feet. Of course, smaller clearance dimensions are acceptable, provided the maximum possible arc length of fifteen feet is not a major requirement of the installation. In such cases, it is strongly recommended that deliberate grounded arc targets be arranged for the Tesla Coil to discharge to, in order to prevent any possibility of the arc causing physical damage to surrounding objects. If the Tesla Coil is to be placed inside of a Faraday Screen or Cage, the metal mesh or wire cloth should be uniformly spaced around the coil, without any physical obstructions.

Once the Base Unit has been placed, the Secondary Coil may be secured to the upper top plate, using the single 3/8"-16 hex head machine bolt provided. This bolt provides both mechanical and electrical connection for the lower end of the Secondary Coil, (refer to pictorial descriptions 2 and 3 for details.) The 30 inch aluminum discharge toroid may now be secured on top of the Tesla Secondary Coil feed-thru insulator, using the hardware provided.

The Control Console may be located in any convenient location away from the Base Unit, up to the full length of the Rotary Gap interconnect cable provided, a distance of approximately twenty-five feet. The High Voltage Power Supply Transformer should be located adjacent to the Control Console, using the prefabricated interconnect cable provided. Also utilize the High Voltage cable provided for connection between the supply transformer output, and the input of the Base Unit, (see schematic diagram and pictorial 3 for details.) When using an unbalanced high voltage output configuration, it is **ABSOLUTELY ESSENTIAL THAT THE GROUND SIDE OF THE HIGH VOLTAGE WINDING GO TO THE BLACK TERMINAL, AND THE HIGH VOLTAGE SIDE GO TO THE RED TERMINAL; FAILURE TO FOLLOW THIS INSTRUCTION COULD CAUSE SERIOUS DAMAGE TO THE EQUIPMENT.** Refer to the schematic diagram for this connection.

A dedicated A.C. power line should be run to an outlet that can be placed close to the Control Console. This feed should be rated for 60 amps, 208 to 240 volts, single phase. Connect the Control Console green lead to ground, the white wire to A.C. common (or neutral,) and the black lead to A.C. high, (hot.) Referring to Pictorial Description Three, note the location of the insulator labeled "GROUND." This terminal is the input for the Tesla Secondary Coil, and **MUST BE RUN AS A SEPERATE LINE TO A VERY GOOD EARTH GROUND.** The physical

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INSTALLATION PROCEDURE, CONT'D

length of this line should be kept as short as possible, and should not exceed fifty feet in length. Use #1 A.W.G. (American Wire Gauge,) stranded copper wire for this connection. The grounding point can be made to the building steel framework, provided this framework also is solidly connected to a low resistance earth ground.

The high voltage cable, provided for connection between the high voltage power supply transformer and the Tesla Coil Base Unit input terminals, can be run inside metal conduit if desired, or may be run in an open metal cable tray. In either case, the tray or conduit should be bonded to electrical ground for safety. This cable is rated for 40,000 volt insulation and should give many years of service.

If the Tesla Coil is to be operated inside of a Faraday Cage, the cage and its associate metal framework should be bonded to the same #1 A.W.G. wire that is run for the Secondary Coil ground. The most desirable point of bonding the cage is at the Tesla Coil Base Unit grounding terminal.

Tuning of the Super Model Nine Tesla Coil System is affected by objects or surfaces around the Secondary Coil. In the case of a Faraday Cage, the effect is that of increased parallel capacitance in the Tesla Secondary circuit. System resonance can be adjusted by altering the location of the outermost Tesla Primary Coil tap location, thus increasing or decreasing the primary circuit series inductance. AS SHIPPED, THIS TAP HAS BEEN SET FOR THE CORRECT POSITION WHEN THE TESLA COIL IS LOCATED INSIDE A FARADY CAGE OF 20 FOOT INSIDE DIAMETER, AND SHOULD REQUIRE NO FURTHER ADJUSTMENT.

Tuning is additionally affected by the index of the Rotary Spark Gap wheel with respect to its brass motor arbor (DWELL ANGLE,) Voltage and Current control settings, and Rotary Gap individual gap setting. Initially, this gap is factory set at 0.100" per gap, giving a total for all four gaps of 0.400". This total gap spacing should not require any adjustment, except for rotation of the stationary electrodes, as discussed in the section on ROUTINE MAINTENENCE. Refer to the Pictorial Description on page four.

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9. OPERATING INSTRUCTIONS - PRECAUTIONS

Pictorial Description numbers five and six show the operation controls for the Super Model Nine Tesla Coil System. Looking at the illustration of the main control panel, note the remote connector, located at the lower right; this connector allows remote control of the Rotary Gap and Local Operate panel switches, (refer to the schematic diagram designation "J4".)

WARNING: UNDER NO CIRCUMSTANCES SHOULD POWER BE APPLIED TO THE SYSTEM UNTIL ALL GROUNDING AND WIRING INSTALLATION WORK HAS BEEN SATISFACTORILY COMPLETED. ANY PERSONS POSSESSING ANY FORM OF ELECTRO-CARDIAC DEVICES (PACEMAKERS) SHOULD LEAVE THE AREA BEFORE ANY ATTEMPT IS MADE TO OPERATE THE SUPER MODEL NINE TESLA COIL SYSTEM. THESE PRECAUTIONS ARE ABSOLUTELY NECESSARY FOR YOUR PROTECTION. WHEN THE SUPER MODEL NINE TESLA COIL SYSTEM IS INSTALLED INSIDE OF A PROPERLY DESIGNED FARADAY CAGE, THE PACEMAKER WARNING NEED NOT APPLY.

Initial operation should be with the current control knob set at about "70" on its dial face, and the voltage control knob set at "0". Turn on the Master Power multibraker switch. The two meters, A.C. VOLTS and A.C. AMPS should show dial face illumination. Next, insert the key on the switch marked "INTERLOCK 1." Turn this key to the right. The large red pilot light next to this switch marked "INTERLOCK READY," should light. Now turn the black knob marked "ROTARY GAP," to the right. You should hear a relay close, and the Rotary Gap Motor energized. This motor has had its armature ground to convert it from 1450 R.P.M. NON-SYNCHRONOUS, TO 1500 R.P.M. SALIENT-POLE SYNCHRONOUS OPERATION. A steady, even sound should be heard from the running of this motor, indicating synchronous rotor rotation with respect to the 50 Hertz line frequency. If for any reason the sound coming from this motor varies, as in the case of the rotor "hunting" or "surging," immediately turn off the power, and contact Tesla Technology Research, for further instructions. Assuming all is correct to this point, turn the VOLTAGE CONTROL clock-wise to the "50" position on its dial. The A.C. VOLTS meter should now show an indication of about 120-140 volts. Now momentarily push in the yellow push button marked "LOCAL OPERATE," and then release. A second relay should be heard to close, and a loud acoustic report of sparks from the Rotary Gap. If no sparking occurs at the Rotary Gap, or only some occasional sparking, increase the Voltage Control to read 180 volts on the voltmeter, and try again. When the point has been reached on the Voltage Control where a steady, continuous sound of sparking occurs at the Rotary Gap, take note of the current reading on the A.C. AMPS meter. It should read between 10 to 40 amps, and may vary somewhat while the Tesla Coil is energized. Place a piece of heavy guage wire on top of the 30" aluminum dishcharge toroid, such that one end protrudes horizontally out from the equator about 12 inches. Using an assistant as an observer, to watch the characteristics of the corona discharge issuing forth from the end of this wire (corona point,) again energize the Tesla Coil. Make a note of the length and intensity of the corona streamers issuing from the end of the corona point. Also note the voltage and current readings.

Try varying the voltage control to achieve the minimum setting where the Tesla Coil discharges in a steady manner. Once this point has been found, next try varying the current control knob, to further enhance the steadiness of the

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OPERATING INSTRUCTIONS CONT'D

discharge. Typically, you will notice that there is a certain "range," over which the coil operates, with one point where it will also be observed that the lowest current reading is obtained, while maintaining steady discharge output. This point is to be noted and maintained. Very little further adjustment of the current control will be required for further general tuning. What has been accomplished by this exercise, is power factor compensation of the characteristic impedance of the A.C. supply circuit to the high voltage supply transformer input, and its complex impedance load to the Tesla Primary resonant tank circuit. Further enhancement of the length and quality of the discharge may require re-positioning the index mark between the Rotary Gap wheel and its associate brass motor arbor mounting. To accomplish this, first turn off all power to the console, and allow the Rotary Gap wheel to slow to a stop. Using an open-end wrench on the hex-faced portion of the arbor, hold the motor shaft from turning, and use an allen hex key to loosen the cap screw on the underside of the Rotary Gap wheel. Change the index mark by about 3-5 degrees, and retighten. Refer to Pictorial #4. Now repeat the above testing procedure. After several combination of settings, the best possible discharge will be secured from the toroid corona point, for a minimum power input level.

SPECIAL NOTICE: THIS TUNING AND ADJUSTMENT PROCEDURE MUST BE CARRIED OUT BY QUALIFIED ELECTRICAL TECHNICIAN PERSONNEL. IF YOU ARE UNSURE IN FOLLOWING ANY OF THESE STEPS, DO NOT PROCEED TO OPERATE THIS SYSTEM. CONTACT TESLA TECHNOLOGY RESEARCH AT ONCE, FOR FURTHER ASSISTANCE.

Assuming all above steps have been satisfactorily completed, you are now ready to adjust the Super Model Nine Tesla Coil System for its maximum output. Energize the system in the prescribed manner, depress the local operate button, and hold it closed. Adjust the VOLTAGE CONTROL to a higher setting, watching the A.C. AMPS meter, so as to not exceed 50 amps on the meter. The observer should be at a distance at least 25 feet away from the Tesla Coil, and have a clear view of the toroid corona point. The primary job of the observer, is to watch for any possibility of any spark breakdown between the Tesla Primary and Secondary Coils. Should this occur, IMMEDIATELY STOP OPERATION OF THE TESLA COIL. Verify that all ground connections and other wiring is intact. It is possible that some slight re-adjustment of the Rotary Gap wheel index, the Console current control, or Rotary Gap gap spacing will have to be performed. The TOTAL GAP SPACING MUST NOT EXCEED 0.400" or 0.100" per gap. Likewise, the smallest individual gap setting should not be less than 0.050" per gap. Use a machinist's feeler gauge to set the gap spacing. When all adjustments have been properly made, the Tesla Coil will be capable of reliable streamer corona discharges up to fifteen feet in length, with no spark breakdown near the base of the Secondary Coil. This output represents approximately 3.5 million volt output potential. Keep a permanent written log of all the adjustments made to this system, including maintenance operations. By merely adjusting the VOLTAGE CONTROL between the minimum and maximum noted settings, the output of your Super Model Nine Tesla Coil System can be regulated for a spark length between several feet, up to about fifteen feet.

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OPERATING INSTRUCTIONS CONT'D

It is recommended that each period of operation of the Super Model Nine Tesla Coil System be limited to a maximum continuous "ON" state not to exceed 10 seconds, with a minimum intervening "OFF" state of one minute. This recommendation is made in order to allow for a maximum life-cycle of the system. Higher order duty cycles will impose more intensive wear on the Control Console autotransformers, the Rotary Gap stationary electrode faces, and eventual heating of the dielectric insulation in the Primary circuit oscillation capacitors. The REMOTE panel connector may be wired to a separate panel, to allow for more convenient demonstration applications, or it may be placed under automatic control from a computer, using external relays in place of manual switches. In any case, the system WILL NOT OPERATE when the KEY SWITCH is in the "OFF" position.

10. ROUTINE MAINTENANCE

After every hour of accumulated operation, under normal circumstances, the Rotary Gap stationary electrodes must be rotated in their mountings, to promote an even wear pattern of the tungsten electrode faces (refer to Pictorial #4.) Locate the hex-socket set screws for each of the stationary electrodes, and loosen so that the electrodes can be rotated approximately 20 degrees in rotation. Using a machinists' feeler gauge, re-gap each of the four stationary electrodes to the original gap settings previously used, and tighten the set screws. Caution: do not over-tighten these set screws; the brass rods are a relatively soft metal, and can easily be gouged, making future adjustments more difficult. Note these adjustments in a written maintenance log sheet, including date, operation performed, and initials of the person making the adjustments. Replacement parts, if required, are available from Tesla Technology Research. Under normal conditions, the rotary electrodes on the Rotary Gap wheel, will require no maintenance at all. The exposed surfaces of the Tesla Primary and Secondary Coils should be kept dry and clean from any dust or debris at all times.

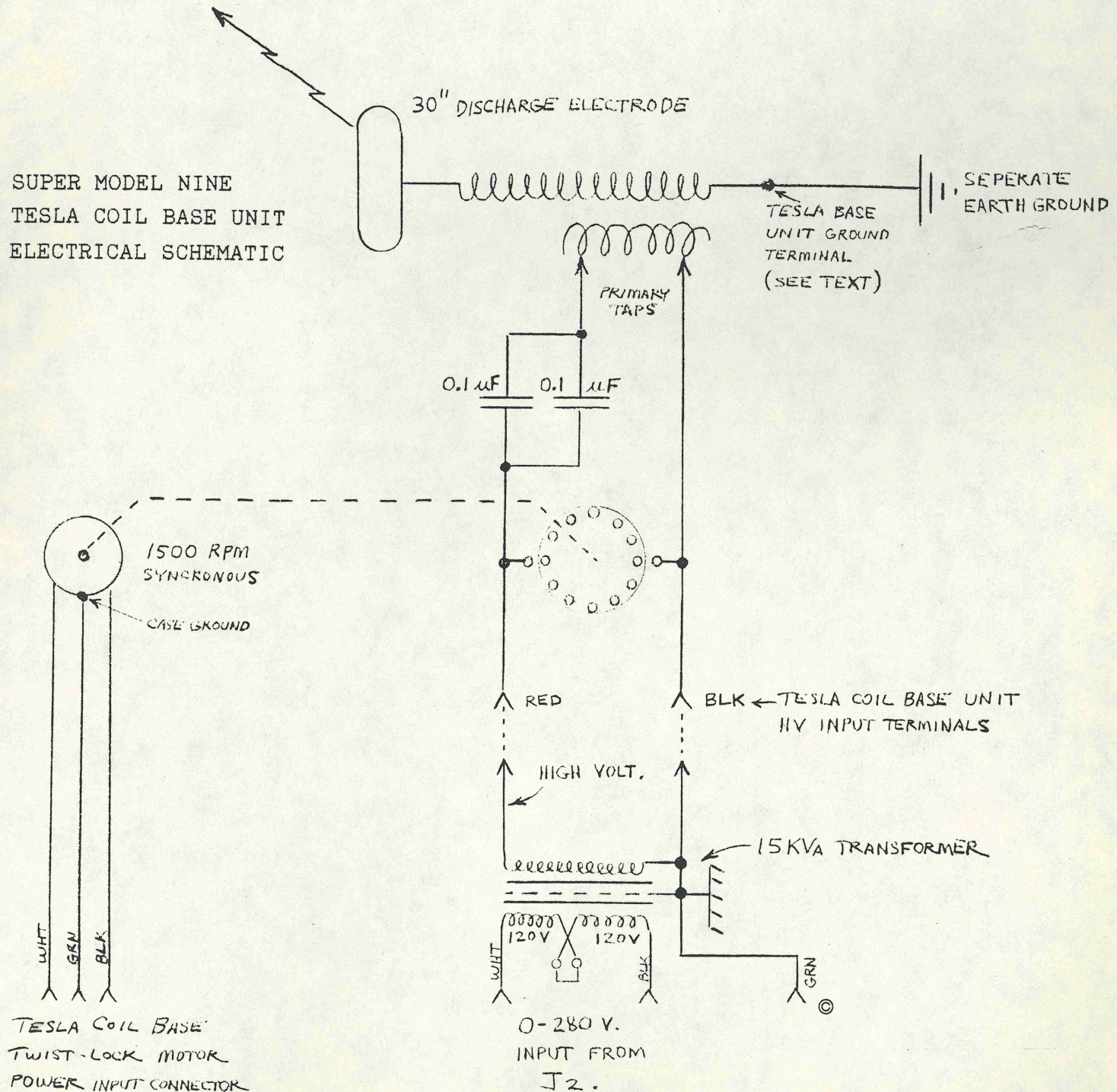
WARNING: MAKE SURE ALL ELECTRICAL POWER TO THE CONTROL CONSOLE IS TURNED COMPLETELY OFF BEFORE ATTEMPTING ANY ADJUSTMENTS OR MAINTENANCE TO THE SUPER MODEL NINE TESLA COIL SYSTEM. A LETHAL ELECTRIC SHOCK HAZARD EXISTS IN THE COMPONENTS OF THIS SYSTEM. REMOVE THE KEY FROM THE CONTROL CONSOLE PANEL DURING MAINTENANCE PERIODS. YOU ARE RESPONSIBLE FOR YOUR OWN SAFETY AS WELL AS FOR OTHERS IN THE VICINITY OF THIS SYSTEM.

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11. POWER REQUIREMENTS AND SCHEMATIC DIAGRAMS

The basic electrical parameters of the Super Model Nine Tesla Coil System are as follows:

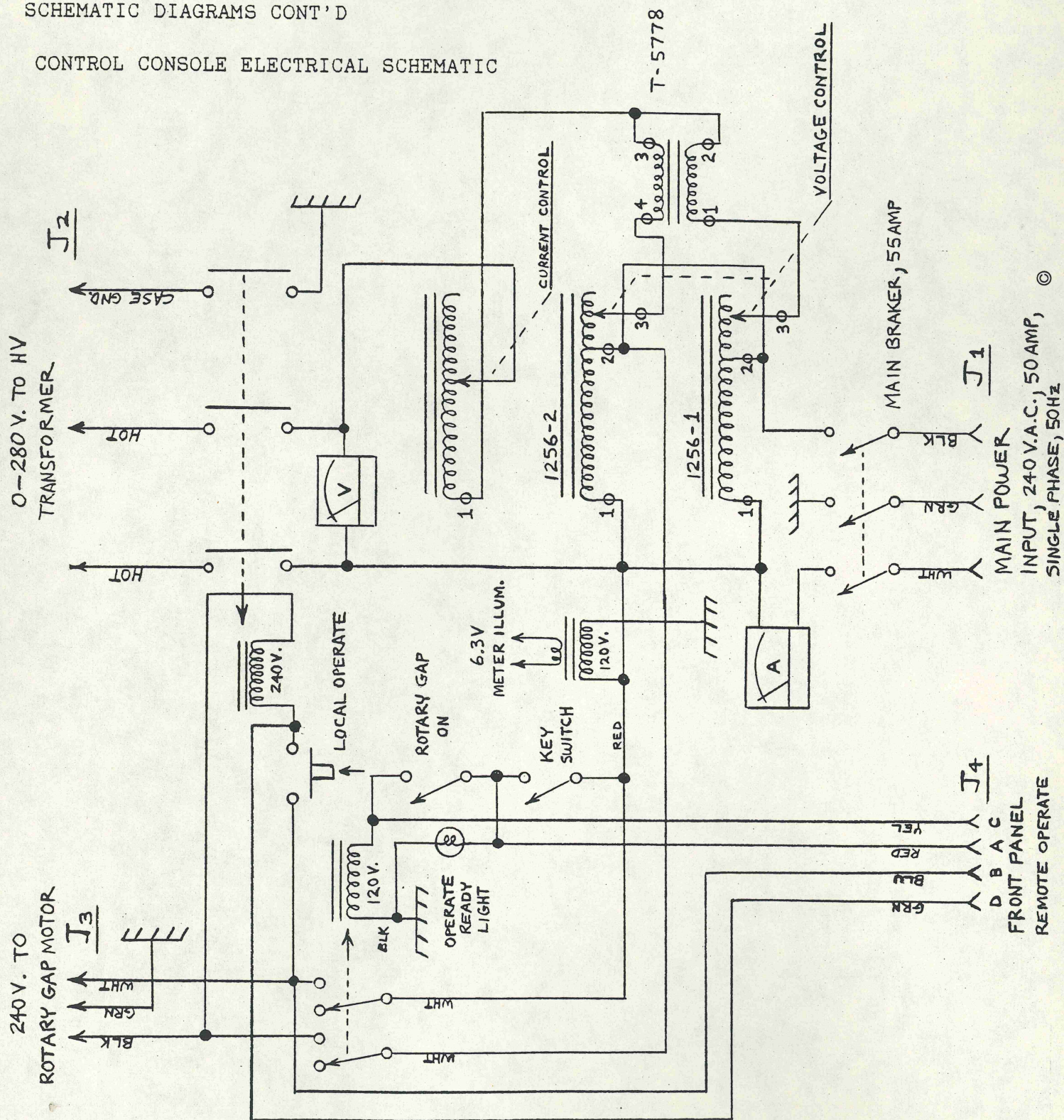
Power input: 208-240 V.A.C., 50 Hz. single phase, 35-50 amps nominal.
Output: 3,500,000 volts (3.5 MV) maximum, 80-95 KHz.



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SCHEMATIC DIAGRAMS CONT'D

CONTROL CONSOLE ELECTRICAL SCHEMATIC



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12. WARRANTY

PLEASE READ CAREFULLY - THIS IS A LIMITED WARRANTY

Tesla Technology Research warrants the complete Super Model Nine Tesla Coil System to be free of defects in workmanship and materials for a period of one year from the date of original purchase, and hereby certifies that this equipment functions as in accordance with its design parameters at the time of shipping. This warranty does not cover the customer's use of this equipment, as Tesla Technology Research has no control over the Super Model Nine Tesla Coil System after shipment to the customer.

Tesla Technology Research assumes no liability for the operational safety of the customer's installation of the Super Model Nine Tesla Coil System.

It is understood that a LETHAL ELECTRIC SHOCK HAZARD exists in the components of the Super Model Nine Tesla Coil System, and that the customer assumes all necessary installation and operation safety requirements of this system. Technical supervision assistance is available from Tesla Technology Research.

Components of the Super Model Nine Tesla Coil System returned by the customer, require prior written authorization, and will be evaluated by Tesla Technology Research. If these components are found to be faulty through no cause of the customer, they will be replaced at no charge, for a period of up to, but not exceeding, one year. No other warranty is expressed or implied.

SUPER MODEL NINE TESLA COIL SYSTEM

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