MODEL FIVE TESLA COIL SYSTEM



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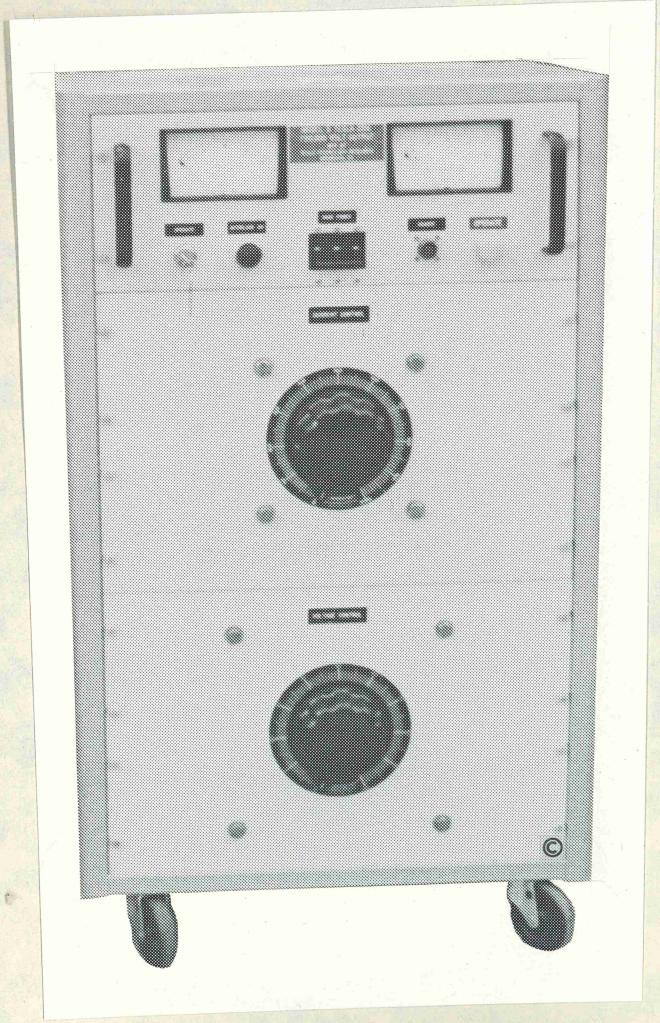
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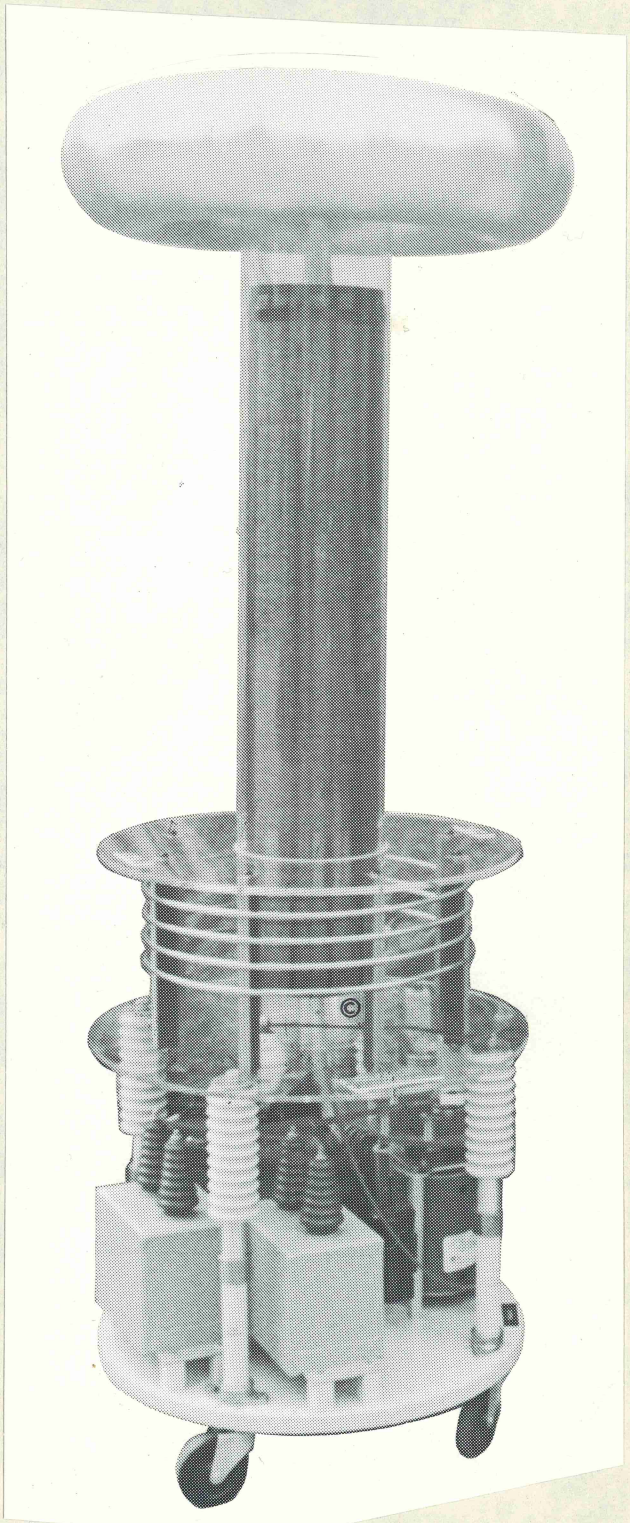
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MODEL FIVE TESLA COIL SYSTEM

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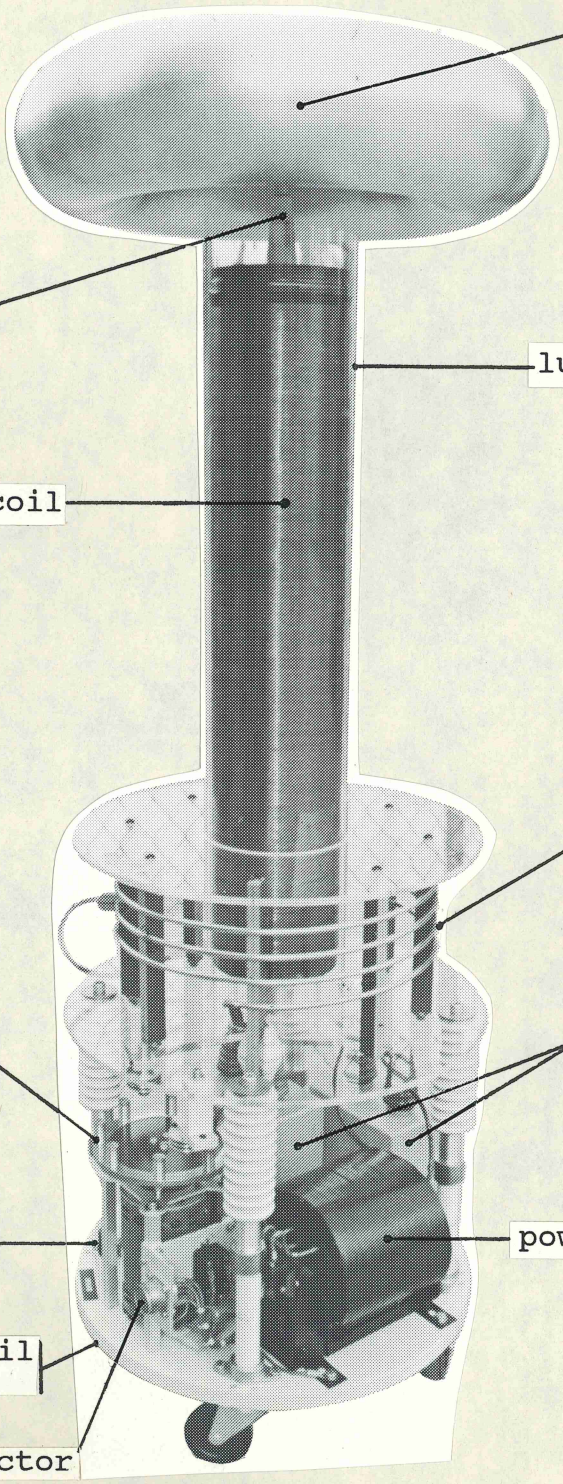
WARNING: READ ALL INSTRUCTIONS CAREFULLY BEFORE ATTEMPTING OPERATION OF MODEL FIVE TESLA COIL SYSTEM.

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1. MODEL FIVE TESLA COIL PICTORIAL DESCRIPTION

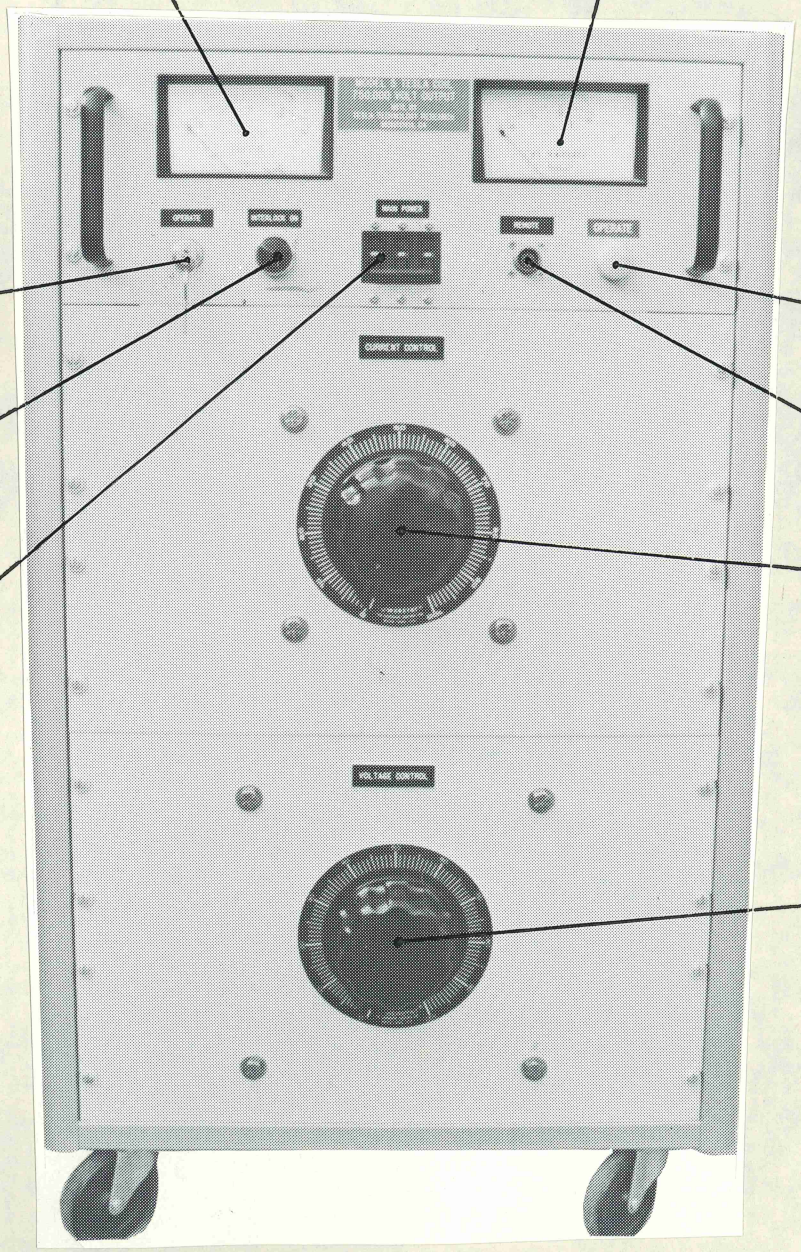


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2. MODEL FIVE POWER SUPPLY PICTORIAL DESCRIPTION



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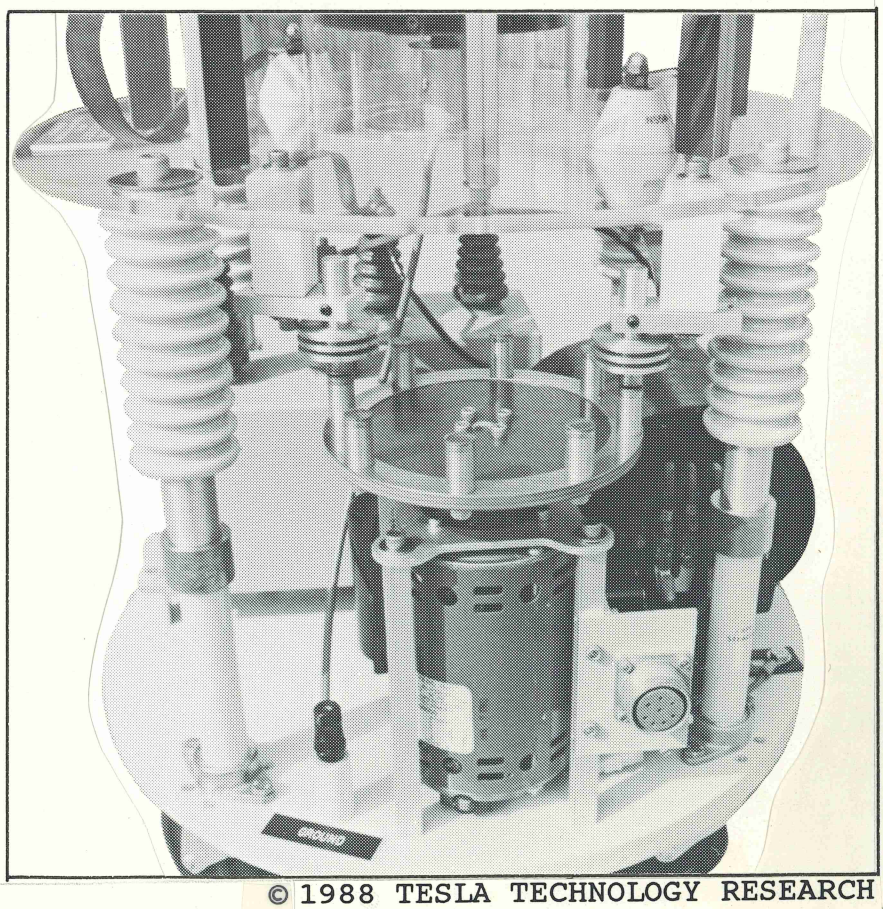
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3. INSTALLATION PROCEDURE

The Model Five Tesla Coil System is designed for easy installation. First, determine that the perspective installation site is physically correct in size to insure safe operation. This may be accomplished by allowing a minimum six foot radius clearance on all sides from the base of the Tesla Coil. A minimum eight foot vertical clearance is required, measured from the Tesla Coil base.

It may be desirable to arrange one or more grounded electrodes near the vicinity of the 20" discharge electrode, thus allowing the high voltage discharge to arc from the toroid to these grounded points. The spacing of each of the grounded points to the toroid discharge electrode determines the amount of high voltage potential built up on the toroid. An arc jumping a straight line measured distance of 40" represents slightly more than 750 KV output potential.

It may also be desirable to arrange some form of booth or alcove in which the Tesla Coil is to be positioned. In this manner, the discharges will be seen more dramatically, especially if the area surrounding the coil and its background are darkened from ambiate light in the room. Additionally, this configuration has the



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3. INSTALLATION PROCEDURE (cont'd)

advantage of keeping spectators at a safe distance.

The power supply rack may be located in any well ventilated area up to a maximum distance from the Tesla Coil determined by the black interconnecting cable length. A suitable 30 amp service outlet should be located so that the power input cable may be directly plugged in. If an extension cable is unavoidably necessary, it must be of the 3 conductor #10 AWG size stranded conductor type and should be rated for at least 30 amp, 120 volt continuous duty.

Once both units are properly positioned, next connect a length of #10 AWG copper braided wire (or equivalent) to a very good earth ground, such as a cold water pipe, if the plumbing runs directly into soil beneath the foundation. If no substantial ground is available, a grounding rod must be driven vertically down through the foundation into the soil. Such a rod should be of the type available from most hardware stores for the purpose of securing a good electrical ground reference. The other end of this cable must be connected to both the rack chassis and the ground terminal on the Tesla Coil base. (See Tesla Coil base unit illustration.) The maximum length of this cable between all points should not exceed 50 feet. Connection at the rack chassis may be accomplished by fastening a suitable 1/4" I.D. eyelet solderless crimp terminal to the 1/4" x 20 thread mounting screw in the back of the cabinet. Grounding connection to the Tesla Coil base unit is made at the insulated ground terminal.

WARNING: UNDER NO CIRCUMSTANCES SHOULD POWER BE APPLIED TO THE SYSTEM UNTIL ALL GROUNDING OPERATIONS HAVE BEEN SATISFACTORILY COMPLETED.

Next, connect the interconnecting cable from the power supply to the Tesla Coil base power input connector. Install the secondary coil by positioning the brass flange on the bottom of the coil directly over the 3/8" x 16 threaded rod of the central porcelain feed-thru bushing on the upper deck of the Tesla Coil

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3. INSTALLATION PROCEDURE (cont'd)

base. Secure by hand, applying gentle clock-wise rotation of the coil until the coil bottom is firmly seated to the lucite support ring located around the mounting bushing.

Next, carefully position the large lucite sleeve around the secondary coil.

Next, position the aluminum 20" toroid on top of the secondary coil high voltage feed-thru bushing. Use the #1/4-20 brass thumb nut and flat washers provided. When the toroid has been properly positioned and secured, the upper edge of the lucite sleeve should just snugly fit against the bottom of the toroid flat central plate area in a centered attitude.

Now make sure that the main power switch breaker is off, and connect the interconnect cable <u>first</u> to the Tesla Coil base, and then connect the A.C. cable to a power outlet.

This completes all installation instructions. Proceed to the next section entitled OPERATION INSTRUCTIONS.

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4. OPERATING INSTRUCTIONS

First, double-check that all previous instructions have been carefully followed before proceeding further.

WARNING: A lethal electrical shock hazard exists in the circuitry inside the rack cabinet and on the Tesla Coil base unit and Tesla primary coil winding. Make sure all power is off before attempting any adjustments. Avoid Murphy's Law which states that if anything can possibly go wrong, IT WILL!

All observers should stay at a minimum distance of six feet away from the Tesla Coil during periods of operation.

ANY PERSONS possessing any form of electro-cardiac devices (pacemakers) should leave the area BEFORE operating the coil.
THESE PRECAUTIONS ARE ABSOLUTELY NECESSARY FOR YOUR PROTECTION.

Position the VOLTAGE CONTROL knob to indicate 100 on the face plate and the CURRENT CONTROL knob to indicate 50 on its face plate respectively.

Apply power by actuating the main power switch breaker to the "on" position, (see page 2). Observe voltage indication on A.C. volt meter; it should read about 140 volts.

Now insert key in key switch and turn clock-wise 90 degrees. This activates the interlock operate ready function, which is verified by the red pilot lamp adjacent to the key switch, and also starts the rotary gap motor.

You are now ready to operate the Tesla Coil. Depress the large yellow button marked "local operate," for three seconds and release. A loud report and a torrent of long corona streamers should be seen emitting from the toroid discharge electrode.

If no sparks are indicated, reset the key switch to the "off" position and carefully inspect all visible connections for proper electrical and mechanical contact. Note: Coil will not operate if key switch is turned 90 degrees counter-clockwise as indicated by no illumination of the interlock ready red pilot lamp.

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4. OPERATING INSTRUCTIONS (cont'd)

If again no sparks appear after repeating the above instructions, DO NOT PROCEED FURTHER. Turn off all power to the power supply rack and consult with TTR for further instructions.

If coil is operating correctly, a current reading on the A.C. ammeter of approximately 25 to 30 amps should be noted during operation. This may vary slightly and is not abnormal. Long corona streamers should continuously issue forth in random directions from the toroid discharge electrode. Occasionally, a heavy discharge may be noted jumping from the lower portion of the secondary coil to the primary coil. If this happens, simply cease operation for a few seconds. This phenomena is caused by the air dielectric becoming overstressed. By stopping operation momentarily, the ionized pockets of air have a chance to dissipate, thus restoring the normal insulation value of the air space between the primary and secondary coil, and operation of the coil may be resumed.

Duration of operation SHOULD NOT EXCEED 10 SECONDS MAXIMUM for a continuous period. Approximately 20 second periods MINIMUM should be observed between successive 10 second periods of operation, with no more than 5 operations per 1/2 hour, to allow for rotary gap cooling. This instruction is also designed to protect the carbon contactors on the variacs from becoming excessively heated and causing a blackened scorch mark on the variac windings at the point of contact. Additionally, it will insure longest rotary gap component life expectancy. Failure to observe these operating instructions may shorten the life expectancy of the Tesla Coil System significantly.

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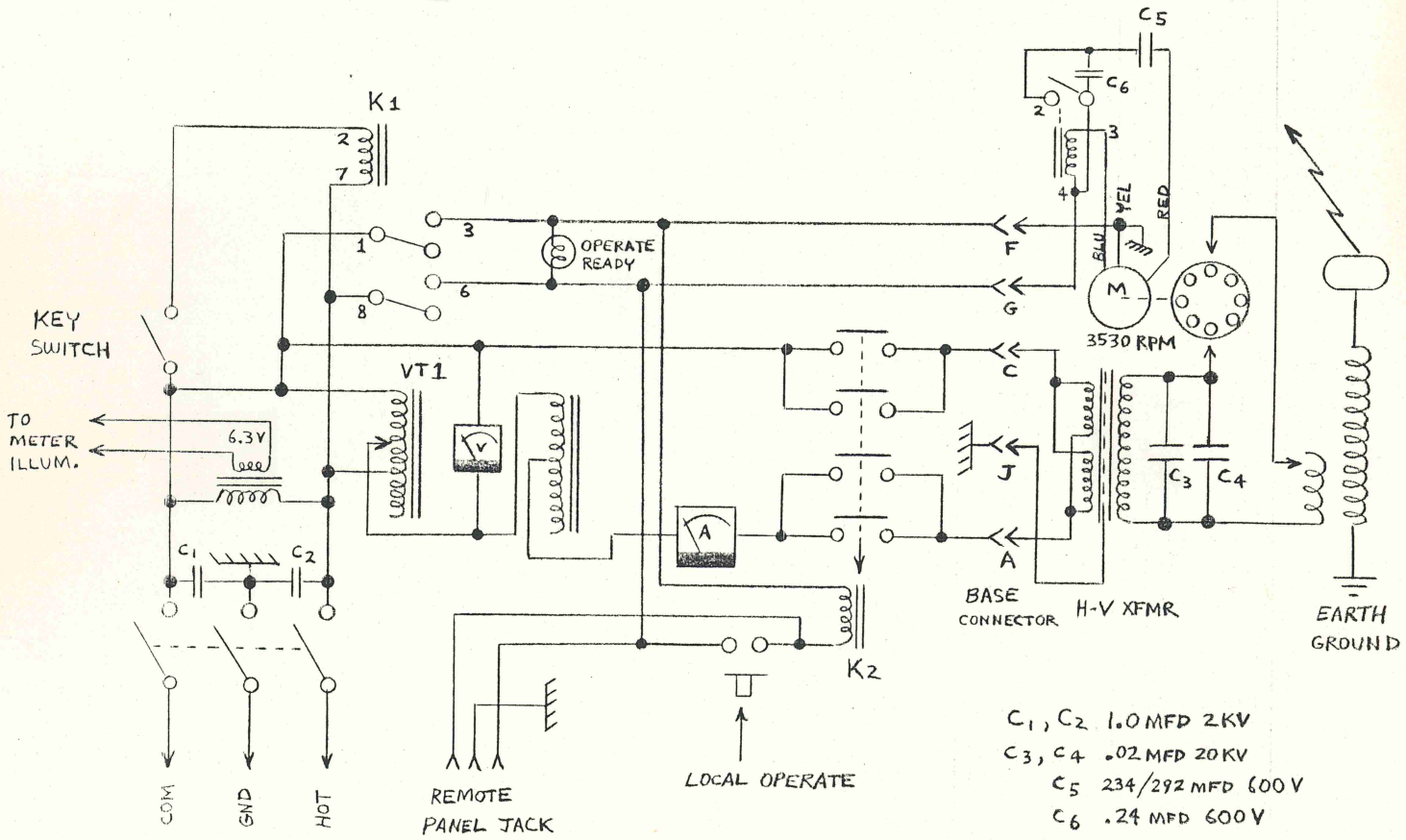
5. POWER REQUIREMENTS AND SCHEMATIC DIAGRAM

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

Power input: 120 V.A.C., 60 HZ single phase, 35 amp nominal

Output: 750,000 volts (750 KV) maximum

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6. ROUTINE MAINTENANCE

Simple periodic maintenance of the Model Five Tesla Coil System will insure continued maximum performance. Basically, only three areas are of concern; the rotary spark gap, lucite sleeve of the Tesla secondary coil, and the upper surfaces of the primary coil. The latter should be regularly cleaned of dust particle build-up. This will aid in preventing unwanted small corona point discharge from propagating in this crucial air dielectric area.

The procedure for periodic cleaning of the lucite sleeve is by first removing the toroid discharge electrode. Then remove the sleeve, being careful not to gouge the windings on the secondary coil. Wash the sleeve with luke-warm water and a mild hand soap which is free of abrasive particles. Thoroughly dry the sleeve only with a soft cotton towel. Make sure no lint particles remain on both the inside and outside surfaces of the sleeve, and then re-install on the coil.

This operation should be performed once after every 5 hour elapsed running times period.

On the rotary gap, careful periodic rotation of the stationary electrodes and inspection of the various tungsten rotary electrodes are absolutely essential in order to insure peak performance of the coil.

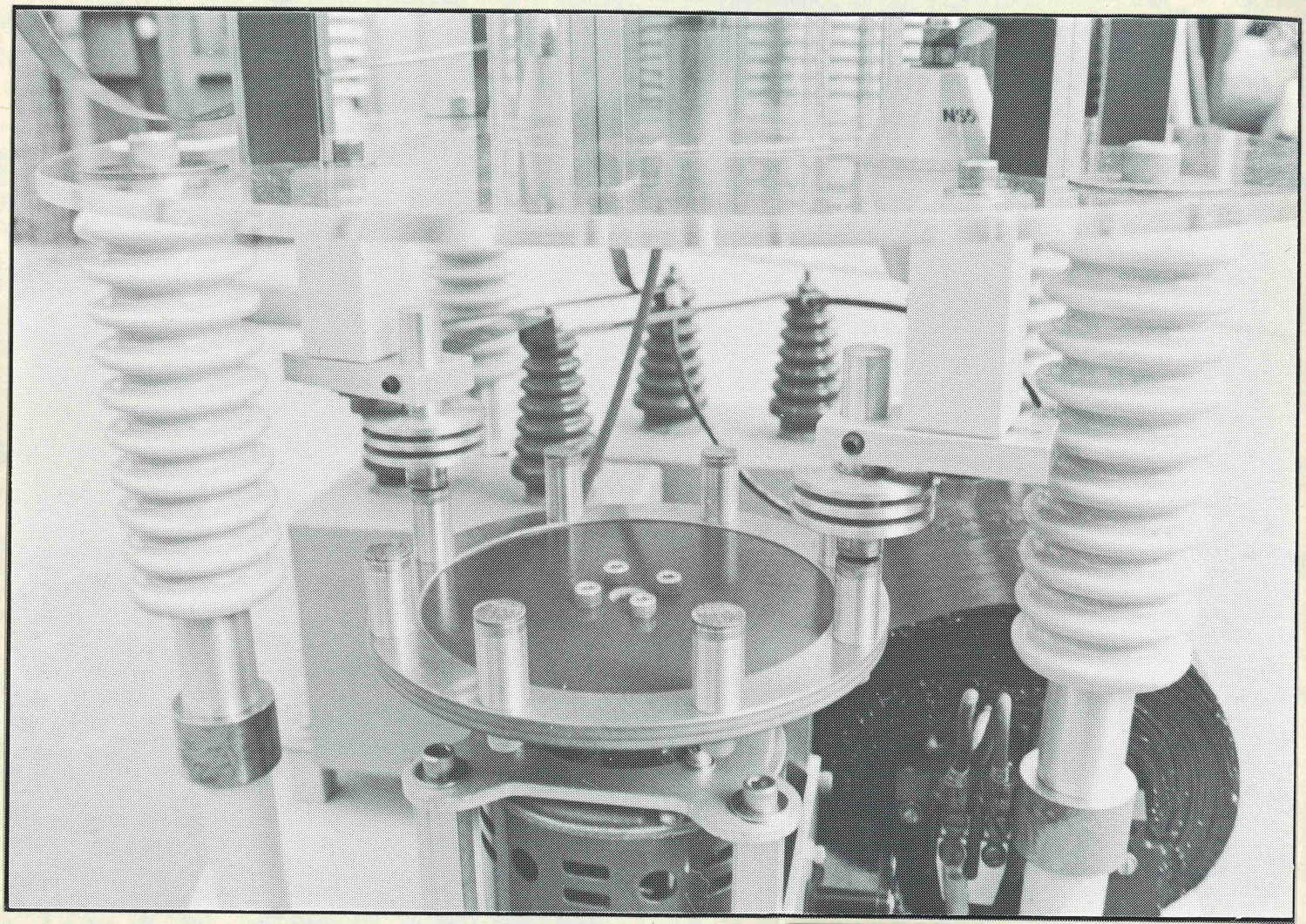
This may easily be accomplished by the following steps. First, loosen the set screw of one of the stationary electrodes. (Refer to the close-up view of rotary gap assembly.) Rotate the electrode about 30 degrees, re-gap to approximately .065 inch, and tighten the set screw. Repeat this procedure on the other stationary electrode. Rotation of the stationary electrodes about once after every hour of accumulated operating time serves to promote an even wear pattern on these electrode faces, thus prolonging their useful life span.

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PICTORIAL DESCRIPTION - TESLA COIL BASE UNIT

(close-up view of rotary gap assembly.)



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7. WARRANTY

READ CAREFULLY - THIS IS A LIMITED WARRANTY

Tesla Technology Research warrants the complete Model Five Tesla Coil System to be free of defects in workmanship and materials for 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 Model Five 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 Model Five Tesla Coil System.

It is understood that a LETHAL ELECTRIC SHOCK HAZARD exists in certain components of the Model Five Tesla Coil System, and that the customer assumes all necessary installation and operation safety requirements of this system.

Components of the Model Five Tesla Coil System returned by the customer 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. No other warranty is expressed or implied.

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WARNING: READ ALL INSTRUCTIONS CAREFULLY BEFORE ATTEMPTING OPERATION OF MODEL FIVE TESLA COIL SYSTEM.

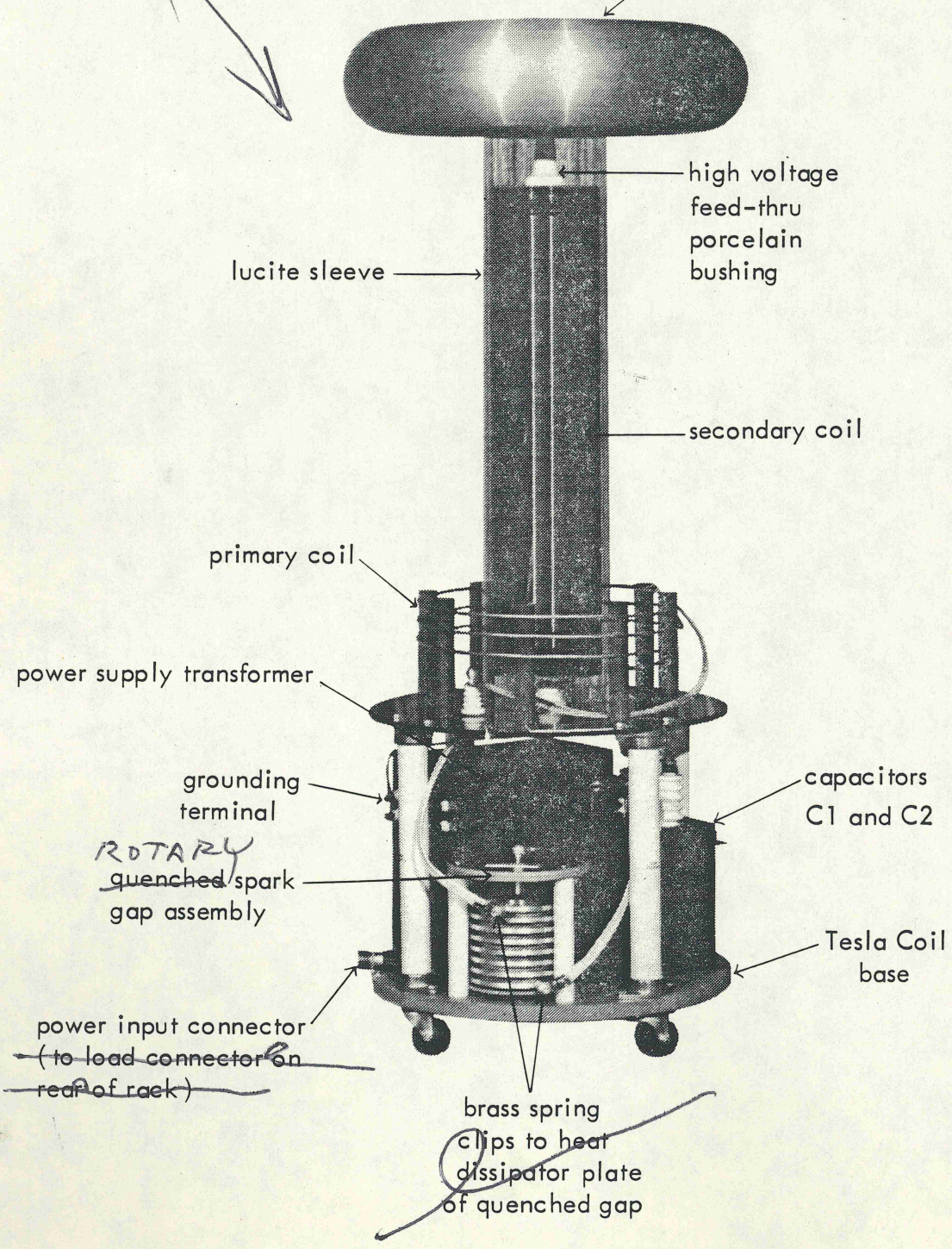
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TTR

PROFESSIONAL SOUND SYSTEMS — UHV DIVISION

1. MODEL FIVE TESLA COIL PICTORIAL DESCRIPTION

INSERT NEW HALF TONE T.C. PHOTO



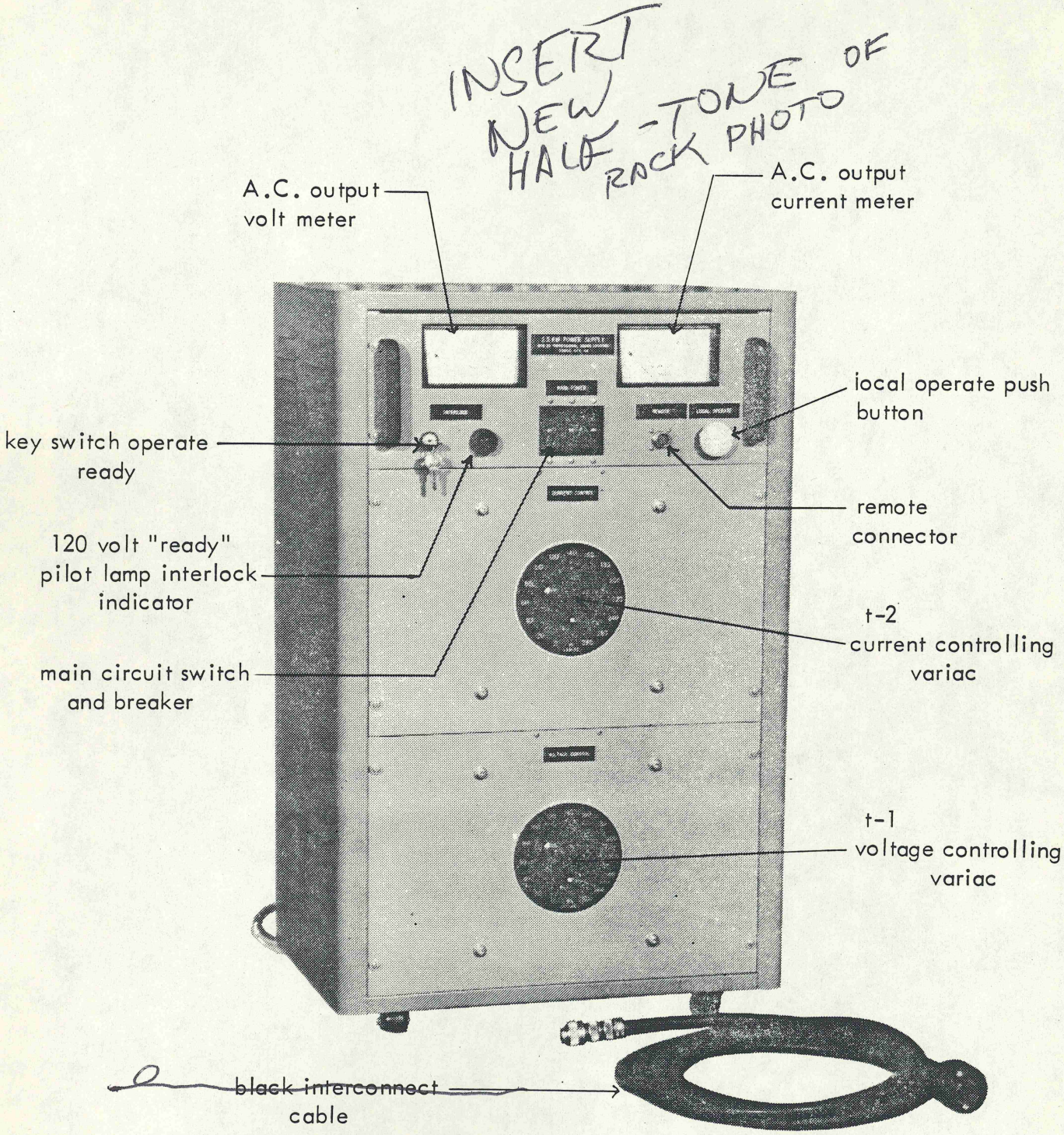
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TTR

PROFESSIONAL SOUND SYSTEMS — UHV DIVISION

2. MODEL FIVE POWER SUPPLY PICTORIAL DESCRIPTION

INSERT NEW HALF-TONE OF RACK PHOTO



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3. INSTALLATION PROCEDURE

The Model Five Tesla Coil System is designed for easy installation. First, determine that the perspective installation site is physically correct in size to insure safe operation. This may be accomplished by allowing a minimum six foot radius clearance on all sides from the base of the Tesla Coil. A minimum eight foot vertical clearance is required, measured from the Tesla Coil base.

It may be desirable to arrange one or more grounded electrodes near the vicinity of the 20" discharge electrode, thus allowing the high voltage discharge to arc from the toroid to these grounded points. The spacing of each of the grounded points to the toroid discharge electrode determines the amount of high voltage potential built up on the toroid. An arc jumping a straight line measured distance of 40" represents slightly more than 750 KV output potential.

It may also be desirable to arrange some form of booth or alcove in which the Tesla Coil is to be positioned. In this manner, the discharges will be seen more dramatically, especially if the area surrounding the coil and its background are darkened from ambiate light in the room. Additionally, this configuration has the advantage of keeping spectators at a safe distance.

The power supply rack may be located in any well ventilated area up to a maximum distance from the Tesla Coil determined by the black interconnecting cable length. A suitable 30 amp service outlet should be located so that the ~~yellow~~ power input cable may be directly plugged in. If an extension cable is unavoidably necessary, it must be of the 3 conductor #10 AWG size stranded conductor type and should be rated for at least 30 amp, 120 volt continuous duty.

Once both units are properly positioned, next connect a length of #10 AWG copper braided wire (or equivalent) to a very good earth ground, such as a cold water pipe, if the plumbing runs directly into soil beneath the foundation. If no substantial ground is available, a grounding rod must be driven vertically down through the foundation into the soil. Such a rod should be of the type available from most hardware stores for the purpose of securing a good electrical ground reference. The other end of this cable must be connected to both the rack chassis and the ~~the case of the high voltage transformer on~~ GROUND TERMINAL ON the Tesla Coil base. The maximum length of this cable between all points should not exceed 50 feet. Connection at the rack chassis may be accomplished by fastening a suitable 1/4" I.D. eyelet solderless crimp terminal to ~~one of~~ the ~~base castor~~ 1/4" X 20 thread mounting screws in the back of the cabinet. ~~(See page 2).~~ Grounding connection to the Tesla Coil base unit is ~~by loosening one of the two #10-32 hex nuts with the metal strap between the two small white porcelain feed-thru bushings on the high voltage transformer on the Tesla Coil base (see page 1). Attach the grounding cable with a #10 solderless crimp termianl to one of these bushings, then reposition the metal strap as originally located and tighten the hex nuts.~~ MADE AT THE INSULATED GROUND TERMINAL.

(SEE TESLA COIL BASE UNIT ILLUSTRATION.)

WARNING: UNDER NO CIRCUMSTANCES SHOULD POWER BE APPLIED TO THE SYSTEM UNTIL ALL GROUNDING OPERATIONS HAVE BEEN SATISFACTORILY COMPLETED.

Next, connect the interconnecting cable ~~(black) to~~ FROM the power supply ~~and~~ to the Tesla Coil base power input connector. Install the secondary coil by positioning the ~~aluminum~~ BRASS flange on the bottom of the coil directly over the 3/8" X 16 threaded rod of the central porcelain feed-thru bushing on the upper deck of the Tesla Coil base. Secure by hand, applying gentle clock-wise rotation of the coil until the coil bottom is firmly seated to the lucite support ring located around the mounting bushing.

Next, position the large lucite sleeve around the secondary coil ~~and secure it at the~~ CAREFULLY

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upper deck of the Tesla Coil base, using the right angle brackets, brass 6-32 thumb screws and thumb nuts provided.

Next, position the aluminum 20" toroid on top of the secondary coil high voltage feed-thru bushing. Use the #6-32 brass thumb nut and flat washers provided. When the toroid has been properly positioned and secured, the upper edge of the lucite sleeve should just snugly fit against the bottom of the toroid flat central plate area in a centered attitude. Check the brass spring clips to ensure that they are securely attached at each end plate of the quenched spark gap (see page 1).

Now make sure that the main power switch breaker is off and connect the yellow INTERCONNECT power cable first to the TESLA COIL BASE, AND THEN CONNECT THE A.C. CABLE TO THE POWER OUTLET. rack and then to the A.C. outlet.

This completes all installation instructions. Proceed to the next section entitled OPERATION INSTRUCTIONS.

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4. OPERATING INSTRUCTIONS

First, double-check that all previous instructions have been carefully followed before proceeding further.

WARNING: A lethal electrical shock hazard exists in the circuitry inside the rack cabinet and on the Tesla Coil base unit and Tesla primary coil winding. Make sure all power is off before attempting any adjustments. Avoid Murphy's Law which states that if anything can possibly go wrong, IT WILL!

All observers should stay at a minimum distance of six feet away from the Tesla Coil during periods of operation.

> ANY PERSONS possessing any form of electro-cardiac devices (pacemakers) should leave the area BEFORE operating the coil.
> THESE PRECAUTIONS ARE ABSOLUTELY NECESSARY FOR YOUR PROTECTION.

Position the VOLTAGE CONTROL knob to indicate ~~140~~ 100 on the face plate and the CURRENT CONTROL knob to indicate ~~260~~ 50 on its face plate respectively. ~~Once the variacs are positioned, they need not be further adjusted.~~

Apply power by actuating the main power switch breaker to the "on" position, (see page 2). Observe voltage indication on A.C. volt meter; IT SHOULD READ ABOUT 140 VOLTS

Now insert key in key switch and turn clock-wise 90 degrees. This activates the interlock operate ready function, which is verified by the red pilot lamp adjacent to the key switch. ~~Voltage reading should be approximately 150 volts.~~

You are now ready to operate the Tesla Coil. Depress the large yellow button marked "local operate," for three seconds and release. A loud report and a torrent of long corona streamers should be seen emitting from the toroid discharge electrode.

If no sparks are indicated, reset the key switch to the "off" position and carefully inspect all visible connections for proper electrical and mechanical contact. Note: Coil will not operate if key switch is turned 90 degrees conter-clockwise as indicated by no illumination of the interlock ready red pilot lamp. ~~Also, the power supply rack is equipped with safety interlock switches on the top and rear access doors. These doors must remain fully closed or coil will not operate.~~

If again no sparks appear after repeating the above instructions, DO NOT PROCEED FURTHER. Turn off all power to the power supply rack and consult with ~~Professional Sound Systems~~ TTR for further instructions.

If coil is operating correctly, a current reading on the A.C. ammeter of approximately 25 to 30 amps should be noted during operation. This may vary slightly and is not abnormal. Long corona streamers should continuously issue forth in random directions from the toroid discharge electrode. Occasionally, a heavy discharge may be noted jumping from the lower portion of the secondary coil to the primary coil. If this happens, simply cease operation for a few seconds. This phenomena is caused by the air dielectric becoming overstressed. By stopping operation momentarily, the ionized pockets of air have a chance to dissipate, thus restoring the normal insulation value of the air space between the primary and secondary coil, and operation of the coil may be resumed.

Duration of operation SHOULD NOT EXCEED 10 SECONDS MAXIMUM for a continuous period. Approximately 20 second periods MINIMUM should be observed between successive 10 second periods of operation, with no more than 5 operations per 1/2 hour, to allow for ~~quenched~~ gap cooling. This instruction is designed to

AND ALSO STARTS THE ROTARY GAP MOTOR, not #

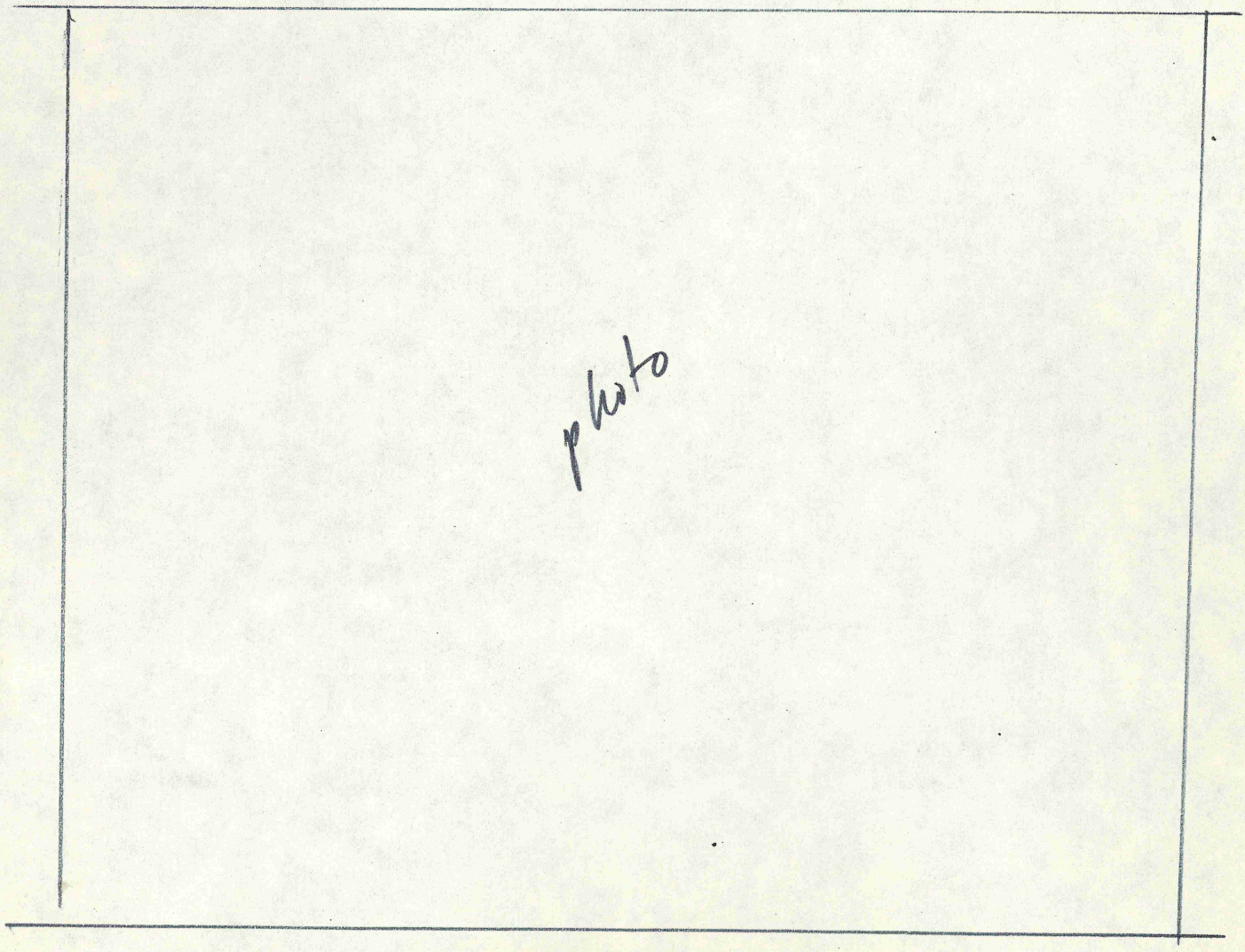
ROTARY

ALSO

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4. OPERATING INSTRUCTIONS (cont'd)

protect the carbon contactors on the variacs from becoming excessively heated and causing a blackened scorch mark on the variac windings at the point of contact. Additionally, it will insure longest ~~quenched~~ ROTARY gap component life expectancy. Failure to observe these operating instructions may shorten the life expectancy of the Tesla Coil System significantly.

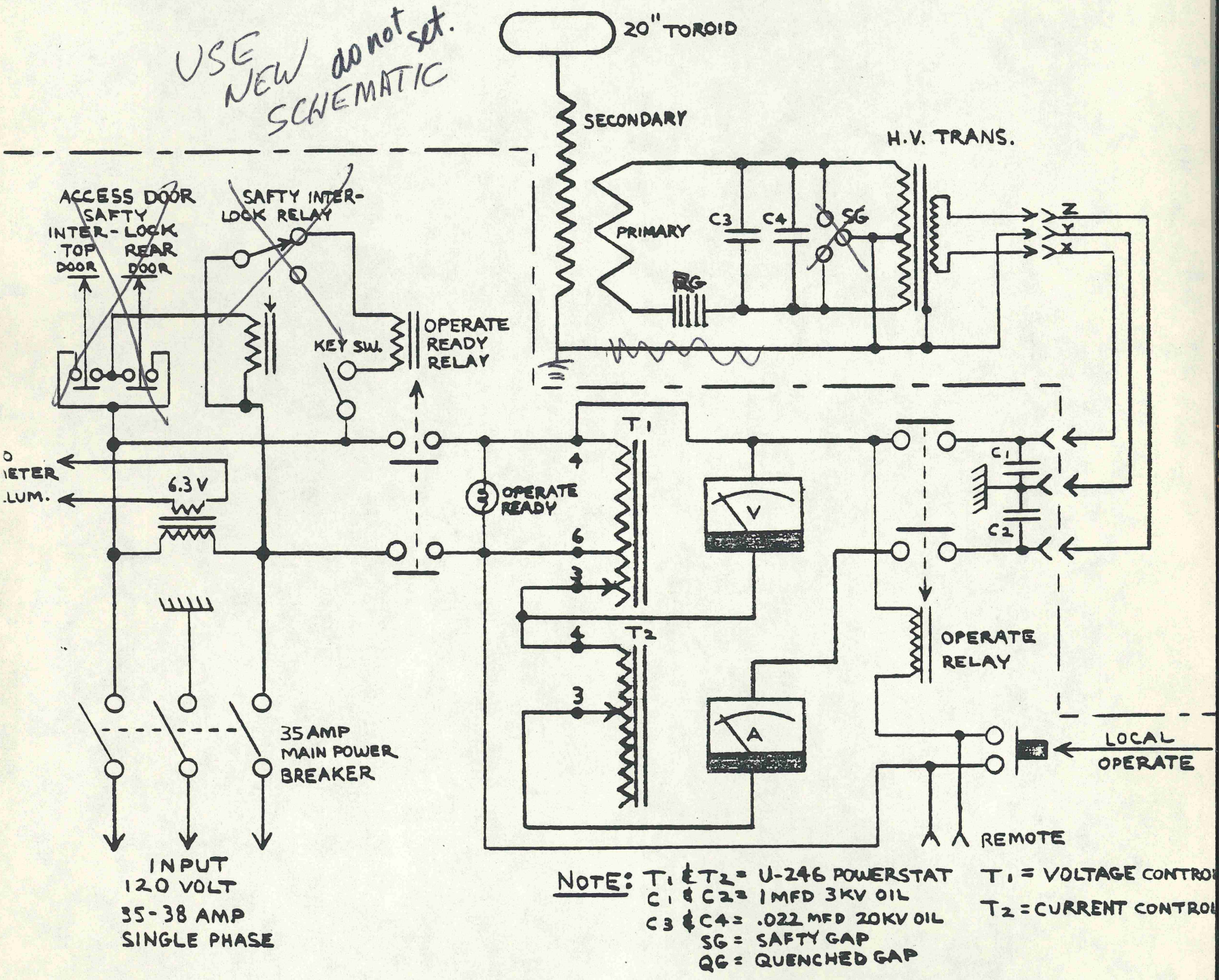


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5. POWER REQUIREMENTS AND SCHEMATIC DIAGRAM

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

Power input: 120 V.A.C., 60 HZ single phase, 35 amp nominal
Output: 750,000 volts (750 KV) maximum



TTR

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6. ROUTINE MAINTENANCE

Simple periodic maintenance of the Model Five Tesla Coil System will insure continued maximum performance. Basically, only three areas are of concern; the ROTARY ~~quenched~~ spark gap, lucite sleeve of the Tesla secondary coil, and the upper surfaces of the primary coil. The latter should be regularly cleaned of dust particle build-up. This will aid in preventing unwanted small corona point discharges from propagating in this crucial air dielectric area.

The procedure for periodic cleaning of the lucite sleeve is by first removing the toroid discharge electrode. Then remove the sleeve, being careful not to gouge the windings on the secondary coil. Wash the sleeve with luke-warm water and a mild hand soap which is free of abrasive particles. Thoroughly dry the sleeve only with a soft cotton towel. Make sure no lint particles remain on both the inside and outside surfaces of the sleeve, and then re-install on the coil.

This operation should be performed once after every 5 hour elapsed running time period.

On the ~~quenched~~ ROTARY gap, careful ~~cleaning~~ PERIODIC ROTATION OF THE STATIONARY ELECTRODES and inspection of the various ~~stainless steel~~ TUNGSTEN ROTARY ELECTRODES ~~sparking surfaces and phenolic ring spacers~~ are absolutely essential in order to insure peak performance of the coil.

This may easily be accomplished by the following steps. ~~First, remove the tension~~ of the 3/8" - 16 hex socket cap screw located in the center of the round top phenolic plate. Note the degree of torque required to loosen this screw and reset to same pressure after re-assembly. Observe the position of the aluminum spacer just beneath this plate. It must be repositioned in the same manner during re-assembly. Remove the top phenolic round plate by loosening the three #10 - 32 pan head screws. Disconnect the brass spring clips and remove the entire gap assembly.

Next, remove the individual gap plates from the phenolic spacer rings. This is accomplished by applying even hand pressure to pull adjacent gap sections apart. Note that the plates MUST NOT be pried apart, but rather by a parallel gentle pulling motion. After all phenolic spacer rings have been removed from the metal discs, carefully inspect both the recessed inner groove wall surfaces on the phenolic spacer rings, and the stainless steel sparking surface plates. There should be no extreme erosion, pitting, or charring on any of these surfaces, but rather a dull blackish surface.

Clean the phenolic spacer ring innergroove wall surfaces with a fine brass wire brush, removing all residue build up. Apply this same technique to the stainless steel sparking plates.

If an air compressor air blast is available, blow all surfaces clean of residue and particles. Now, re-assemble the gap sections by applying an even pressure by hand to press-fit the phenolic spacer rings alternately between the metal discs.

Reposition the entire gap assembly in its holder. Locate and tighten the three top phenolic disc screws. Locate and tighten the compression aluminum spacer rod against the center of the top metal disc and tighten the 3/8" - 16 hex socket cap compression screw.

Reattach connecting cables by means of the two brass spring clips. These must make a tight press fit to the uppermost and lowermost aluminum plates.

~~This procedure should be CAREFULLY followed after every 1 hour elapsed running time period. Failure to meet this requirement may considerably shorten the quenched gap assembly life expectancy.~~ Replacement parts, if needed, are available from ~~Professional Sound Systems UHV - Division.~~ TTR.

INSERT COPY "A" AND GAP PHOTO

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COPY A

FIRST, LOOSEN THE ~~TWO~~ SET SCREW OF ONE OF THE STATIONARY ELECTRODES. (REFER TO THE CLOSE-UP VIEW OF ROTARY GAP ASSEMBLY.) ROTATE THE ELECTRODE ABOUT 30 DEGREES, RE-GAP TO APPROXIMATLY .065 INCH, AND TIGHTEN THE SET SCREW. ~~BE CAREFUL NOT TO OVER-TIGHTEN THE SET SCREWS.~~

REPEAT THIS PROCEEDURE ON THE OTHER STATIONARY ELECTRODE.

~~THIS~~ ROTATION OF THE STATIONARY ELECTRODES ABOUT ONCE AFTER EVERY HOUR OF ACCUMULATED OPERATING TIME ~~PROPER~~ SERVES TO PROMOTE AN EVEN WEAR PATTERN ON THESE ELECTRODE FACES, THUS PROLONGING THEIR USEFUL LIFE SPAN.

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7. WARRANTY

FOR ONE YEAR FROM THE DATE OF ORIGIONAL PURCHASE,

READ CAREFULLY - THIS IS A LIMITED WARRANTY

~~Professional Sound Systems UHV - Division~~ TTR warrants the complete Model Five Tesla Coil System to be free of defects in workmanship and materials 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 ~~Professional Sound Systems UHV - Division~~ TTR has no control over the Model Five Tesla Coil System after shipment to the customer.

~~Professional Sound Systems UHV - Division~~ TTR assumes no liability for the operational safety of the customer's installation of the Model Five Tesla Coil System.

It is understood that a LETHAL ELECTRIC SHOCK HAZARD exists in certain components of the Model Five Tesla Coil System, and that the customer assumes ~~the~~ ALL necessary installation and operation safety requirements of this system.

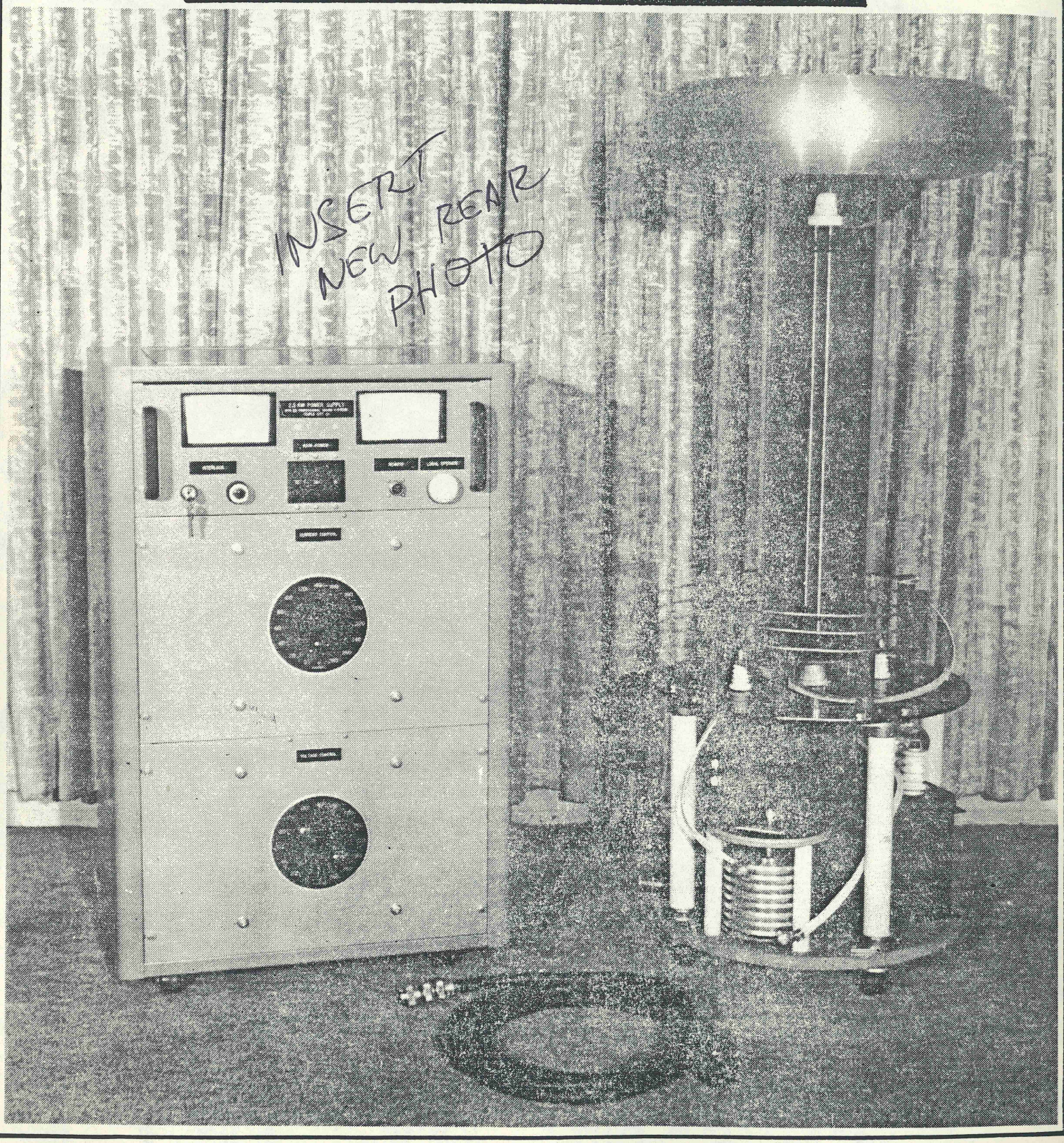
Components of the Model Five Tesla Coil System returned by the customer will be evaluated by ~~Professional Sound Systems UHV - Division.~~ TTR If these components are, ~~in the estimation of Professional Sound Systems,~~ found to be faulty through no cause of the customer, they will be replaced at no charge. No other warranty is expressed or implied.

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7 set. 3 times

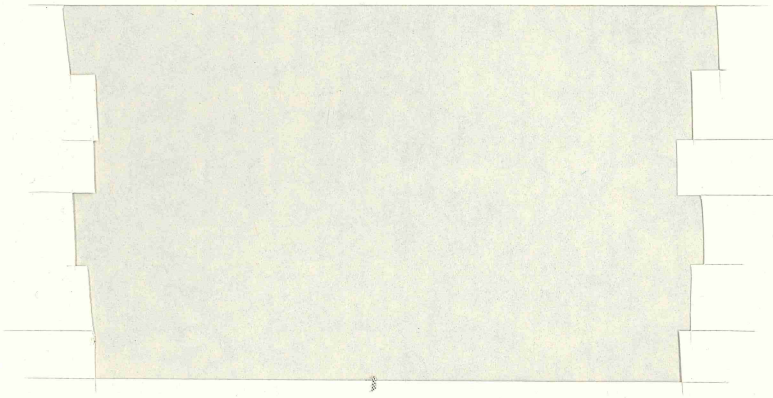
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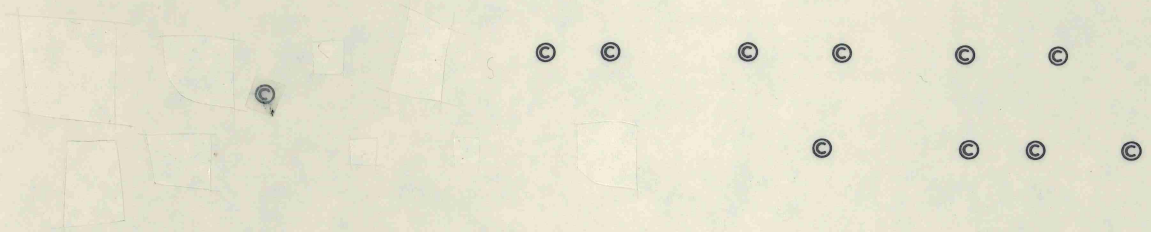
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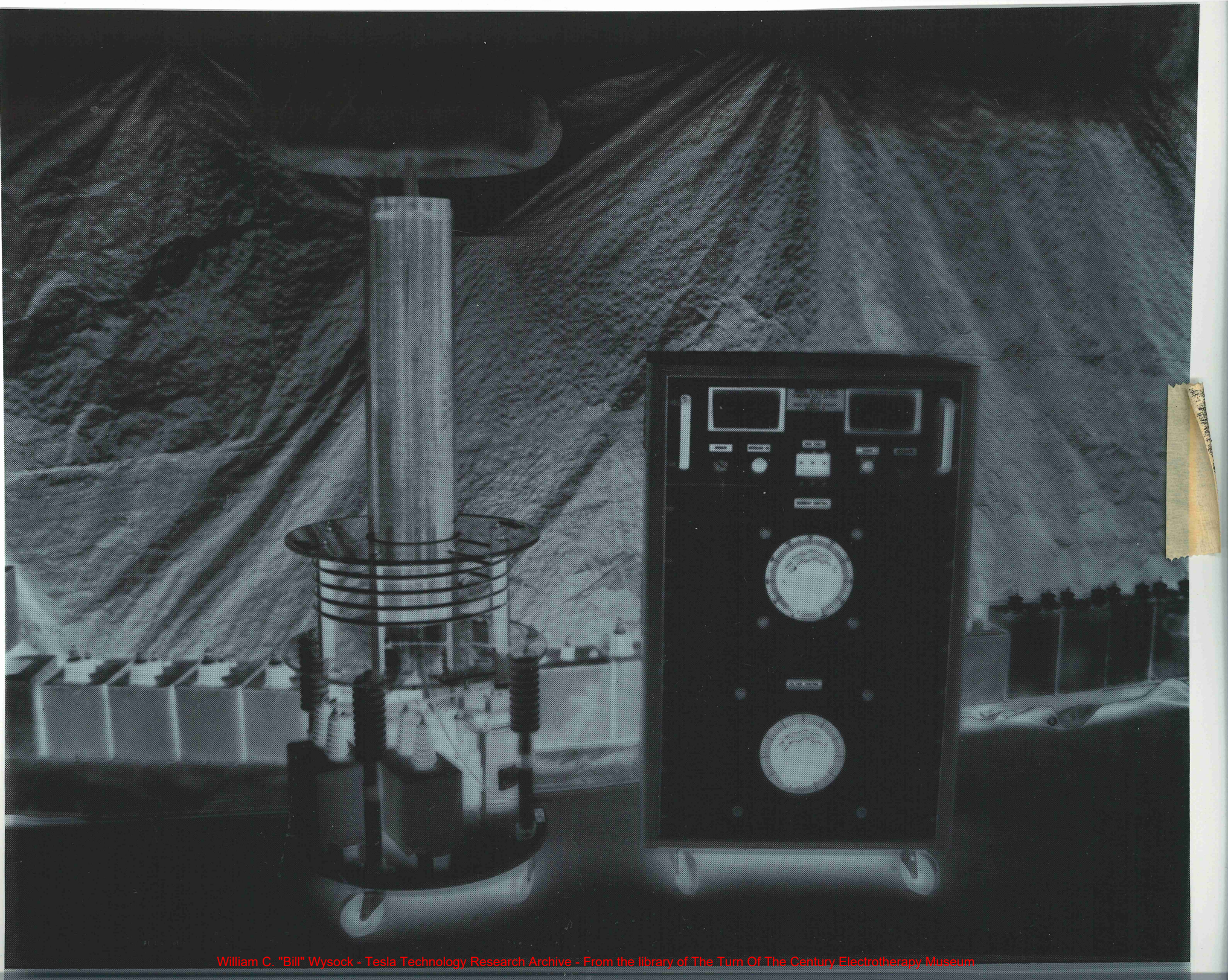
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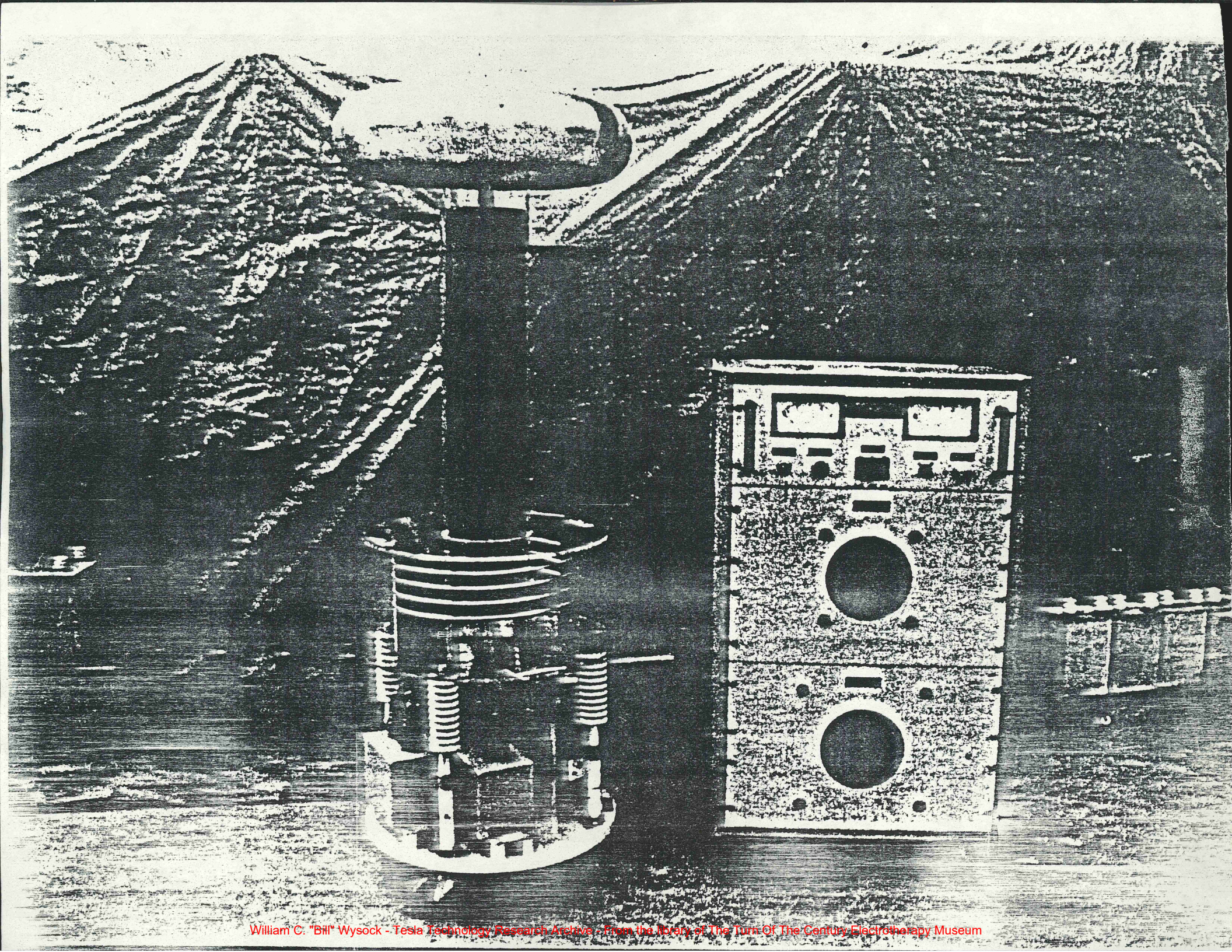
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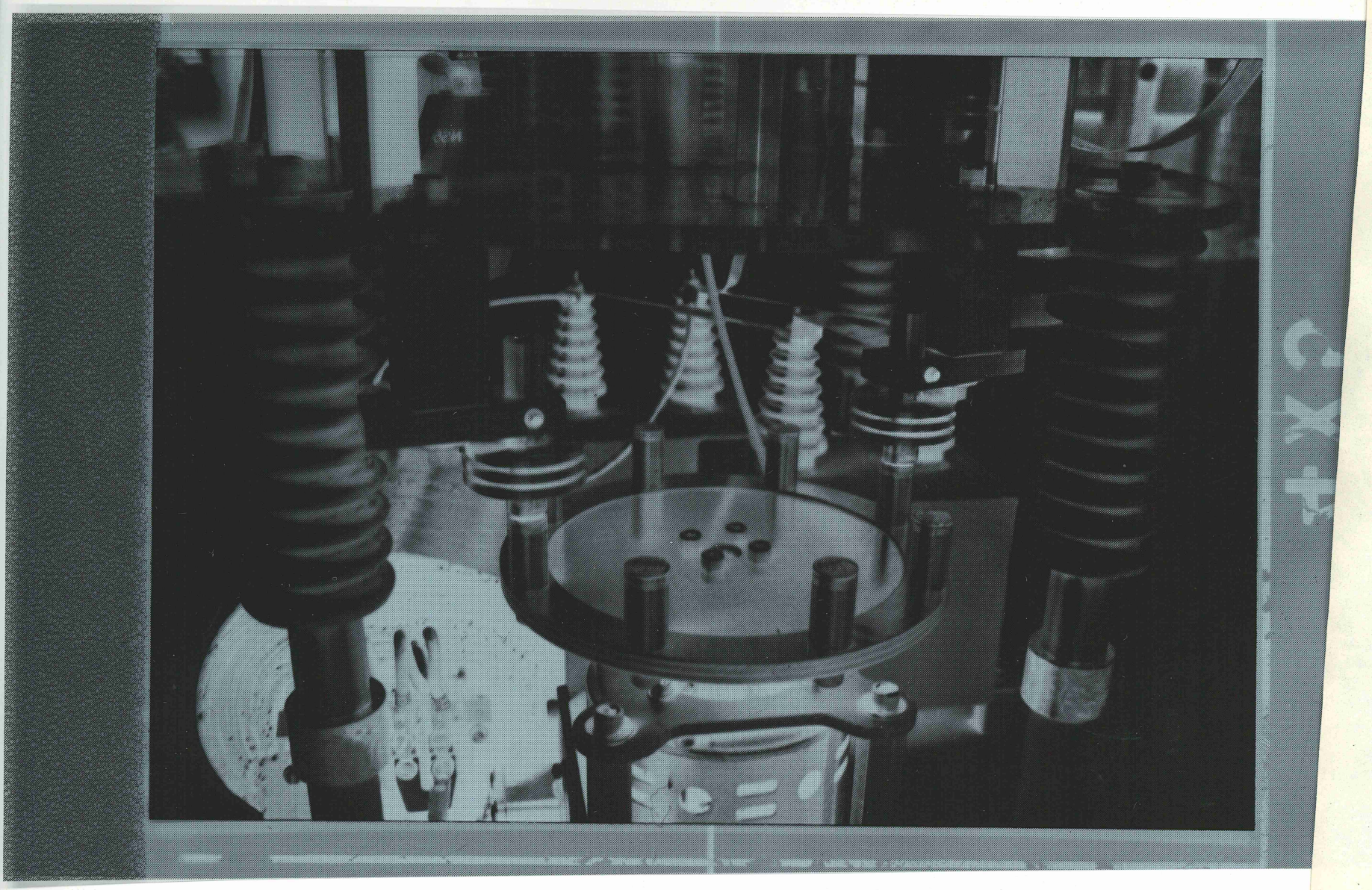
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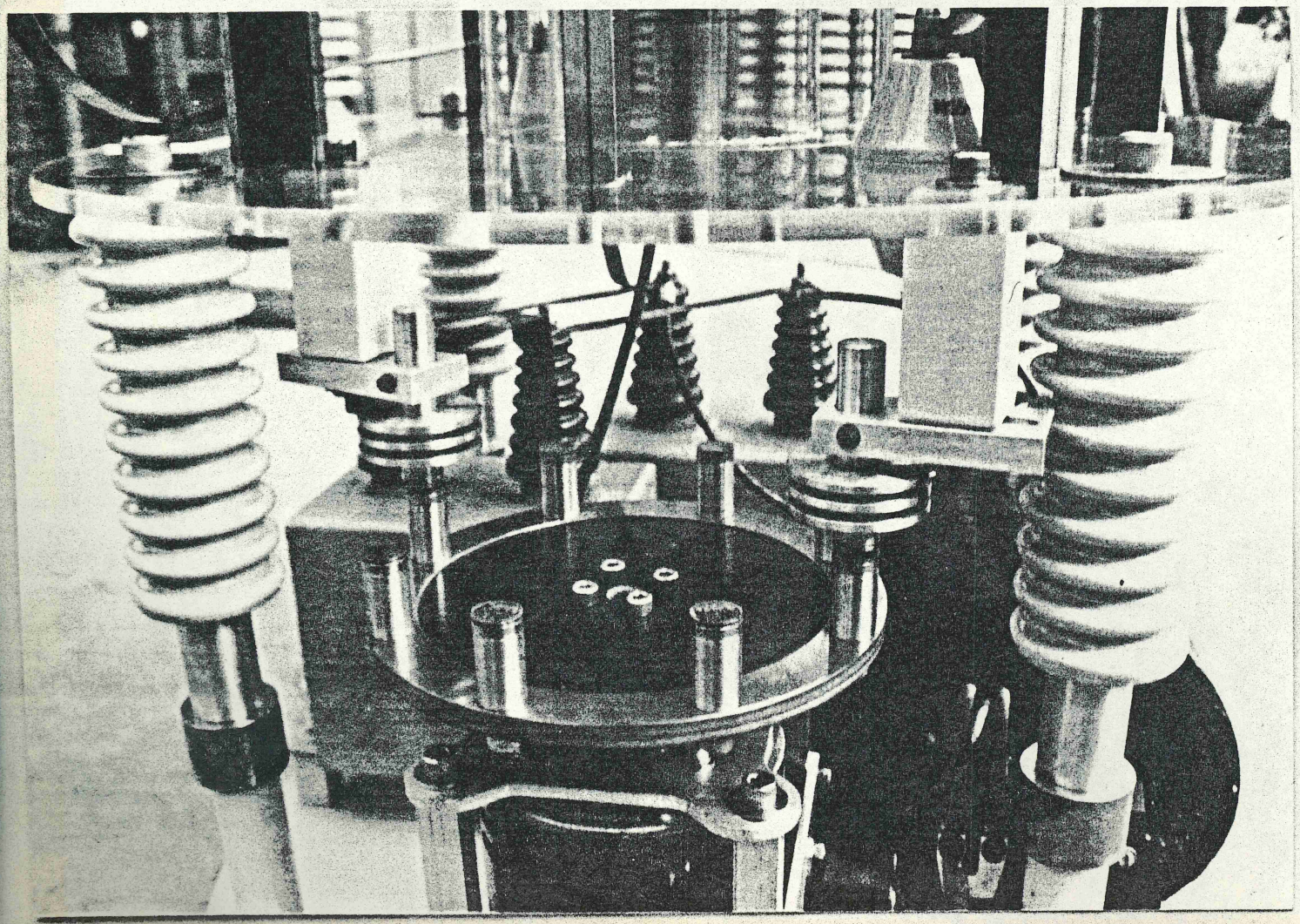
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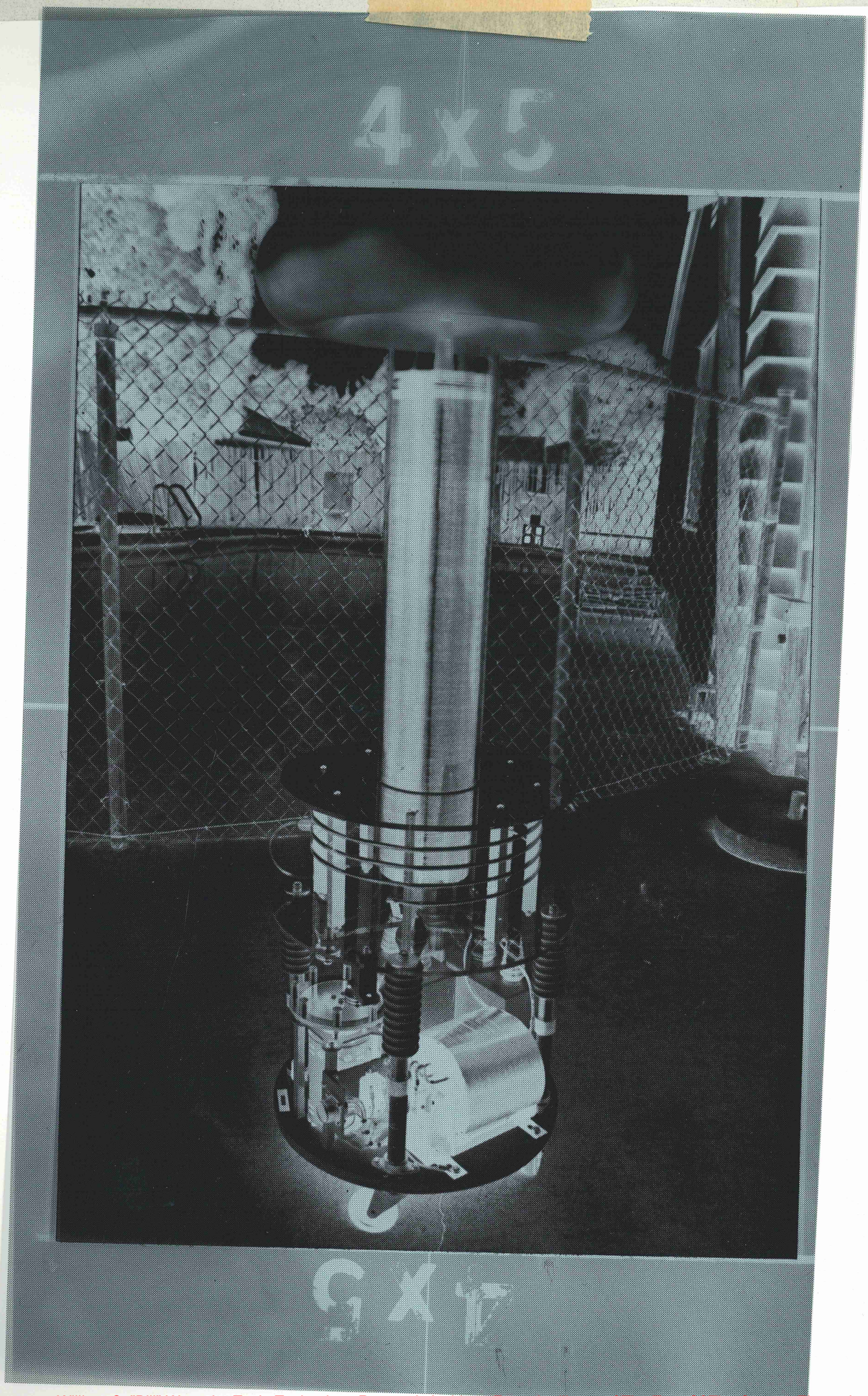
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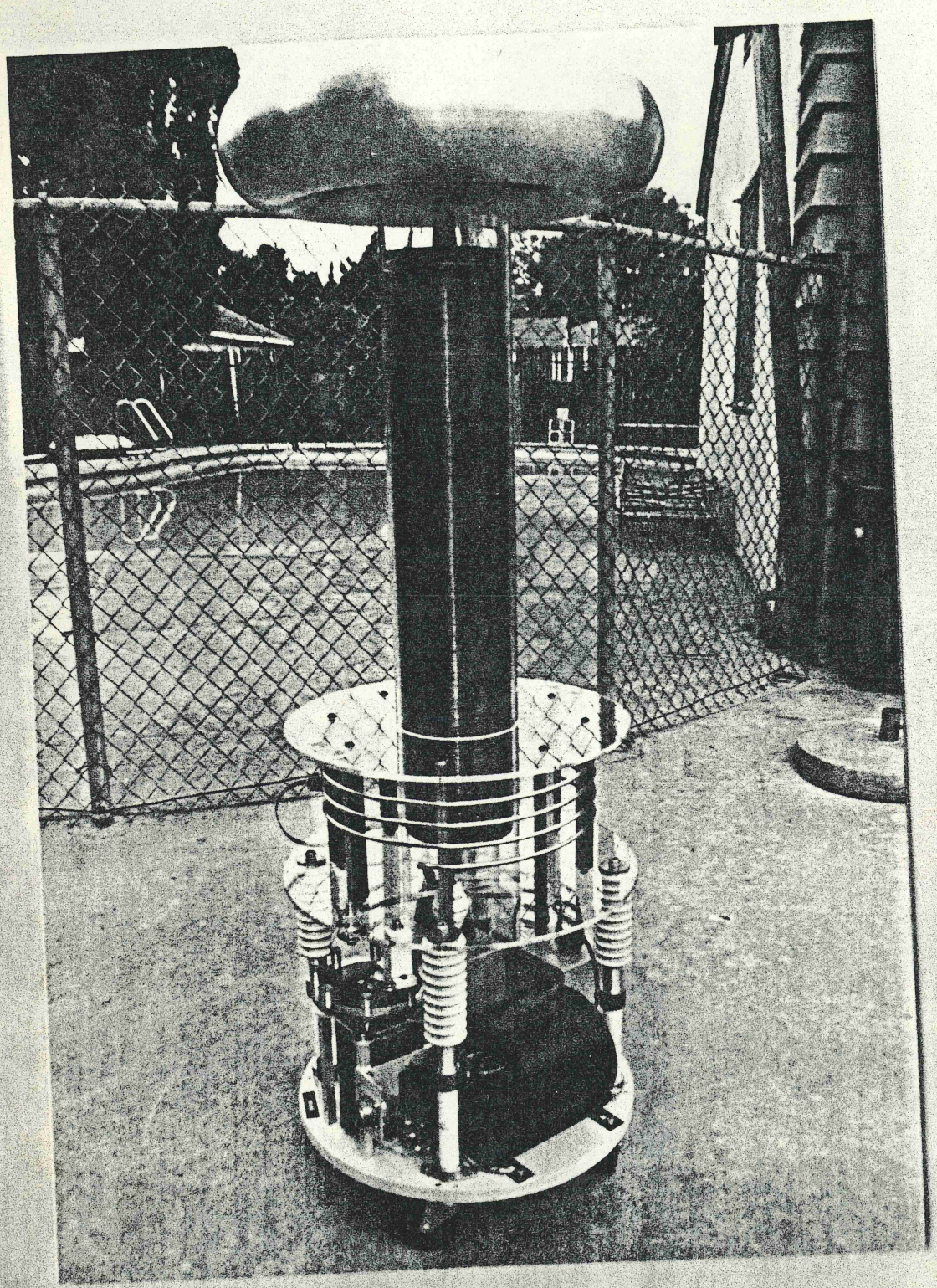
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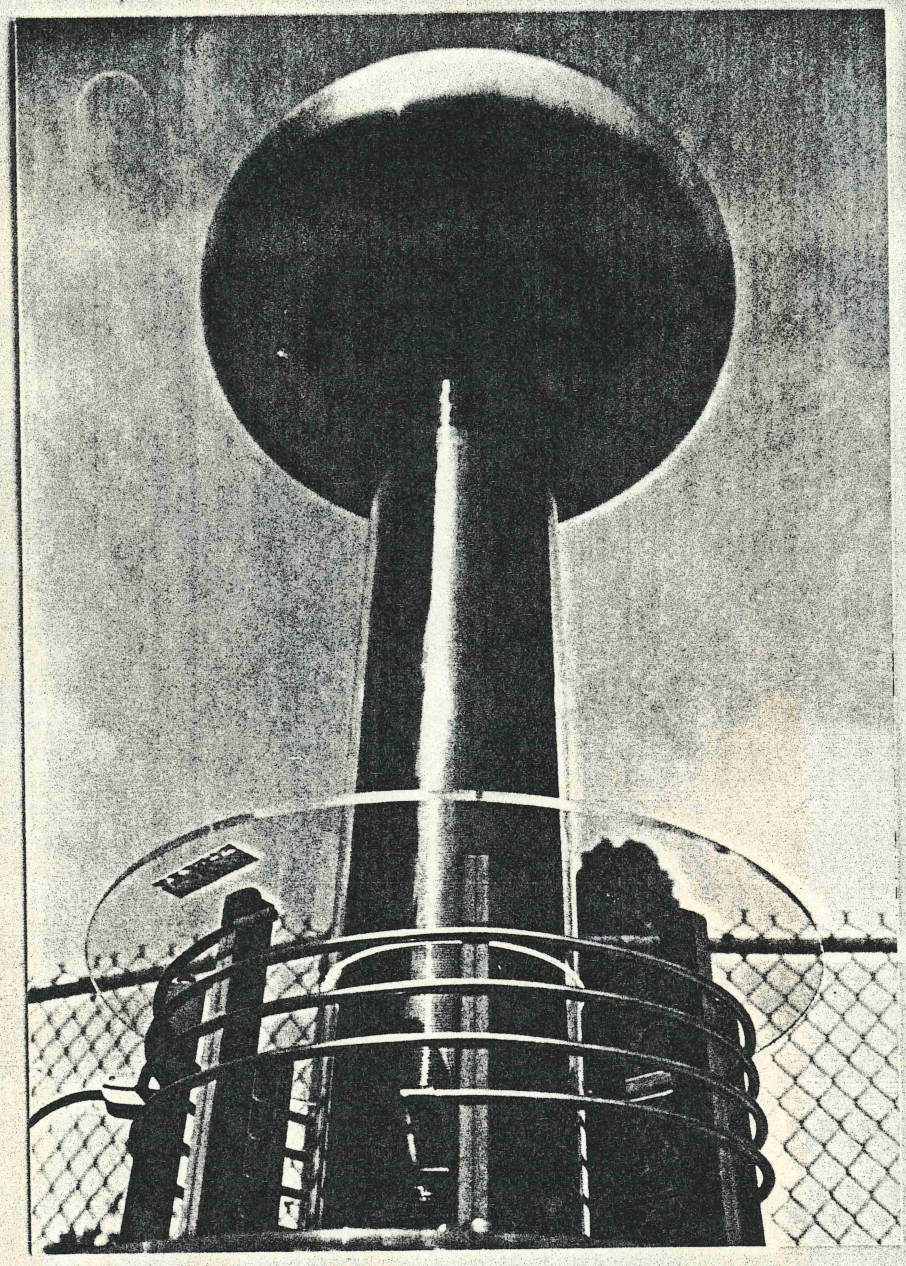
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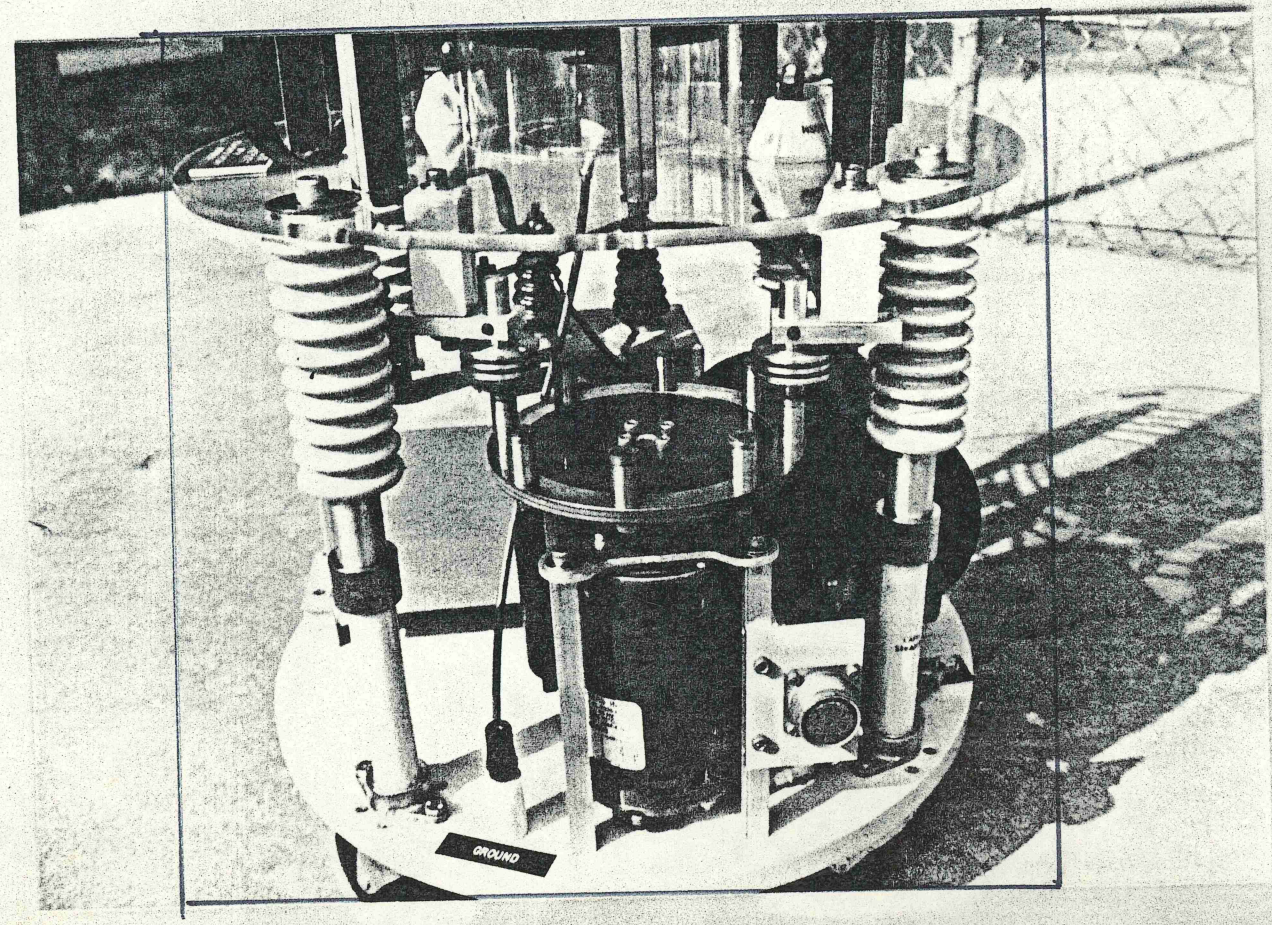
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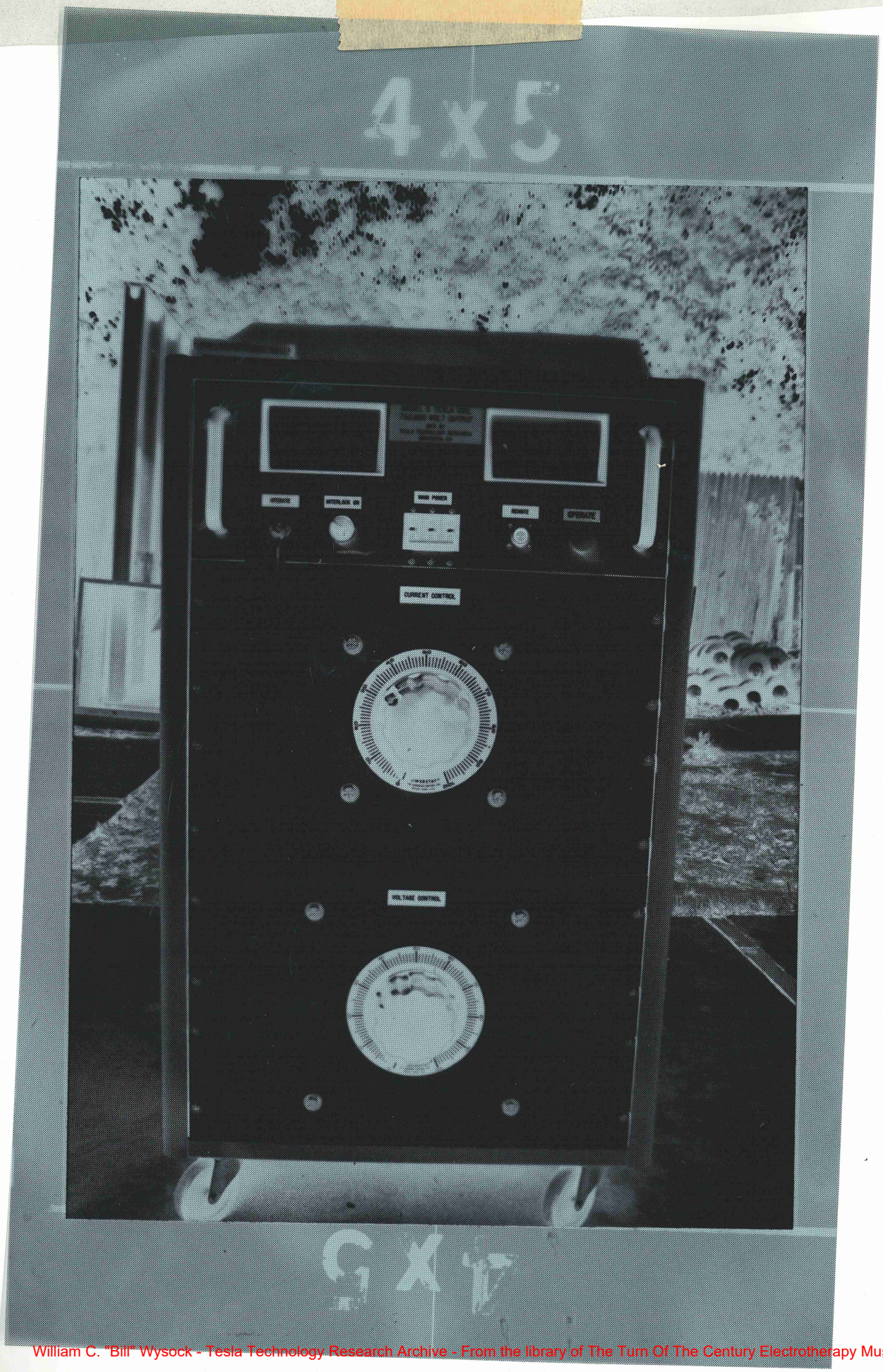


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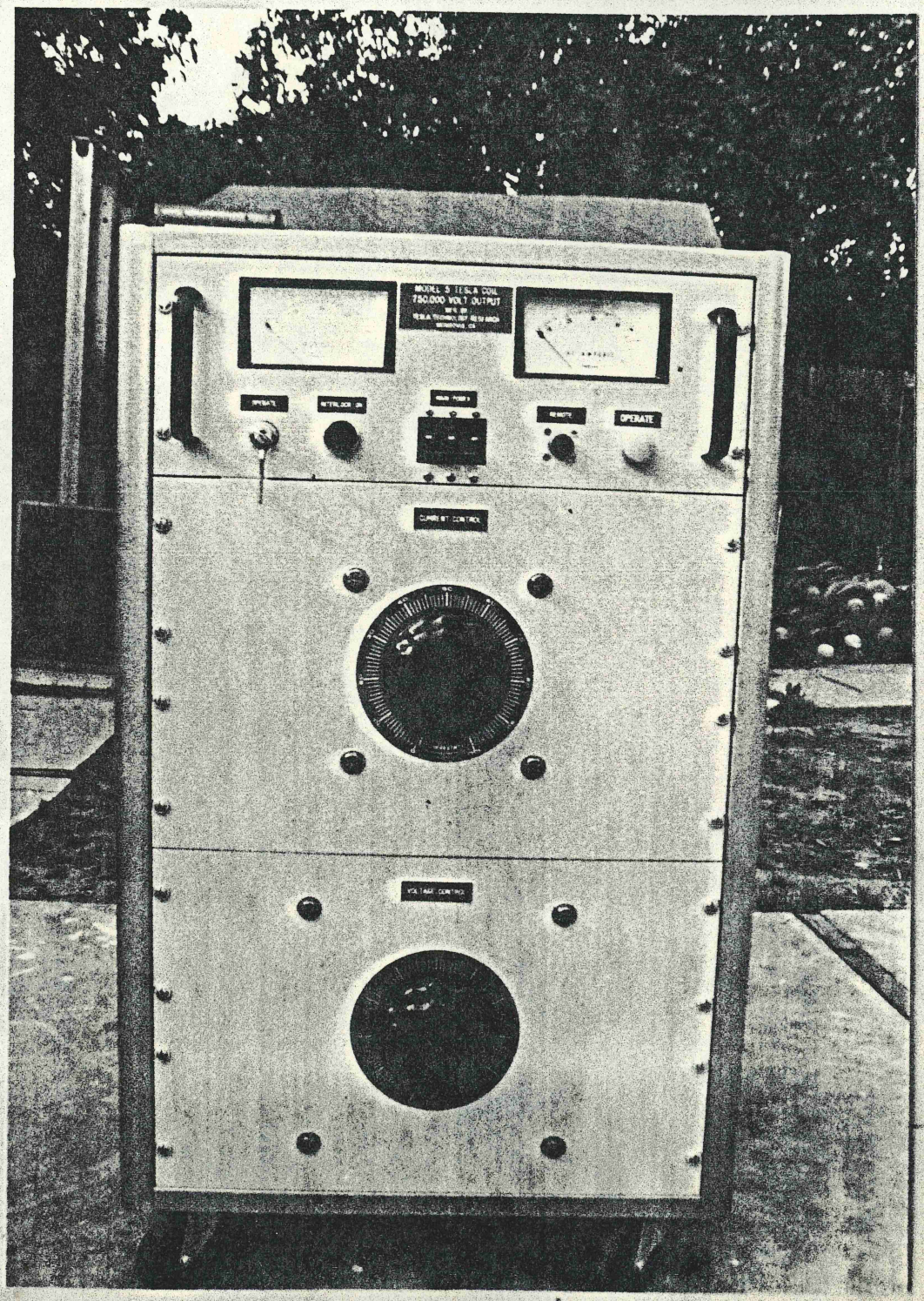


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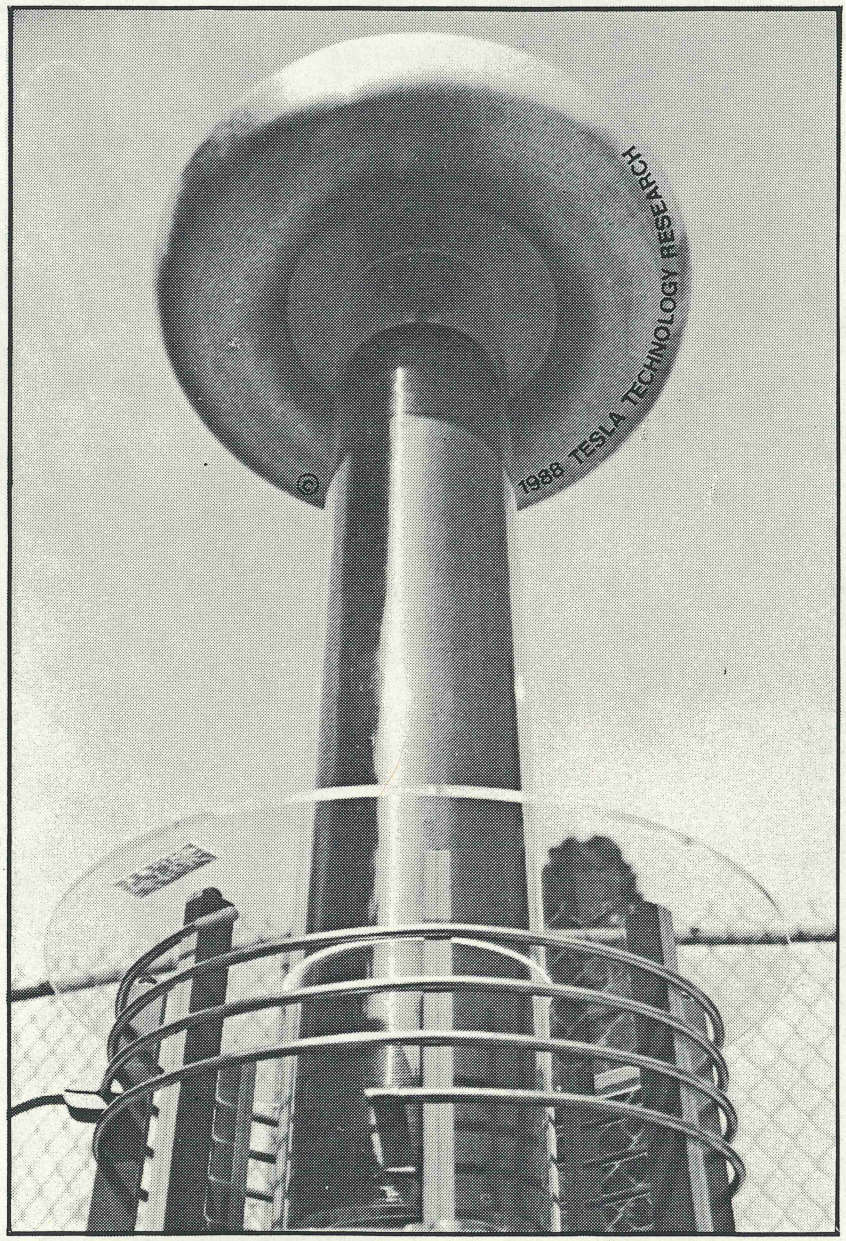


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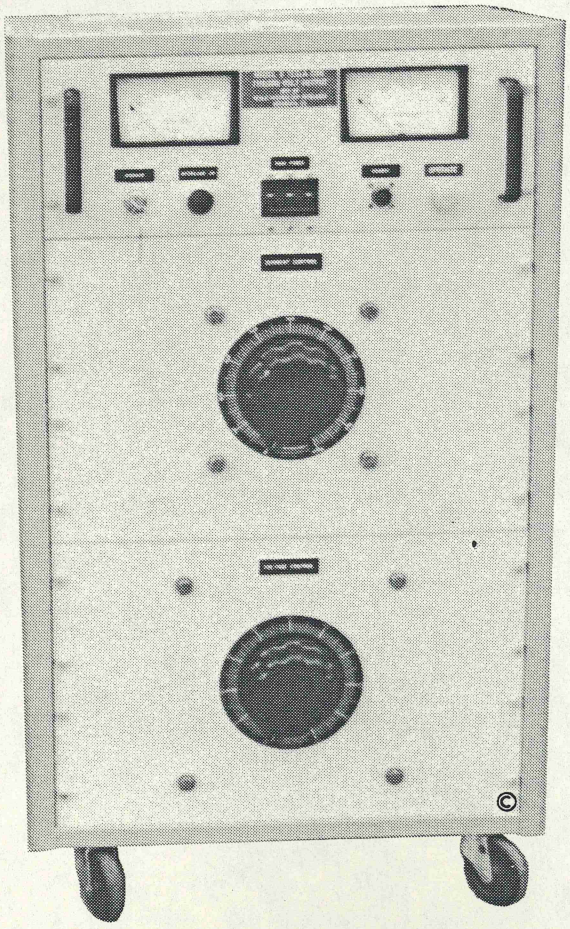
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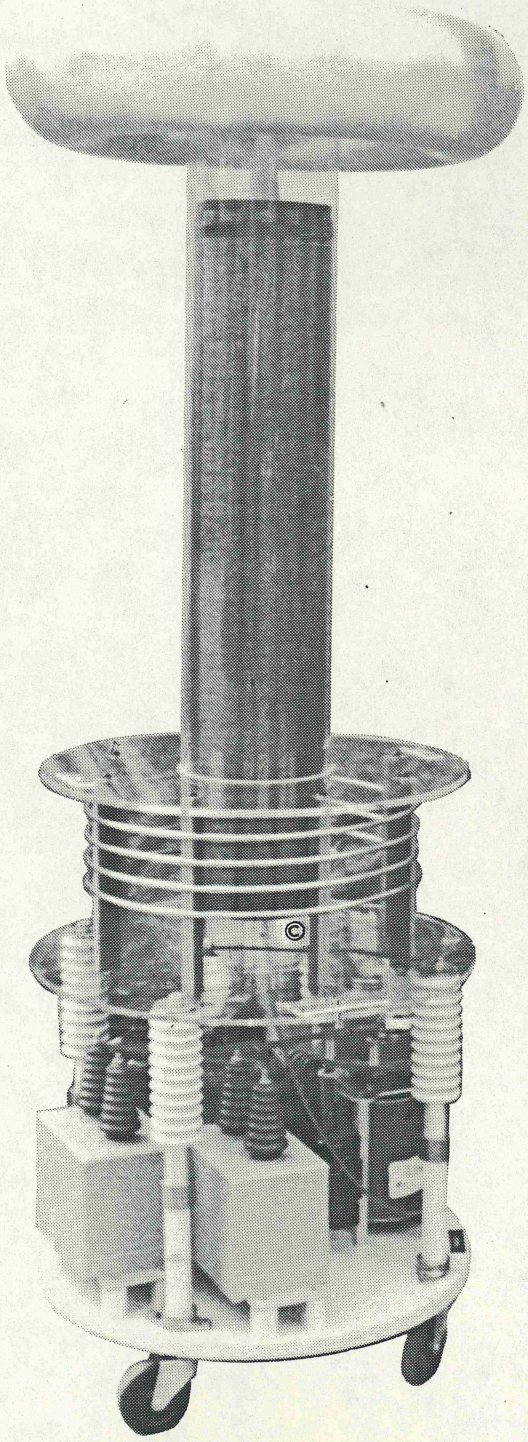
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MODEL FIVE TESLA COIL SYSTEM

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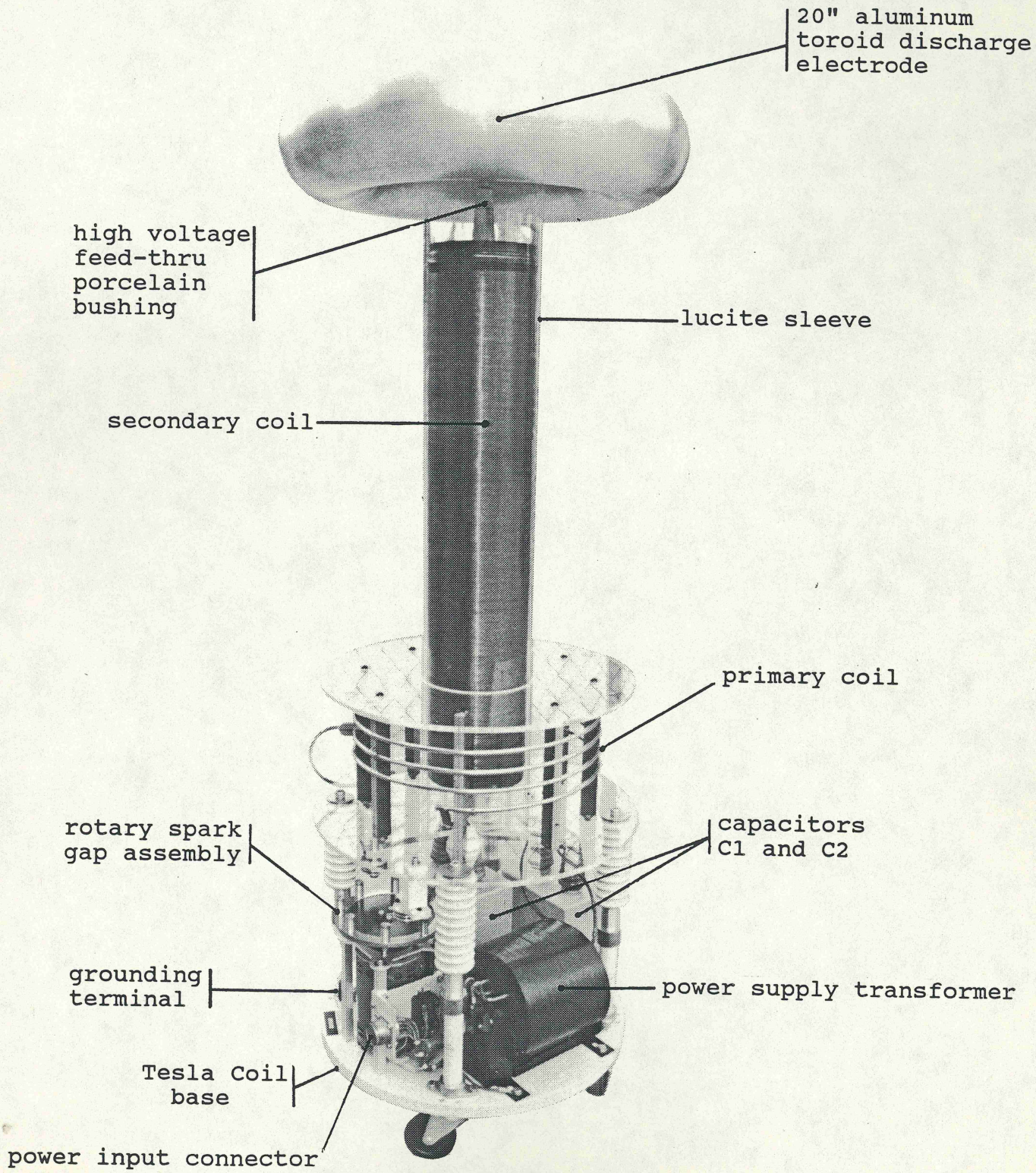
WARNING: READ ALL INSTRUCTIONS CAREFULLY BEFORE ATTEMPTING OPERATION OF MODEL FIVE TESLA COIL SYSTEM.

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1. MODEL FIVE TESLA COIL PICTORIAL DESCRIPTION

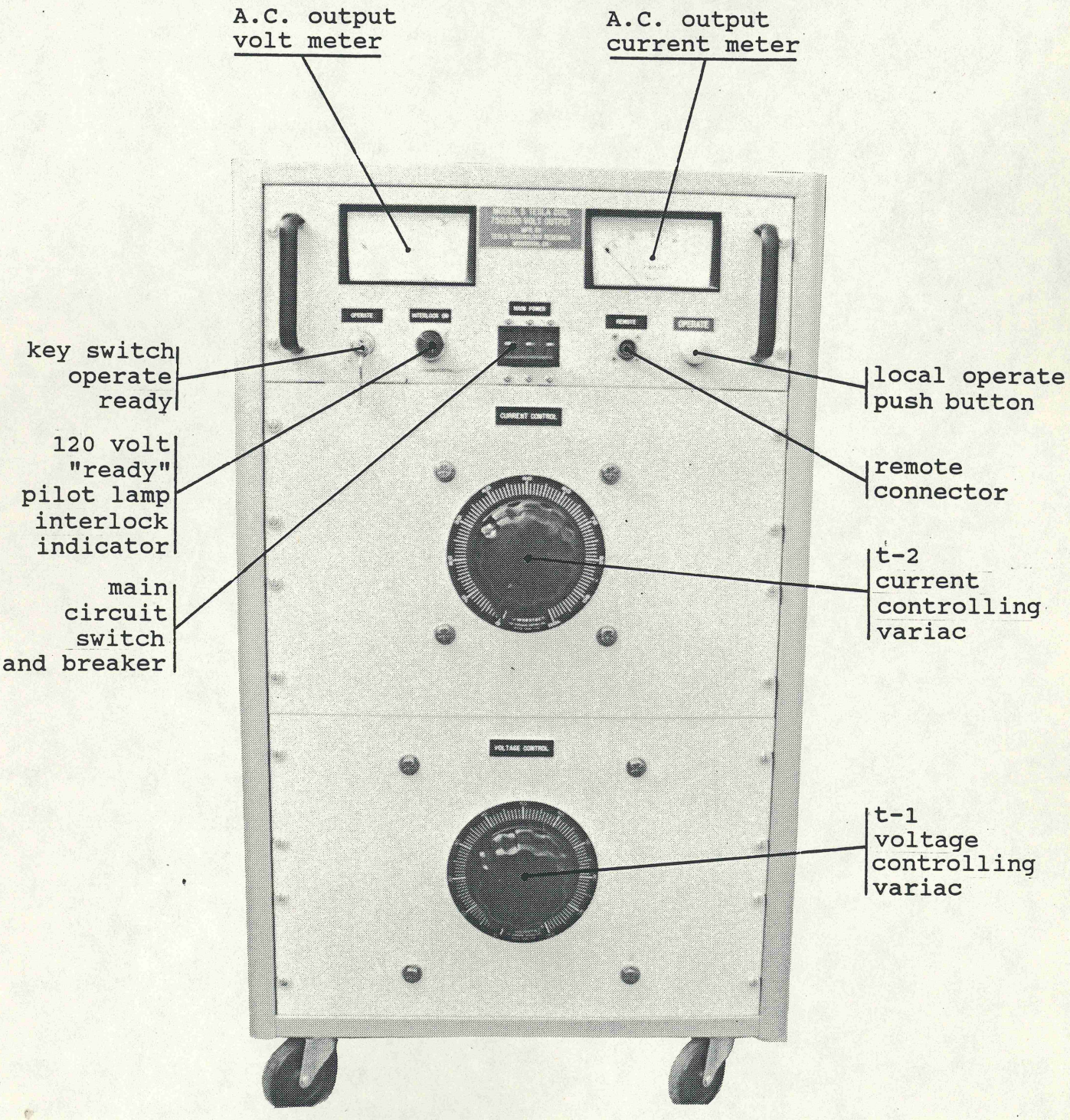


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2. MODEL FIVE POWER SUPPLY PICTORIAL DESCRIPTION



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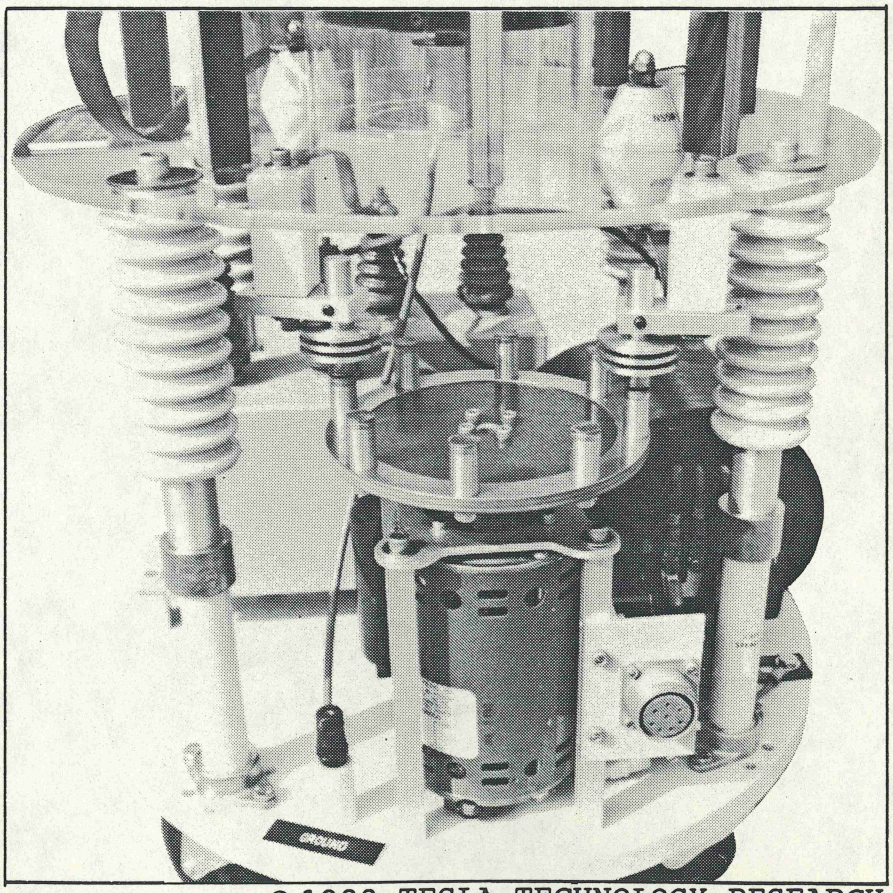
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3. INSTALLATION PROCEDURE

The Model Five Tesla Coil System is designed for easy installation. First, determine that the perspective installation site is physically correct in size to insure safe operation. This may be accomplished by allowing a minimum six foot radius clearance on all sides from the base of the Tesla Coil. A minimum eight foot vertical clearance is required, measured from the Tesla Coil base.

It may be desirable to arrange one or more grounded electrodes near the vicinity of the 20" discharge electrode, thus allowing the high voltage discharge to arc from the toroid to these grounded points. The spacing of each of the grounded points to the toroid discharge electrode determines the amount of high voltage potential built up on the toroid. An arc jumping a straight line measured distance of 40" represents slightly more than 750 KV output potential.

It may also be desirable to arrange some form of booth or alcove in which the Tesla Coil is to be positioned. In this manner, the discharges will be seen more dramatically, especially if the area surrounding the coil and its background are darkened from ambiate light in the room. Additionally, this configuration has the



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3. INSTALLATION PROCEDURE (cont'd)

advantage of keeping spectators at a safe distance.

The power supply rack may be located in any well ventilated area up to a maximum distance from the Tesla Coil determined by the black interconnecting cable length. A suitable 30 amp service outlet should be located so that the power input cable may be directly plugged in. If an extension cable is unavoidably necessary, it must be of the 3 conductor #10 AWG size stranded conductor type and should be rated for at least 30 amp, 120 volt continuous duty.

Once both units are properly positioned, next connect a length of #10 AWG copper braided wire (or equivalent) to a very good earth ground, such as a cold water pipe, if the plumbing runs directly into soil beneath the foundation. If no substantial ground is available, a grounding rod must be driven vertically down through the foundation into the soil. Such a rod should be of the type available from most hardware stores for the purpose of securing a good electrical ground reference. The other end of this cable must be connected to both the rack chassis and the ground terminal on the Tesla Coil base. (See Tesla Coil base unit illustration.) The maximum length of this cable between all points should not exceed 50 feet. Connection at the rack chassis may be accomplished by fastening a suitable 1/4" I.D. eyelet solderless crimp terminal to the 1/4" x 20 thread mounting screw in the back of the cabinet. Grounding connection to the Tesla Coil base unit is made at the insulated ground terminal.

WARNING: UNDER NO CIRCUMSTANCES SHOULD POWER BE APPLIED TO THE SYSTEM UNTIL ALL GROUNDING OPERATIONS HAVE BEEN SATISFACTORILY COMPLETED.

Next, connect the interconnecting cable from the power supply to the Tesla Coil base power input connector. Install the secondary coil by positioning the brass flange on the bottom of the coil directly over the 3/8" x 16 threaded rod of the central porcelain feed-thru bushing on the upper deck of the Tesla Coil

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3. INSTALLATION PROCEDURE (cont'd)

base. Secure by hand, applying gentle clock-wise rotation of the coil until the coil bottom is firmly seated to the lucite support ring located around the mounting bushing.

Next, carefully position the large lucite sleeve around the secondary coil.

Next, position the aluminum 20" toroid on top of the secondary coil high voltage feed-thru bushing. Use the #1/4-20 brass thumb nut and flat washers provided. When the toroid has been properly positioned and secured, the upper edge of the lucite sleeve should just snugly fit against the bottom of the toroid flat central plate area in a centered attitude.

Now make sure that the main power switch breaker is off, and connect the interconnect cable first to the Tesla Coil base, and then connect the A.C. cable to a power outlet.

This completes all installation instructions. Proceed to the next section entitled OPERATION INSTRUCTIONS.

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4. OPERATING INSTRUCTIONS

First, double-check that all previous instructions have been carefully followed before proceeding further.

WARNING: A lethal electrical shock hazard exists in the circuitry inside the rack cabinet and on the Tesla Coil base unit and Tesla primary coil winding. Make sure all power is off before attempting any adjustments. Avoid Murphy's Law which states that if anything can possibly go wrong, IT WILL!

All observers should stay at a minimum distance of six feet away from the Tesla Coil during periods of operation.

ANY PERSONS possessing any form of electro-cardiac devices (pacemakers) should leave the area BEFORE operating the coil.
THESE PRECAUTIONS ARE ABSOLUTELY NECESSARY FOR YOUR PROTECTION.

Position the VOLTAGE CONTROL knob to indicate 100 on the face plate and the CURRENT CONTROL knob to indicate 50 on its face plate respectively.

Apply power by actuating the main power switch breaker to the "on" position, (see page 2). Observe voltage indication on A.C. volt meter; it should read about 140 volts.

Now insert key in key switch and turn clock-wise 90 degrees. This activates the interlock operate ready function, which is verified by the red pilot lamp adjacent to the key switch, and also starts the rotary gap motor.

You are now ready to operate the Tesla Coil. Depress the large yellow button marked "local operate," for three seconds and release. A loud report and a torrent of long corona streamers should be seen emitting from the toroid discharge electrode.

If no sparks are indicated, reset the key switch to the "off" position and carefully inspect all visible connections for proper electrical and mechanical contact. Note: Coil will not operate if key switch is turned 90 degrees counter-clockwise as indicated by no illumination of the interlock ready red pilot lamp.

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4. OPERATING INSTRUCTIONS (cont'd)

If again no sparks appear after repeating the above instructions, DO NOT PROCEED FURTHER. Turn off all power to the power supply rack and consult with TTR for further instructions.

If coil is operating correctly, a current reading on the A.C. ammeter of approximately 25 to 30 amps should be noted during operation. This may vary slightly and is not abnormal. Long corona streamers should continuously issue forth in random directions from the toroid discharge electrode. Occasionally, a heavy discharge may be noted jumping from the lower portion of the secondary coil to the primary coil. If this happens, simply cease operation for a few seconds. This phenomena is caused by the air dielectric becoming overstressed. By stopping operation momentarily, the ionized pockets of air have a chance to dissipate, thus restoring the normal insulation value of the air space between the primary and secondary coil, and operation of the coil may be resumed.

Duration of operation SHOULD NOT EXCEED 10 SECONDS MAXIMUM for a continuous period. Approximately 20 second periods MINIMUM should be observed between successive 10 second periods of operation, with no more than 5 operations per 1/2 hour, to allow for rotary gap cooling. This instruction is also designed to protect the carbon contactors on the variacs from becoming excessively heated and causing a blackened scorch mark on the variac windings at the point of contact. Additionally, it will insure longest rotary gap component life expectancy. Failure to observe these operating instructions may shorten the life expectancy of the Tesla Coil System significantly.

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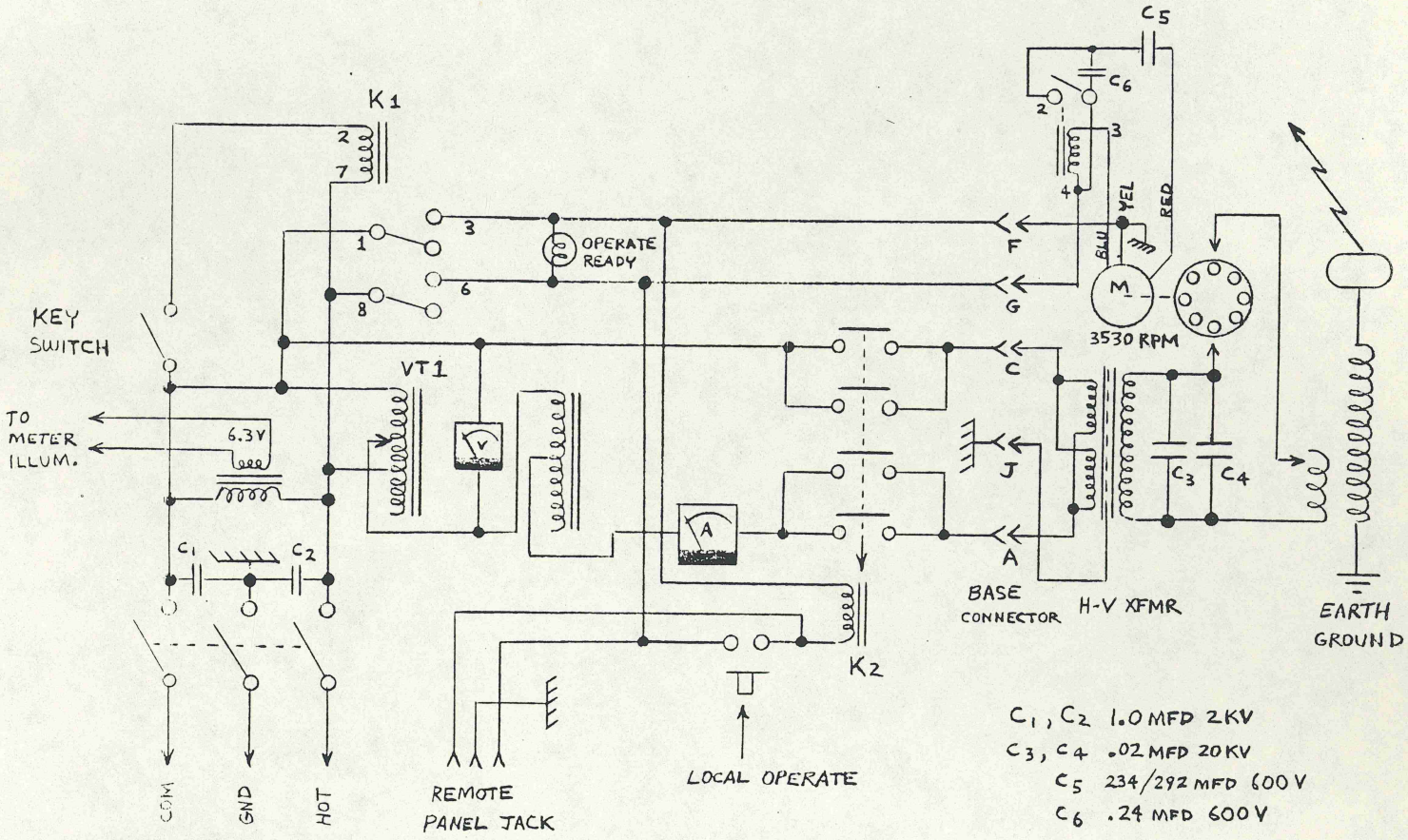
5. POWER REQUIREMENTS AND SCHEMATIC DIAGRAM

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

Power input: 120 V.A.C., 60 HZ single phase, 35 amp nominal

Output: 750,000 volts (750 KV) maximum

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6. ROUTINE MAINTENANCE

Simple periodic maintenance of the Model Five Tesla Coil System will insure continued maximum performance. Basically, only three areas are of concern; the rotary spark gap, lucite sleeve of the Tesla secondary coil, and the upper surfaces of the primary coil. The latter should be regularly cleaned of dust particle build-up. This will aid in preventing unwanted small corona point discharge from propagating in this crucial air dielectric area.

The procedure for periodic cleaning of the lucite sleeve is by first removing the toroid discharge electrode. Then remove the sleeve, being careful not to gouge the windings on the secondary coil. Wash the sleeve with luke-warm water and a mild hand soap which is free of abrasive particles. Thoroughly dry the sleeve only with a soft cotton towel. Make sure no lint particles remain on both the inside and outside surfaces of the sleeve, and then re-install on the coil.

This operation should be performed once after every 5 hour elapsed running times period.

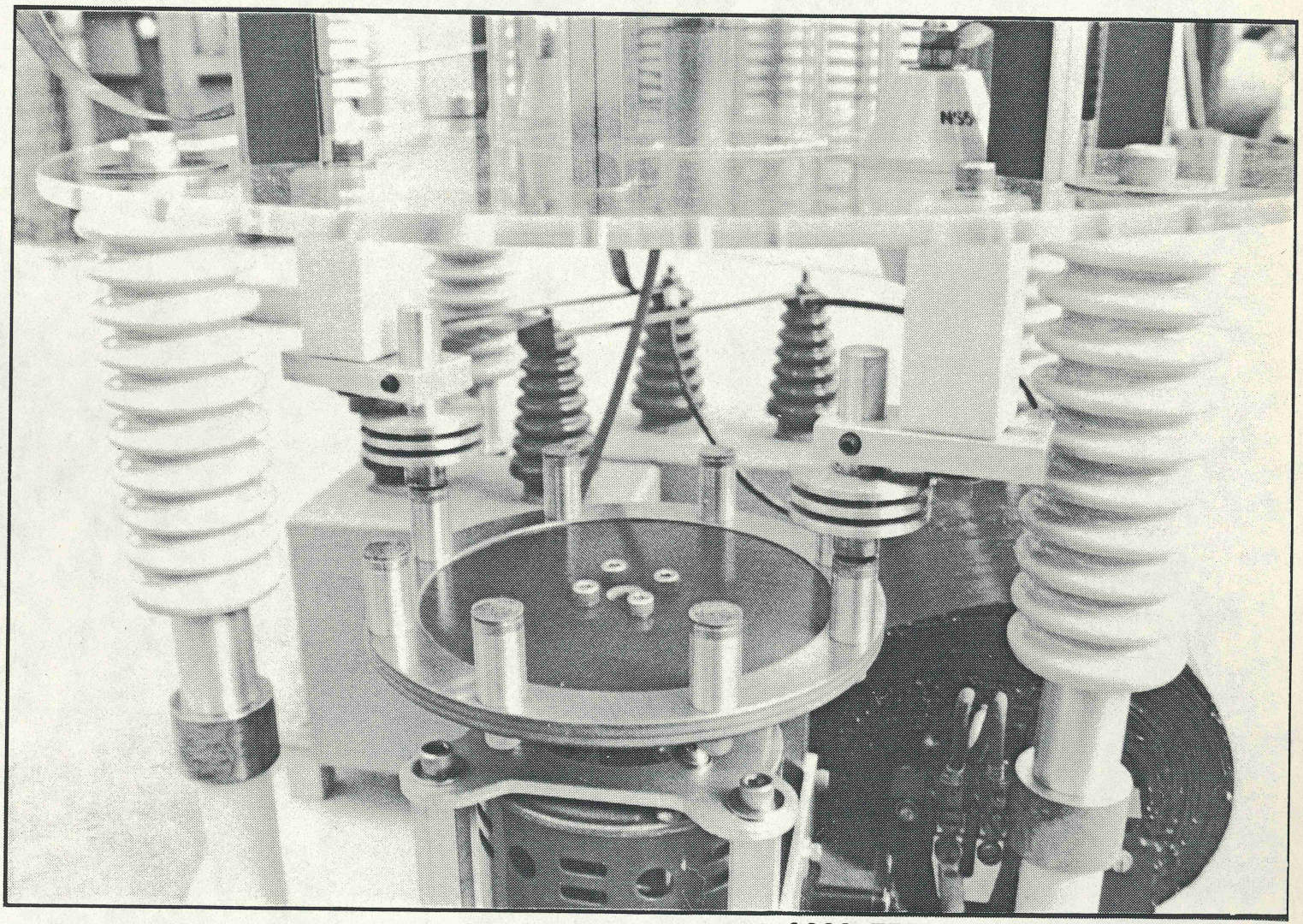
On the rotary gap, careful periodic rotation of the stationary electrodes and inspection of the various tungsten rotary electrodes are absolutely essential in order to insure peak performance of the coil.

This may easily be accomplished by the following steps. First, loosen the set screw of one of the stationary electrodes. (Refer to the close-up view of rotary gap assembly.) Rotate the electrode about 30 degrees, re-gap to approximately .065 inch, and tighten the set screw. Repeat this procedure on the other stationary electrode. Rotation of the stationary electrodes about once after every hour of accumulated operating time serves to promote an even wear pattern on these electrode faces, thus prolonging their useful life span.

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PICTORIAL DESCRIPTION - TESLA COIL BASE UNIT

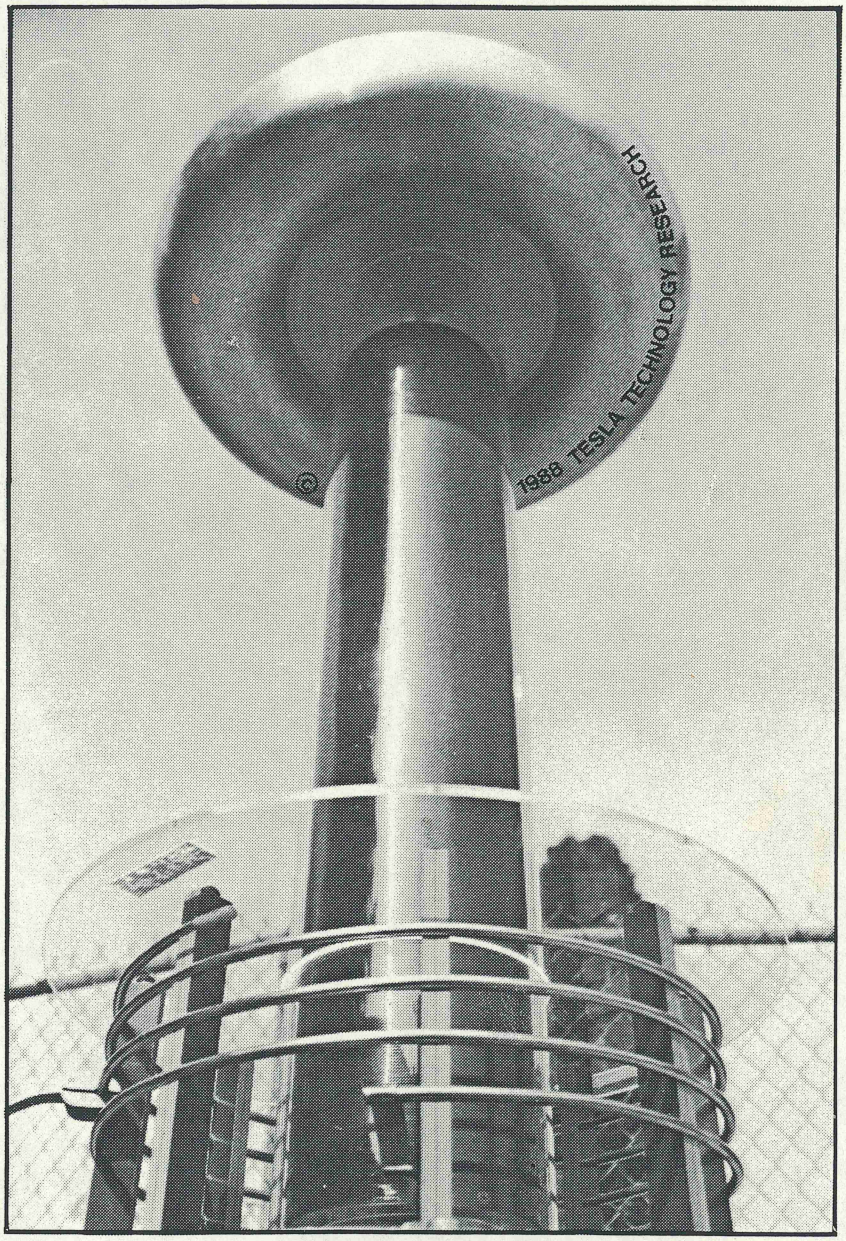
(close-up view of rotary gap assembly.)



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MODEL FIVE TESLA COIL SYSTEM



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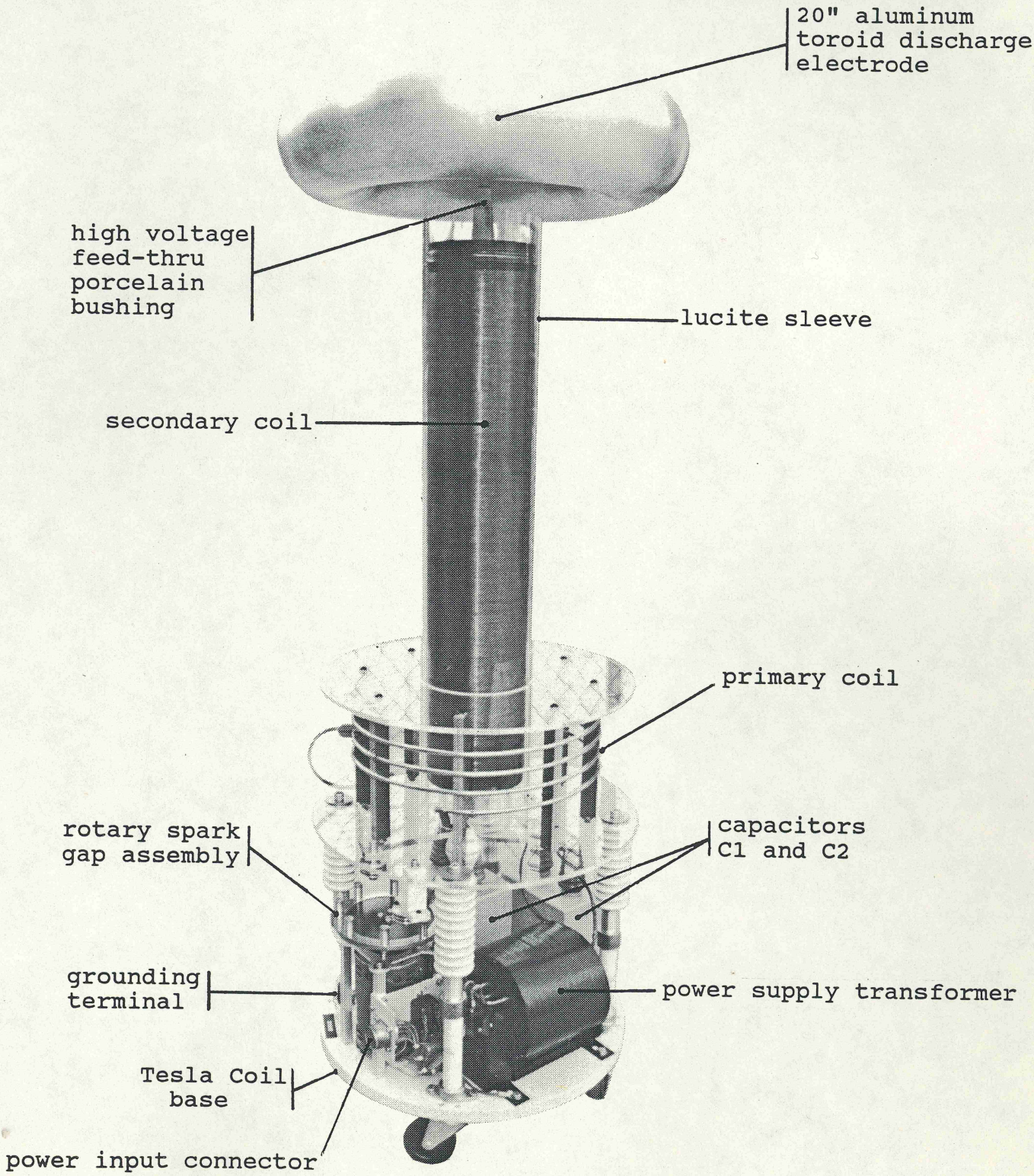
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1. MODEL FIVE TESLA COIL PICTORIAL DESCRIPTION

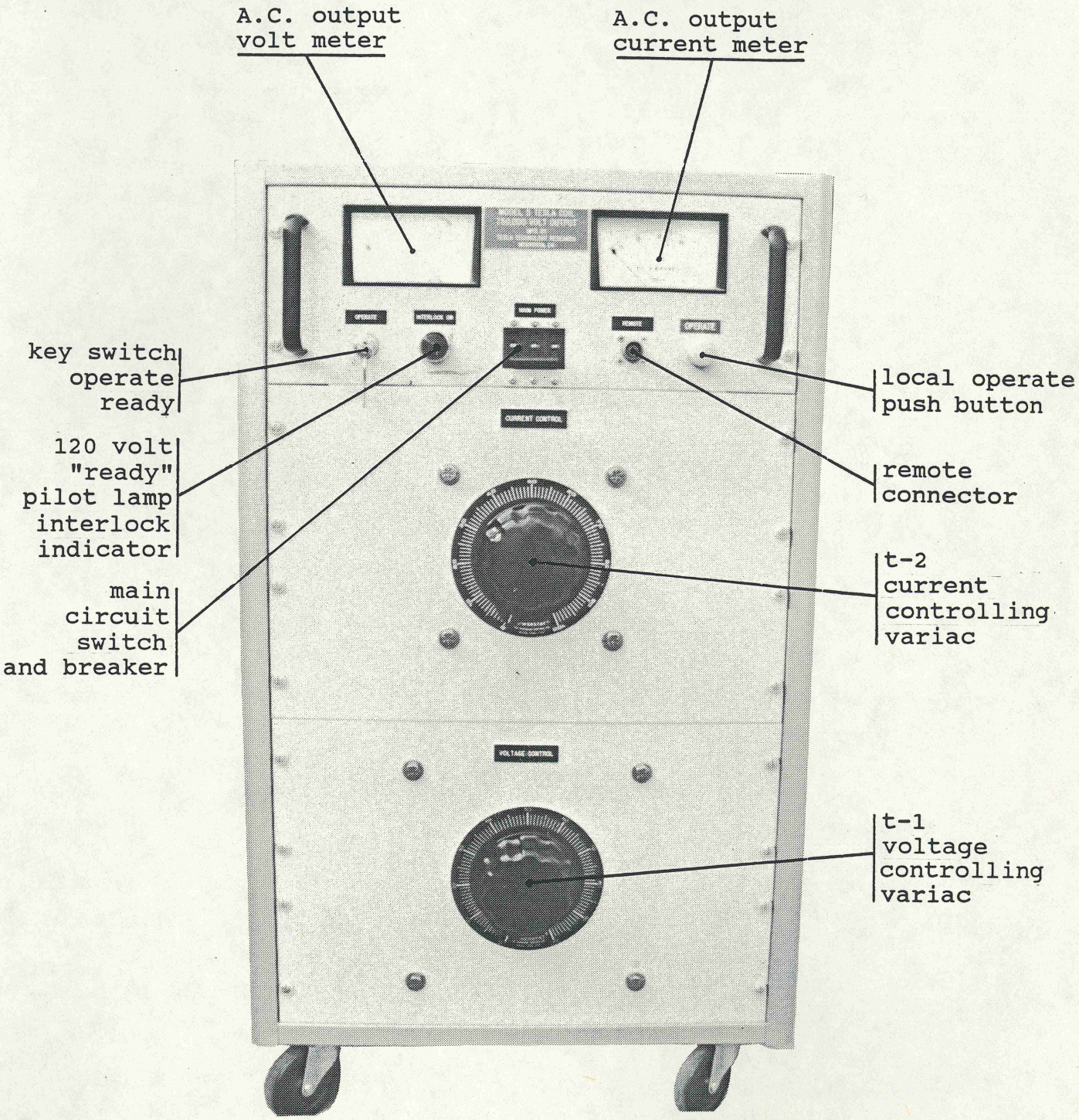


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2. MODEL FIVE POWER SUPPLY PICTORIAL DESCRIPTION



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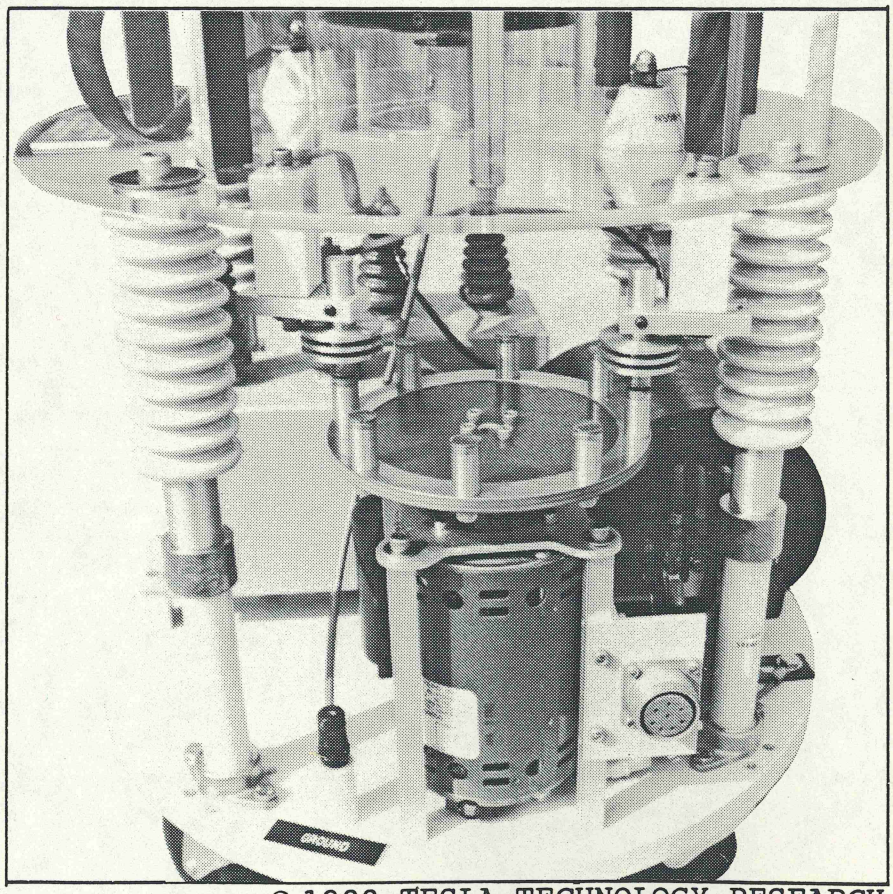
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3. INSTALLATION PROCEDURE

The Model Five Tesla Coil System is designed for easy installation. First, determine that the perspective installation site is physically correct in size to insure safe operation. This may be accomplished by allowing a minimum six foot radius clearance on all sides from the base of the Tesla Coil. A minimum eight foot vertical clearance is required, measured from the Tesla Coil base.

It may be desirable to arrange one or more grounded electrodes near the vicinity of the 20" discharge electrode, thus allowing the high voltage discharge to arc from the toroid to these grounded points. The spacing of each of the grounded points to the toroid discharge electrode determines the amount of high voltage potential built up on the toroid. An arc jumping a straight line measured distance of 40" represents slightly more than 750 KV output potential.

It may also be desirable to arrange some form of booth or alcove in which the Tesla Coil is to be positioned. In this manner, the discharges will be seen more dramatically, especially if the area surrounding the coil and its background are darkened from ambiate light in the room. Additionally, this configuration has the



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3. INSTALLATION PROCEDURE (cont'd)

advantage of keeping spectators at a safe distance.

The power supply rack may be located in any well ventilated area up to a maximum distance from the Tesla Coil determined by the black interconnecting cable length. A suitable 30 amp service outlet should be located so that the power input cable may be directly plugged in. If an extension cable is unavoidably necessary, it must be of the 3 conductor #10 AWG size stranded conductor type and should be rated for at least 30 amp, 120 volt continuous duty.

Once both units are properly positioned, next connect a length of #10 AWG copper braided wire (or equivalent) to a very good earth ground, such as a cold water pipe, if the plumbing runs directly into soil beneath the foundation. If no substantial ground is available, a grounding rod must be driven vertically down through the foundation into the soil. Such a rod should be of the type available from most hardware stores for the purpose of securing a good electrical ground reference. The other end of this cable must be connected to both the rack chassis and the ground terminal on the Tesla Coil base. (See Tesla Coil base unit illustration.) The maximum length of this cable between all points should not exceed 50 feet. Connection at the rack chassis may be accomplished by fastening a suitable 1/4" I.D. eyelet solderless crimp terminal to the 1/4" x 20 thread mounting screw in the back of the cabinet. Grounding connection to the Tesla Coil base unit is made at the insulated ground terminal.

WARNING: UNDER NO CIRCUMSTANCES SHOULD POWER BE APPLIED TO THE SYSTEM UNTIL ALL GROUNDING OPERATIONS HAVE BEEN SATISFACTORILY COMPLETED.

Next, connect the interconnecting cable from the power supply to the Tesla Coil base power input connector. Install the secondary coil by positioning the brass flange on the bottom of the coil directly over the 3/8" x 16 threaded rod of the central porcelain feed-thru bushing on the upper deck of the Tesla Coil

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3. INSTALLATION PROCEDURE (cont'd)

base. Secure by hand, applying gentle clock-wise rotation of the coil until the coil bottom is firmly seated to the lucite support ring located around the mounting bushing.

Next, carefully position the large lucite sleeve around the secondary coil.

Next, position the aluminum 20" toroid on top of the secondary coil high voltage feed-thru bushing. Use the #1/4-20 brass thumb nut and flat washers provided. When the toroid has been properly positioned and secured, the upper edge of the lucite sleeve should just snugly fit against the bottom of the toroid flat central plate area in a centered attitude.

Now make sure that the main power switch breaker is off, and connect the interconnect cable first to the Tesla Coil base, and then connect the A.C. cable to a power outlet.

This completes all installation instructions. Proceed to the next section entitled OPERATION INSTRUCTIONS.

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4. OPERATING INSTRUCTIONS

First, double-check that all previous instructions have been carefully followed before proceeding further.

WARNING: A lethal electrical shock hazard exists in the circuitry inside the rack cabinet and on the Tesla Coil base unit and Tesla primary coil winding. Make sure all power is off before attempting any adjustments. Avoid Murphy's Law which states that if anything can possibly go wrong, IT WILL!

All observers should stay at a minimum distance of six feet away from the Tesla Coil during periods of operation.

ANY PERSONS possessing any form of electro-cardiac devices (pacemakers) should leave the area BEFORE operating the coil.
THESE PRECAUTIONS ARE ABSOLUTELY NECESSARY FOR YOUR PROTECTION.

Position the VOLTAGE CONTROL knob to indicate 100 on the face plate and the CURRENT CONTROL knob to indicate 50 on its face plate respectively.

Apply power by actuating the main power switch breaker to the "on" position, (see page 2). Observe voltage indication on A.C. volt meter; it should read about 140 volts.

Now insert key in key switch and turn clock-wise 90 degrees. This activates the interlock operate ready function, which is verified by the red pilot lamp adjacent to the key switch, and also starts the rotary gap motor.

You are now ready to operate the Tesla Coil. Depress the large yellow button marked "local operate," for three seconds and release. A loud report and a torrent of long corona streamers should be seen emitting from the toroid discharge electrode.

If no sparks are indicated, reset the key switch to the "off" position and carefully inspect all visible connections for proper electrical and mechanical contact. Note: Coil will not operate if key switch is turned 90 degrees counter-clockwise as indicated by no illumination of the interlock ready red pilot lamp.

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4. OPERATING INSTRUCTIONS (cont'd)

If again no sparks appear after repeating the above instructions, DO NOT PROCEED FURTHER. Turn off all power to the power supply rack and consult with TTR for further instructions.

If coil is operating correctly, a current reading on the A.C. ammeter of approximately 25 to 30 amps should be noted during operation. This may vary slightly and is not abnormal. Long corona streamers should continuously issue forth in random directions from the toroid discharge electrode. Occasionally, a heavy discharge may be noted jumping from the lower portion of the secondary coil to the primary coil. If this happens, simply cease operation for a few seconds. This phenomena is caused by the air dielectric becoming overstressed. By stopping operation momentarily, the ionized pockets of air have a chance to dissipate, thus restoring the normal insulation value of the air space between the primary and secondary coil, and operation of the coil may be resumed.

Duration of operation SHOULD NOT EXCEED 10 SECONDS MAXIMUM for a continuous period. Approximately 20 second periods MINIMUM should be observed between successive 10 second periods of operation, with no more than 5 operations per 1/2 hour, to allow for rotary gap cooling. This instruction is also designed to protect the carbon contactors on the variacs from becoming excessively heated and causing a blackened scorch mark on the variac windings at the point of contact. Additionally, it will insure longest rotary gap component life expectancy. Failure to observe these operating instructions may shorten the life expectancy of the Tesla Coil System significantly.

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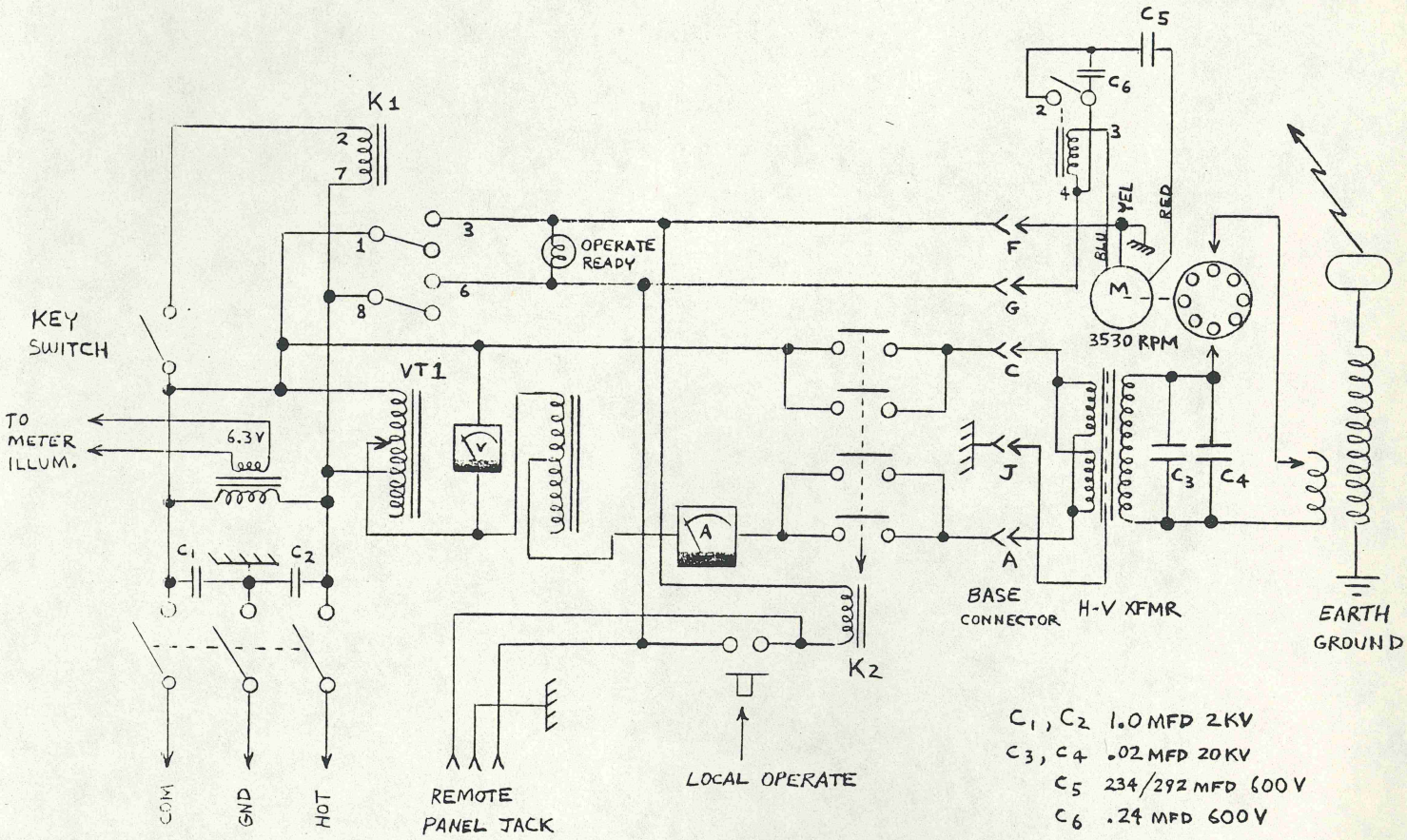
5. POWER REQUIREMENTS AND SCHEMATIC DIAGRAM

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

Power input: 120 V.A.C., 60 HZ single phase, 35 amp nominal

Output: 750,000 volts (750 KV) maximum

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6. ROUTINE MAINTENANCE

Simple periodic maintenance of the Model Five Tesla Coil System will insure continued maximum performance. Basically, only three areas are of concern; the rotary spark gap, lucite sleeve of the Tesla secondary coil, and the upper surfaces of the primary coil. The latter should be regularly cleaned of dust particle build-up. This will aid in preventing unwanted small corona point discharge from propagating in this crucial air dielectric area.

The procedure for periodic cleaning of the lucite sleeve is by first removing the toroid discharge electrode. Then remove the sleeve, being careful not to gouge the windings on the secondary coil. Wash the sleeve with luke-warm water and a mild hand soap which is free of abrasive particles. Thoroughly dry the sleeve only with a soft cotton towel. Make sure no lint particles remain on both the inside and outside surfaces of the sleeve, and then re-install on the coil.

This operation should be performed once after every 5 hour elapsed running times period.

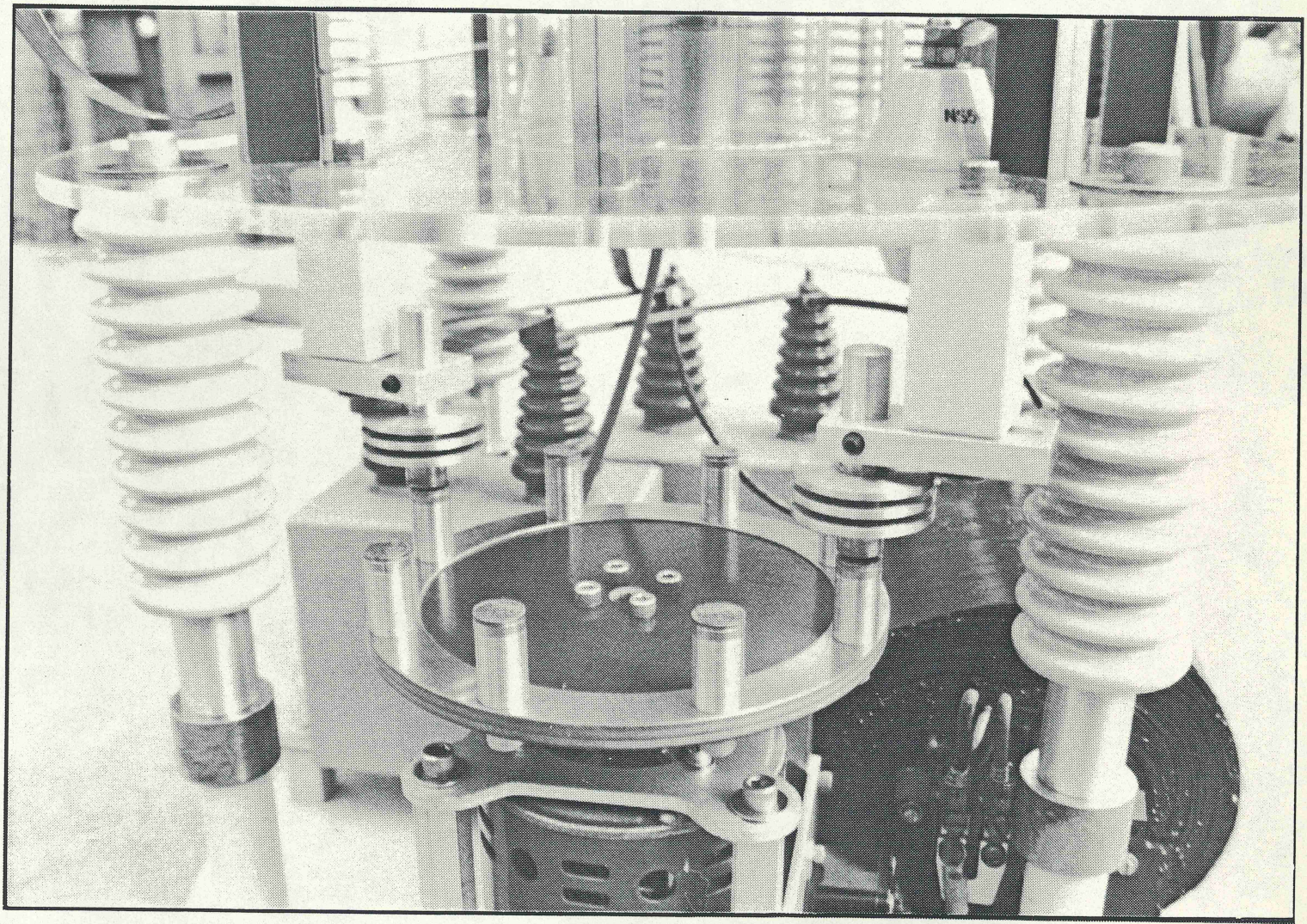
On the rotary gap, careful periodic rotation of the stationary electrodes and inspection of the various tungsten rotary electrodes are absolutely essential in order to insure peak performance of the coil.

This may easily be accomplished by the following steps. First, loosen the set screw of one of the stationary electrodes. (Refer to the close-up view of rotary gap assembly.) Rotate the electrode about 30 degrees, re-gap to approximately .065 inch, and tighten the set screw. Repeat this procedure on the other stationary electrode. Rotation of the stationary electrodes about once after every hour of accumulated operating time serves to promote an even wear pattern on these electrode faces, thus prolonging their useful life span.

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PICTORIAL DESCRIPTION - TESLA COIL BASE UNIT

(close-up view of rotary gap assembly.)



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7. WARRANTY

READ CAREFULLY - THIS IS A LIMITED WARRANTY

Tesla Technology Research warrants the complete Model Five Tesla Coil System to be free of defects in workmanship and materials for 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 Model Five 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 Model Five Tesla Coil System.

It is understood that a LETHAL ELECTRIC SHOCK HAZARD exists in certain components of the Model Five Tesla Coil System, and that the customer assumes all necessary installation and operation safety requirements of this system.

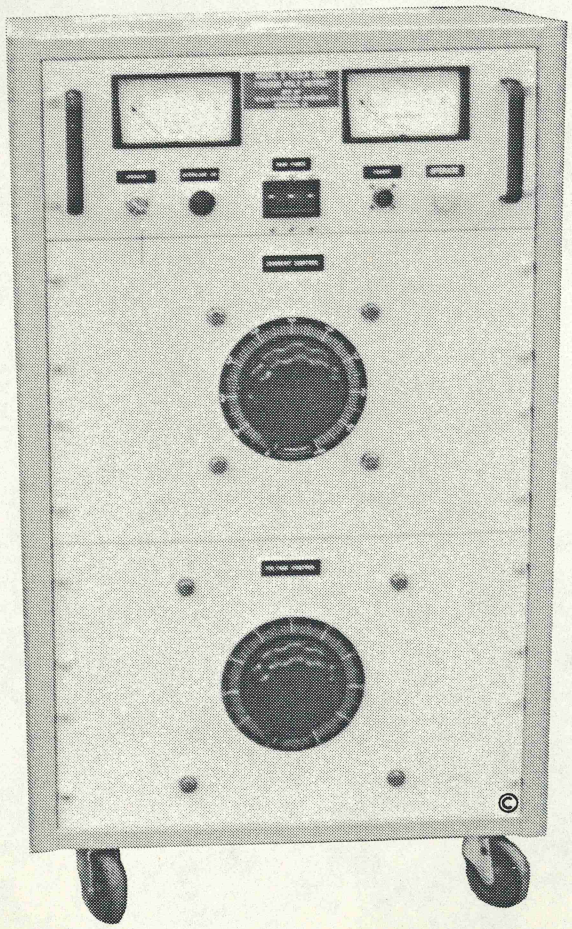
Components of the Model Five Tesla Coil System returned by the customer will be evaluated by Tesla Technology Research. If these components are found to be faulty through no cause of the customer, they will be replaced at no charge. No other warranty is expressed or implied.

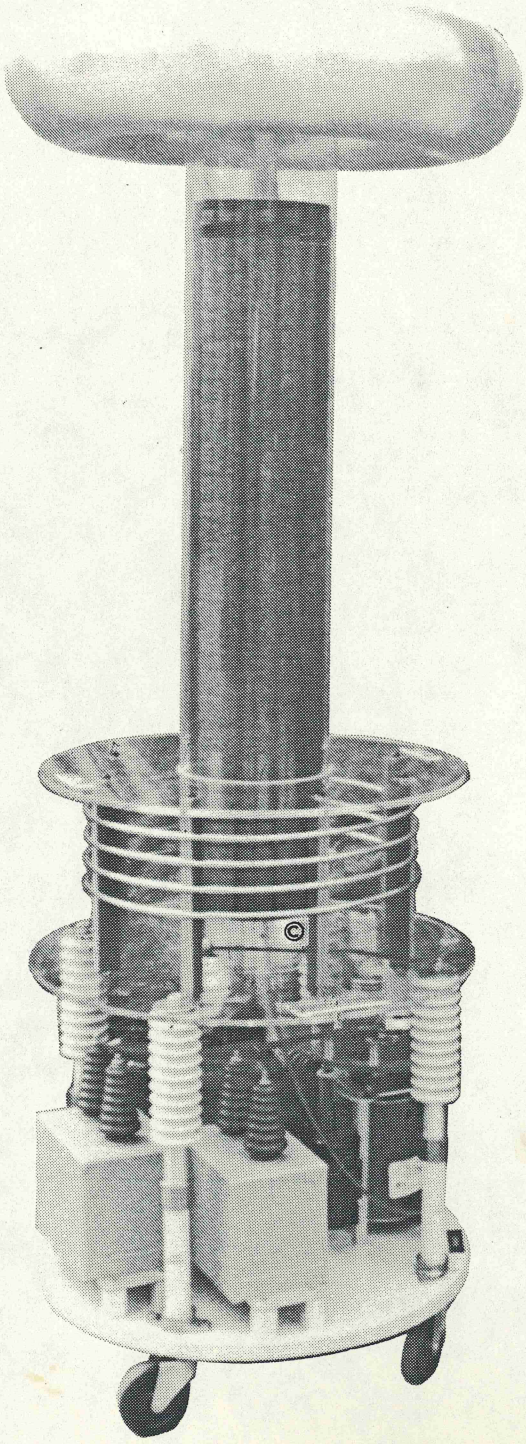
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2527 TREELANE AVE., MONROVIA, CA 91016 (818) 359-1373

MODEL FIVE TESLA COIL SYSTEM





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REC'D
4-30-79

1550 Gallatin Rd. N.
Madison, Tn. 37115
April 27, 1979

Mr. William C. Wysock
Professional Sound Systems
4914 Baldwin Ave.
Temple City, Ca. 91780

Dear Mr. Wysock:

I really enjoyed our phone conversation a few weeks ago. The information saved me some work (and certainly headaches) on my large Tesla coil.

As stated in our conversation, I will send you photocopies of the Tesla coil texts of Haller & Cunningham and Transtrom. Some of the illustrations are unclear — my photocopies aren't much better. I think that all the "essentials" can be discerned though.

As for photocopy costs, I'm sending you the Haller & Cunningham text at no charge since you've been so helpful to me. The Transtrom text cost me $9.10 to photocopy. If this is agreeable with you, I am deducting this amount from the $42.00 price you quoted for the English edition of Tesla's Colo. Springs Notebook.

Please find enclosed a check for $32.90 for the notebook. If you need any additional money for shipping, etc., please indicate so in your next correspondence.

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The two photocopies I'm sending you should arrive shortly via UPS. They are being shipped today.

How are efforts going to revive the Tesla Society? I want to encourage that all I can. There is something else I thought of that would benefit a great many experimenters and certainly yourself. If you could spare a few days, why not write a short text on Tesla coil theory, construction, and operation?

Here's my line of reasoning. You probably know more about this subject than anyone else alive today. The book would also serve as a catalog that would advertize your complete coils and various components. I have seen many Tesla coil articles that are confusing and some that are dead wrong! Your text could help clear the air.

I would like some <u>approximate</u> prices from you on the following components: (or the nearest to these you sell)

1. 15 kV, 200 mA (220 V pri) transformer
2. 15 kV, 800 mA (220 V pri) transformer
3. 40 kV, 0.035 μF oil dielectric capacitor
4. 40 kV, 0.141 μF oil dielectric capacitor

Obviously, I chose the capacitance values so that $X_C = X_L$ approximately.

I still have some more questions about your larger model coils. As I have said previously, don't hesitate in telling me that some aspect is confidential!

About how many turns of wire is there

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on the secondary of models 8, 9, 10? Most old plans just blindly call for 600. Have you determined any particular spacing (turns/in) as optimum?

If you ever publish some operation manuals for your various coils that give component values, dimensional specs, etc., please let me know how much they're selling for. I would be interested to see what your idea of a modern, efficient Tesla coil circuit would look like.

I could obviously write on. I had better close at this point. Your patience in reading a letter this long is appreciated. I'll be looking forward to receiving your reply when you get time. Best of wishes always for longer sparks!

Yours truly,
Steven C. Caldwell
(615) 868-2749

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Mr. Steven G. Caldwell
1550 Gallatin Rd. N.
Madison, Tn. 37115
May 16, 1979

Dear Mr. Caldwell;

Thankyou for your letter of 4-27-79, and for sending the two copies of the books. The Colorado Springs Notebook is being sent tomorrow. You should receive it in a couple of days.

As to your comments regarding the publishing of a current authorative book on Tesla Coil construction and theory, I would like to call your attention to my efforts in this endevor. First, I an now in the process of writing a comprehensive guide for experimenters for the construction of various coil configurations-up to about the 5 megavolt range. I am also using some of our proto-type coils as "test beds," for the experimental proof of some of the material that will be published. As you may already know, the largest of these, the Model Ten Proto-type, is now producing over 6.3 megavolts and corona discharges over 22 feet in lenght.

As to the pricing info you requested; (shown are the availabe units)

1. 20KV, 350 MA., 120 V PRIMARY Transformer----------125.00 ea.
2. 7.5 KV, 240MA., 240 V PRIMARY " ---------- 85.00 ea.
3. 17.4 KV, 2 AMP, 120 V PRIMARY " ----------695.00 ea.
4. 12 KV, 1 AMP, 240/120 PRIMARY " ----------285.00 ea.

All the above transformers are available from stock, and have been used as part of our standard line of coil models. Except for item #2 above, all are oil insulated and will stand more than twice their rated voltage in insulation margin.

5. 42 KV, .022 MFD OIL CAPACITOR----------175.00 ea.
6. 40 KV, .12 MFD " " ----------395.00 ea. *
7. 20 KV, .025 MFD " " ----------150.00 ea. *

NOTE: (*) denotes capacitors which are especially custom built to our specifications exclusivly for applications in Tesla Ciol oscillation circuits of medium to high power input ratings and very high pulse rates.

I am curious as to why you are interested in capacitors of such high operating voltage ratings when the transformers you are interested in are of a considerably lower output voltage. Also, what coil(s) are you contemplating for a capacity as high as .141 MFD?

In answer to your questions about the number of turns and the spacing of those turns of models 8,9,10, the figures are only meaningfull as long as you were to use the same sizes of coil forms as we use. Model 10 for example, has something like 420 turns and the spacing between each turn is approximatly 0.25 inch, and consists of #12 A.W.G. stranded-plastic insulated wire. As to the determination of turns/inch as beigg optimum, there is indeed a value for these perameters which is ideal for any given size of coil.

We unfortunatly do not have any spare manuals for our ciols. I am however, enclosing a general brochure for your interest. Yours truly,

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Model Five Tesla Coil

Original Art + Halftone Negs for Owner's Manual

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NEW MODEL 5 COIL - 1988
MASTER ARTWORK - TTR

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WALT DISNEY IMAGINEERING

TESLA COIL SYSTEM 5D

MAINTENANCE MANUAL

MANUFACTURED BY: TESLA TECHNOLOGY RESEARCH
2527 Treelane Ave., Monrovia, Ca. 91016
(818) 359-1373

WARNING:

THE ELECTRICAL CURRENT IN THE MACHINERY OF THIS INSTALLATION CARRIES A LETHAL ELECTRIC SHOCK HAZARD; DO NOT ATTEMPT ANY ADJUSTMENT OR MAINTENANCE TO THIS SYSTEM UNTIL ALL POWER IS COMPLETELY SHUT OFF AND LOCKED OUT. ALL WORK MUST BE PERFORMED ONLY BY QUALIFIED TECHNICAL PERSONNEL. READ THIS MANUAL COMPLETELY BEFORE ATTEMPTING ANY ADJUSTMENT TO THIS EQUIPMENT. SPARE PARTS AND ADDITIONAL TECHNICAL ASSISTANCE IS AVAILABLE THROUGH THE ABOVE ADDRESS.

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1. MODEL 5D TECHNICAL DESCRIPTION AND SPECIFICATIONS.

Model 5D consists of a rack cabinet-enclosed power supply section and an enclosed Tesla Coil assembly, configured on a 24 inch diameter base. The power supply major operating components are; voltage control autotransformer, current control autotransformer, high voltage step-up power transformer, power and control relays. The Tesla Coil major operating components are; motor-driven rotary spark gap assembly, oscillation capacitors, Tesla primary and secondary coils, and a 20 inch diameter toroid discharge electrode. The voltage and current controls are adjustable for obtaining the desired result. The settings can be noted on the control dial plates. Refer to pictorial illustration on page 7.

The power requirement for System One is 208 V.A.C., single phase with a neutral leg (grounded,) and a current rating of 30 amps. The prototype model 5D coil utilizes manual controls for rotary gap and local operate functions. In the production version, to be perminently installed, four 24 V.D.C. feeds are required to operate the system relay logic; K3 relay emergency enable, K4 relay-rotary gap motor power on, K5 relay-high voltage on, and K6 relay-feedback signal indication of system main breaker switch energized. Relays K4 and K5 are sequentially latched in order to energize the system. K3 relay, the emergency stop relay, has override priority, and remains in a continuous ON state during normal conditions. This system requires a nominal current of 20 amps for full rated output. The Tesla Coil is designed to give a solid 24 inch long corona discharge as installed, yielding a potential output of approximately 250,000 volts at a resonate frequency of about 375 KHz.

The integrity of the Tesla secondary ground system deserves special attention to detail. It is absolutely essential to provide a SEPERATE EARTH GROUND to the GROUND TERMINAL, located on the side of the Model 5D Base Unit, which possess the following electrical characteristics; (1) low R.F. impedance at the fundemental operating frequency, and (2) non resonant physical length. Practice has shown that this is not as simple and straight forward as it might appear; the bottom line here is, "THE ONLY THING YOU CAN TAKE FOR GRANTED IS NOTHING AT ALL." Refer to the pictorial illustration on page 9.

2. MODEL 5D MAINTENANCE PROCEDURE.

Periodic maintenance is required on the rotary spark gap assembly, which is located in the bottom portion of the 24 inch diameter base housing. Access to this area is provided by removal of the lucite plastic skirt plate, which is held in place by two stainless steel screws and brass thumb nuts. The solid tungsten-faced stationary electrodes should be rotated about their axis, approximately 20 degrees, initially on a once-per-month basis, or more frequently if required, to promote an even wear pattern on their faces. This also insures the longest life of these parts. Use a 3/32 inch hex key wrench to loosen the mounting of the stationary electrodes, rotate to the new position, and tighten the set screws. Care should be taken to maintain the same gap spacing on each gap.
It is a good practice to first measure each gap with a feeler gauge, and reset to the same distance after rotation. The nominal setting should be held between 0.040 to 0.060 inch for each gap. Additional care should be taken not to over-tighten the set screws, to avoid galling these units.

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Refer to the pictorial illustration of the rotary gap assembly on page 8. The only additional scheduled maintenance required for this system is a visual inspection of the interior area around the base plate, and the exposed external surfaces of the coil, including the exterior wiring and connections. The outside areas should be visually inspected for mechanical flaws such as loose connetions or broken wires BEFORE EACH OCCASION OF OPERATING THE EQUIPMENT.

A heavy build-up of dust and debris, or a wet surface on the coil, will very likely cause a high voltage short to develop. The interior area inspection need only be during gap re-positioning. This area should be observed to be relatively clean and dry at all times.

The permanently installed Model 5D Tesla Coil Base unit must be supplied with an air supply line that provides pressurized dry air to the base of enclosed portion of the Tesla Coil. A regulator should be placed in line, and maintained at about 5 p.s.i., during times of operation of the coil.

During periods of operation, concentrations of oxides of nitrogen and ozone are generated inside the Tesla Coil base assembly. These gases must be purged from the base interior via the dry air supply. FAILURE to maintain the air supply to the base assembly will significantly shorten the life expectancy of this system, and will void the manufacturer warranty, when the Model 5D Tesla Coil is permanently installed.

At the time of writing of this manual, no further maintenance adjustment is specified for Model 5D.

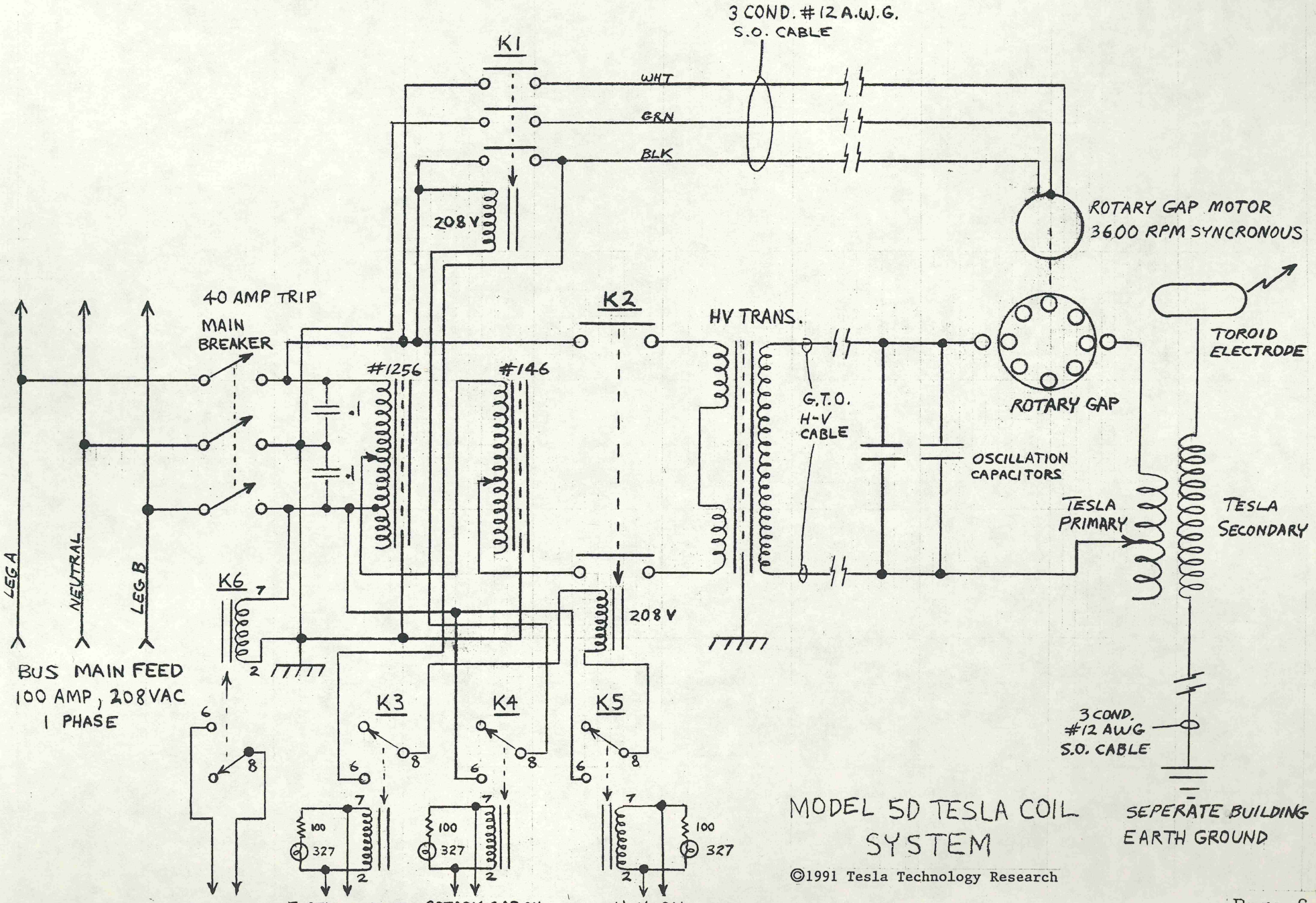
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3. WARRANTY OF THE MODEL 5D TESLA COIL SYSTEM.

Tesla Technology Research warrants the entire Model 5D Tesla Coil System to be free of defects, both in materials and workmanship, at the time of original delivery to the original customer. As stated in the original contractual agreement and disclosure, this equipment IS A PROTOTYPE, and is designed for experimental project development use only. Due to the nature of intended operation, [and possible modification(s) to] this equipment, NO OTHER WARRANTY IS EITHER EXPRESSED OR IMPLIED. The customer shall bear ALL LIABILITY(S), both direct and indirect, for any use(s) of this equipment, after the point of original delivery to the same. Tesla Technology Research RESERVES THE RIGHT TO DUPLICATE ANY AND ALL EQUIPMENTS as originally supplied to the customer, for its own intended purposes in the indefinite future.

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NOTES: PROTOTYPE SYSTEM HAS K_3, K_4, K_5, K_6 OMITTED.
K4 IS A-B KEY SWITH. K5 IS FRONT PANEL PUSH BUTTON.

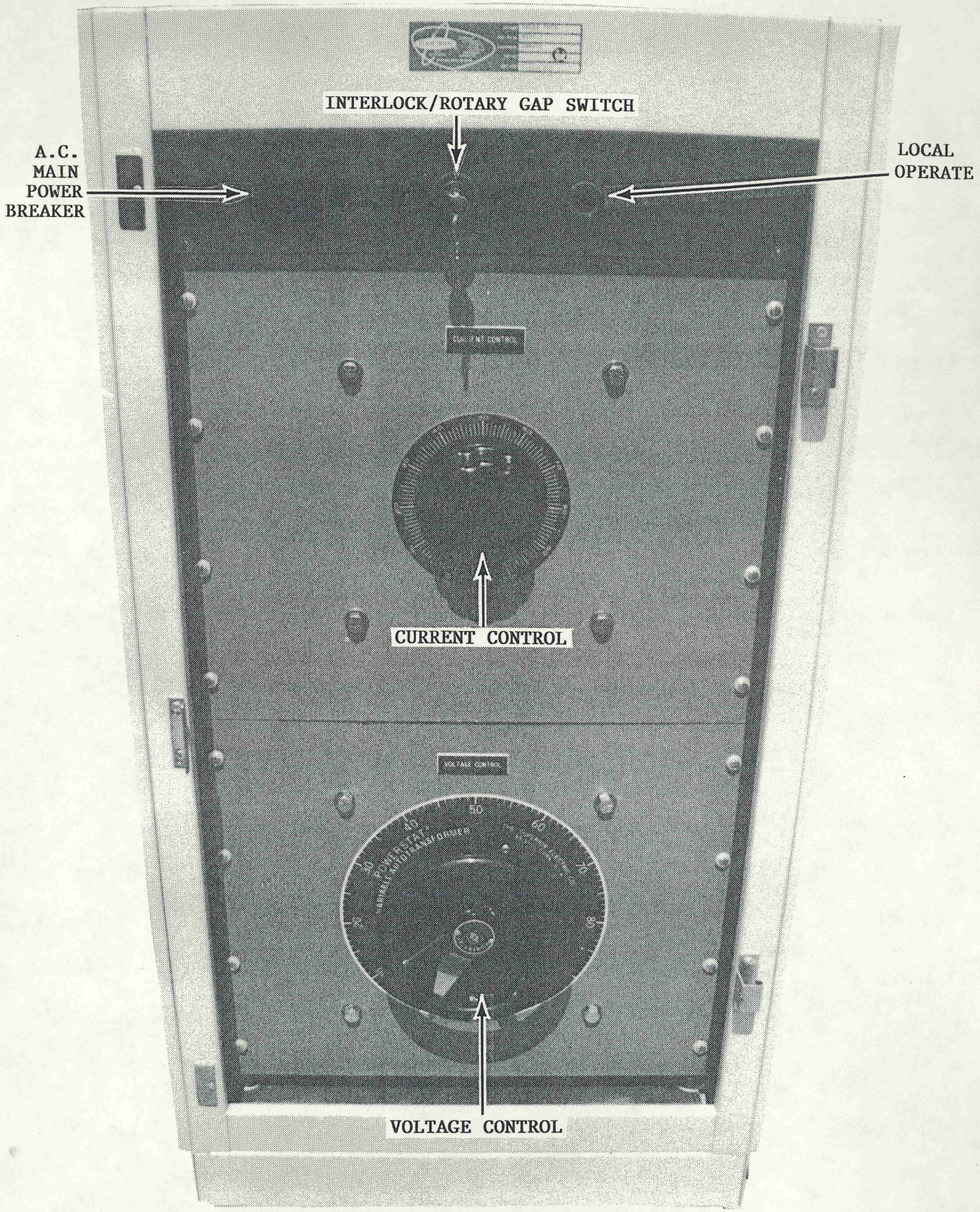


MODEL 5D TESLA COIL SYSTEM

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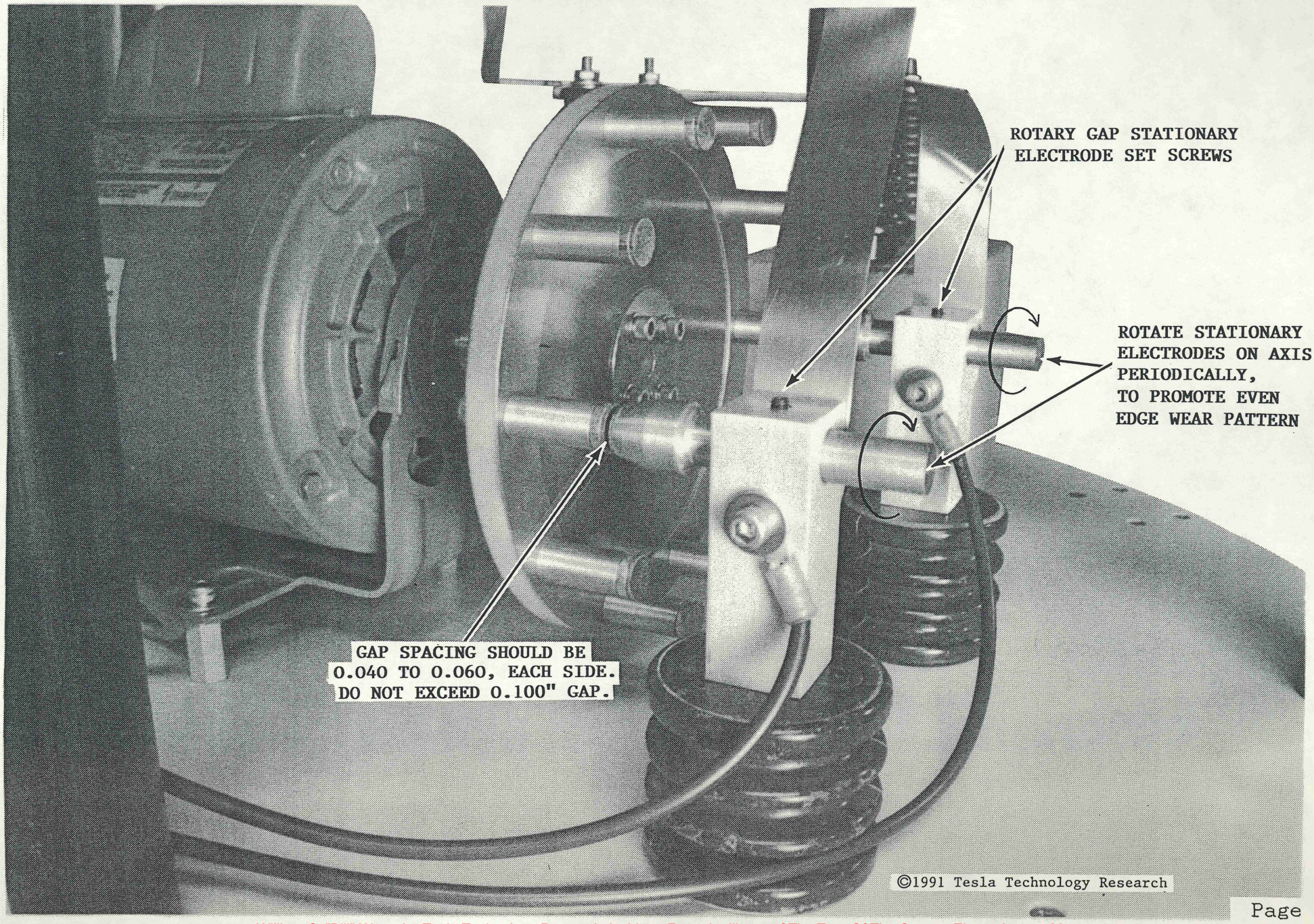
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MODEL 5D TESLA COIL POWER SUPPLY



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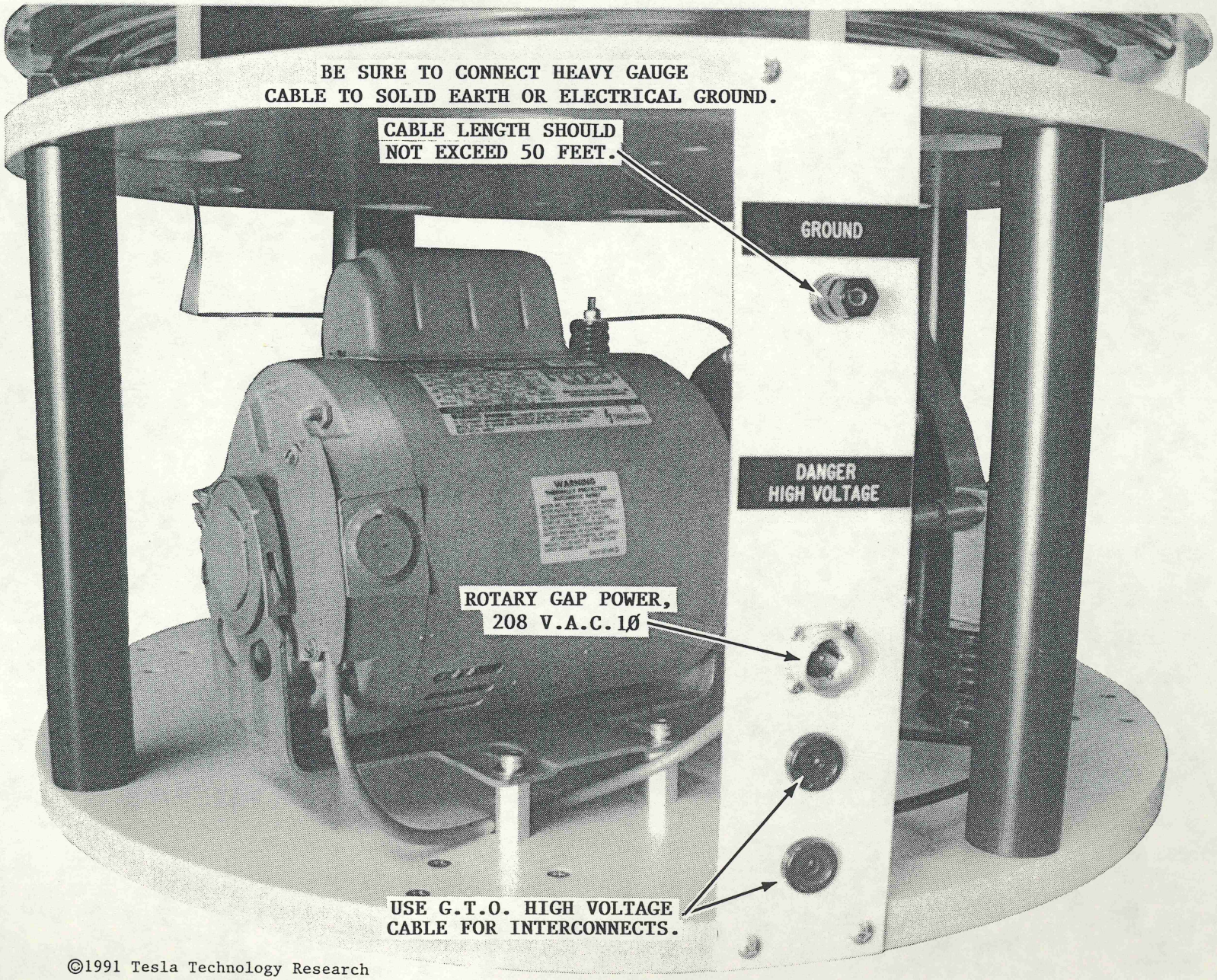
TESLA TECHNOLOGY RESEARCH
MODEL 5D TESLA COIL • BASE UNIT • ROTARY GAP



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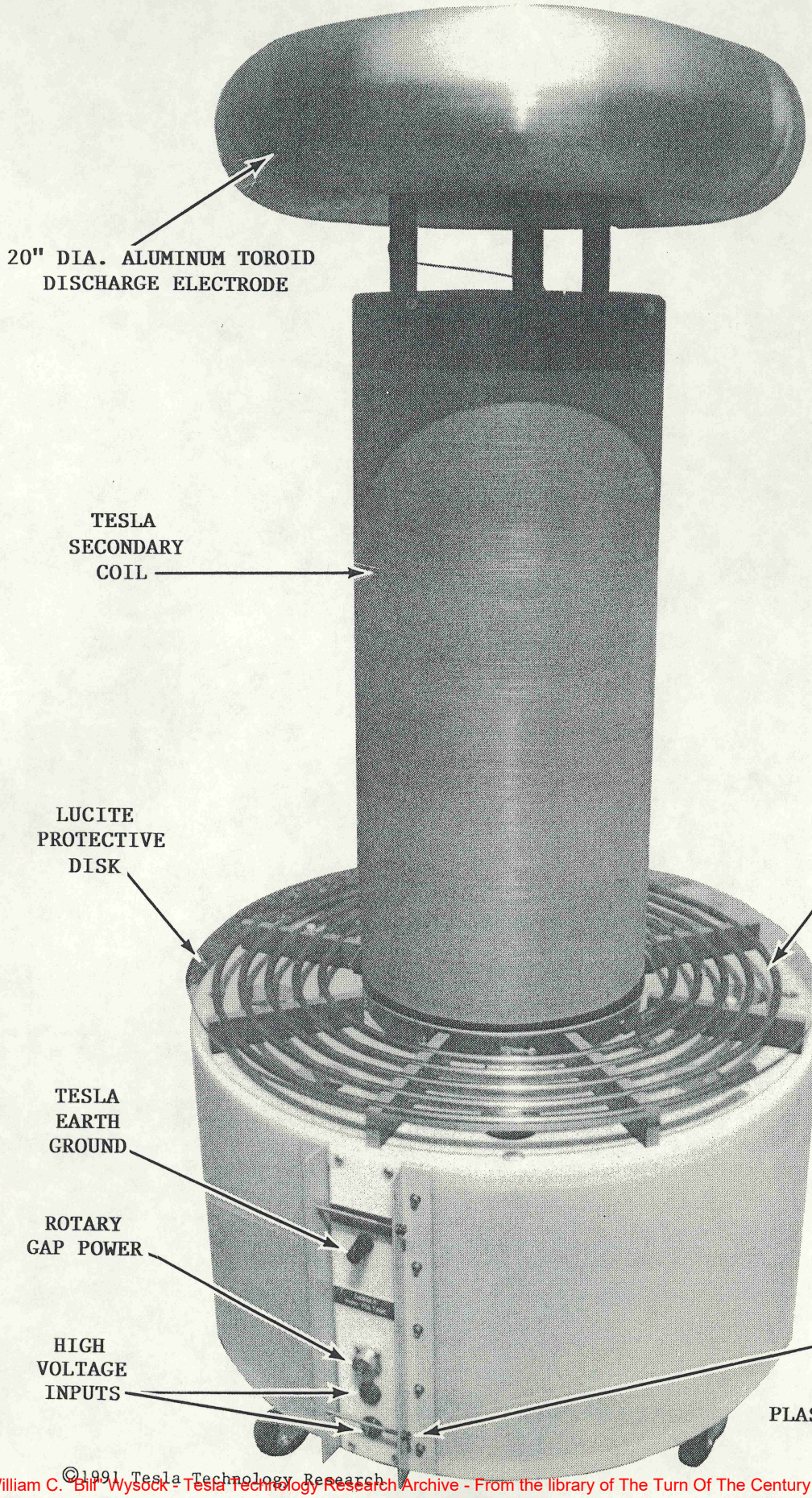
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MODEL 5D TESLA COIL BASE UNIT



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MODEL 5D TESLA COIL



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2,3,21 Honkawa-Cho, Maka-Ku
Hiroshina-Shi, Japan, 730

Dear Mr. Yamabe, as requested in your telephone call to me of Sept. 22, 1992, Please find enclosed the following information, which is being sent to you by FAX as well as hard copy in the mail. I trust that this information will serve the necessary purpose, and your interest. Information regarding price, export shipping and on-site technical assistance and demonstration, will be covered on the last sheet of this transmittal. Please review the enclosed items at your convenience. If you have any questions, or if I may be of further assistance, please do not hesitate to call or write.

MODEL TWELVE DUAL TESLA COIL SYSTEM

September 24, 1992

engineered and constructed by

TESLA TECHNOLOGY RESEARCH
2527 Treelane Ave.
Monrovia, CA. 91016
(818) 359-1373
fax (818) 358-8576

William C. Wysock, President

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

COMPANY BACKGROUND

Tesla Technology Research, a Monrovia California based company, was origionally formed by its owner and sole propriator, William C. Wysock, in 1975. First established as Professional Sound Systems-Ultra High Voltage Division, the company was renamed in 1985, in order to achieve better product/customer identification. Since that time, the company has established a broad customer base, including MCA/Universal Studios, Walt Disney Imagineering, Dave Archer Studios, Batelle Research Memorial Institute, University of West Virginia, University of New Mexico, University of California-Berkely, Lawerence-Livermore and more then sixty musuems of science and industry, world wide. Participation in prior International Tesla Society symposia have included a technical paper presented in 1986 on safety and health considerations for the installation of Tesla Coils for public viewing, large Tesla Coil demonstrations in 1988 and 1990, a technical paper entitled, "Modern Spark Gap Technology" in 1991 at the First Extraordinary Science Symposium, and the debute of a first-of-a-kind double Tesla Coil System at the 1992 Tesla Symposium with the addition of a three hour long Tesla Coil workshop.

ABSTRACT

The design and construction of a 1/2 Lambda Tesla Coil are discussed. The most significant feature of this system is that the primary resonant tank circuit is a series fed configuration. The system consists of two identical 1/4 Lambda Tesla resonators which are electrically phased to produce oppisite sign oscillations between the respective high voltage terminals. The first public demonstration of this system was set up in an indoor auditorium at Chyanne Mountain High School in Colorado Springs, CO., between July 21 to 25, 1992, to co-inside with the occasion of the Fifth Bi-annual International Tesla Society Symposium. Observations from the results obtained with this prototype system are noted.

SYSTEM DESIGN

The Model 12 Tesla Coil system consists of two each 1/4 wavelength Tesla transformers, arranged to have each primary coil fed in series. One inch diameter copper tubes, 10 feet in length, are connected between standoff insulators in a bi-filar arrangement, to lower self inductance and increase capacity. There are four seperate 10 foot long links for this connection. In the middle of one side of the primary tank circuit is placed the oscillation capacitor bank. As deployed in the Chyanne Mountain High School Auditorium, the total capacity used was .125 mfd. The power supply transformer was parallel connected across the capacitor bank. Oppisite the capacitor bank on the return side of the tank circuit was a synchronous rotary spark gap. This gap has been specially modified so that it has both adjustable dwell angle and duration. Further, the two characteristics may be independantly adjusted from each other or ganged together. At the ends of the 10 foot transmission line busses are four flexible conneting cables made from 250 MCM welding cable stock. These connect to 1" x 14" x 1/4" copper buss terminals, which in turn strap on to the 4" wide copper ribbon primary inductances. The base platforms upon which are wound these Tesla primary inductances, have access cut-outs between their respective copper ribbon phenolic support blocks, thus allowing for any arrangement of inductance connection. Each primary inductance consists of 5 turns, arranged in an Archimedian spiral, on 1" turns spacing.

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The two Tesla secondary coils are identical, but wound in oppisite directions. Each coil form is made from phenolic tube stock. Provisions for additional insulation or dielectric strength have been provided for the interior air space of each tube. The windings on these tubes consists of 350 turns, space-wound at the rate of six turns per inch. The wire stock consists of # 16 A.W.G. stranded, PVC insulated wire. Each winding is 2,424 feet in length. Each winding assembly is painted with several coats of electrical gylpt insulating varnish. Each secondary coil is terminated with three separate hollow aluminum toroid discharge electrodes. The first acts as a final turn of the coil, and serves to reduce electrical stress at the top of each winding. The second and third toroids serve to add needed total terminal capacity, and are sized to distribute the high voltage charge over an effective area much larger then the size of the individual toroids themselves. Adjustable brass rods are provided on the side of each upper toroid assembly, to direct the discharge from each coil to the oppisite side.

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A careful review of the available literature was made over a 15 year period for any Tesla Coil systems similar to the one built and exhibited. Whereas there were a number of 1/2 Lambda or wavelength coils built and described in various historical periodicals, none were found that followed the design criteria of this system. Moreover, it is believed that this Model 12 Tesla Coil system is the largest of its design ever built and publicly demonstrated.

MODEL 12 TESLA COIL SYSTEM SUMMARY

The above described system consists of the following components:

1). Two each, 1/4 Lambda Tesla Coils; each consisting of a 48 inch diameter double platform mounting base, with 4 each swivel castors and 4 each porcelain pedistal mounting insulators, 4 inch wide copper ribbon-5 turn Tesla primary coil mounted on 8 each 0.75 inch thick phenolic spacer blocks, 28 inch diameter by 72 inch tall Tesla secondary coil, mounting brackets, 36 inch diameter by 2 inch cross-section secondary coil top turn toroid corona supression ring, 12 inch diameter insulation spacer tube, 30 inch diameter by 7 inch cross-section toroid, and 44 inch diameter by 7 inch cross-section top mounting toroid assembly.

2). Oscillation capacitor bank; consisting of 6 each 0.025 MFD 40,000 volt capacitors, arranged on an insulated base platform with 4 each pedistal mount porcelain insulators and 4 each swivel castors, and aluminum buss connecting bars for adjusting the number of units in circuit.

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MODEL 12 TESLA COIL SYSTEM SUMMARY-CONTINUED

3). Synchronous rotary spark gap assembly; custom configured for operation with this Tesla Coil system, featuring both adjustable dwell angle and spark gap dwell duration; 4 gap design with solid tungsten electrodes, 120/240 volt 60 Hz 1/2 H.P. salient pole capacitor start/induction run motor, 120 volt red warning light, all mounted on a double rectangular platform with 4 each swivel castors.

4). 37.5 KVA power transformer; 240/480 volt input, 32,000-36,400 volt output (tap adjustable) in oil filled steel transformer case (oil is non P.C.B.), mounted on a 30 inch diameter base with 4 each heavy duty swivel castors.

5).* Power supply control console; consisting of one 3-gang variac (autotransformer) for voltage control, one 3-gang variac for current control and power factor correction, L-C line filter, 150 amp master power braker, rotary gap power switch, safety interlock key switch, pilot lamp panel status indicators, switchboard style load voltmeter 0-300 V.A.C., load ammeter 0-250 amps, power and logic control relays, input and output panel mount connectors and cables, all mounted in a standard E.I.A. 19 inch panel width instrumentation type rack cabinet, approximately 60 inches high, 22 inches wide, 26 inches depth, with 4 heavy duty swivel castors.

6). Transmission line system; consisting of 8 each 30 inch high porcelain standoff insulators, 4 sets of 4 each, 10 foot long by 3/4 inch copper tube buss bars, 4 lengths of flexible 250 MCM welding cables with copper lug terminations and copper bars for attachment to the Tesla primary coil assemblies, 4 inch wide copper ribbon flexible links for connection to the rotary gap, and bifilar 4-0 copper cables with copper lugs for connection to the capacitor bank, special transmission line ground overhead protection buss system, and all necessary mounting hardware.

* SPECIAL NOTE: This item requires a minimum 60 day lead time for manufacture.

ONE MILLION VOLT VAN DE GRAAFF GENERATOR

This unit operates as a static electrical machine, which is performance dependant on the degree of relative humidity and a clean operating environment. Power to run this generator is 120 volt A.C. at approximately 3 amps, 60 Hz. This power supplies a variac (variable voltage autotransformer), which is used to regulate the electrostatic belt speed from the base-mounted motor. This generator has an overall dimension of approximatly 48 inches high, with a base approximately 18 inches square. The base is equipped with 4 swivel castors. The aluminum shpere charge collector is 24 inches in diameter. This generator is normally configured to produce a positive charge on the sphere. The unit is supplied with a remote control box, which contains all the operating controls. This unit will, under proper conditions, produce "artifical lightning" bolts approximately 36 inches long, with about 20 microamps of discharge current.

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WARRENTIES, PRICES, TERMS, AND CONDITIONS

1). Tesla Technology Research warrents the Model 12 Tesla Coil System and the One Million Volt Van de Graaff Generator, to be free from defects, both in materials and workmanship, at the time of origional shipment to the origional customer. No other warrenty is expressed or implied. Due to the nature of this equipment, the customer must determine its suitability and application, to be both safe and correct for its intended use. IT MUST BE FULLY UNDERSTOOD THAT THIS EQUIPMENT CARRIES A LETHAL ELECTRICAL SHOCK HAZARD. It must be handled and operated ONLY by properly qualified personnel, and in an appropriate and SAFE environment.

2). The price of the Model 12 Tesla Coil System, complete is $75,000.00, United States currency.* The price of the One Million Volt Van de Graaff Generator is $6,500.00, U.S. currency.* SPECIAL NOTE: * denotes price excluding shipping, packaging, handling, exportation fees, applicable tariffs (if any), and insurance.

3). The TERMS and CONDITIONS of this QUOTATION are as follows:

A). This quotation shall remain valid until December 1, 1992.

B). Payment in United States currency, for the full amount, made payable to Tesla Technology Research at Monrovia, California, United States of America, is required by the DEADLINE of this quotation, as above specified. Otherwise, this QUOTATION shall be declared null and void, and shall be subject to renegotiation.

C). Upon receipt for payment in the full amount, Tesla Technology Research shall make ready for shipment and export, all equipments herein specified, within sixty (60) working days, from the date of receipt and acknowledgement of payment.

D). All packaging, handling, export licenses and fees, tariffs, and insurance, will be billed to the customer, AS AN ADDED COST TO THE CUSTOMER, AT THE TIME AND PLACE OF SHIPMENT, WHICH IS SPECIFIED AS F.O.B. MONROVIA, CALIFORNIA, U.S.A. The customer shall agree in writing, to pay any and all such costs accrued herein, in United States currency, to Tesla Technology Research, within thirty (30) calinder days from the date of receipt of full shipment.

E). The customer may elect to arrange for all shipping and export, provided this is arranged with Tesla Technology Research in advance. In such case, the customer will only be billed for packaging and handling.

F). On site technical assistance is available from Tesla Technology Research. A flat rate of $500.00 per day (portal to portal) shall apply, plus all transportation fees (round trip), and room and board costs. A thirty (30) day advance notice of request for assistance, to Tesla Technology Research, is required. Payment for the full amount, must be paid in U.S. currency, to Tesla Technology Research within thirty (30) days from the date of invoice to the customer.

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ROUGH DRAFT

International Tesla Society

Fifth Bi-annual Symposium

July 23-26, 1992

Colorado Springs, Colorado

Benefit ZAP SHOW performance

conducted at the Chyanne Mountain High School Auditorium

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The author wishes to thank Mr. Lowell Beezley, Mr. Brent Turner, and Mr. Pete Miller, for their assistance in construction of this equipment. This system was built only four weeks prior to deadline for the 1992 symposium! Further acknowledgement is due to the International Tesla Society, Mr. Steve Elswick, Mr. Brad Norman, Mr. Thomas E. Wright, and Mr. J.W. McGinnis, for their support and encouragement, in bringing this week-long demonstration during the 5th bi-annual International Tesla Society Symposium, into reality. The Principal and the administrative staff of the Chyanne Mountain High School (is) ARE acknowledged for their support in providing a beautiful large auditorium facility, in which the ZAP shows were conducted. Lastly, I wish to thank my family, and especially my wife Lynn, for putting up with the long hard hours of preparation, and the many fine cooked meals for the construction crew.

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The two Tesla secondary coils are identical, but wound in oppisite directions. Each coil form is made from phenolic tube stock. Porvisions for additional insulation or dielectric strength have been provided for the interior air space of each tube. The windings on these tubes consists of 350 turns, space-wound at the rate of six turns per inch. The wire stock consists of # 16 A.W.G. stranded, PVC insulated wire. Each winding is 2,424 feet in length. Each winding assembly is painted with several coats of electrical gylpt insulating varnish. Each secondary coil is terminated with three spearate hollow aluminum toroid discharge electrodes. The first acts as a final turn of the coil, and serves to reduce electrical stress at the top of each winding. The second and third toroids serve to add needed total terminal capcity, and are sized to distribute the high voltage charge over an effective area much larger then the size of the individual toroids themselves. Adjustable brass rods are provided on the side of each upper toroid assembly, to direct the discharge from each coil to the oppisite side.

The power supply for the Model 12 Tesla Coil System consists of a 37.5 KVa utility pole transformer, with the low voltage terminals set for either 240 or 480 volts, and the high voltage terminals set for 36.4 KV. Power is fed to this transformer from two triple-stack autotransformers, the first stack being wired for variable voltage control, the second in series connection with the output of the first, for current control and power factor correction. In use at the Chyanne Mountain High School Auditorium, the power feed was from two legs or phases of a 208 volt 3-phase line, with a 125 amp power breaker being used as a master switch. The actual measured voltage across any two of this 3 phase line measured 201 volts A.C. RMS. The load voltage applied to the Model 12 coil in this auditorium was limited to 150 volts, which is about 60% of full system operating capacity. This was due to the fact that as large as this auditorium was, it nevertheless was still not large enough to allow for safe placement of the two Tesla Coils at their maximum design distance of 40 feet. The input power was thus limited to 150 volts, in order to prevent the possibility of stray arcs from the two secondary coils to their adjacent walls, audience seating areas, etc. Power drawn from this line was about 120 amps, at the settings used.

Ground plane capacitance effects on a double coil system of this size is a very significant factor. During inital tuning, it was discovered that there was much greater capacitive loading on the left hand coil in the auditorium, then the right side. This was due to the fact that behind the left hand wall area were located many electrical conduits, breaker boxes, etc., all of which added to that coil's parallel electrostatic capacitance. The effect on the Tesla primary coil tuning was finally corrected for this condition, by having the left hand primary inductance set at exactly 2.0 turns, while the right side was set for exactly 1.75 turns. The difference in the two primary coils was only 27 inches in lenght of the 4 inch wide copper ribbon! This gave some indication of the "M" (mutual coupling cooefficent) of the system! As origionally tested at Monrovia, CA. the week before the Symposium, both coils resonated together and equally at 1.875 turns. As origionally set up in the auditorium, these settings provided a 17'+ corona discharge from the right hand coil, while the left hand coil only gave about a 20" corona! By offseting the two primarys by only a 27" lenght of ribbon, both coils now gave a 17'+ discharge. It should be noted here that the physical length of each primary inducatance is 75 feet, and the total primary resonant tank circuit is 216 feet.

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MODEL 12 TESLA COIL SYSTEM PERFORMANCE

The demonstrations at the Chyanne Mountain High School Auditorium in Colorado Springs marked the first public demonstration of this coil system. No attempt had been made to quantify system performance prior to shipping the equipment to Colorado due to lack of time. The system was set up in Monrovia, CA., initially, to verify system capability only. As set up in Colorado, this coil system resonated at approximately 33 KHz in 1/2 Lambda configuration. The rotary gap gave satisfactory performance and was run at a pulse repetition rate (PRF) of 240 pulses per second, (PPS). Each oscillatory pulse duration was limited to about 40 microseconds. The primary resonant tank circuit carried peak currents in excess of 10 KA. A resonant rise on the A.C. mains was observed to be on the order of 50 volts, (this voltage was out of phase with respect to the charging load voltage of 150 volts.) The straight line distance between the corona discharge rods on the two Tesla secondary coils was set at about 28 feet, however, considering the tenuous path taken by most of the power arcs between the two coils, the actual arc path length may have been on the order of about 36 feet.

Careful attention had to be paid to the grounding arrangement of the input to the two secondary coils. This was accomplished by having each ground leg from each secondary coil be of exactly the same physical lenght and path, joining a a common point, then being connected to a good electrical RF ground reference, (the water main valve for the fire extinguisher system of the auditorium was utilized as the master grounding point.)

The sound pressure levels of the discharges from this Tesla Coil system were measured with the auditorium empty, using a real time spectrum analyzer with an "A" weighted scale. Peak amplitude under 1 KHz measured 109 dB SPL in the middle row seating area.

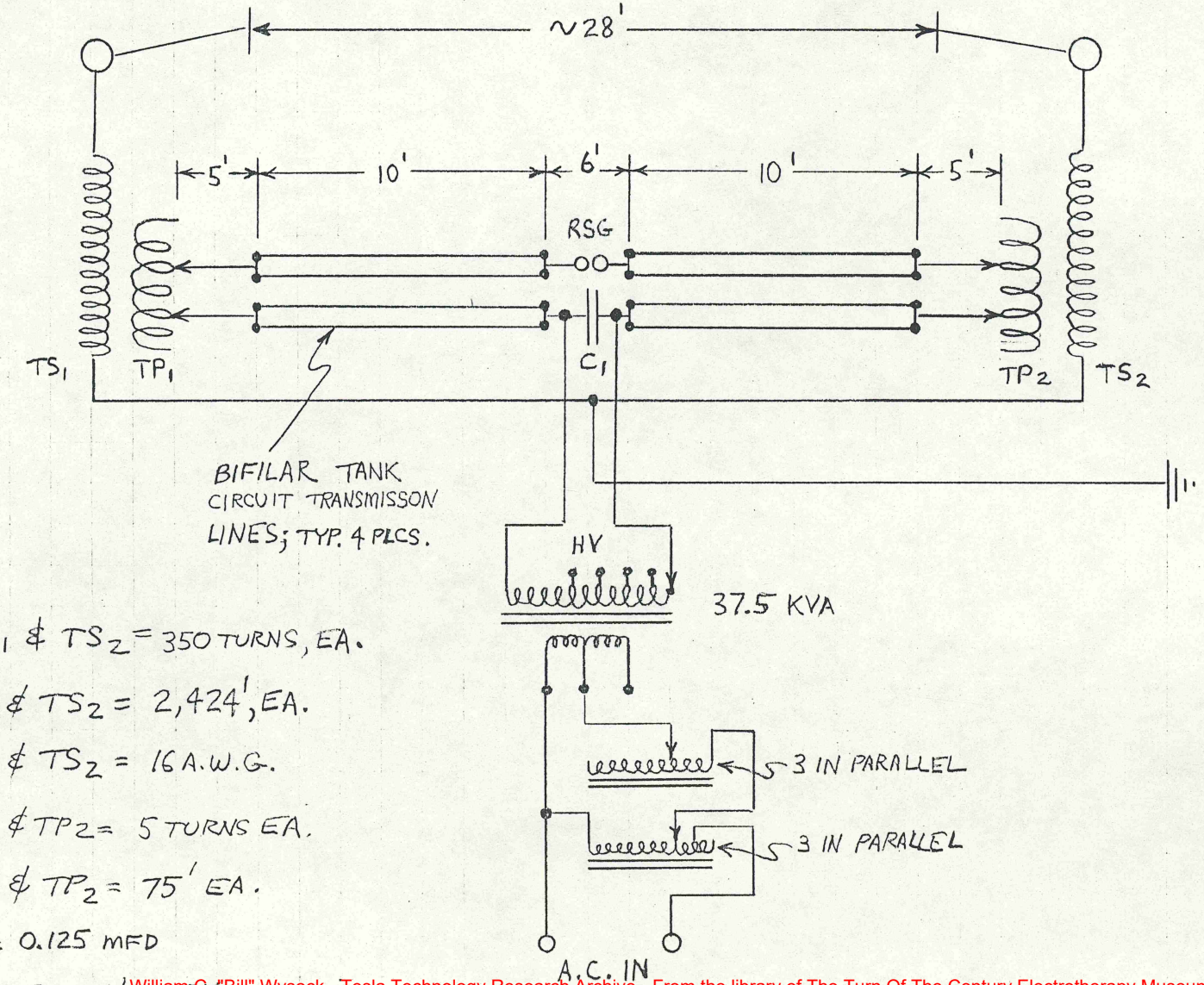
A careful review of the available literature was made over a 15 year period for any Tesla Coil systems similar to the one built and exhibited. Whereas there were a number of 1/2 Lambda or wavelength coils built and described in various historical periodicals, none were found that followed the design criteria of this system. Moreover, it is believed that this Model 12 Tesla Coil system is the largest of its design ever built and publicly demonstrated.

ACKNOWLEDGEMENT

The author wishes to thank Mr. Lowell Beezley, Mr. Brent Turner, and Mr. Pete Miller, for their assistance in construction of this equipment. This system was built only four weeks prior to deadline for the 1992 symposium! Further acknowledgement is due to the International Tesla Society, Mr. Steve Elswick, Mr. Brad Norman, Mr. Thomas E. Wright, and Mr. J.W. McGinnis, for their support and encouragement, in bringing this week-long demonstration during the 5th bi-annual International Tesla Society Symposium, into reality. The Principal and the administrative staff of the Chyanne Mountain High School is acknowledged for their support in providing a beautiful large auditorium facility, in which the ZAP shows were conducted. Lastly, I wish to thank my family, and especially my wife Lynn, for putting up with the long hard hours of preparation, and the many fine cooked meals for the construction crew.

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MODEL 12 ½λ TESLA COIL SYSTEM
33 KHz



TS_1 & TS_2 = 350 TURNS, EA.

TS_1 & TS_2 = 2,424', EA.

TS_1 & TS_2 = 16 A.W.G.

TP_1 & TP_2 = 5 TURNS EA.

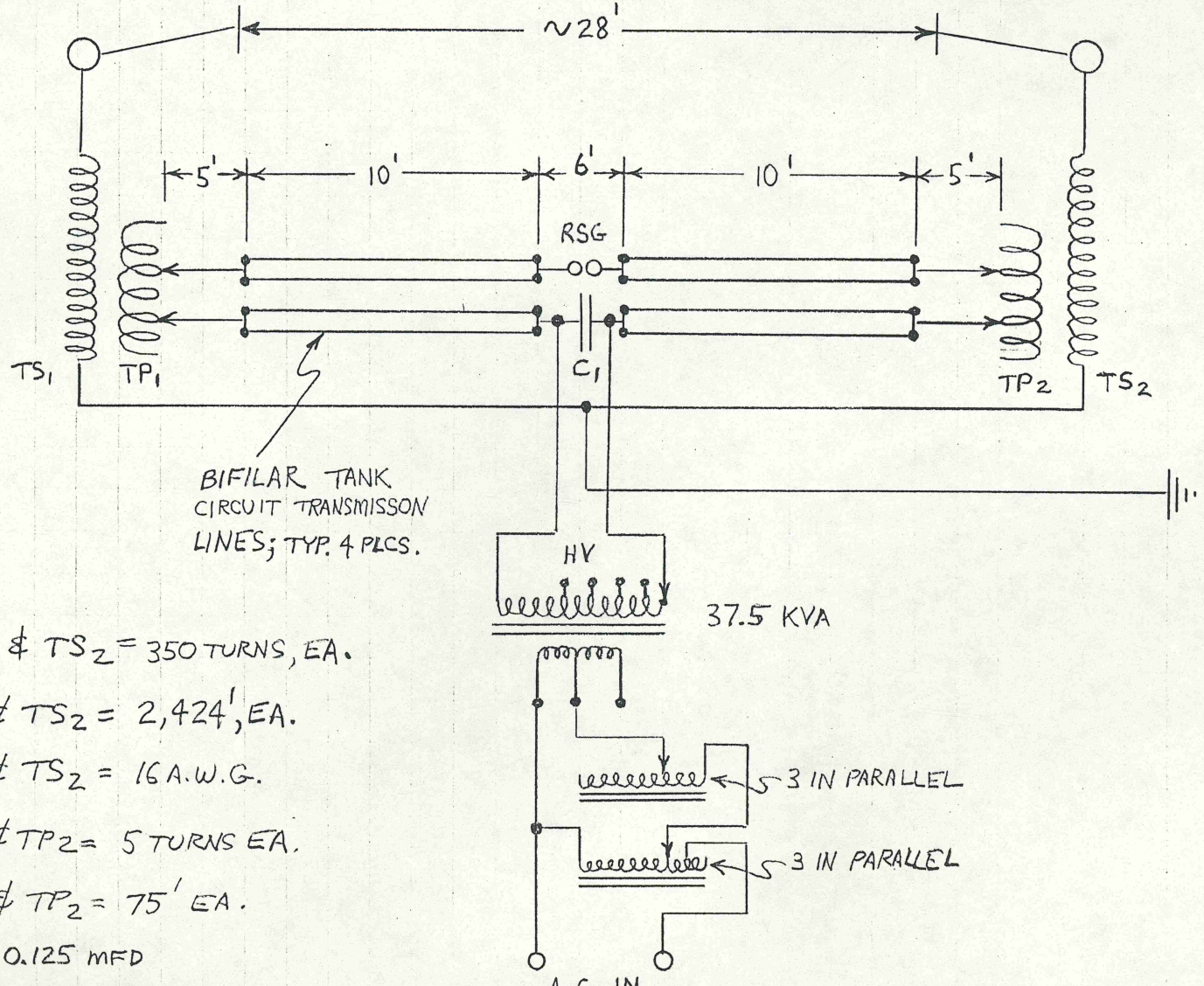
TP_1 & TP_2 = 75' EA.

C_1 = 0.125 MFD

RSG = ROTARY SPARK GAP.

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MODEL 12 ½λ TESLA COIL SYSTEM
33 KHz



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TP_1 & TP_2 = 5 TURNS EA.

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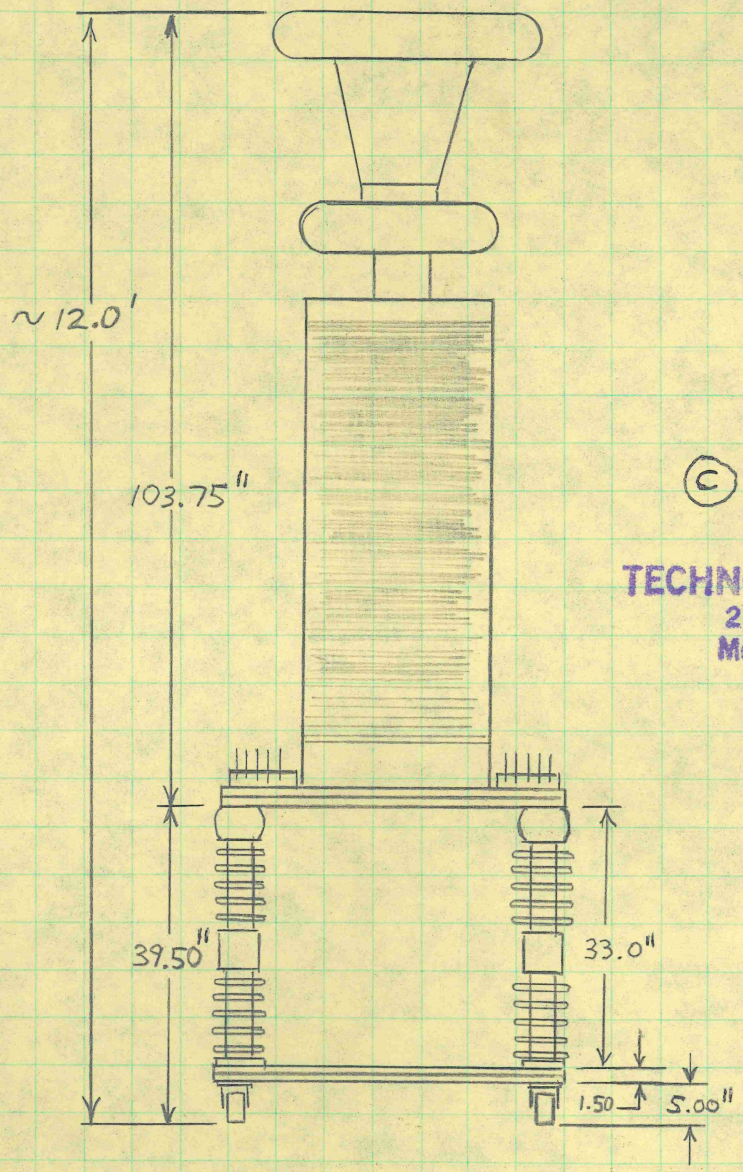
RSG = ROTARY SPARK GAP.

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MODEL 12 TESLA COIL

(TYPICAL; ONE OF TWO UNITS)



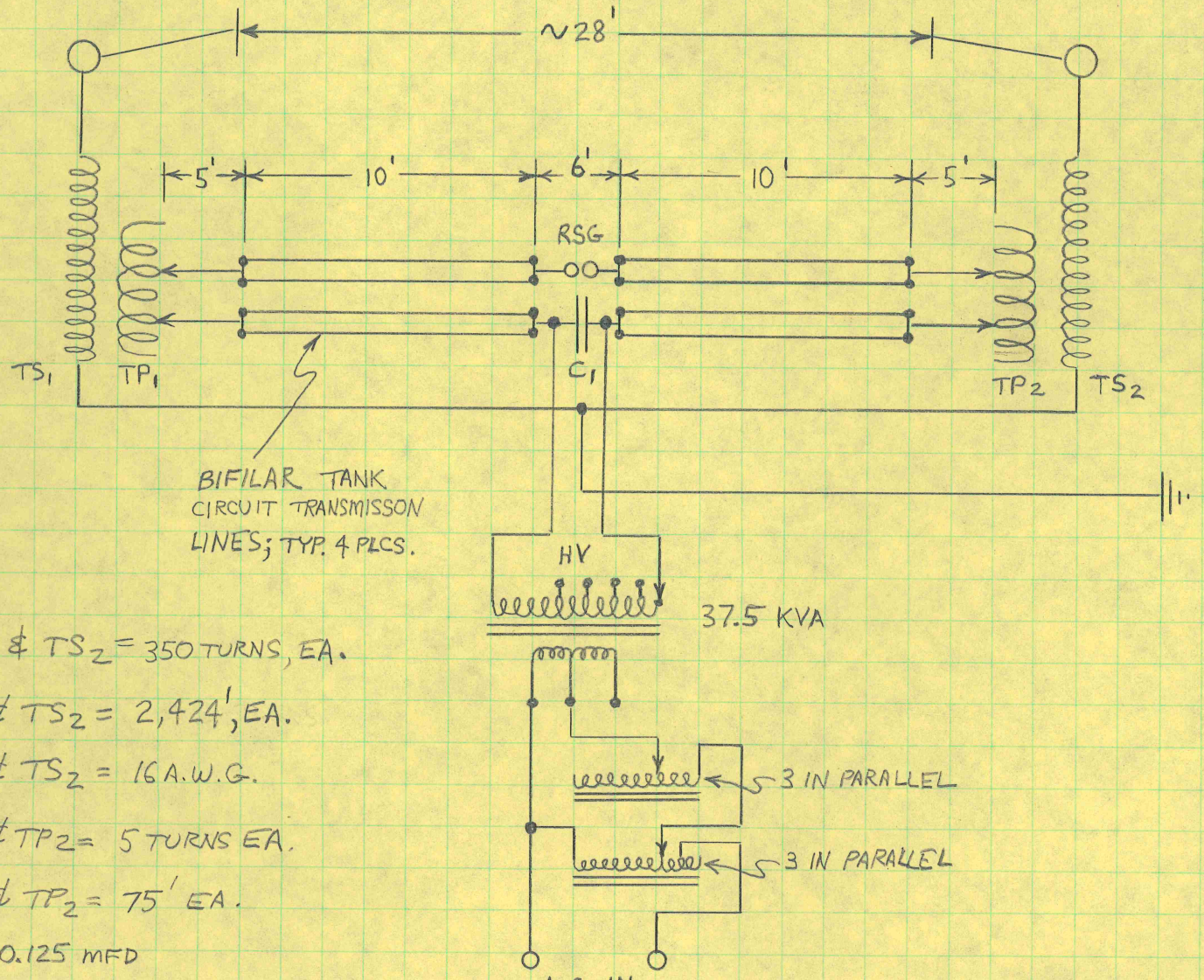
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NOTE: DEMINSIONS SHOWN AS FEET AND INCHES.

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MODEL 12 ½λ TESLA COIL SYSTEM
33 KHz

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Monrovia, CA 91016



TS_1 & TS_2 = 350 TURNS, EA.

TS_1 & TS_2 = 2,424', EA.

TS_1 & TS_2 = 16 A.W.G.

TP_1 & TP_2 = 5 TURNS EA.

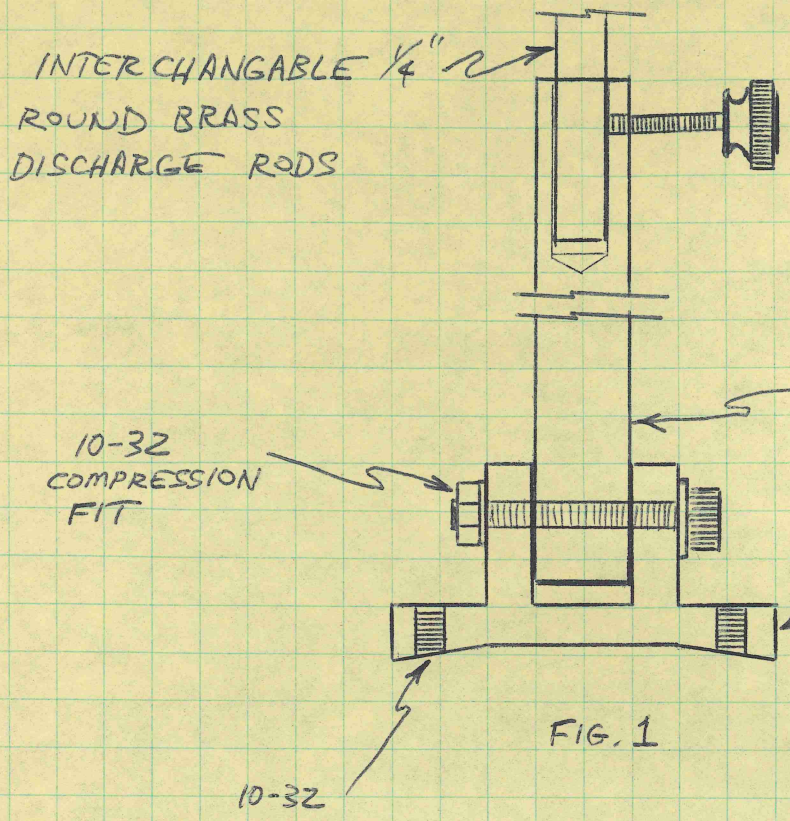
TP_1 & TP_2 = 75' EA.

C_1 = 0.125 MFD

RSG = ROTARY SPARK GAP

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7-8-92



NOTE: DRAWN TO APPROX. SCALE.

FIG. 1

DISCHARGE ELECTRODE DETAIL

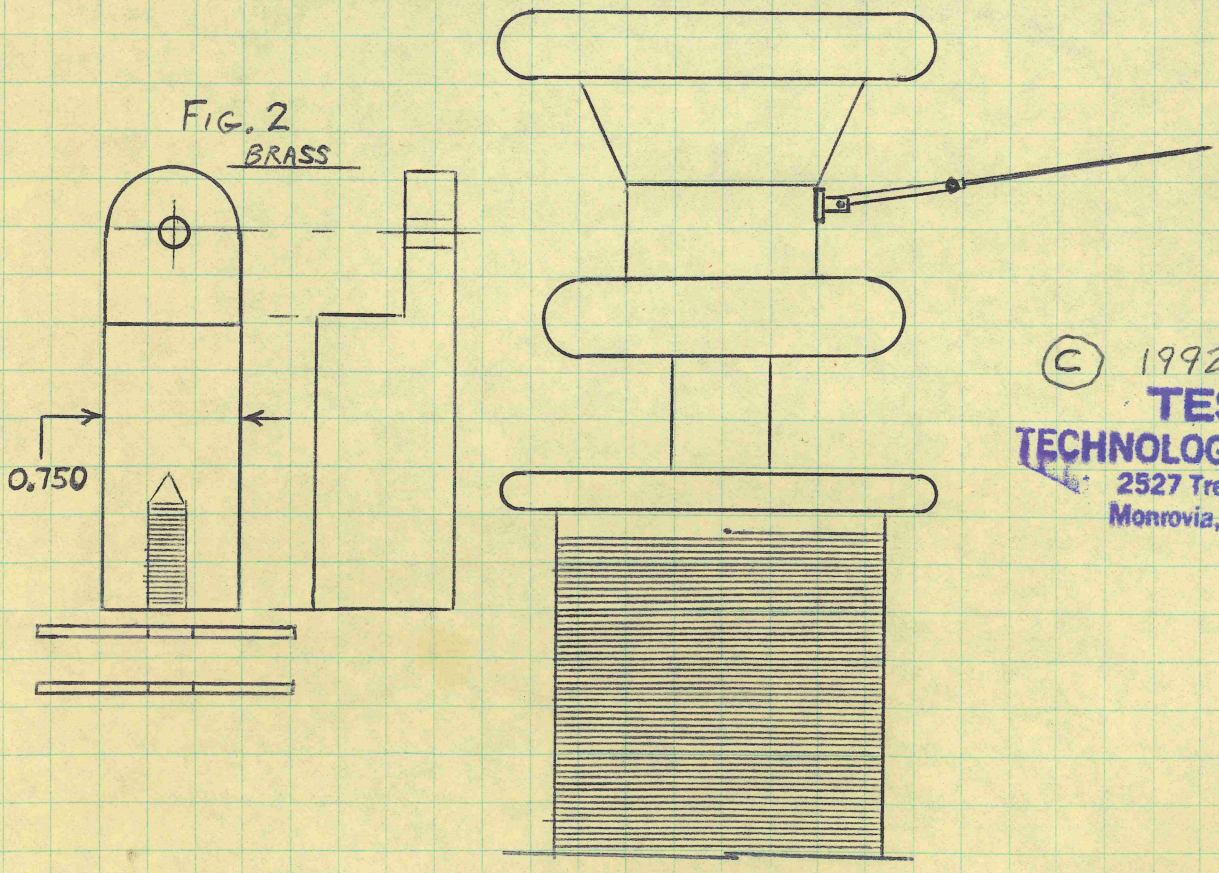
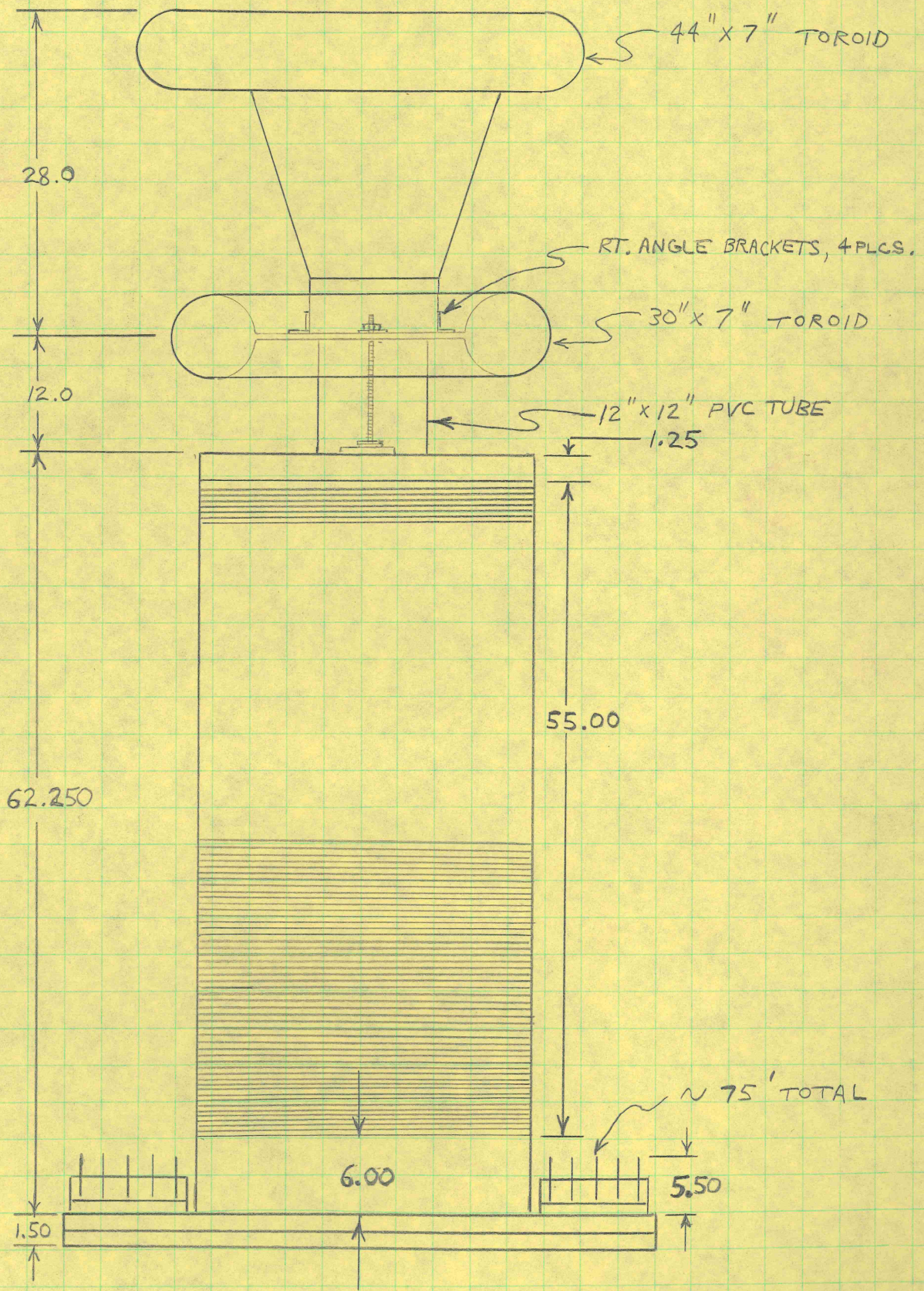


FIG. 2

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MODEL 12
SECONDARY COIL CALCULATIONS

WIRE O.D. = 0.120

$C = [28.00 + \frac{1}{2}(0.120)]\pi$

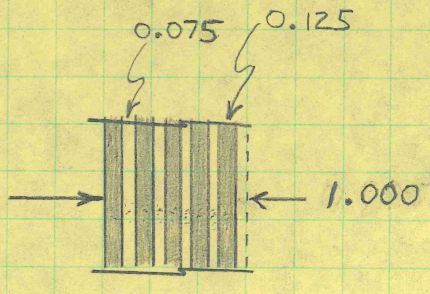
C = 88.153090" PER TURN

H = WINDING HEIGHT, INCHES = 55.00"

(@ 6 TPI (TURNS-PER-INCH) L = WINDING LENGTH

L = 2,424'

T = TURNS TOTAL = 330



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MODEL 12 COIL PREPARATION 6-5-92

H.D. = HOME DEPOT B.E. = BUILDER'S EMPORIUM M-C = McMASTER-CARR

HOME DEPOT SHOPPING LIST

H.D. ✓ 1. 8 CARTRIDGES OF RTV SILICONE.

2. MAKITA BELT SANDER & SANDING BELTS.

3. CARBIDE ROUTER BIT.

4. 4 EA. ½" NPT PIPE FLANGES.

5. 2 EA. ½" x 10" PIPES. (OR 1 EA. 12": CUT IN 2 PARTS).

M-C ✓ 6. 8 EA. LARGE RIGHT ANGLE BRACKETS.
M-C ✓ 8 EA. MEDIUM RIGHT ANGLE BRACKETS.

M-C ✓ 7. 64 EA. HEX-HEAD BOLTS: 5/8" (?) N.C. x 2½".
M-C ✓ 64 EA. FLAT WASHERS: 5/8" (?).

B.E. ✓ 8. 4 CANS ~~ALUMINUM - SILVER~~ COPPER/KRYLON SPRAY PAINT - RUST-O-LIEM.

H.D. ✓ 9. ~~8~~ 4 EA. COPPER PIPES; 10' x 1" . ¾"
H.D. ✓ 8 EA. COPPER END CAPS; 1".

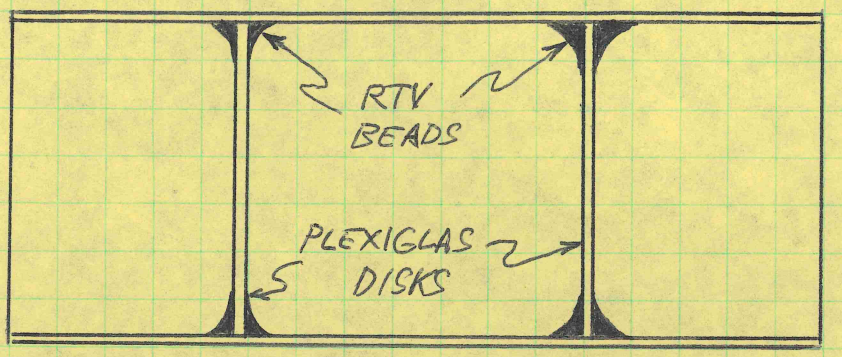
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Model 12 Coil Preparation

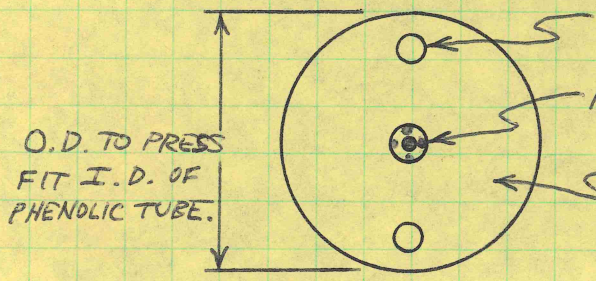
1. Coat phenolic tube interiors with 2 coats each of shellac.

2. Use RTV silicone to secure 2 plexiglas spacer plates inside each tube as follows:



NOTES:
Use full-size silicone cartridge with squeez applicator for each bead. i.e., 4 ea. cartridges req'ed for ea. coil form.

3. Fabricate particle board end plates as follows:



4" I.D. access hole, 2 plcs.

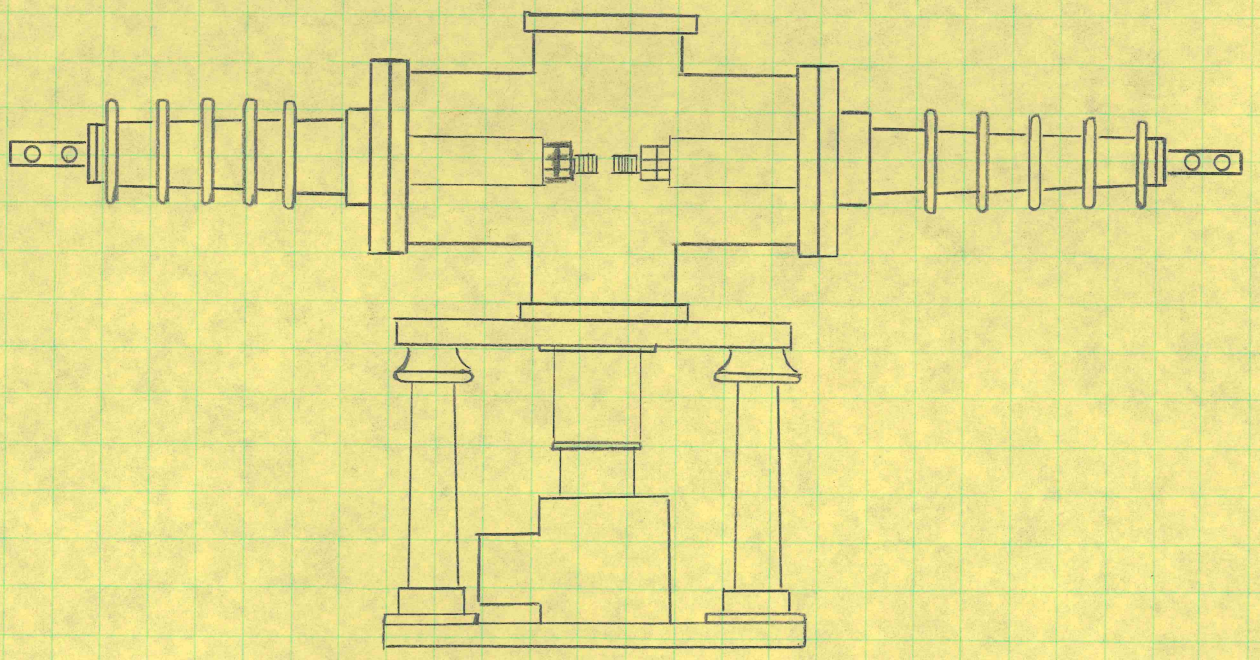
Pipe flange ½" NPT

Paint ea. face (top plate only) with glypt.

Paint ea. face (bottom plate only) with krylon.

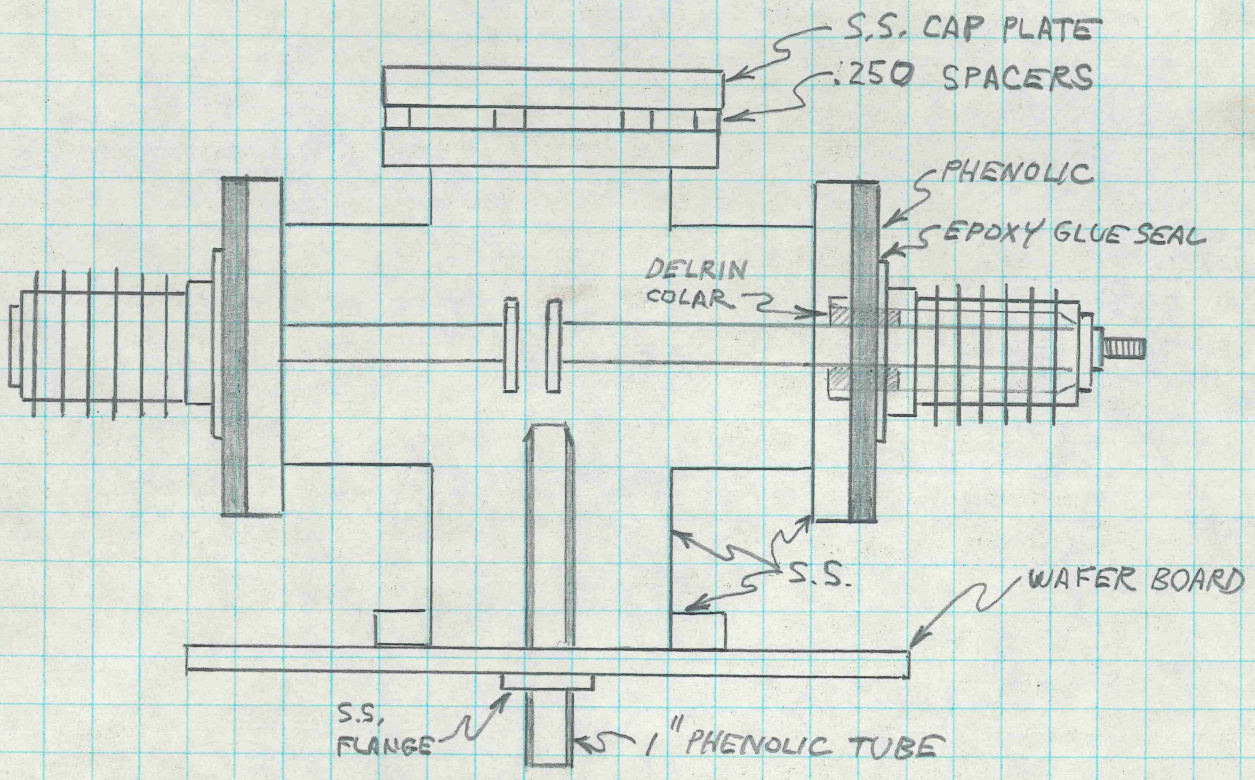
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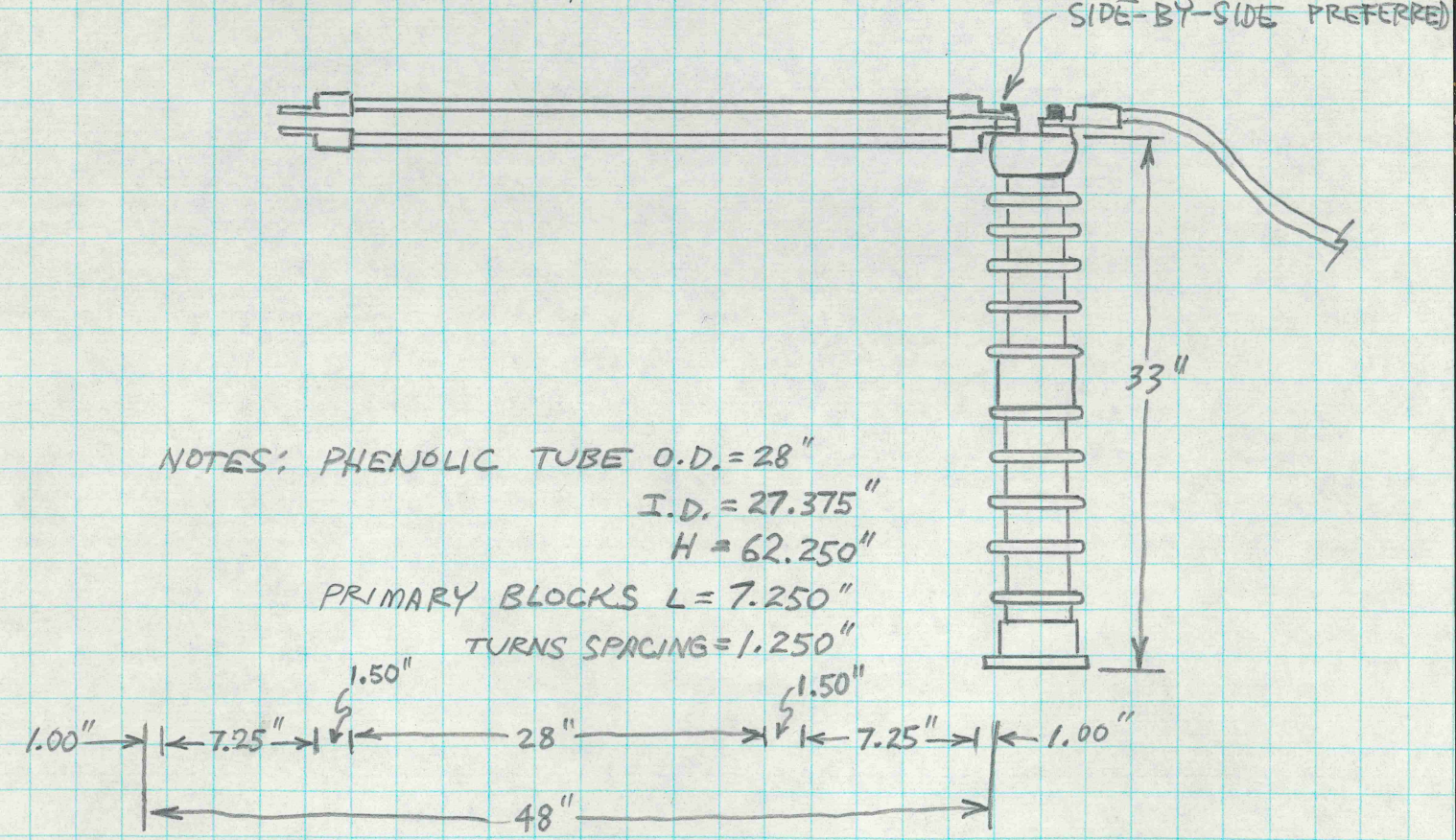
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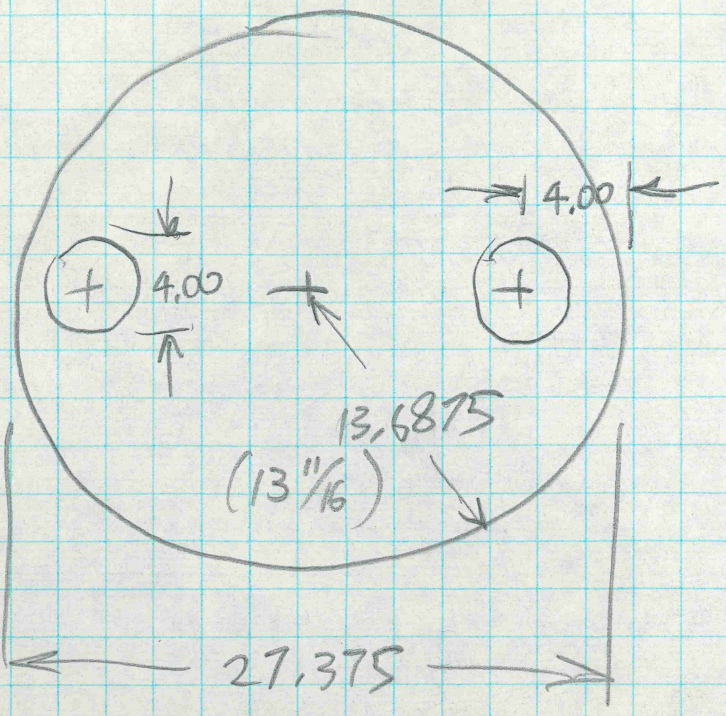
1.	HEX HEAD CAP SCREW # 91236A803	5/8"-11 x 2 1/4"	35 28	32.53/100
1A.	" " " " # 91236A794	5/8"-11 x 1"	6 03	21.93/100 (25)
2.	FINISHED FULL HEX NUT # 90473A035	5/8"-11	14 98	12.64/100
3.	18-8 STAINLESS STEEL FLAT WASHER # 92141A035	5/8"	16 36	16.46/100
4.	(BLUE) SINGLE FLASH STROBE LIGHT # 5947T76		60 83	56.55/EA.
5.	DANGER FLAG 8" x 12" # 5859T24	(12 & UP $1.93 EA.)	23.16/12	2 09 EA. - 25 08
6.	FLEXIBLE SHAFT COUPLING 5/8" x 5/8" # 6410K43		19 95	19.64/EA.
7.	FLAT CORNER BRACE	2" x 5/8" # 1556A13	(1-24 @ .27 EA.)	2.70/10 .36 3 60
7A.	" " "	5" x 1" # 1556A18	(1-24 @ 1.30 EA.)	13.00/10 1.89 18.90



NOTES: PHENOLIC TUBE O.D. = 28"
I.D. = 27.375"
H = 62.250"
PRIMARY BLOCKS L = 7.250"
TURNS SPACING = 1.250"

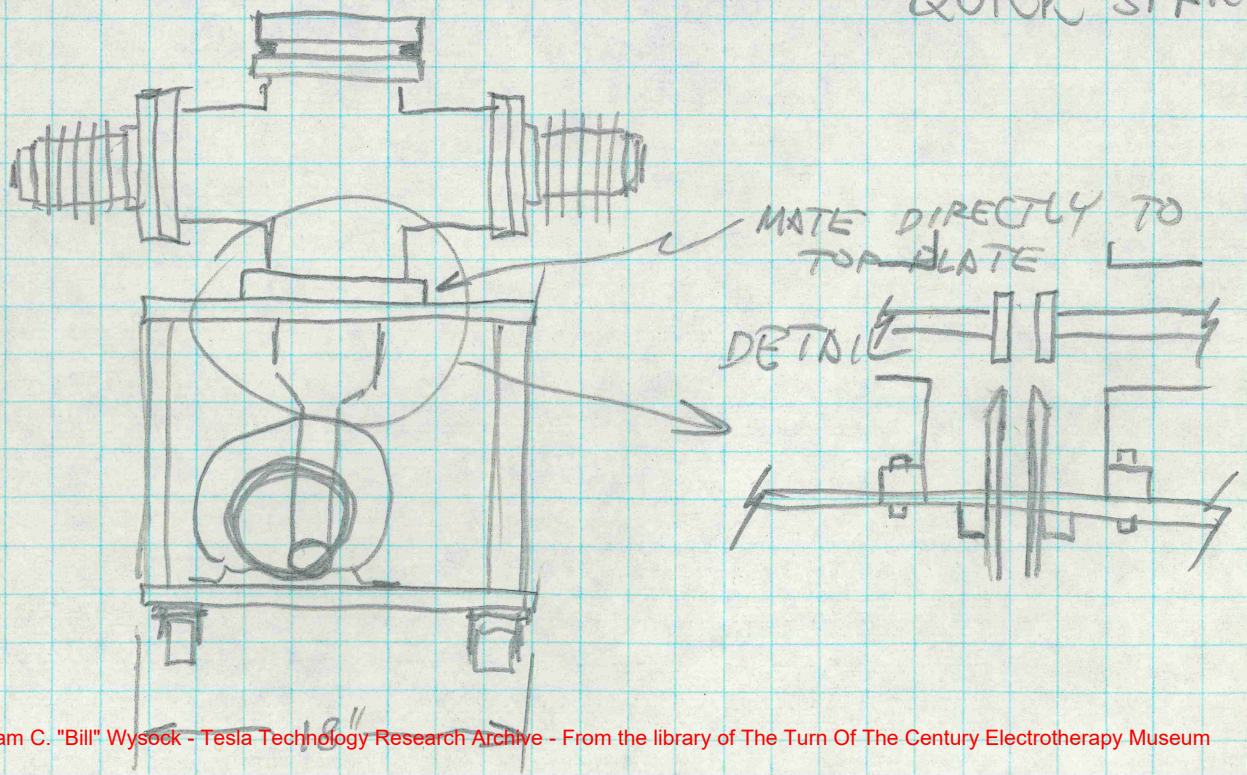
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3M
SPAK - FAST

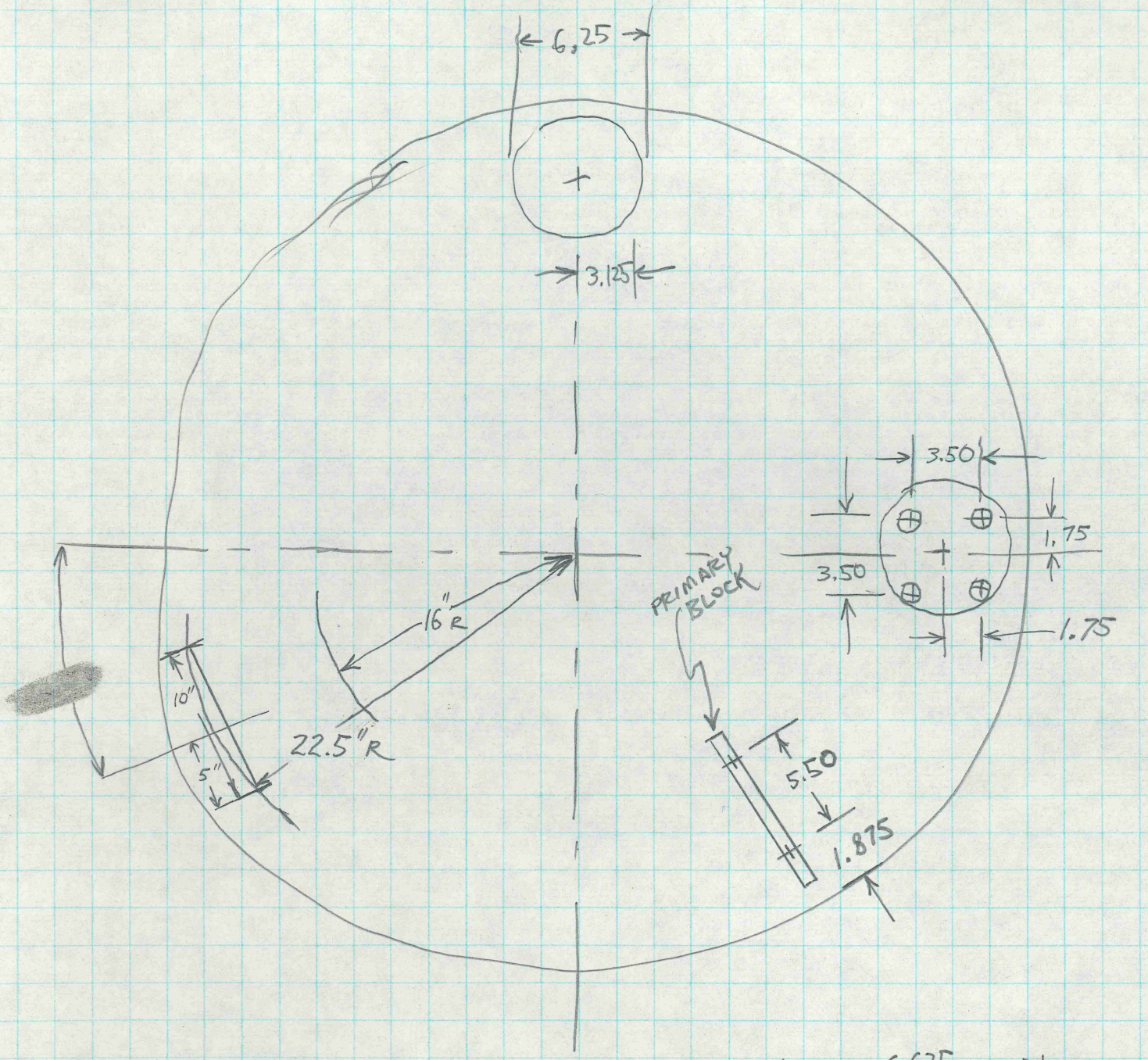
RED DEVIL
QUICK SPAK?

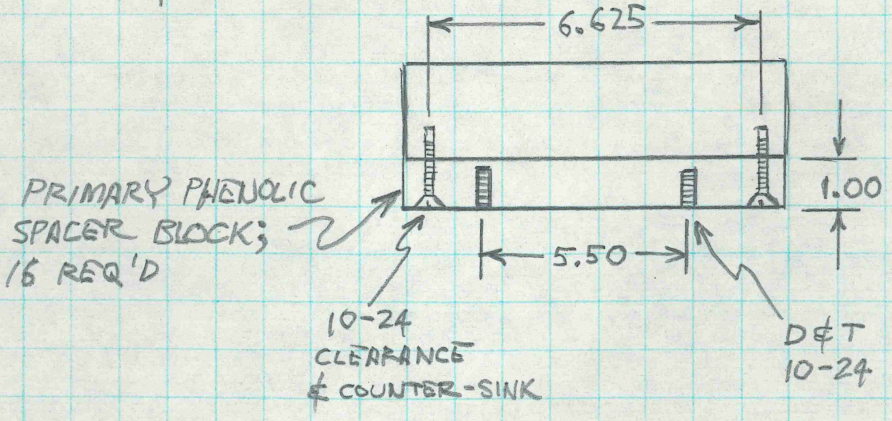


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1.75
.125
1.875

6-29-92



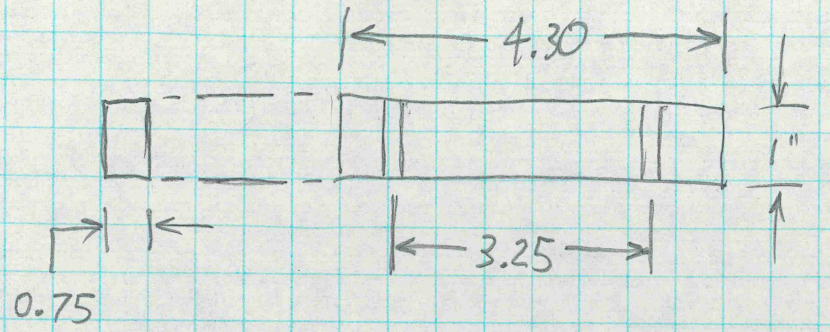


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BLOWER SPACER BLOCKS

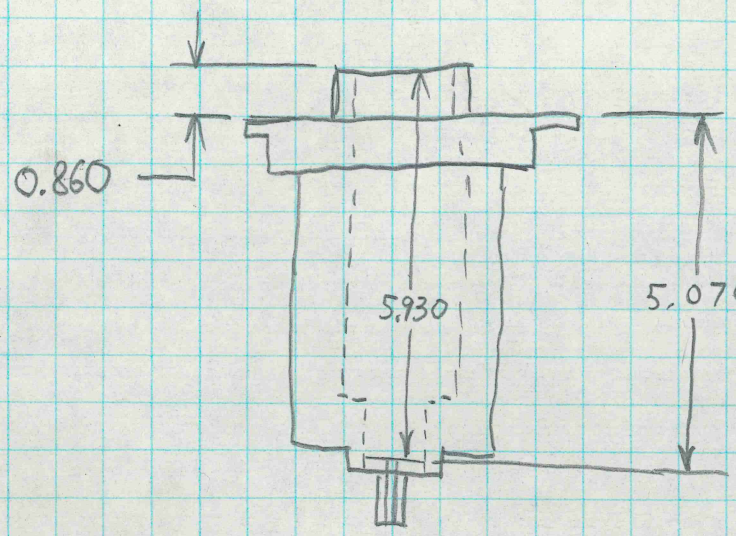
2 REQ'D

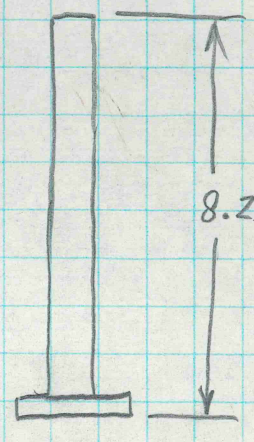


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5.930
.860
5.070
(NET, EACH)

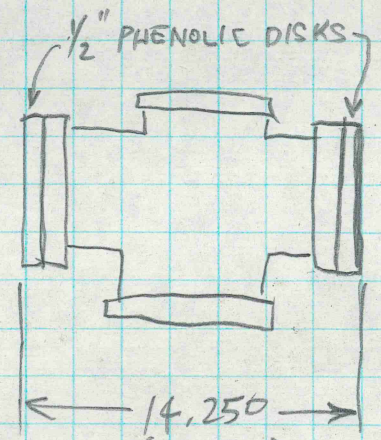




2 x 8.25 = 16.50

5.070
5.070
14.250
24.390
16.500
7.890 (Δ TOTAL)

3.945 EA.
− 0.225 EA.
3.720 EA. NET



GAP = 2 x .225 = 0.450

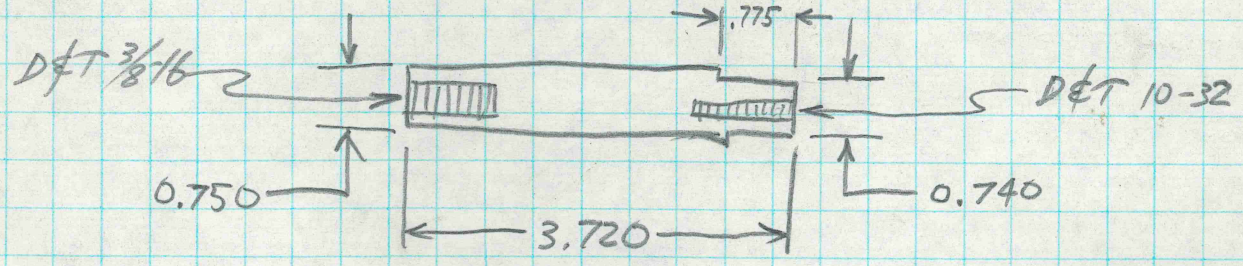
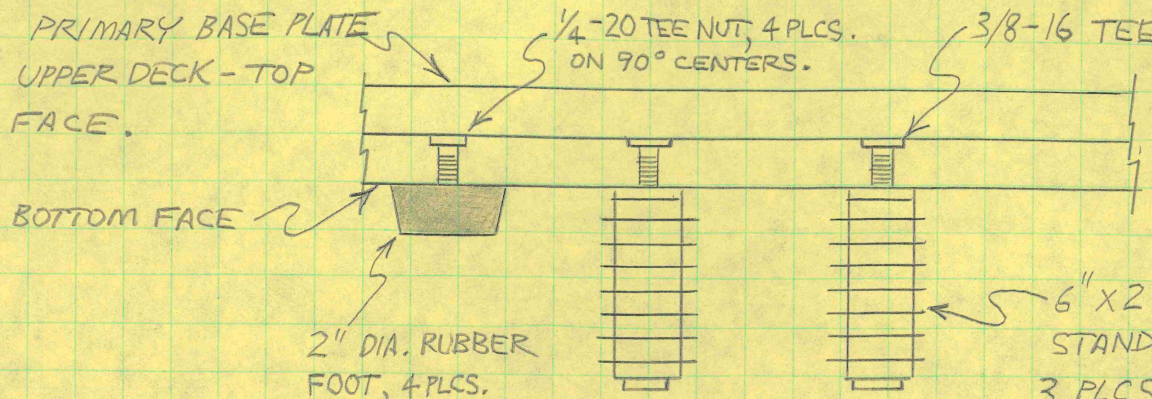


FIG. 1

MAKE 2 EA., FIG. 1
BRASS

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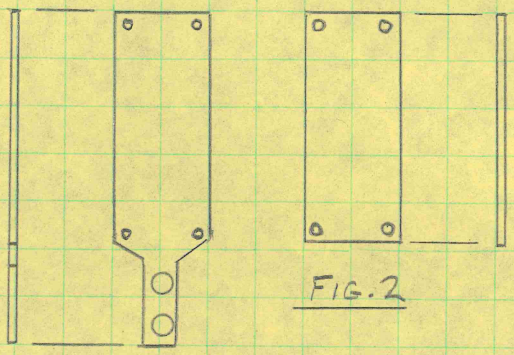


FIG. 1

FIG. 2

PRIMARY COIL TERMINALS

4 EA. OF FIG. 1 & 2 REQ'D.

OFHC COPPER PLATE STOCK.

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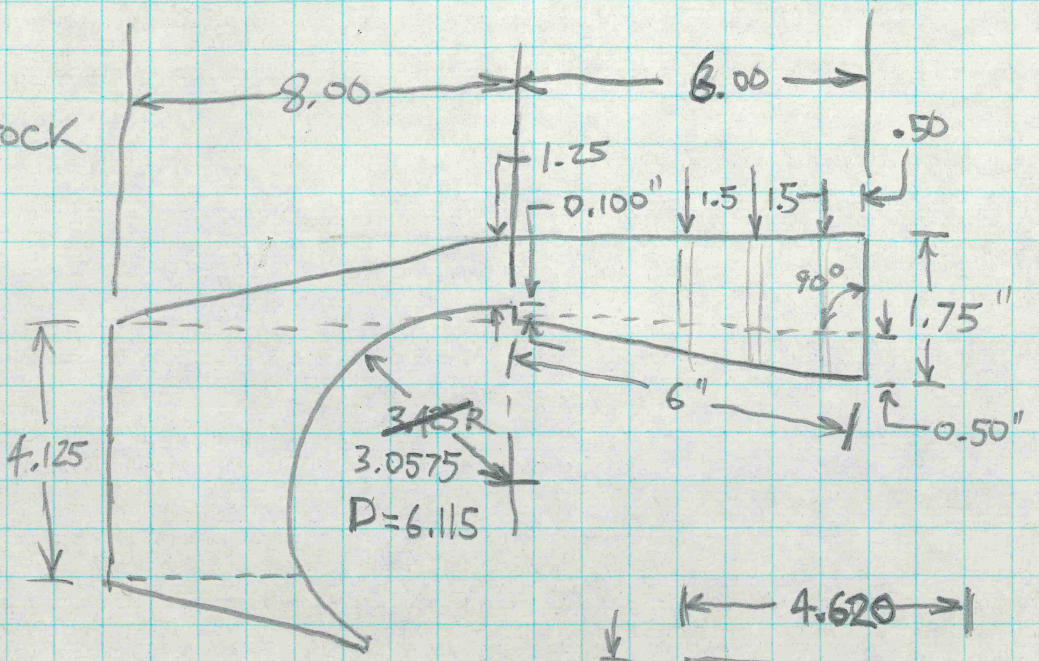
2.80
.3125
3.1125

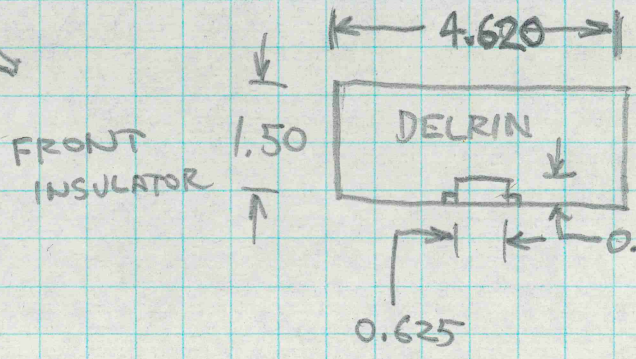
2.80
.C25
[3.425R]

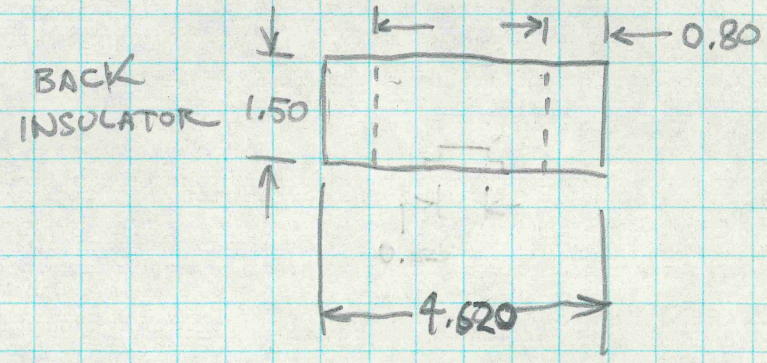
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ROTARY GAP MODIFICATIONS

1 EA. 17" X 8" X ½" STOCK





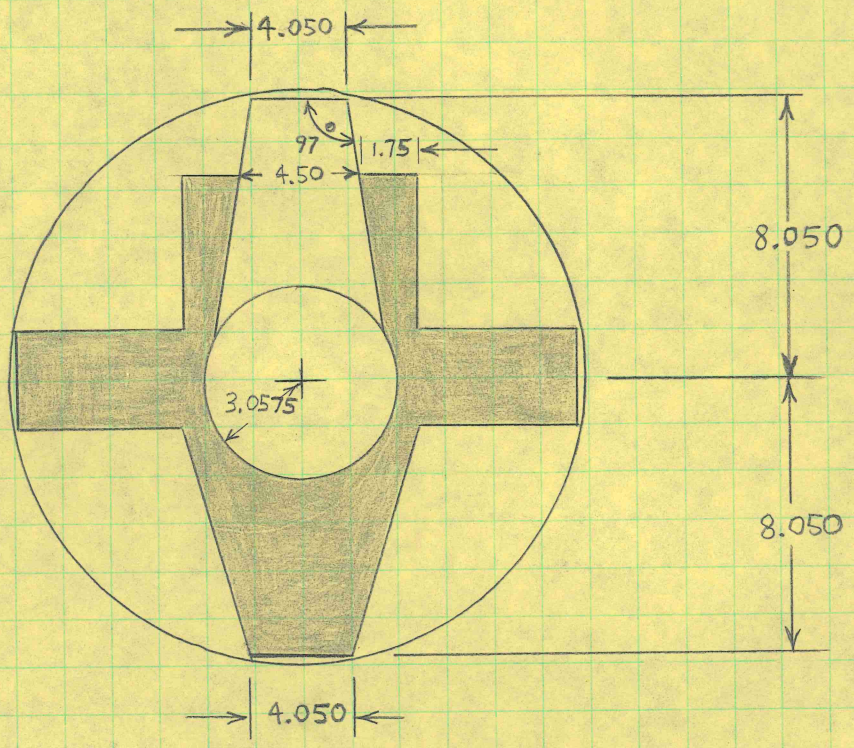


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MODEL 12 TESLA COIL

SYNCRONOUS ROTARY GAP MODIFICATIONS

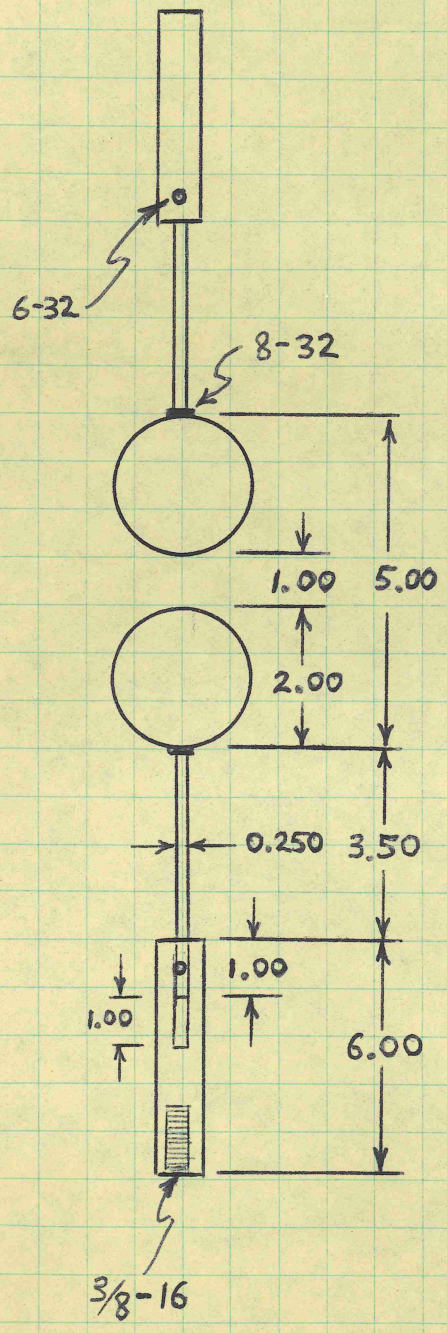


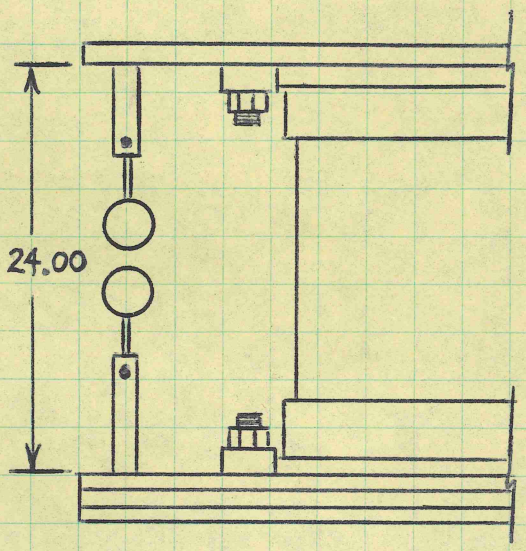
William C. "Bill" Wysock - Tesla Technology Research Archive - From the library of The Turn Of The Century Electrotherapy Museum

7-15-92

MODEL 12 TESLA COIL

CAPACITOR BANK SAFETY GAP





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

MODEL 12 TESLA COIL
DISCHARGE ELECTRODES

7-9-92

FINAL DESIGN

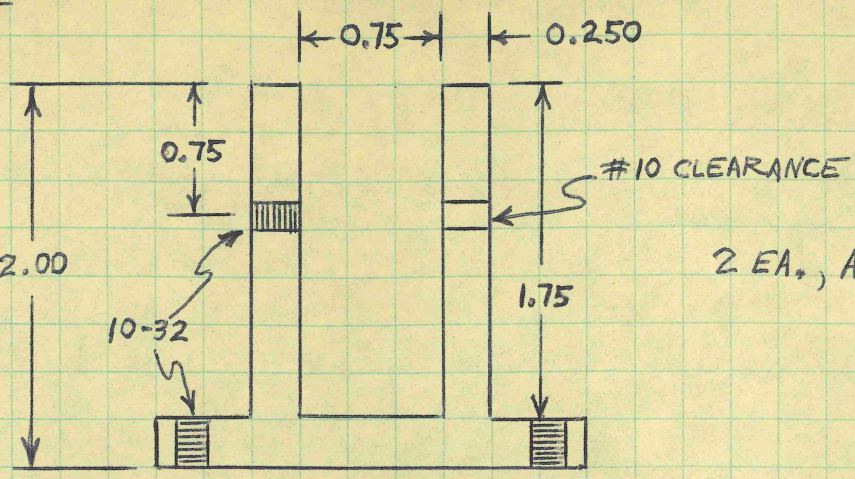


FIG. 1

2 EA., ALUMINUM

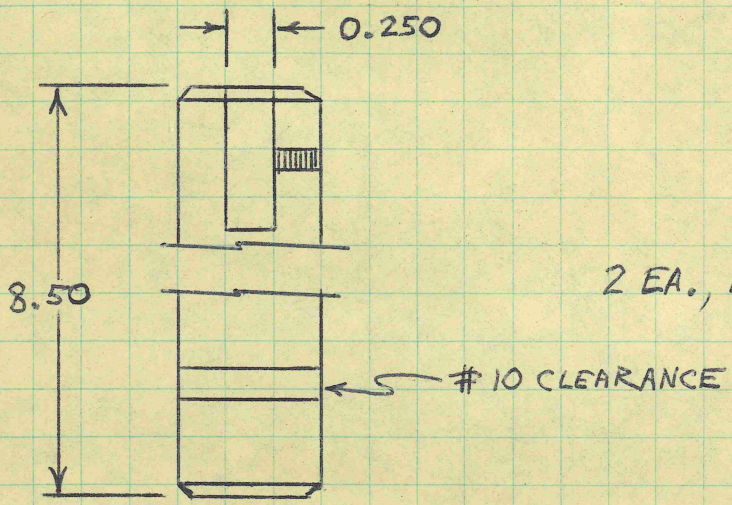


FIG. 2

2 EA., BRASS

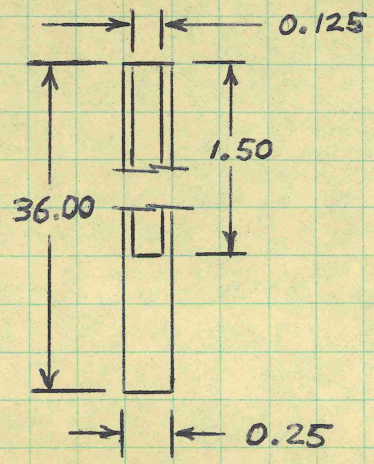


FIG. 3

2 EA., BRASS

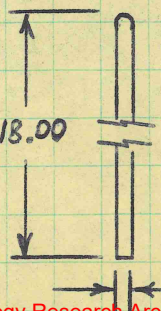


FIG. 4

2 EA., BRASS

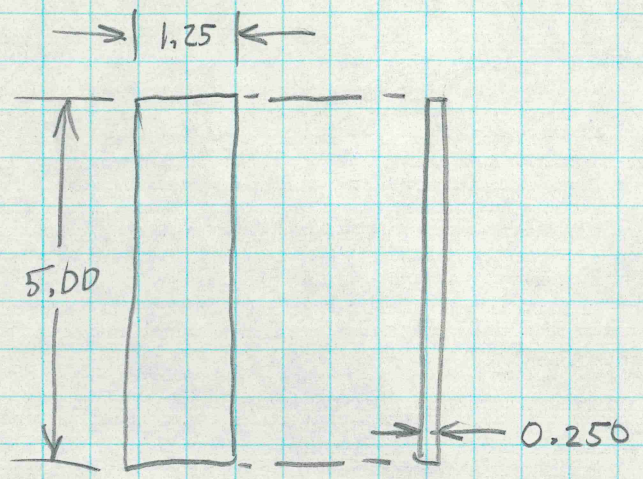
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MODEL 12

7-7-92

SECONDARY COIL
CORONA RING SUPPORT
BRACKETS

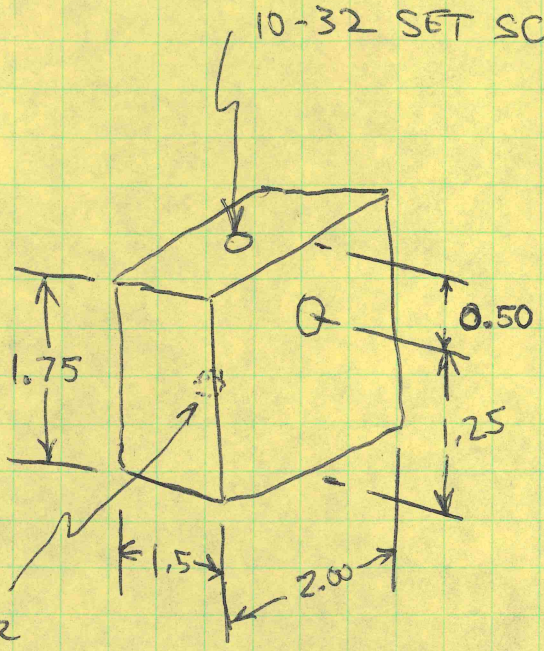
PHENOLIC

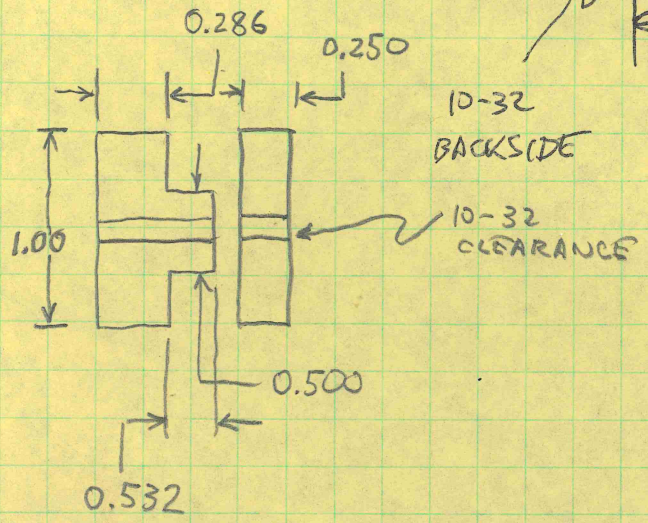


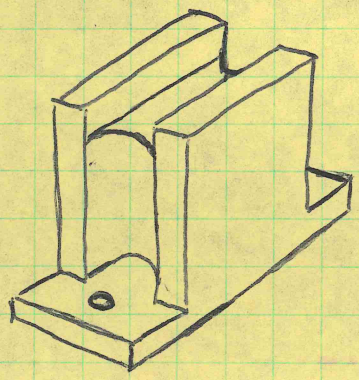
8 EA. REQ'D.

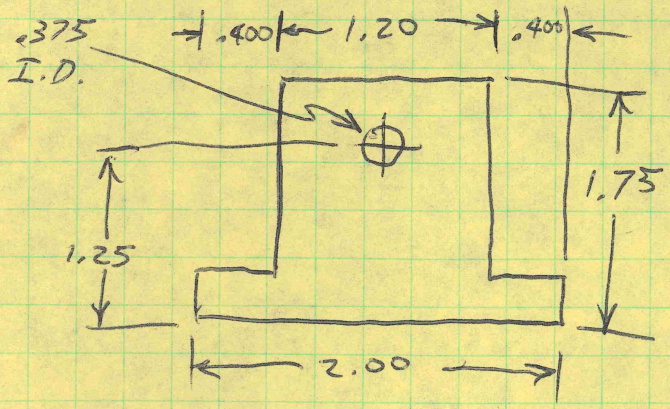
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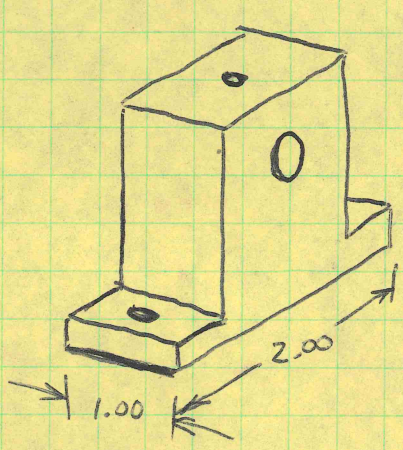
7-7-92

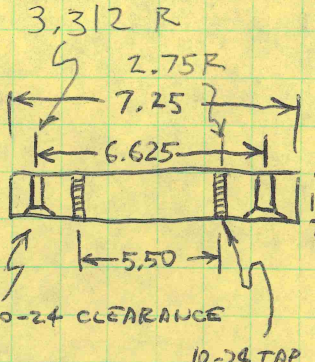












✓ (1) MAKE 3 EA. OF ABOVE.

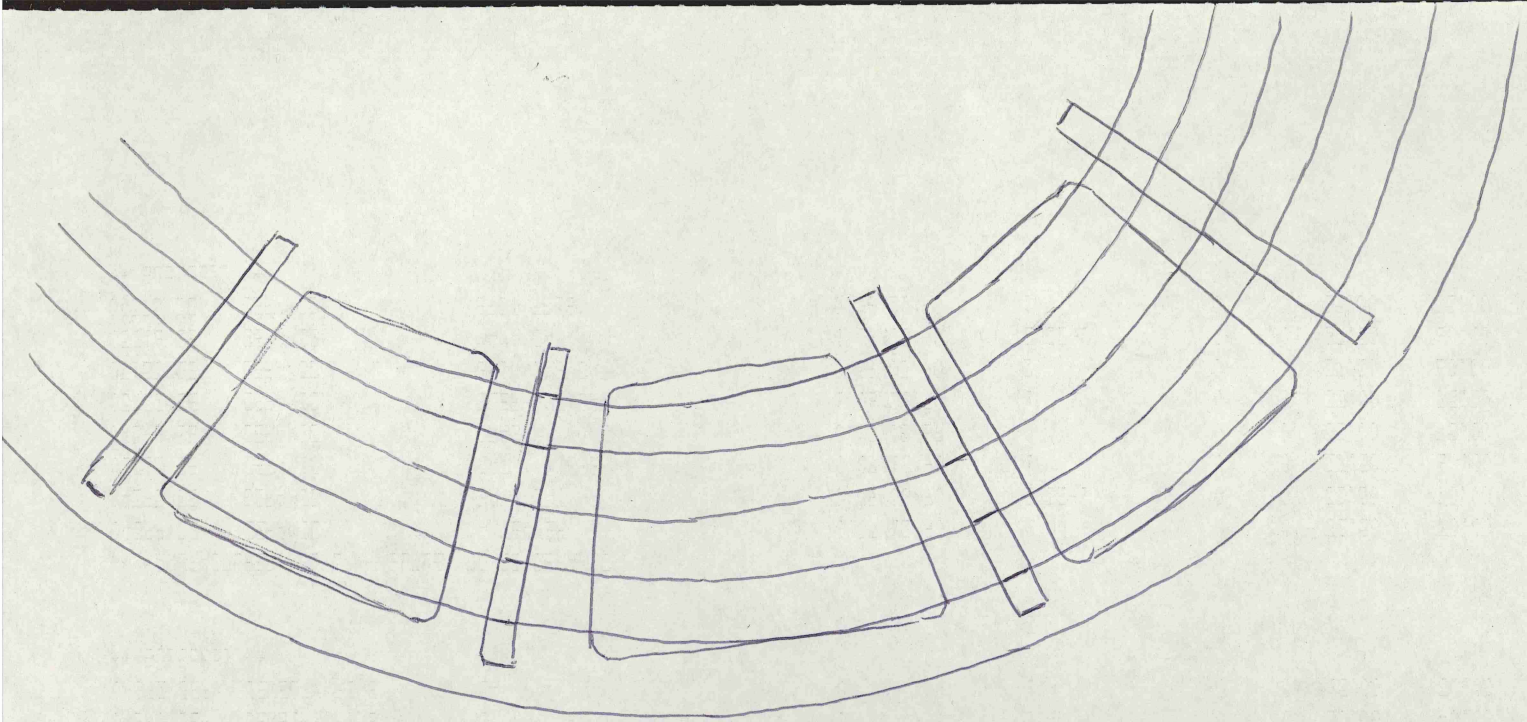
✓ (2) MAKE 16 EA. PRIMARY SPACERS.

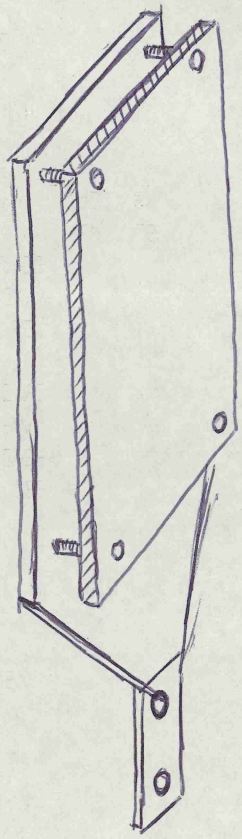
✓ (3) MAKE 2 EA. ½ PHENOLIC DISKS 8" O.D., 1.980 I.D..

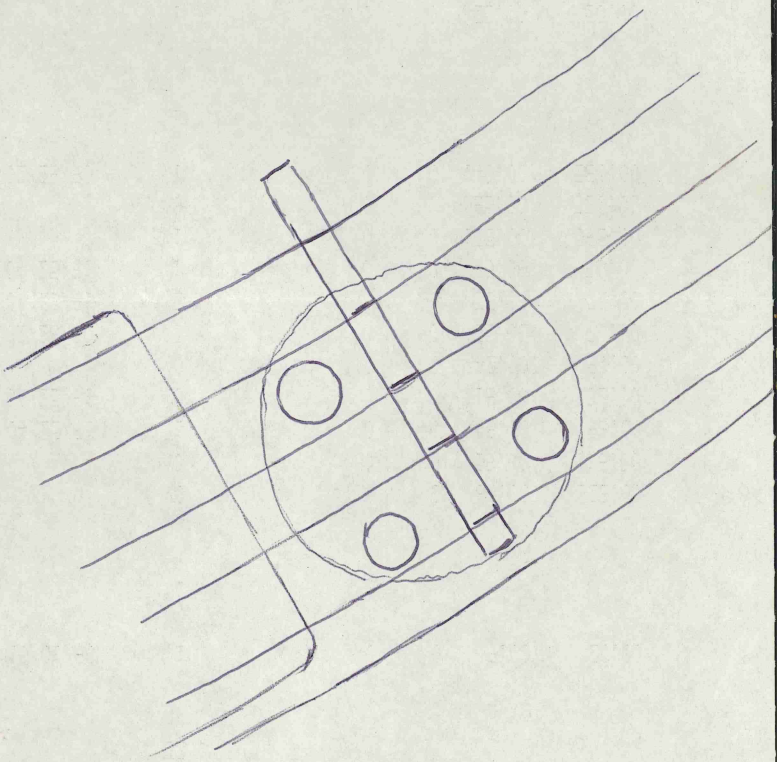
✓ (4) MAKE 4 EA. PRIMARY TAP TERMINAL PLATES.

✓ (5) MAKE COPPER ROTARY CAP BUS BARS.

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7-5-92

7-17-92
TEST RESULTS
1 7/8 TURNS

CLOCK-WISE SECONDARY COIL & BASE

GROUND BRACKET LOCATION I.D. BY 1 EA. COUNTER-SINK MARK TO IMMEDIATE RIGHT OF BRACKET.

1 7/8 TURNS

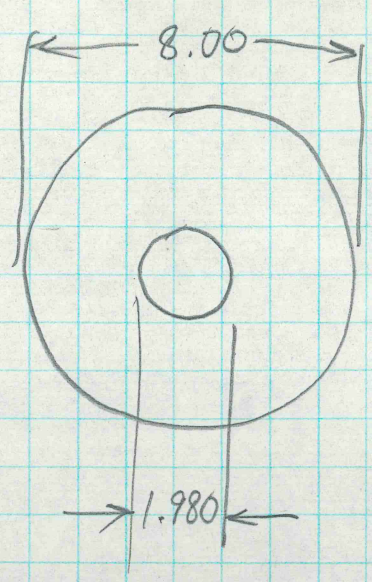
COUNTER-CLOCK-WISE SECONDARY

I.D. BY 2EA. COUNTER-SINK MARKS TO IMMEDIATE RIGHT OF GROUND BRACKET.

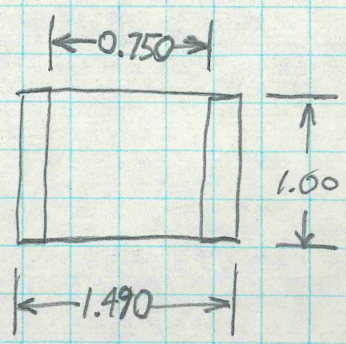
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6-29-92

PRESSURIZED SPARK GAP



1/2" PHENOLIC
2 REQ'D.

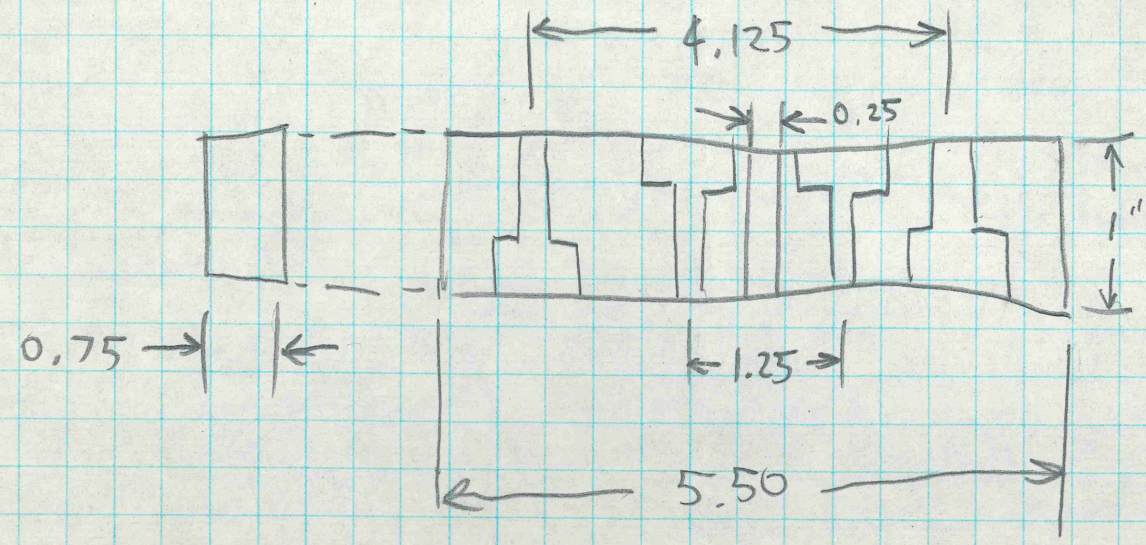


DELRIN COLLARS
2 REQ'D

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7-5-92

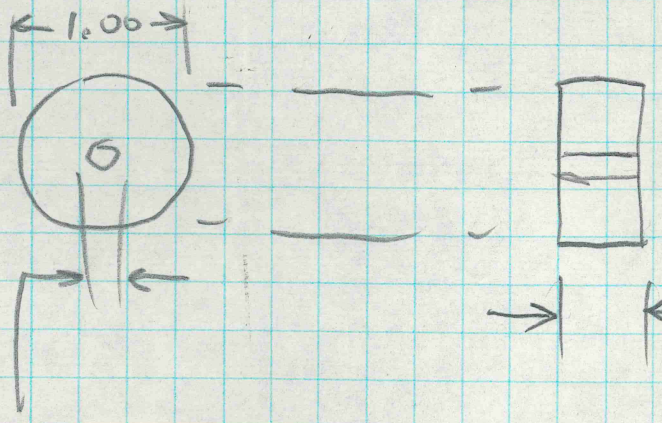
FOR STROBE LIGHT



PHENOLIC OR DELRIN

1 EA.

FOR ROTARY GAP



4 EA.

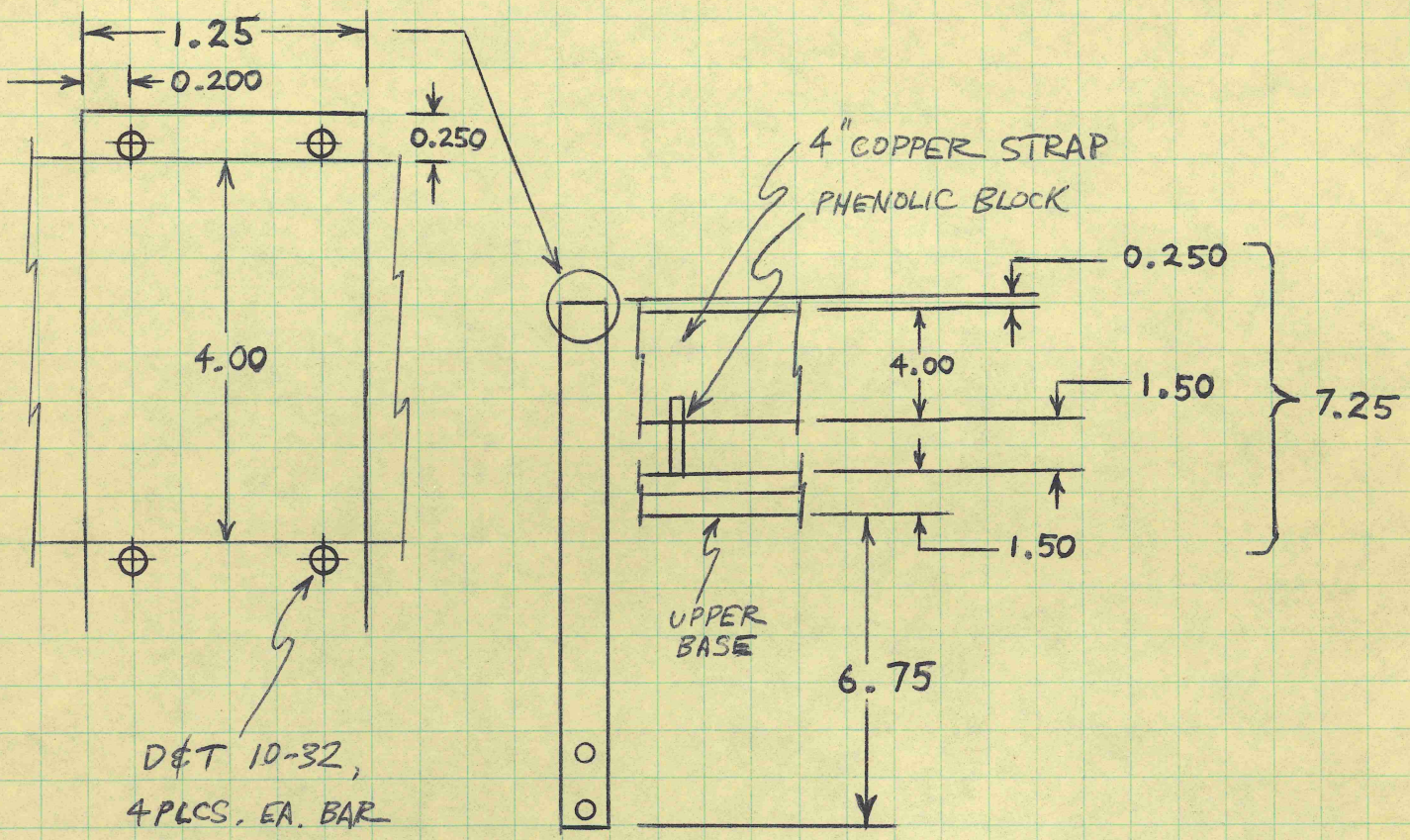
BRASS

10-32 CLEARANCE

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7-6-92

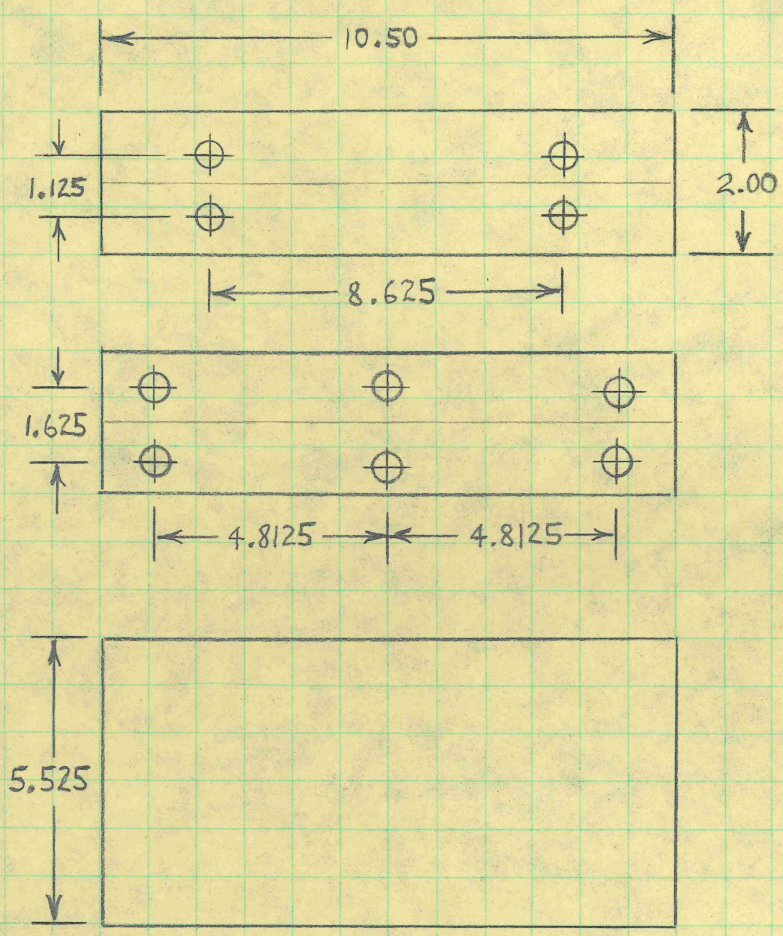
MODEL 12 COIL
PRIMARY TAP TERMINALS



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

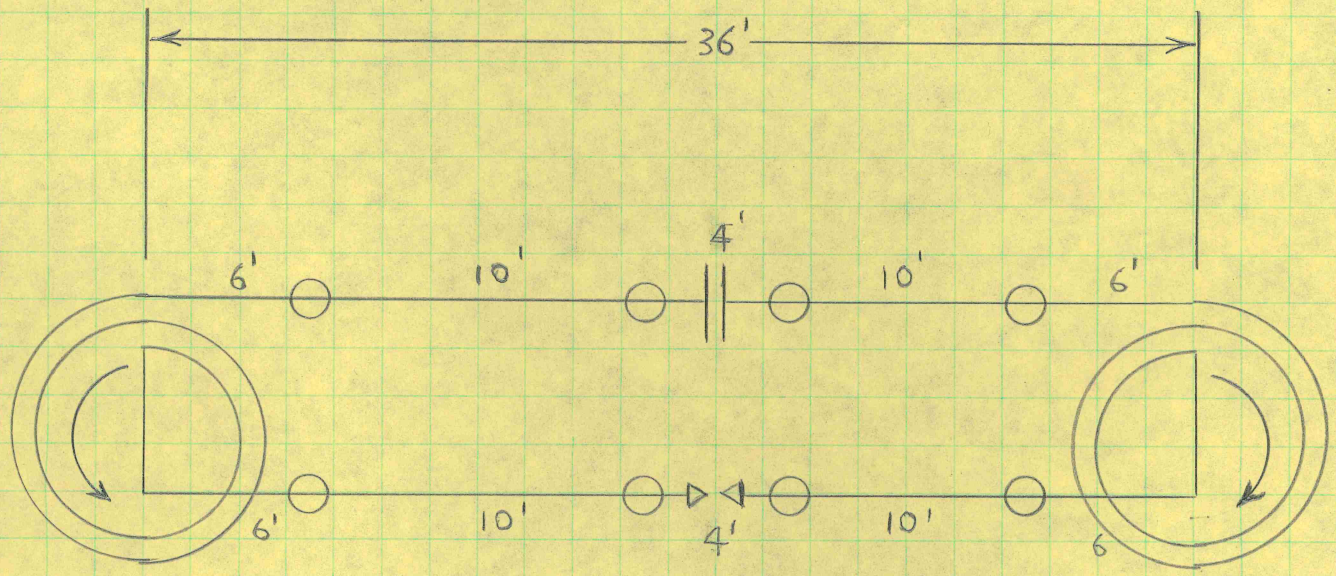
6-16-92

ROTARY GAP MOUNTING BLOCK



NOTE: ALL HOLES, D&T 3/8-16, TYP. 10 PLCS.

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PRIMARY TOTAL ~216'

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-F-

AWM VW-1

IRRADIATED PVC INSULATED WIRE

STYLE No.	1431	
Max. Volt	600 Volts	
Temp. Rating	105 °C	
Insulation Thick.	Min. avg.	: 30 Mil
	Min. at any point	: 27 Mil

Use : For use as Motor Leads or Internal Wiring of Appliances. 2,500 Volts Peak - For Electronic Use Only

EQUIPMENT WIRE

TYPE | REW (XL PVC)

IDENTIFYING MARKER : LL27627

MAX. VOLT.	600 VOLTS
TEMP. RATING	105°C (60° C : EXPOSED OIL)

Size	AWG: 18(19/0.254)
Color	VIOLET
Length	5.000FT(1.525m)
Lot No.	01-8095

Date of Manufacture : APR198[illegible]

SUMITOMO ELECTRIC INDUSTRIES
KANTO WORKS 1431-[illegible]

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



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

Model 12 Coil Data - 1992

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MODEL 2 TC

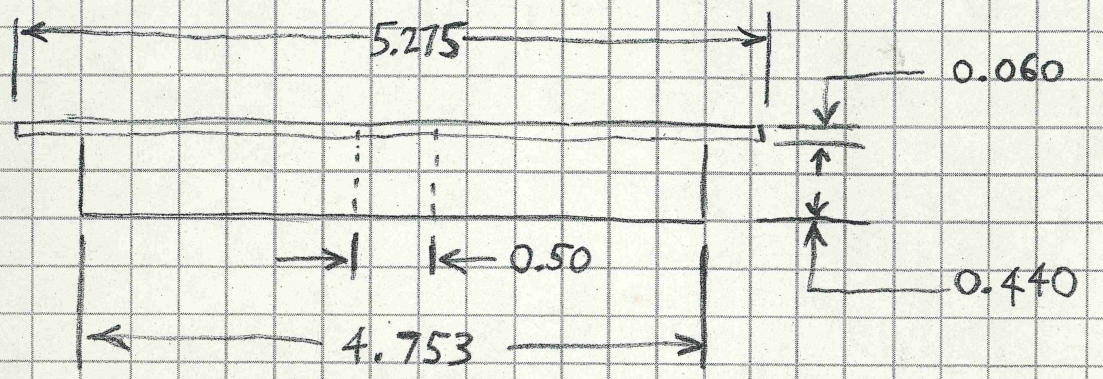
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AEROFLEX LINTEK

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MODEL 2 COIL NOTES ~~7/28/02~~ 8/5/04

SECONDARY COIL ENDS



MAKE 4 EA.

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BIG 5 SPORTING GOODS - #137
2515 E El Segundo Blvd
El Segundo, CA 90245
(310-297-7777

1119839 1 7481 137 001

1997469 BERKLEY BIG GAME 25LB
8.99 1 8.99
1997444 BERKLEY BIG GAME 20LB
8.99 1 8.99

Subtotal 17.98
Sales Tax 8.2500% 1.48
TOTAL $19.46

Cash 100.00
CHANGE ======> 80.54

Thanks for shopping at Big 5!
Please visit our website at
www.big5sportinggoods.com

11/01/04 10:01

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

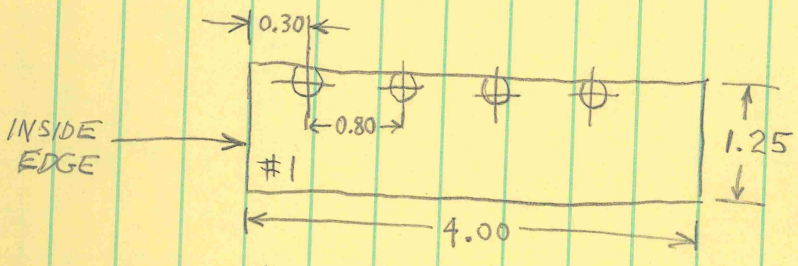
O.D. = 3.760

I.D = 3.250

BRASS TERM.

O.D. = 5.280

I.D. = 4.750



#1 = 0.30
2 = 0.40
3 = 0.50
4 = 0.60
5 = 0.70
6 = 0.80
7 = 0.90
8 = 1.00
#1 = 1.10 ← START OF TURN #2

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

Labor charges 8-10-04

1. Machine 4 5" disks	1.5 Hrs	67.50
2. Machine 16 coil forms	1.5 Hrs	67.50
3. Machine 4 posts	1.0 Hrs	45.00
Total	4.0 Hrs	$180.00
Discount		-20.00
		$160.00

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

Labor charges	8-10-04	
1. Machine 8 coil forms	1.5 Hrs	$67.50

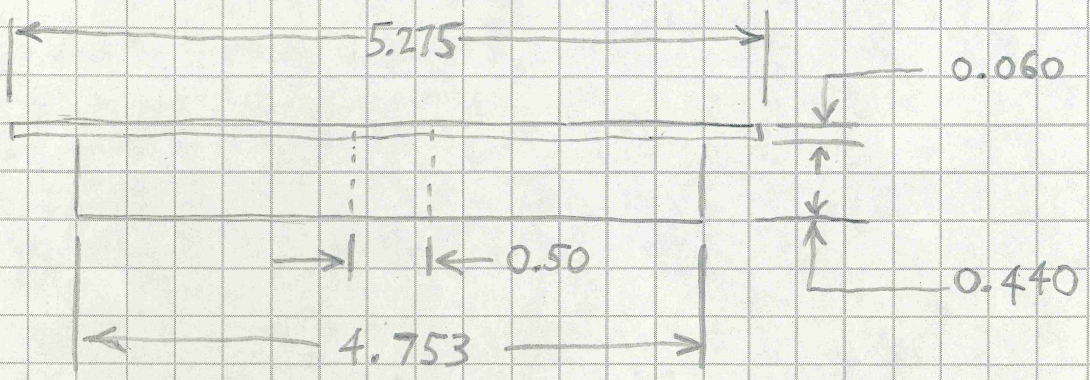
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MODEL 2 COIL NOTES 1/28/02

SECONDARY COIL ENDS



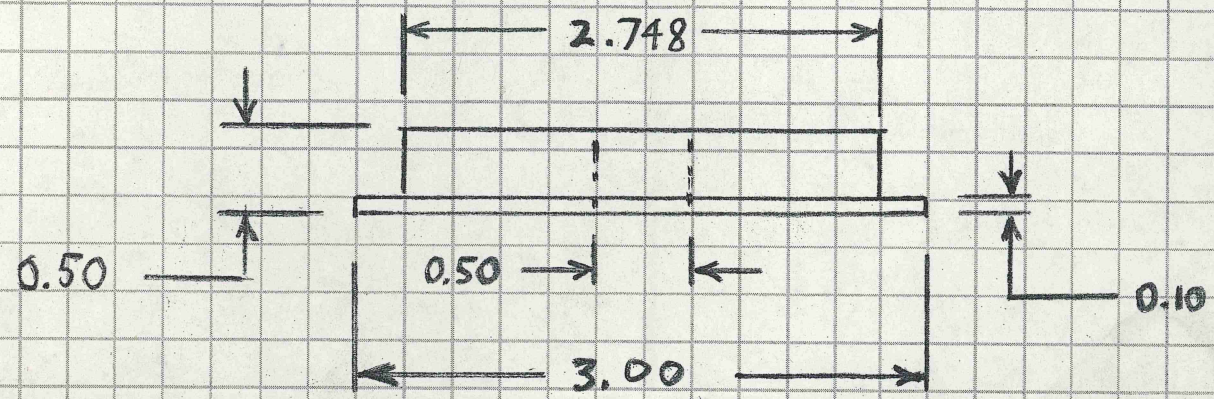
MAKE 4 EA.

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6/24/04 MAKE 2 EA. PHENOLIC ROUND DISCS.



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MODEL 2 10/10/04

FOR JOE SINGLETON PROJECT

SEC. COIL WINGING LENGTH : 22"

" " FORM " : 24"

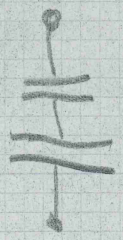
" WIRE A.W.G. = #26 (RED)

" " SPACER = 20 LB. MONO FICIMENT

" " D.C. RESISTANCE = 18.0 Ω

PRIMARY CAPS

10/14/04



TYPE 1970

.024 @ 5 KV AEROVOX

.022 @ 5 KV C-D

CM 908223 J

RR1, TAP = 7.0 TURNS

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FRANCE

PACKING SLIP

WESTRIM PRODUCTS

France / Westrim
P.O. BOX 300
2268 FAIRVIEW BLVD
FAIRVIEW, TN 37062

BILL TO:
00001405
MISCELLANEOUS

SHIP TO
1405-01
WILLIAM C WYSOCK
2527 TREELANE AVENUE
MONROVIA, CA
91016

SHIP NO:
54327

LOCATION
TN-SHIPPING
00000

SHIP DATE	SALES CODE	FREIGHT NOTES	FREIGHT TERMS	SHIP VIA
1/14/04	90	0345383326	Invoice	UNITED PARCEL SERVICE

ITEM	ORDER QTY	B.O QTY	ORDER#/ITEM#	CUSTOMER PO#	PART#	PART# DESCRIPTION	QTY SHIPPED
1	2 EA	0	43916 1	WYSOCK	48022	12060 P	2

CREDIT CARD ORDER. PLEASE CHARGE EXACTLY $45.90 FOR UPS SHIPPING CHARGES.

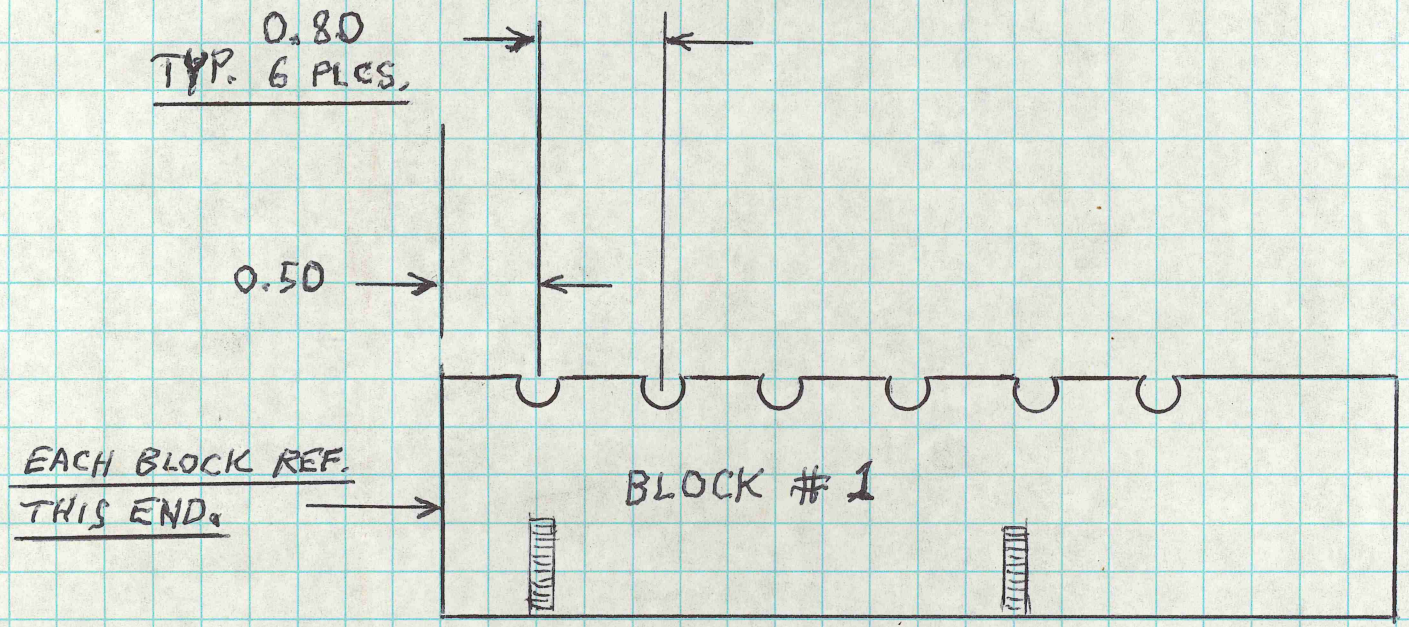
2 CARTONS
1 SKIDS
74 LBS

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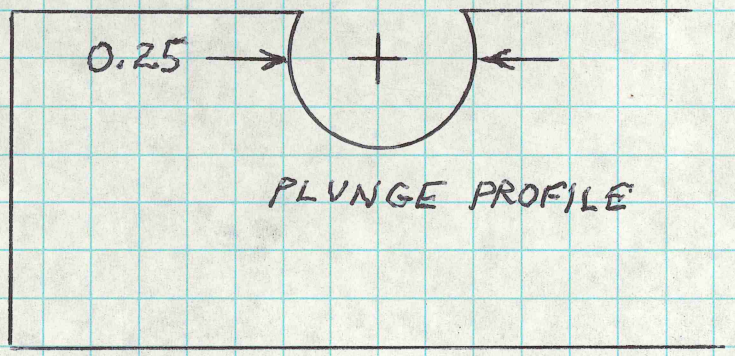
293-6690 (800)

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MODEL 2 COIL PRIMARY BLOCKS 9-26-03

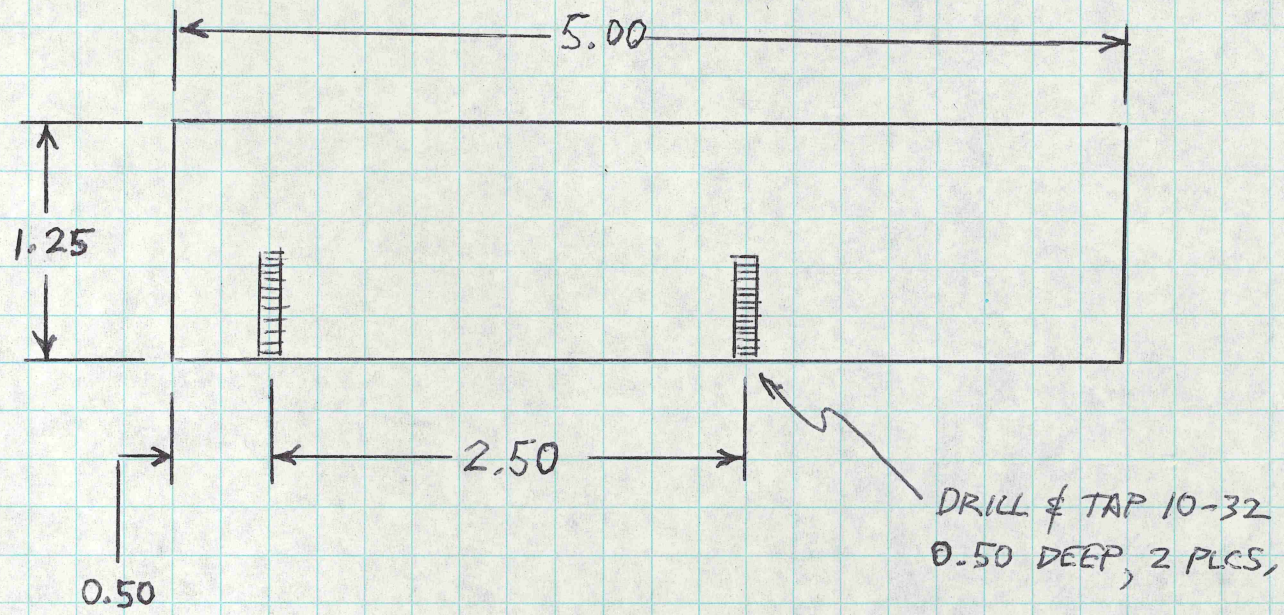


BLOCK	1ST SLOT
1	0.50
2	0.60
3	0.70
4	0.80
5	0.90
6	1.00
7	1.10
8	1.20



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2/9/01



MODEL 2 COIL PRIMARY 3/8" THICK PHENOLIC BLOCKS,

TOPS FORM 3314
LITHO IN U.S.A.

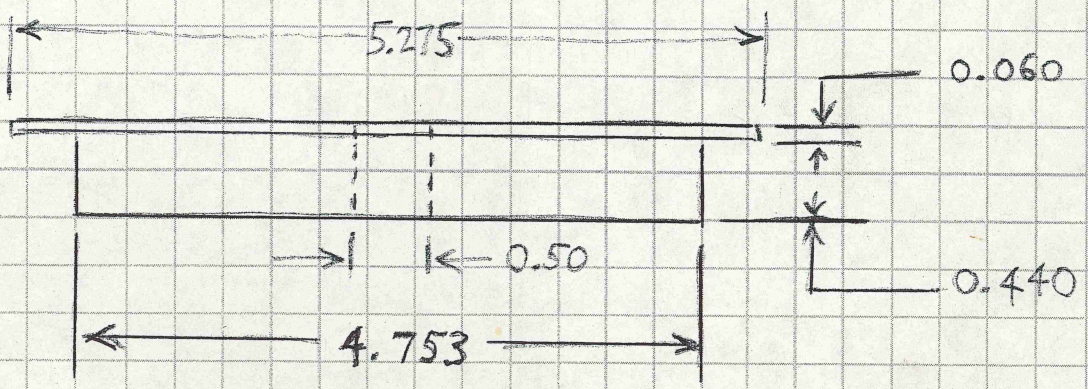
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MODEL 2 COIL NOTES 1/28/02

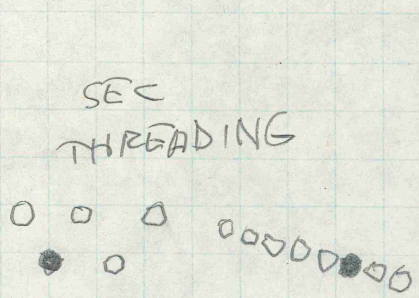
SECONDARY COIL ENDS

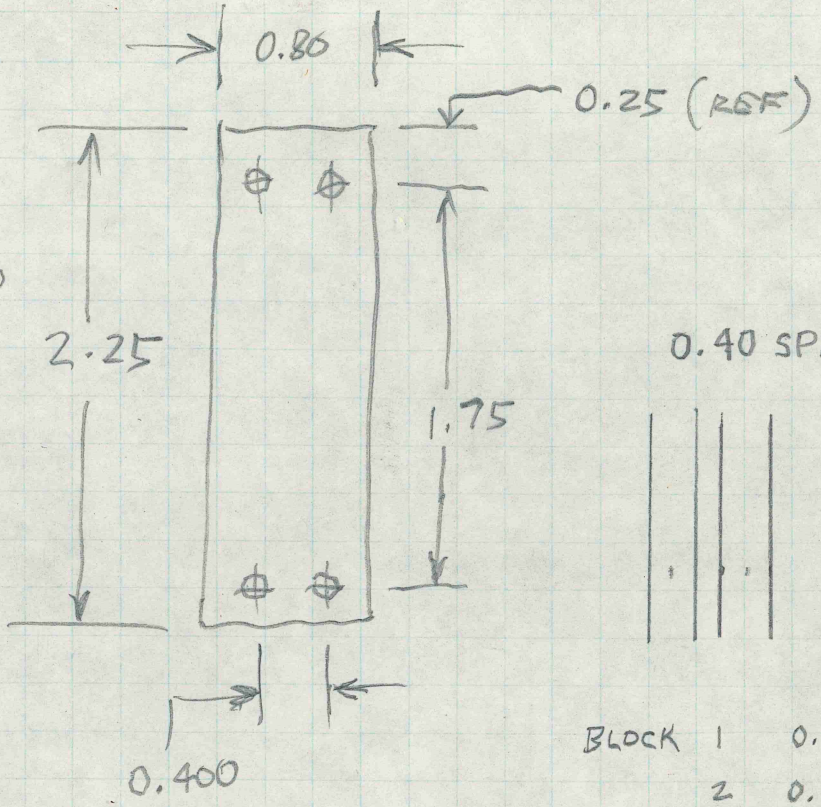


MAKE 8 EA.

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MODEL 2 COIL



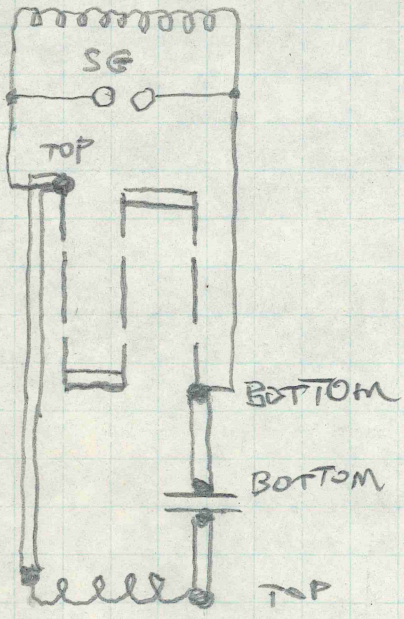


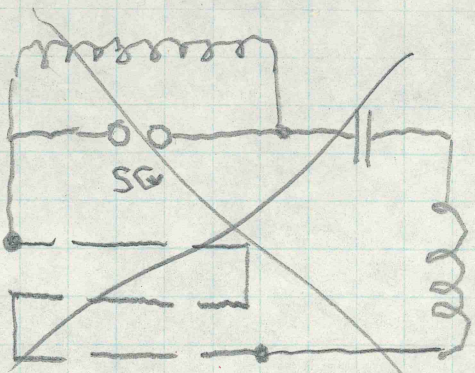
SECONDARY COIL
= 17 OHMS
(.022 AWG)

2/20/02 = 20 OHMS
(.021 AWG WITH
.018 MONO FILAMENT
SPACER)

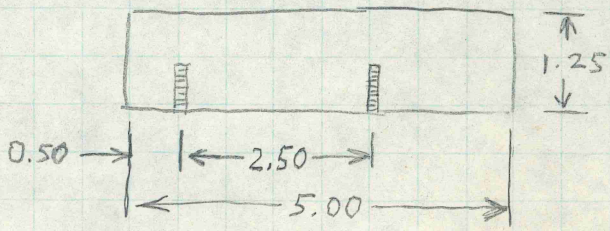
0.40 SPACING

BLOCK	1	0.900
	2	0.957
	3	1.014
	4	1.071
	5	1.128
	6	1.185
	7	1.242
	8	1.299





PRIMARY BLOCKS

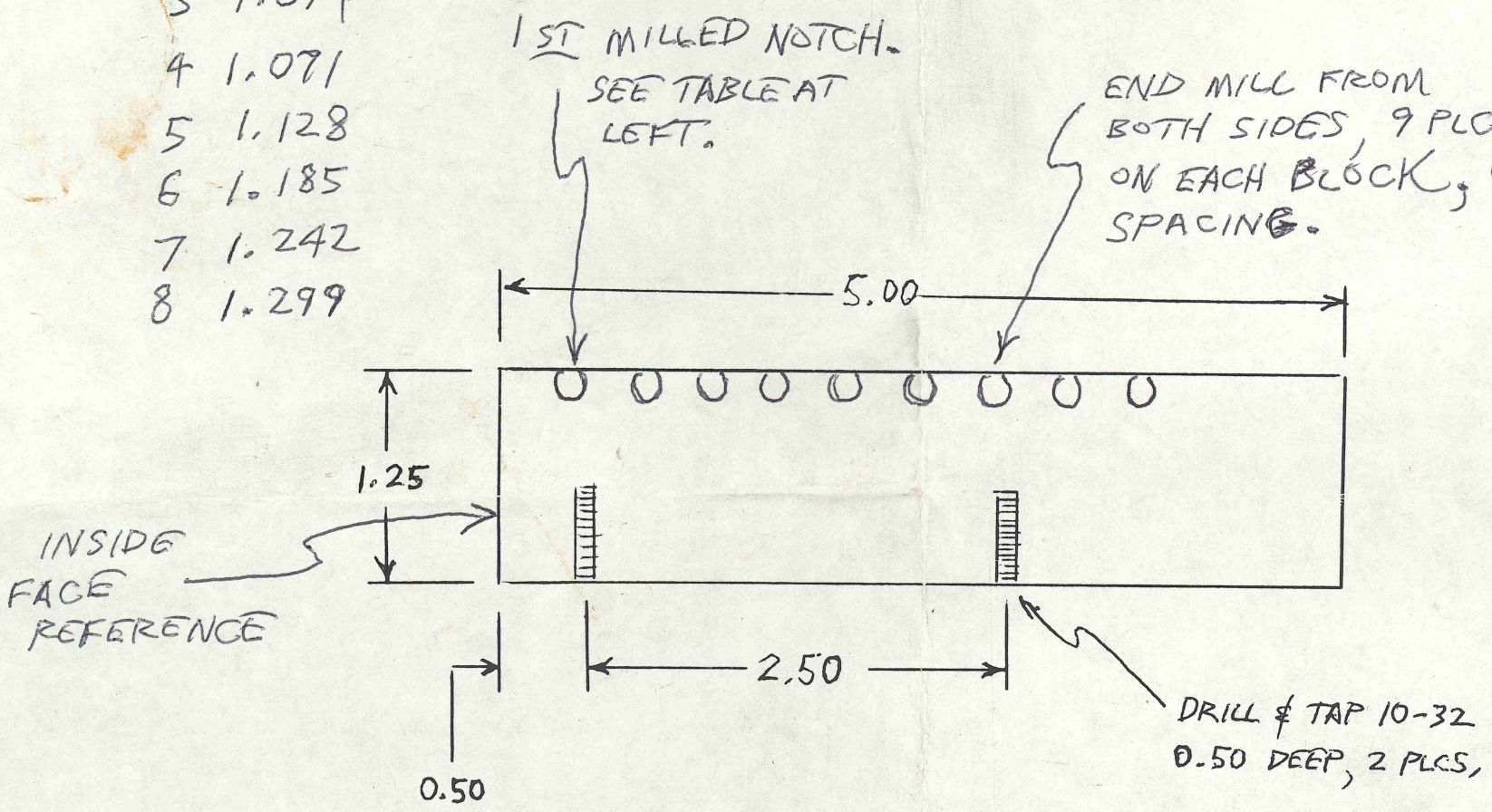


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FROM INSIDE FACE TO 1ST NOTCH

BLOCK 1	0.900
2	0.957
3	1.014
4	1.071
5	1.128
6	1.185
7	1.242
8	1.299

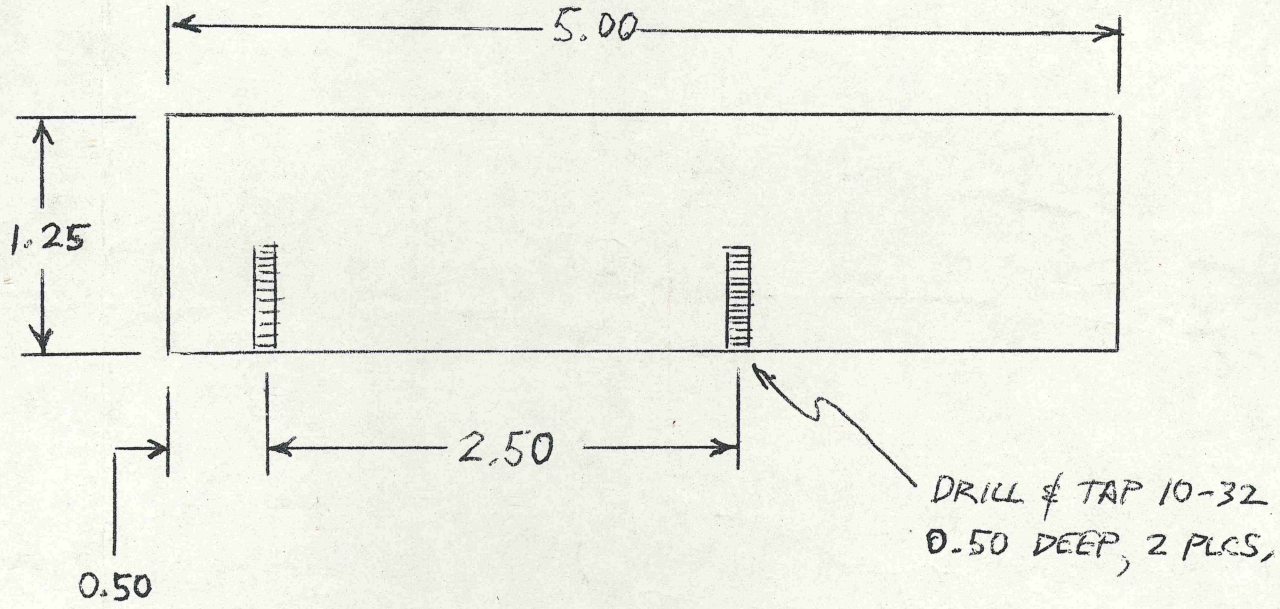
~~2/9/01~~
1/12/04



MODEL 2 COIL PRIMARY 3/8" THICK PHENOLIC BLOCKS,

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~~2/9/01~~
8/5/02



MODEL 2 COIL PRIMARY 3/8" THICK PHENOLIC BLOCKS,

MAKE 16 EA. & HOLD FOR ADDITIONAL DRAWING

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03

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03082005	03082005	VERBAL BILL W.	7	PPD	3/20	UPS GROUND	1	3

HANDLING CHARGE			
4.20	BUYER: BILL W. (DIANE)	626-359-1373	NON-TAXABLE

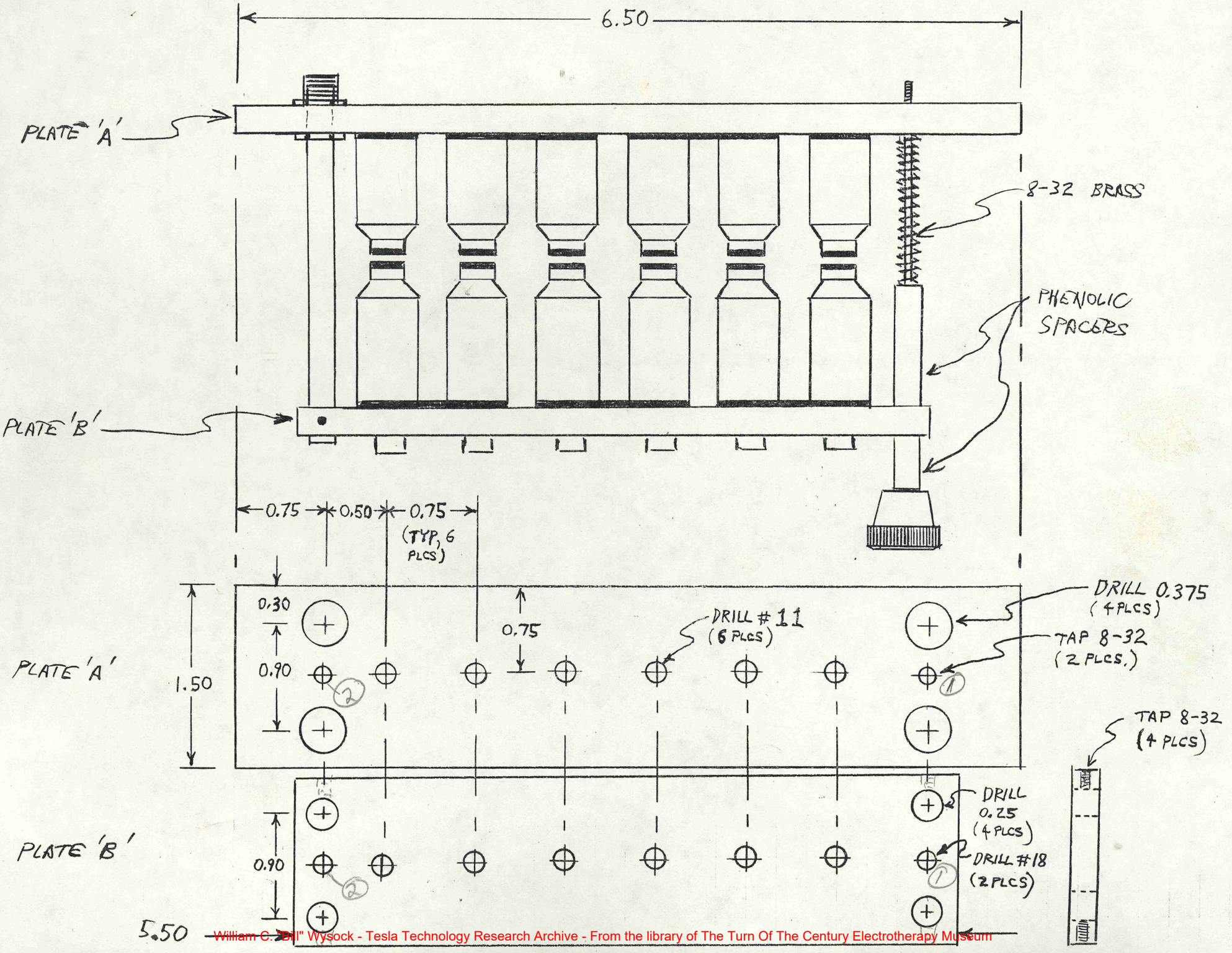
ITEM NO.	DESCRIPTION	U/M	UNIT PRICE	QTY. ORDERED	QTY. SHIPPED
01	SM-00150 PACKING RESALE & AMERICAN EXPRESS [redacted] LIST [redacted]	EACH	[redacted]	50	50

CERTIFICATION

WE HEREBY CERTIFY THAT PARTS PROCESSED UNDER THIS PURCHASE ORDER HAVE BEEN PROCESSED IN ACCORDANCE WITH ALL APPLICABLE INSTRUCTIONS AND SPECIFICATIONS. PHYSICAL AND CHEMICAL REPORTS PERTAINING TO MATERIAL USED IN PROCESSING OF THIS ORDER ARE ON FILE IN THE MANUFACTURER'S PLANT AND AVAILABLE FOR INSPECTION.

PRESIDENT

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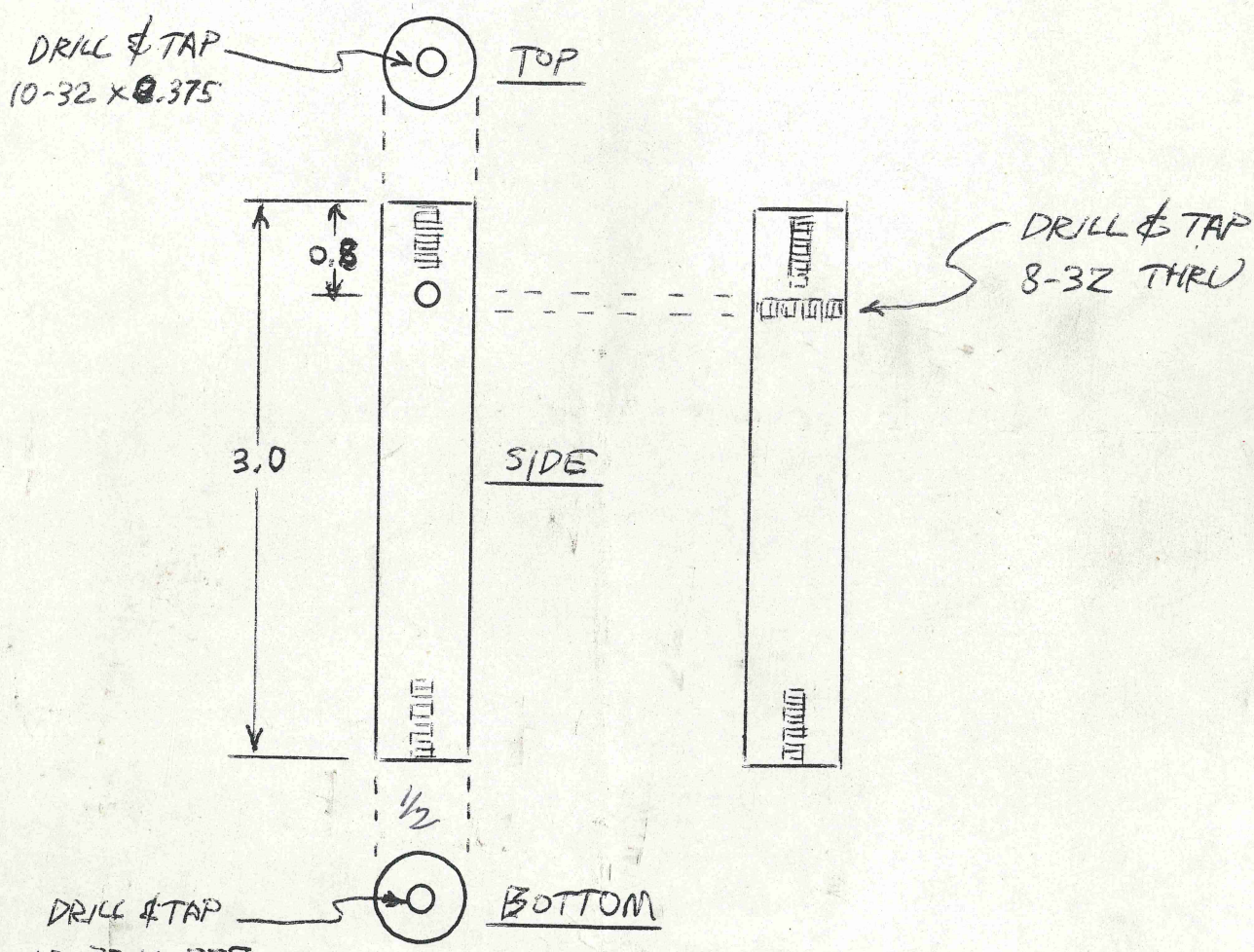
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9/2/04

MODEL 2
SAFETY GAP
HOLDER

BRASS - BRIGHT FINISH

MAKE 12 PCS.



1/4-20 ~~10-32~~ x .375

BOTTOM HOLE
ONLY

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TESLA TECHNOLOGY RESEARCH

SUPER MODEL NINE TESLA COIL SYSTEM

CONTENTS

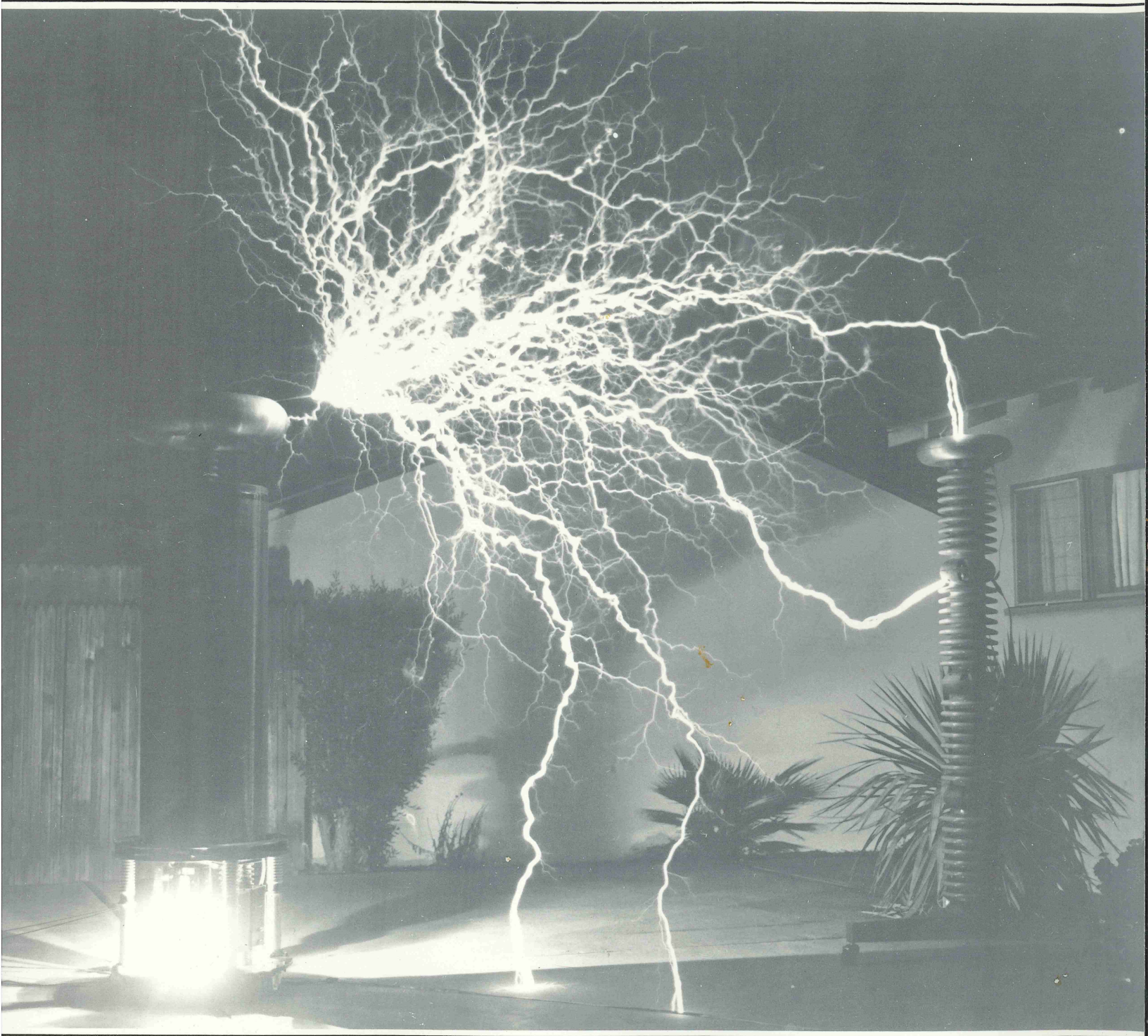
1.	PICTORIAL DESCRIPTION	- TESLA SECONDARY COIL	Page One
2.	PICTORIAL DESCRIPTION	- TESLA PRIMARY BASE UNIT	Page Two
3.	PICTORIAL DESCRIPTION	- BASE UNIT CONNECTOR TERMINALS - BASE UNIT SECONDARY GROUND	Page Three
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WARNING: READ ALL INSTRUCTIONS BEFORE 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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SUPER MODEL NINE
TESLA COIL SYSTEM



OWNER'S MANUAL

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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

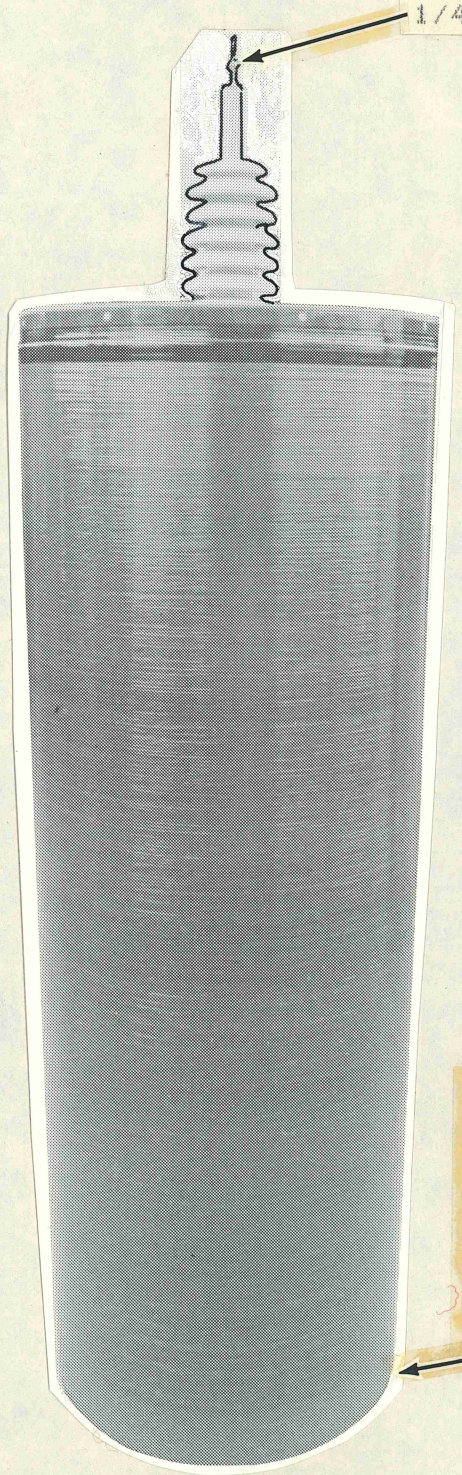
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1. PICTORIAL DESCRIPTION - TESLA SECONDARY COIL

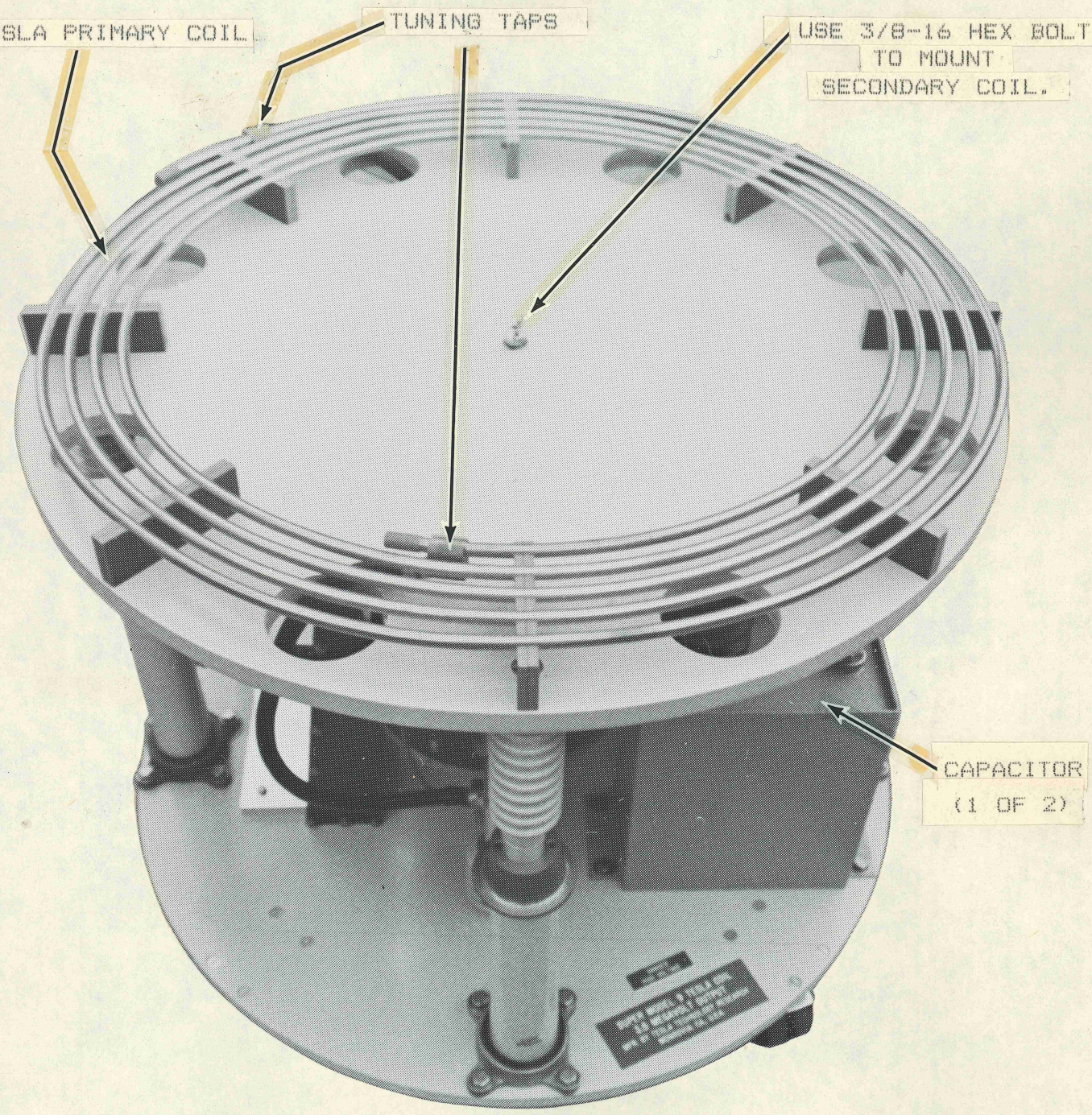


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2. PICTORIAL DESCRIPTION - TESLA PRIMARY BASE UNIT

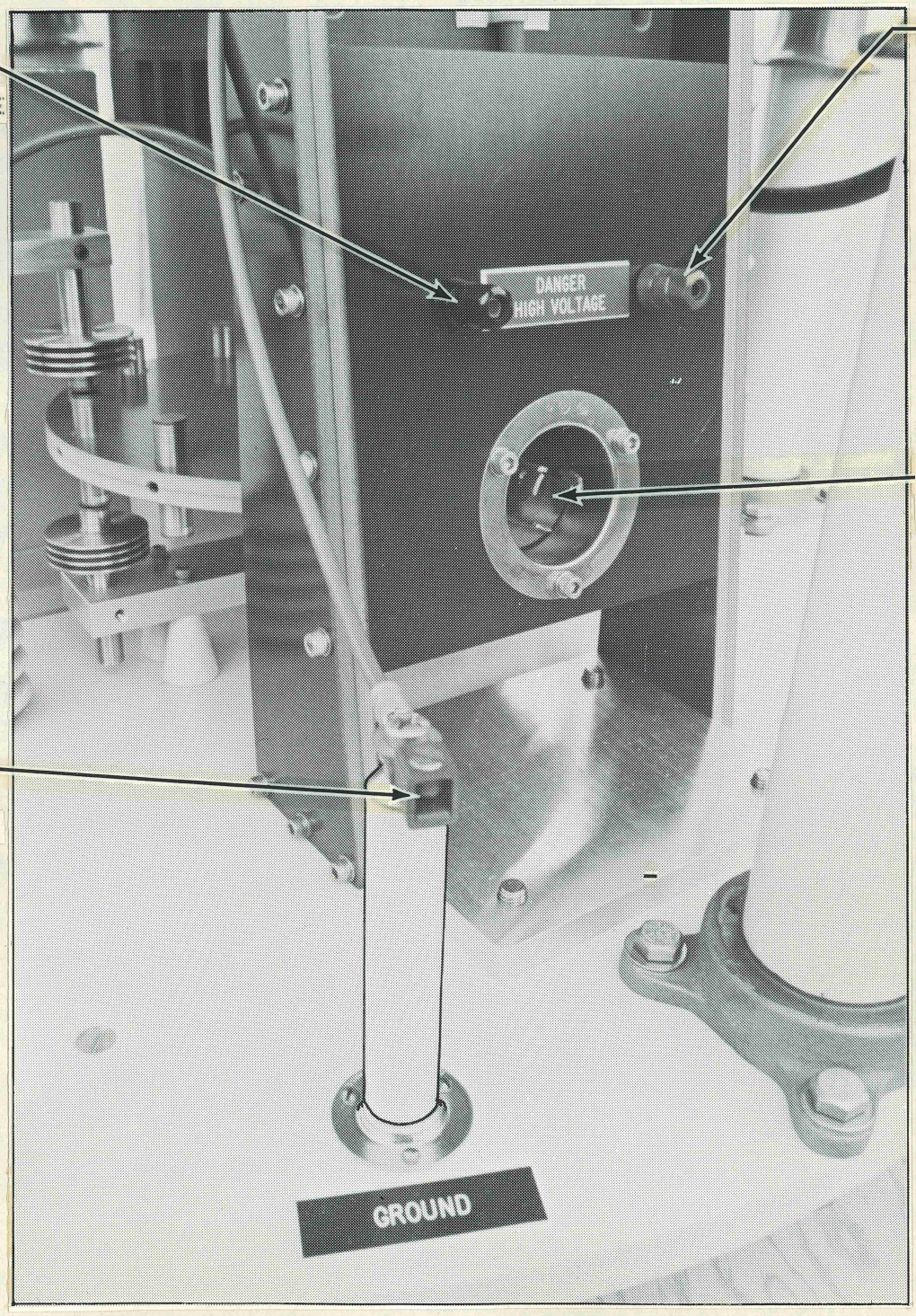


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3. PICTORIAL DESCRIPTION - BASE UNIT CONNECTOR TERMINALS
BASE UNIT SECONDARY GROUND



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.

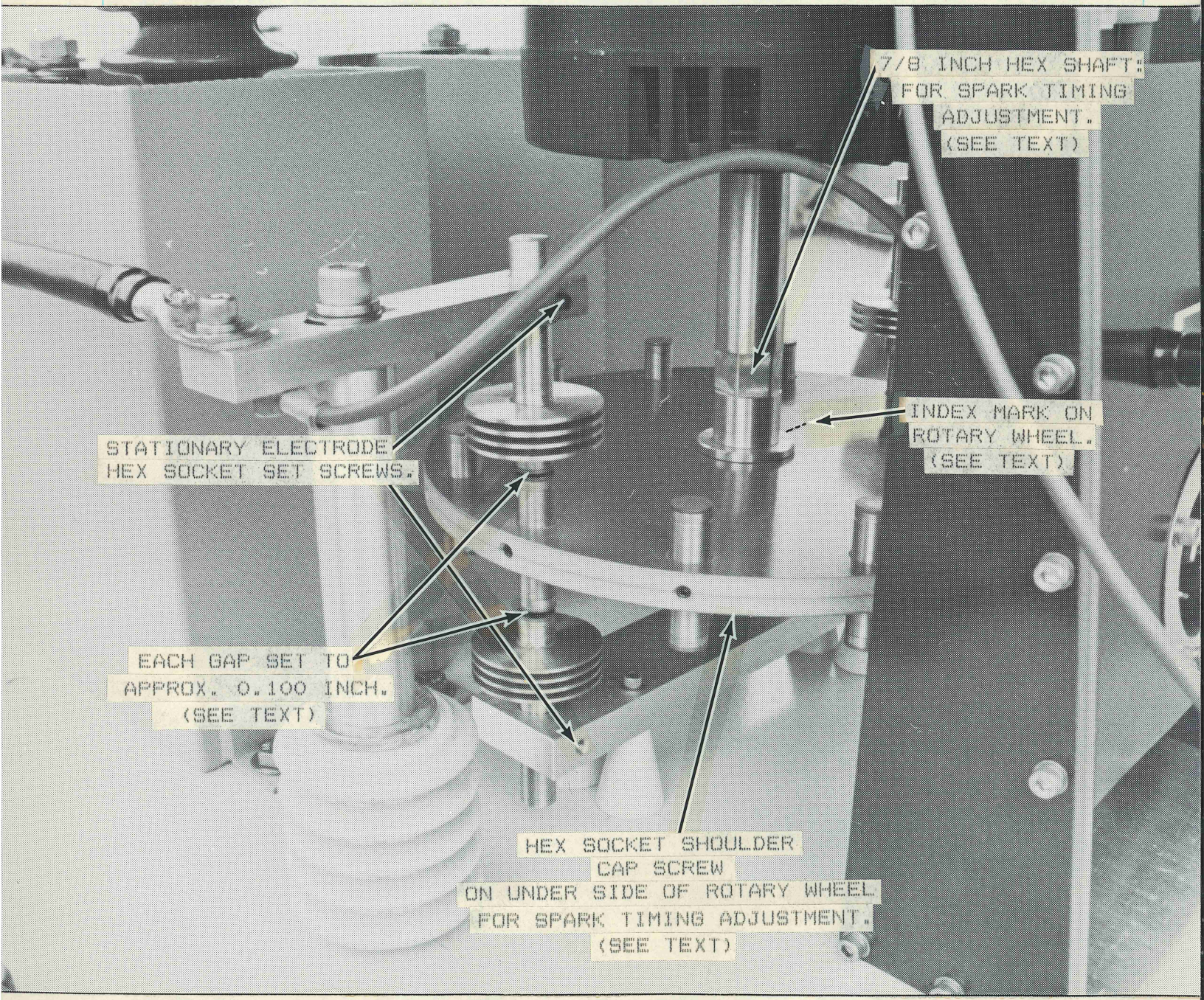
THIS TERMINAL MUST GO TO SEPERATE EARTH GROUND.

(SEE TEXT)

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4. PICTORIAL DESCRIPTION - BASE UNIT ROTARY GAP ASSEMBLY

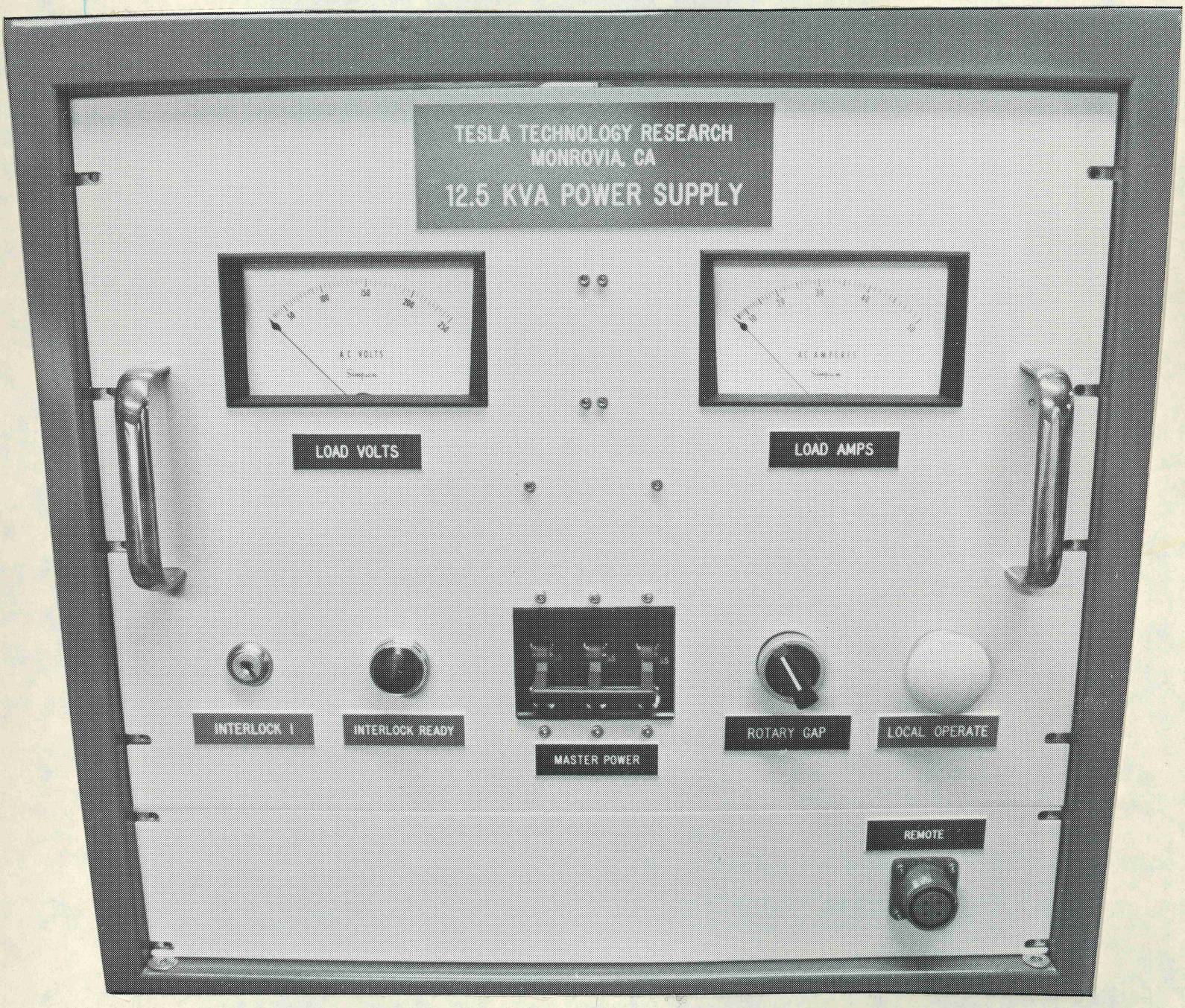


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5. PICTORIAL DESCRIPTION - CONTROL CONSOLE OPERATING PANEL

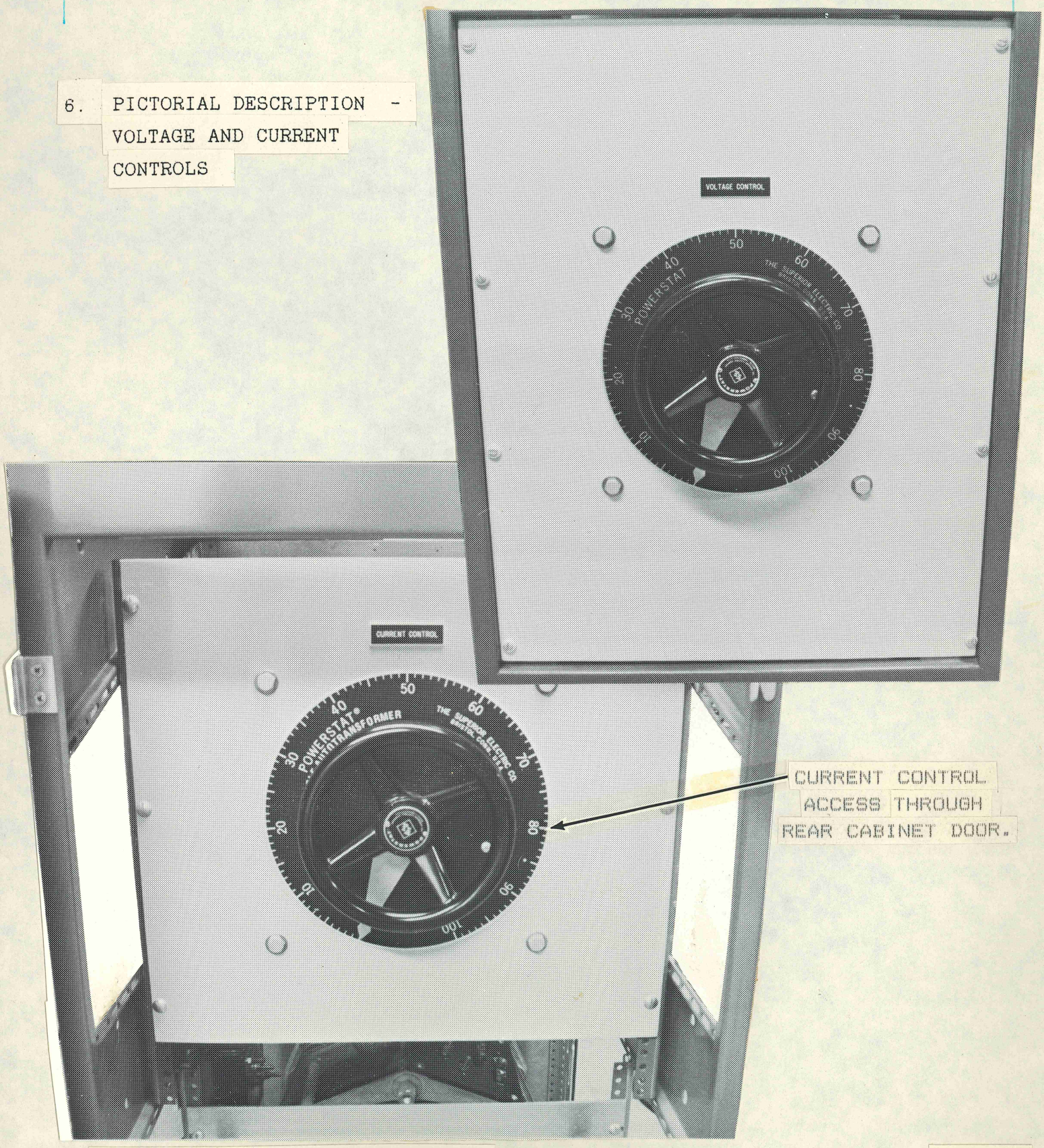


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6. PICTORIAL DESCRIPTION - VOLTAGE AND CURRENT CONTROLS



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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 furter 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 reccomended 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 machanical 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 interconnet 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 labled "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. Initally, 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-SYNCRONOUS, TO 1500 R.P.M. SALIENT-POLE SYNCRONOUS OPERATION. A steady, even sound should be heard from the running of this motor, indicating syncronous 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 dishcarge 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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OPRERATING 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 mimimum 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 REASERCH 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 then 0.050" per gap. Use a machinist's 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 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 mimimum 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 ware 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 seperate 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 guage, re-gap each of the four stationary electrodes to the origional 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 debries 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.

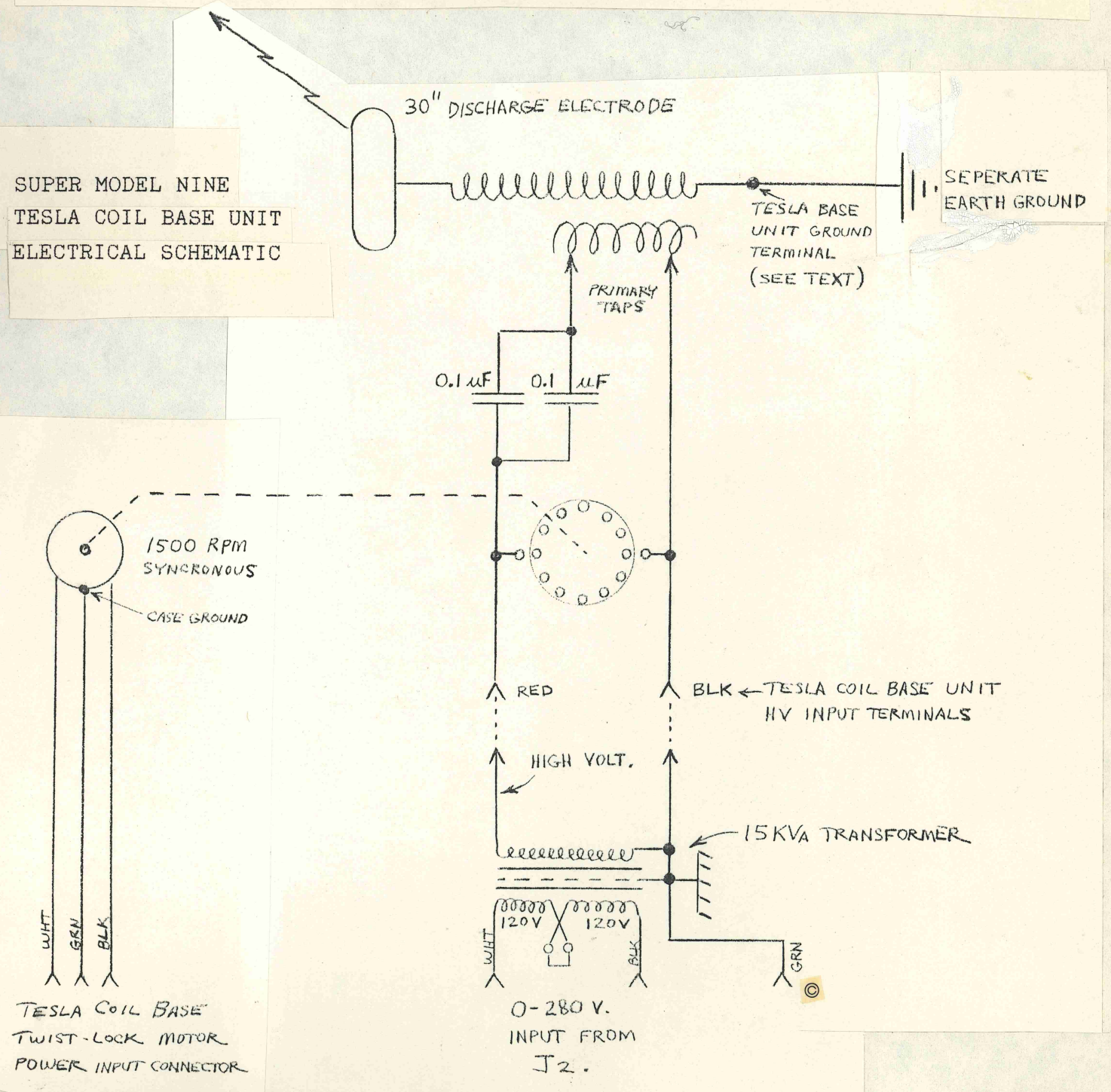
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11. POWER REQUIREMENTS AND SCHEMATIC DIAGRAMS

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

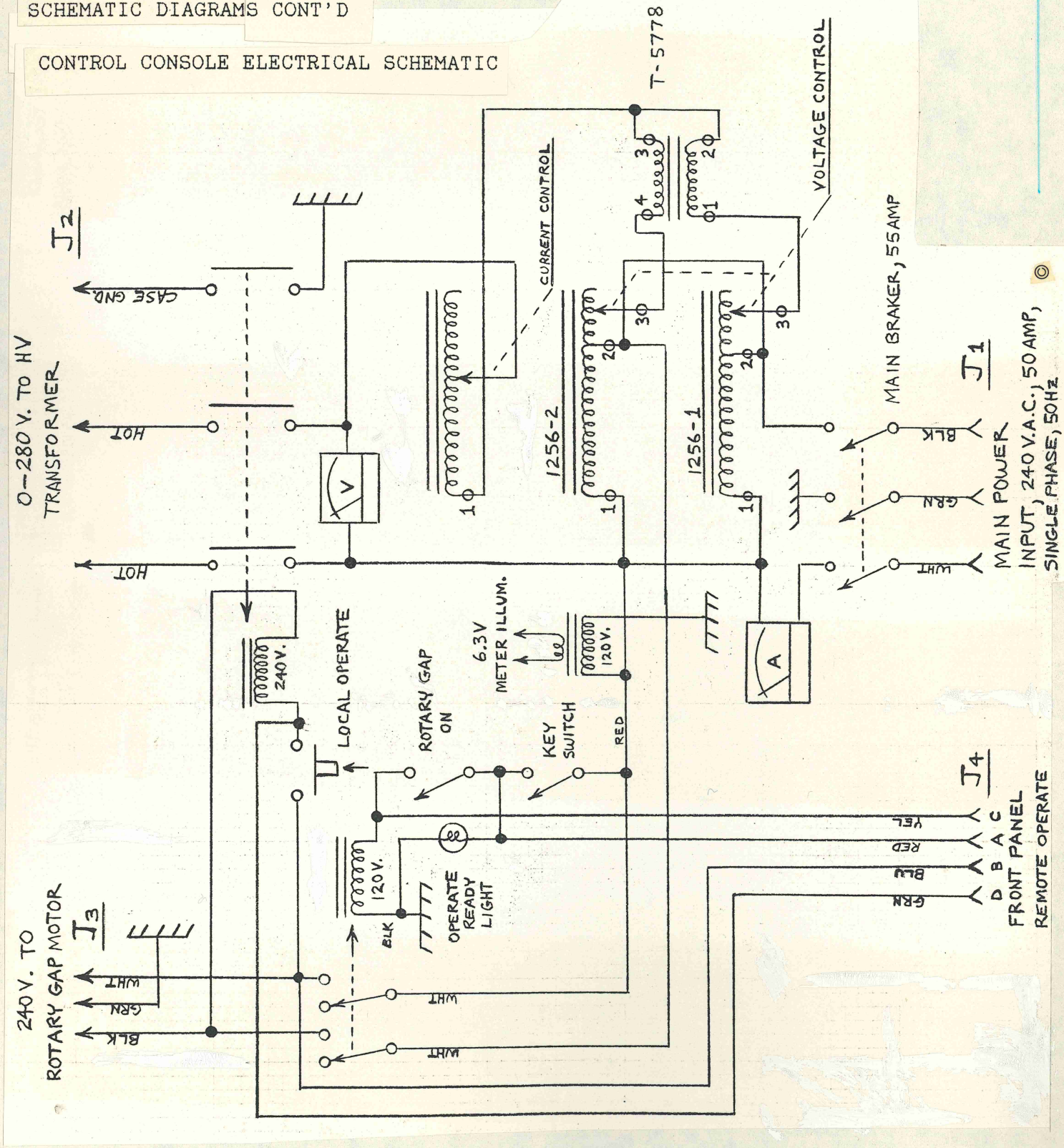
Power input: 208-240 V.A.C., 50 Hz. single phase, 35-50 amps nominal.
Output: 3,500,000 volts (3.5 MV) maximum, 80-95 KHz.



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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 origional 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.

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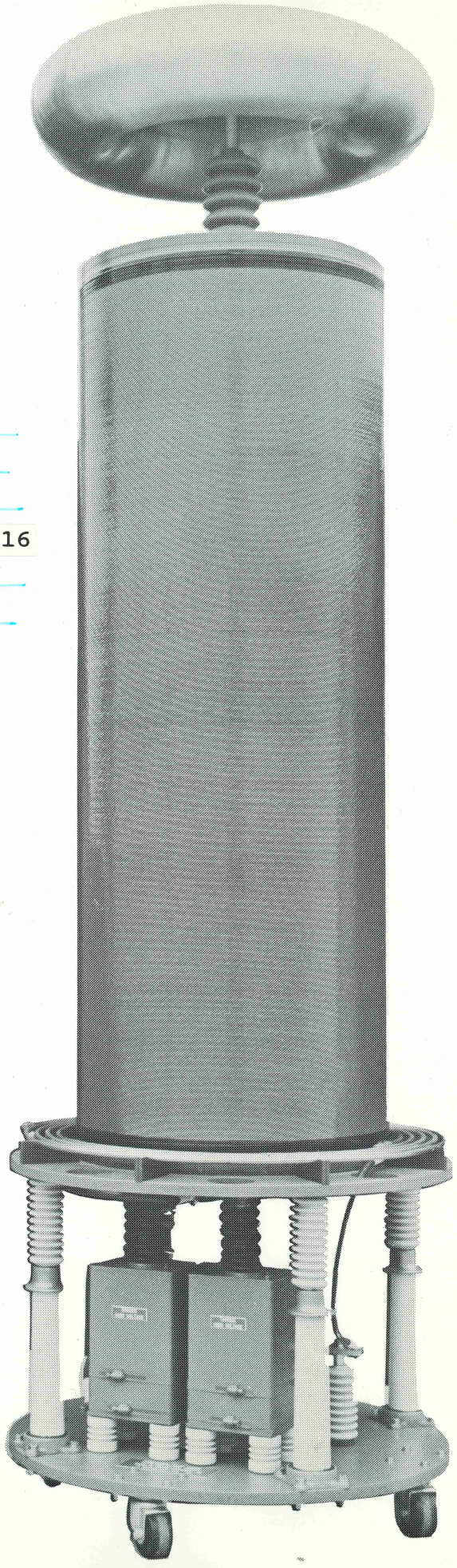
SUPER MODEL NINE TESLA COIL SYSTEM

TESLA TECHNOLOGY RESEARCH

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

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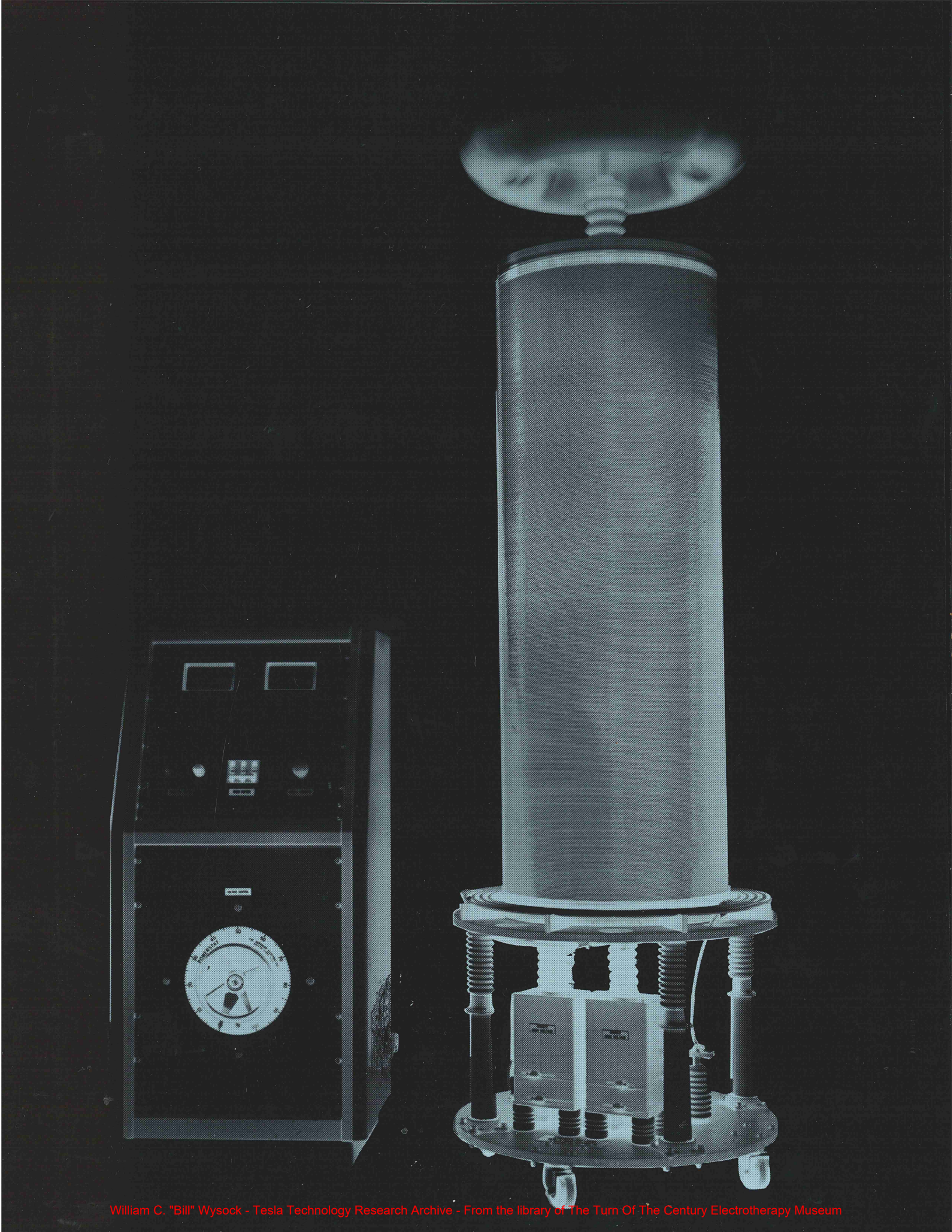
SUPER MODEL 9 COIL

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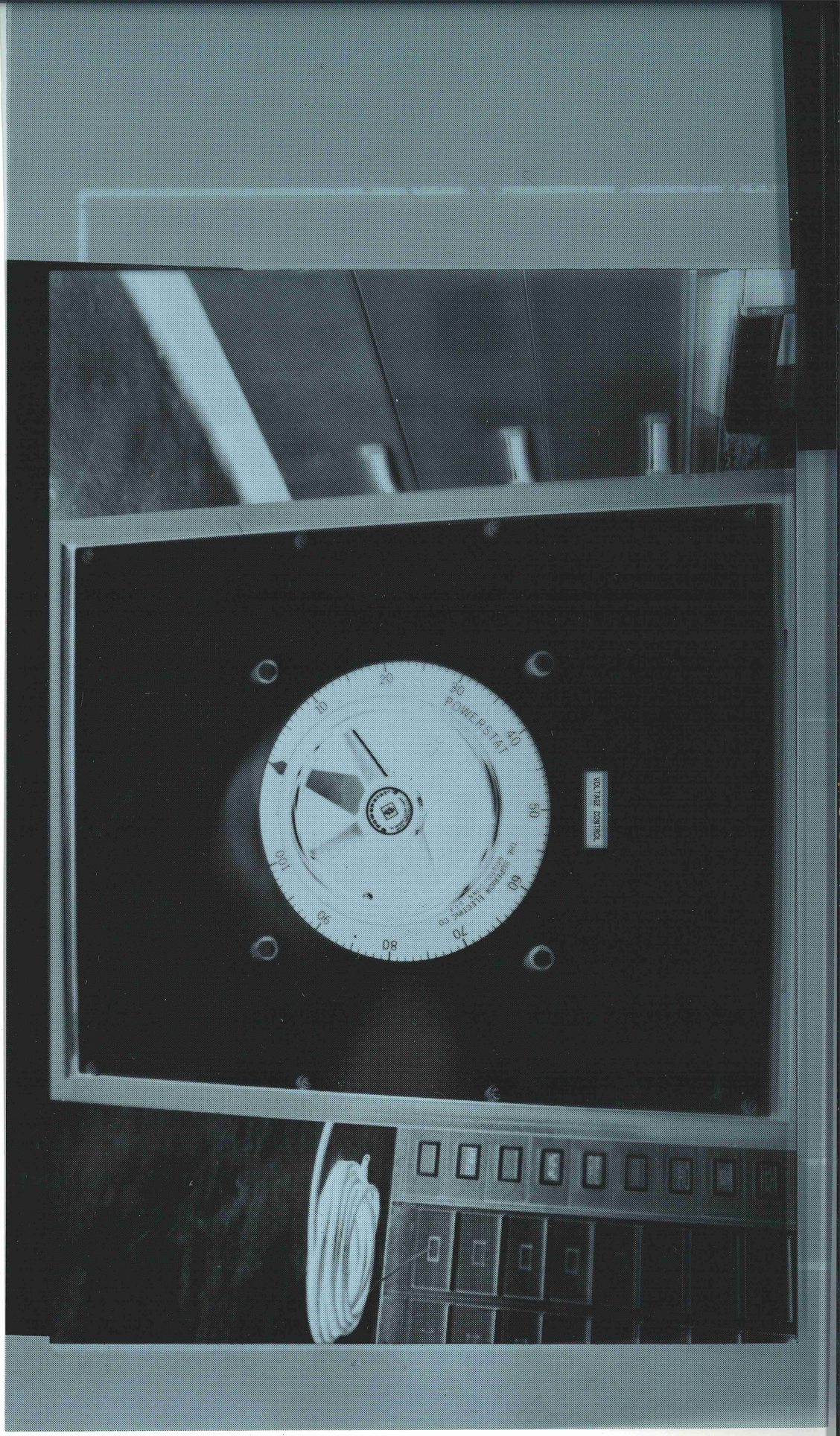
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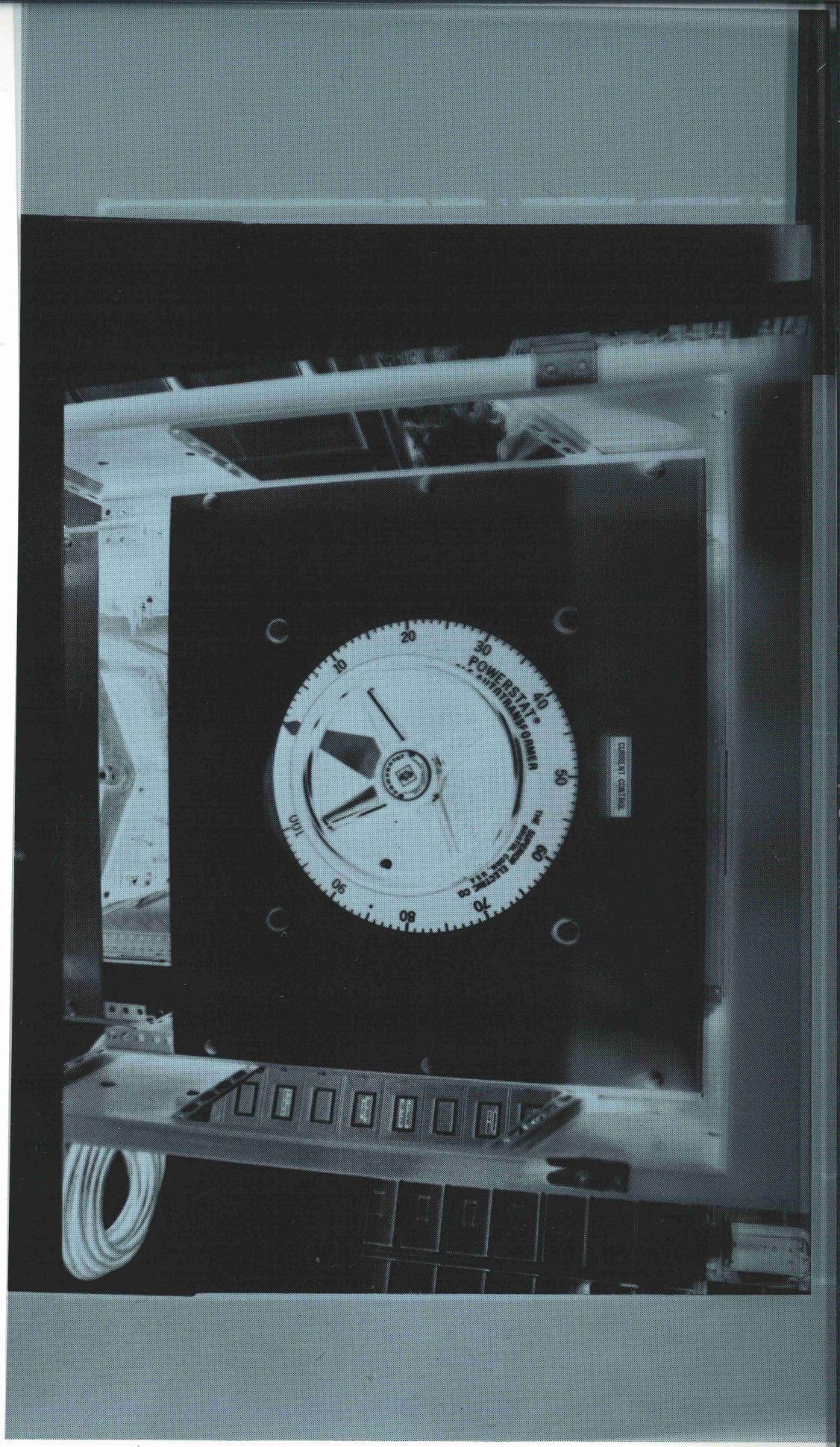
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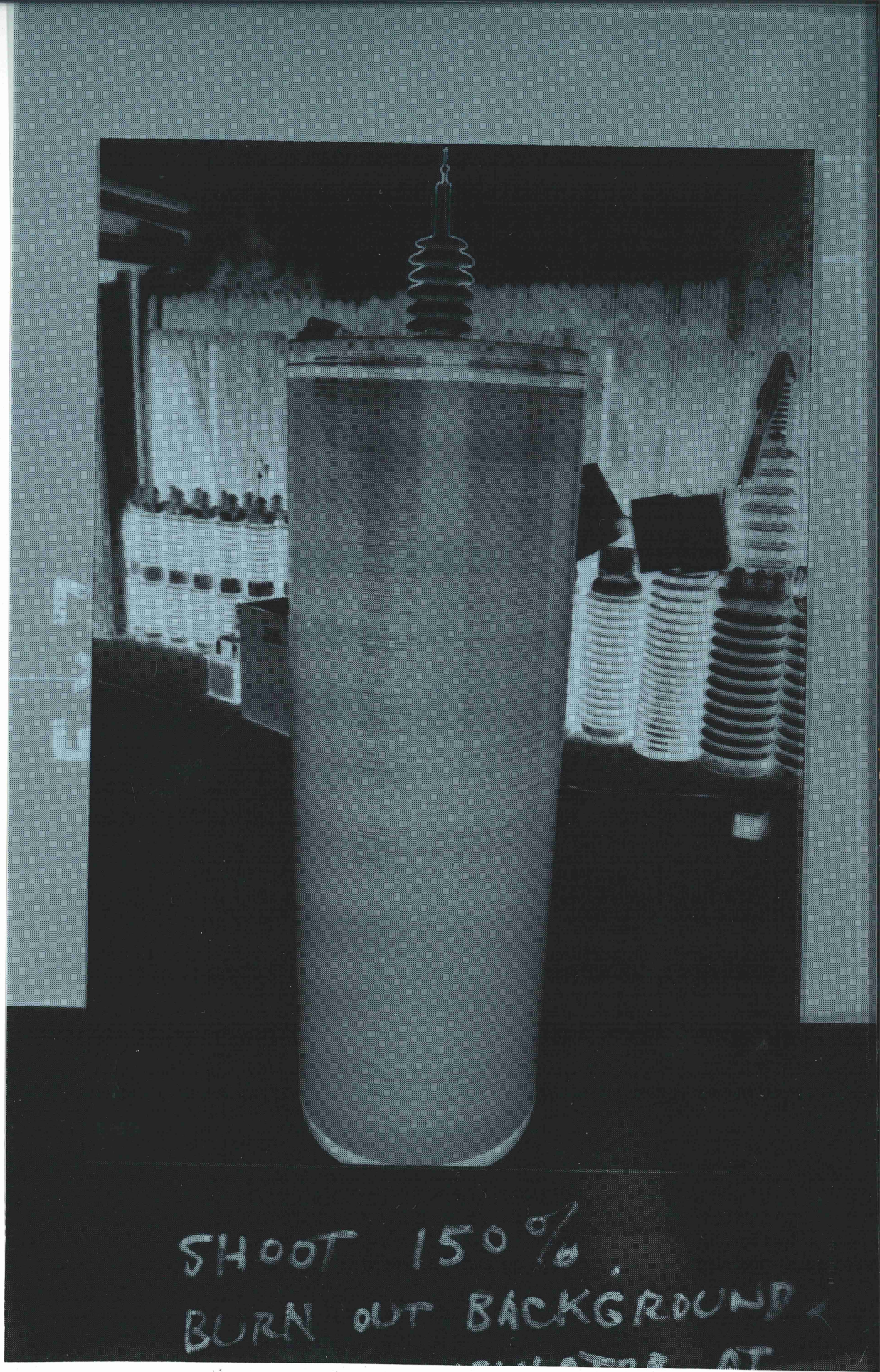
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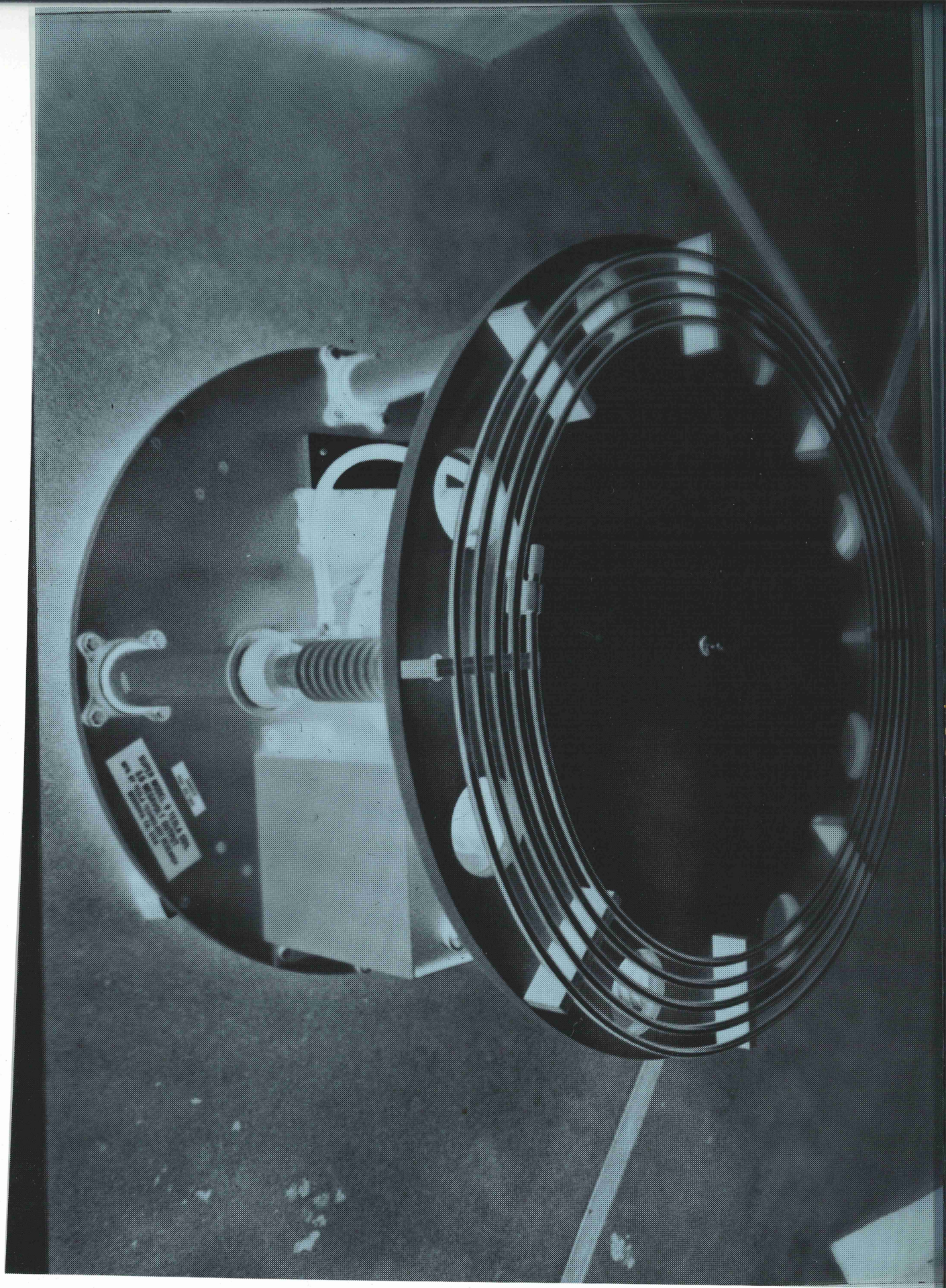
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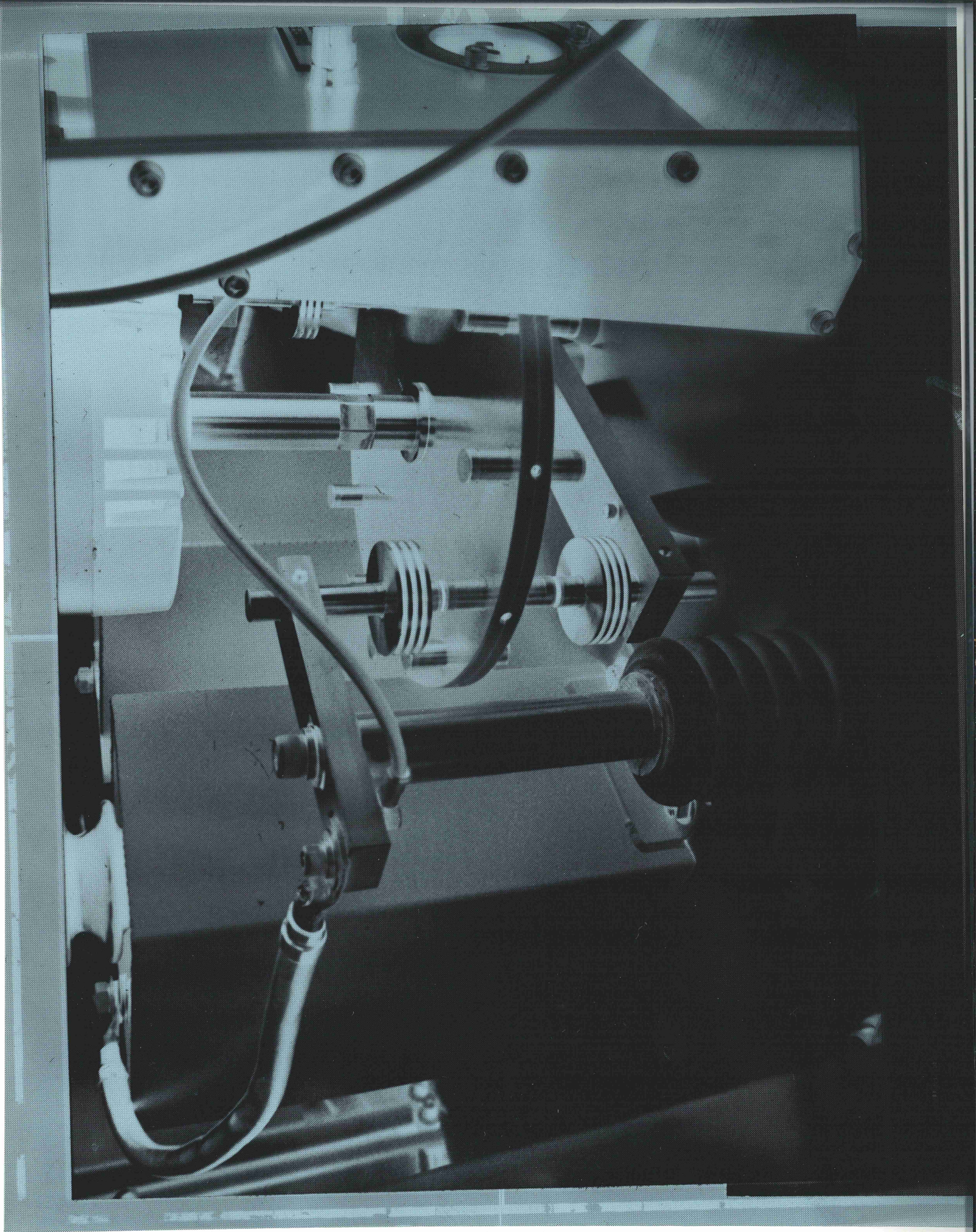
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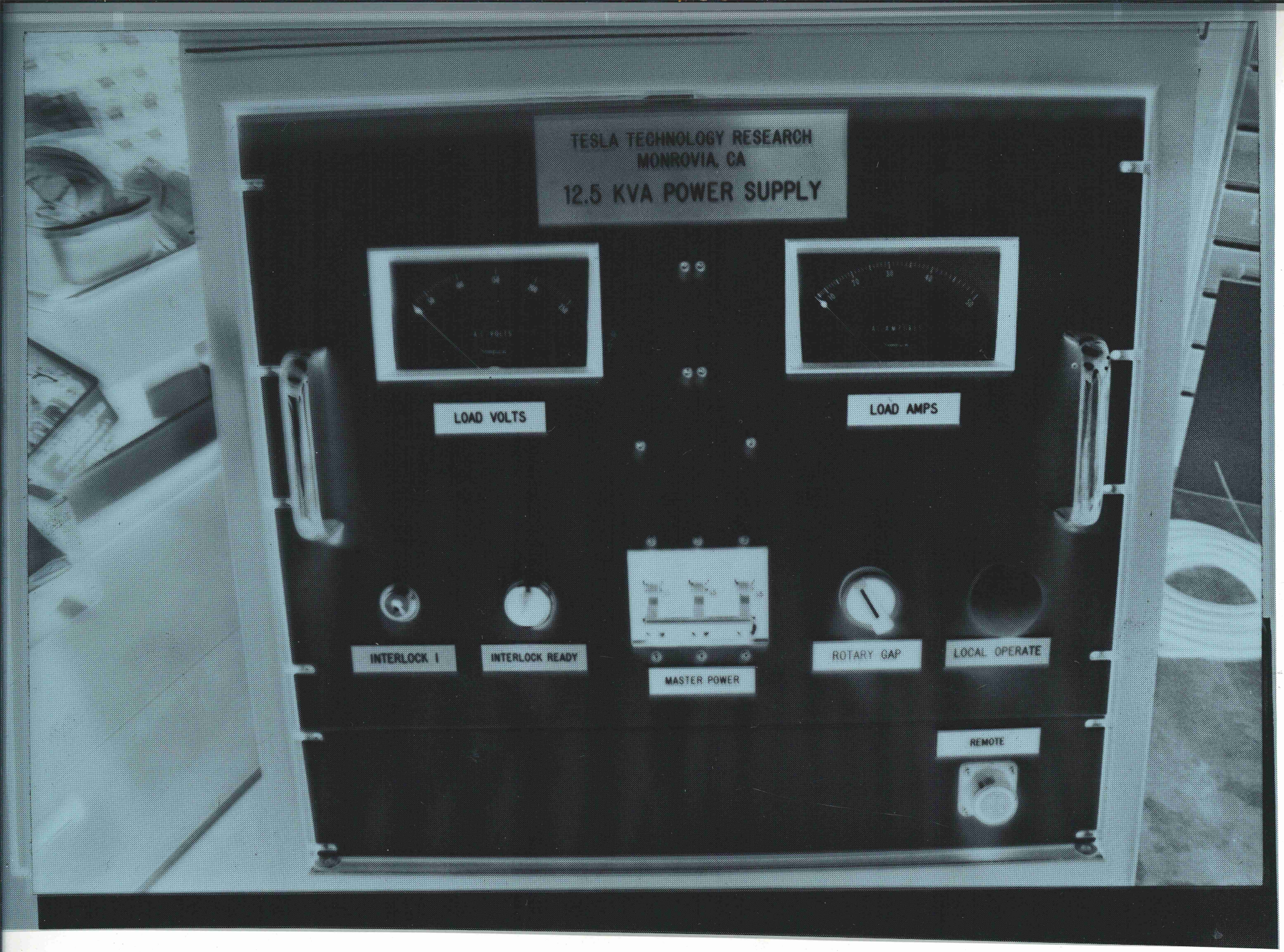
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SUPER MODEL NINE TESLA COIL SYSTEM

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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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UNPACKING INSTRUCTIONS

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 furter 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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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 reccomended 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 machanical 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 interconnet 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 ESSICIENTAL 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 labled "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. Initally, 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.

objects
capsd
capacitance

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OPERATING INSTRUCTIONS

Pictorial Description numbers six, seven and eight, show the operationg 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-SYNCRONOUS, TO 1500 R.P.M. SALIENT-POLE SYNCRONOUS OPERATION. A steady, even sound should be heard from the running of this motor, indicating syncronous 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 dishcarge 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.

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OPRERATING INSTRUCTIONS CONT'D

Try varing 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 sereral combination of settings, the best possible discharge will be secured from the toroid corona point, for a mimimum 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 REASERCH 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 then 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 stremer 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 perminent written log of all the adjustments made to this system, including maintenance operations. By mearly 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

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WARRENTY

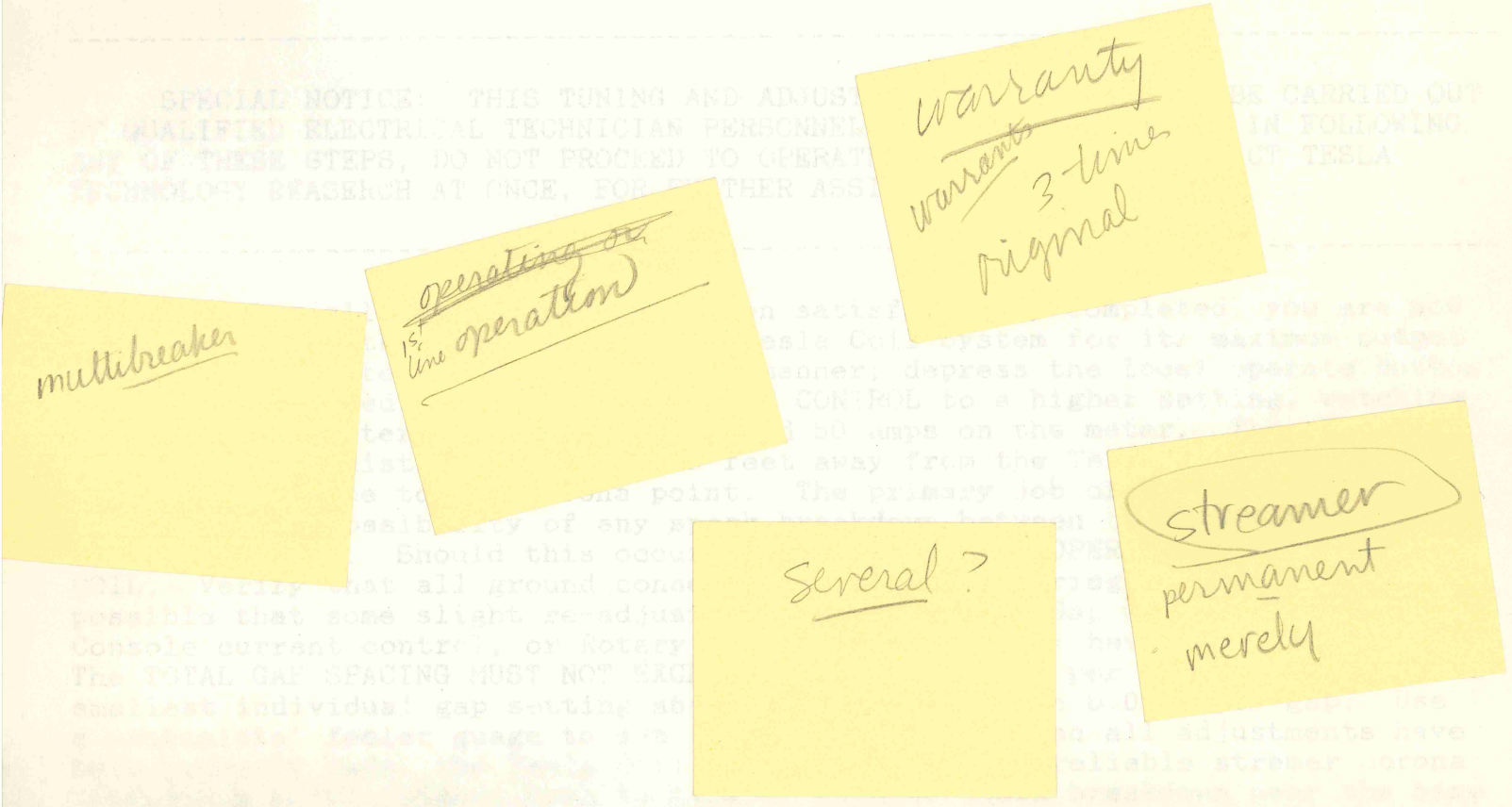
PLEASE READ CAREFULLY - THIS IS A LIMITED WARRENTY

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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.



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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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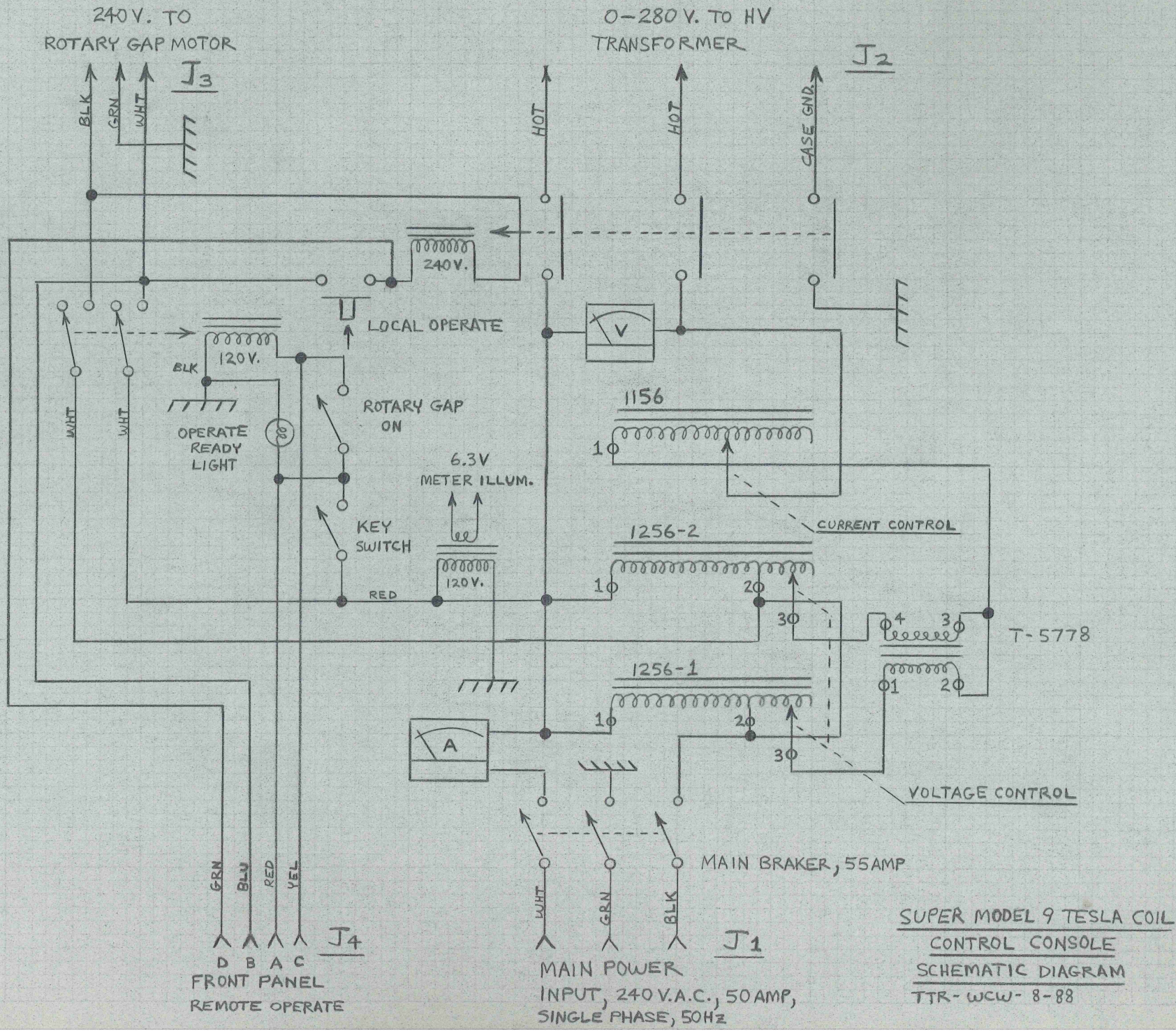
CONTROL CONSOLE ELECTRICAL SCHEMATIC

SUPER MODEL NINE TESLA COIL BASE UNIT ELECTRICAL SCHEMATIC

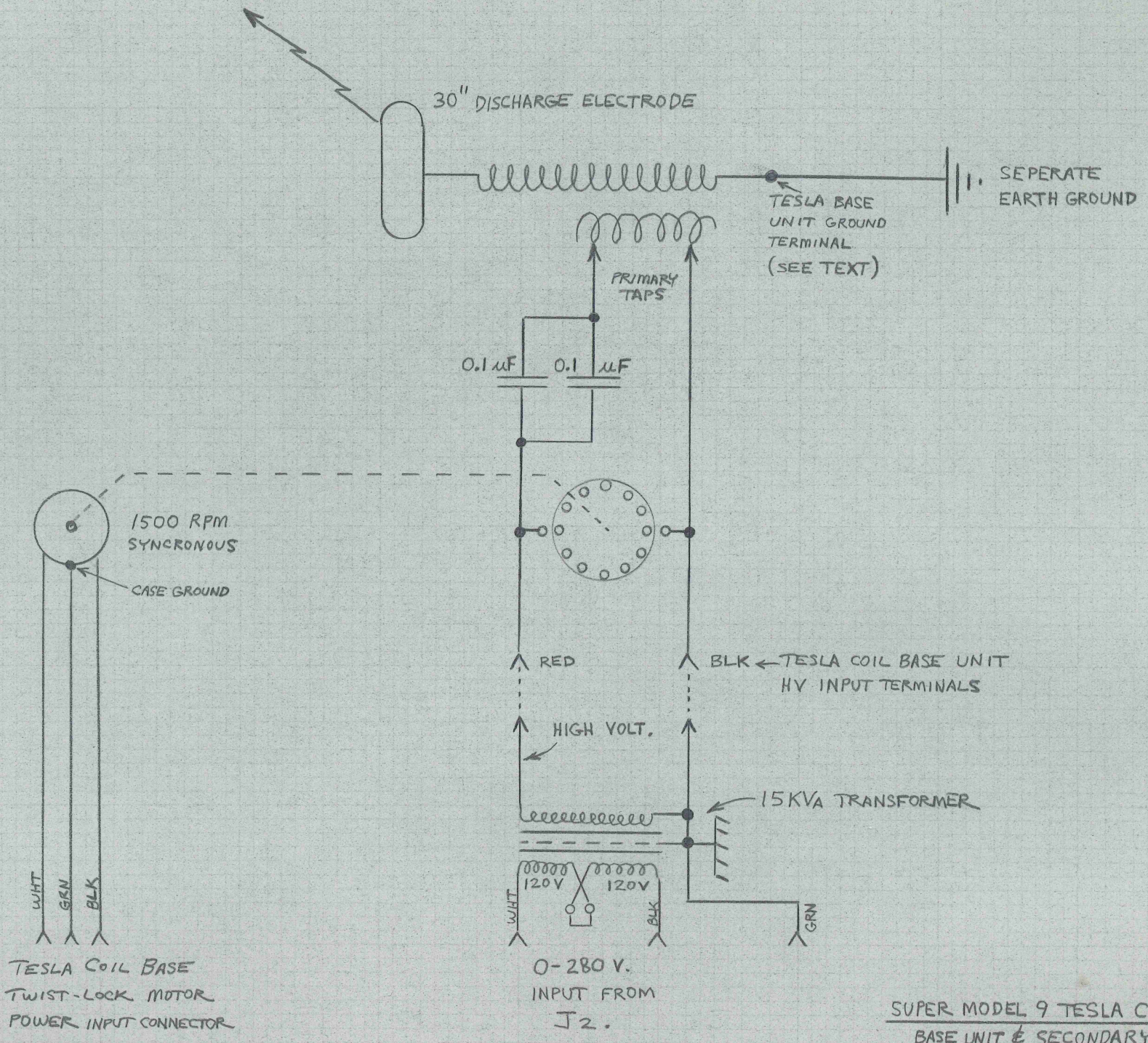
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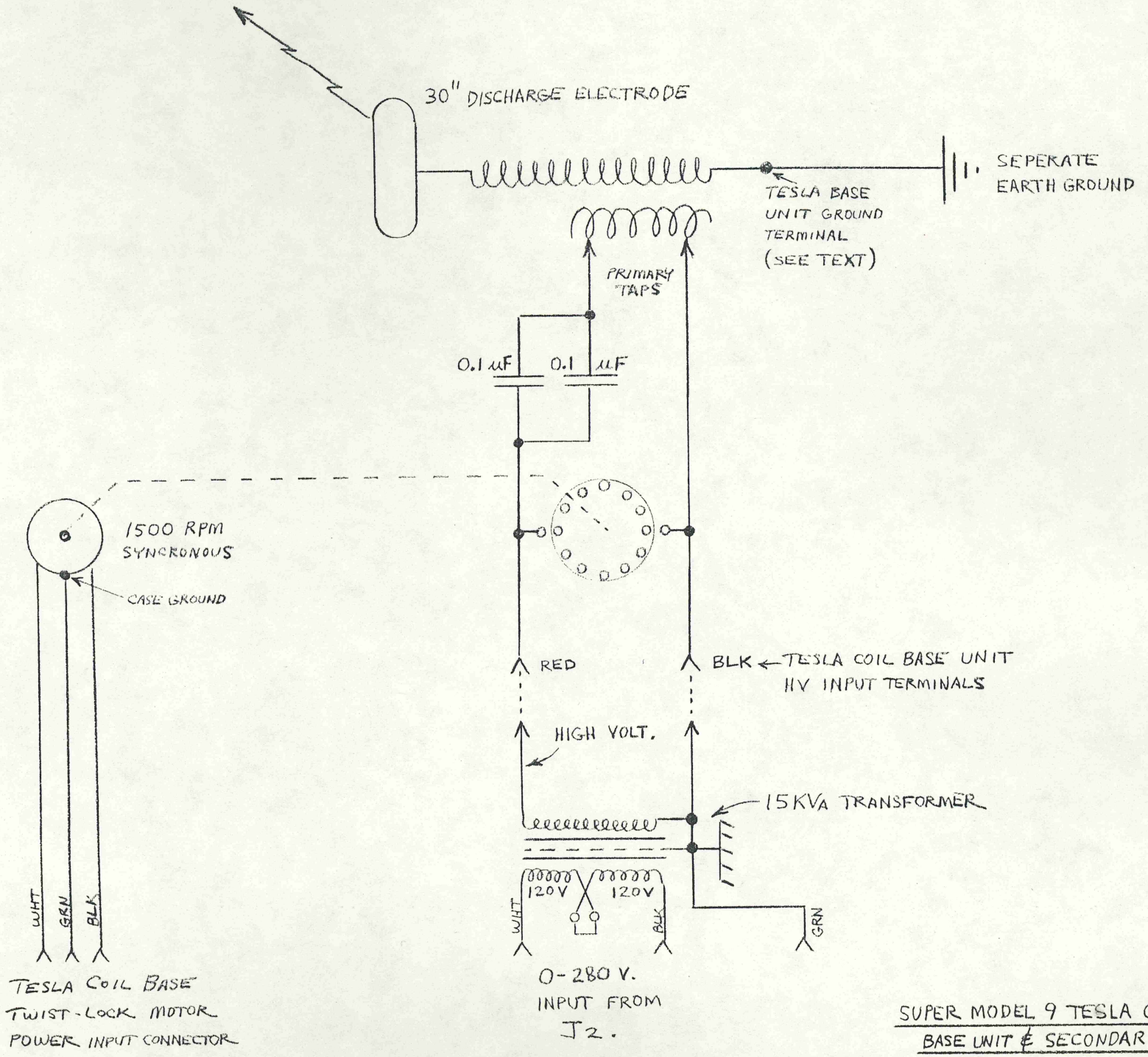


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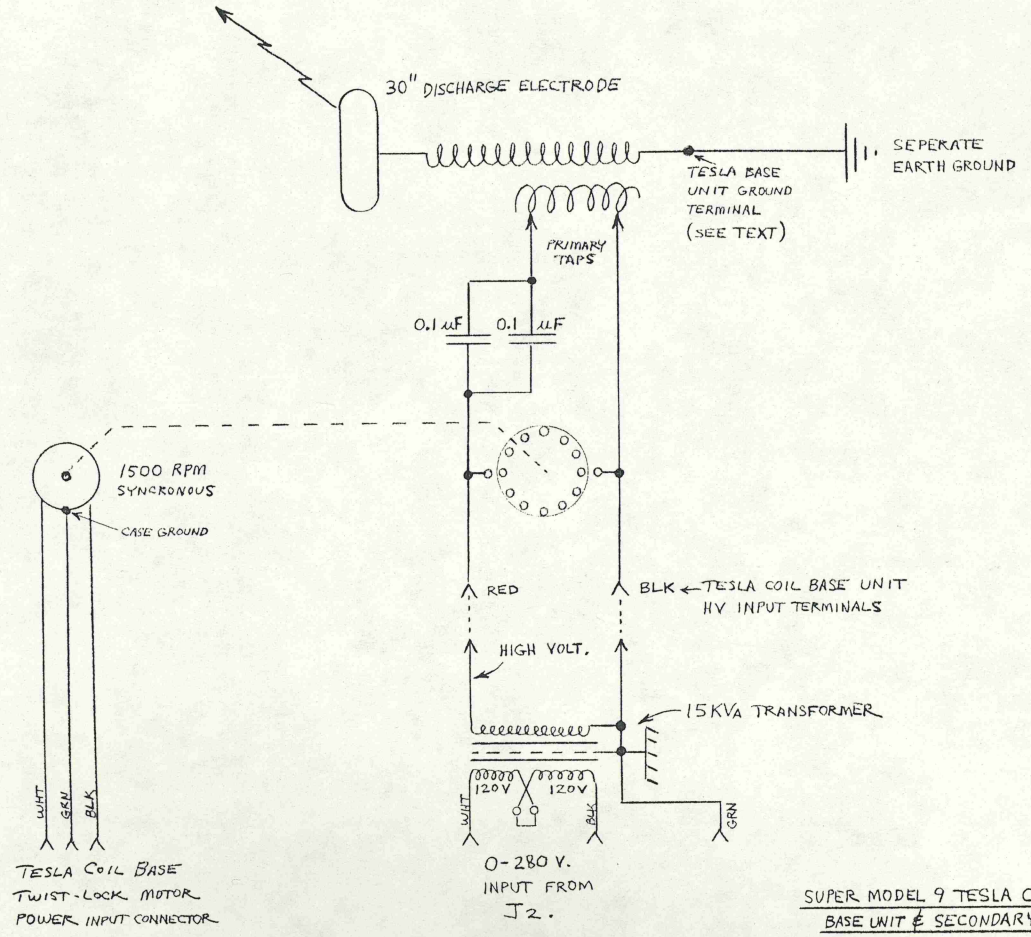
SUPER MODEL 9 TESLA COIL
BASE UNIT & SECONDARY COIL
SCHEMATIC DIAGRAM
TTR-WCW-8-88

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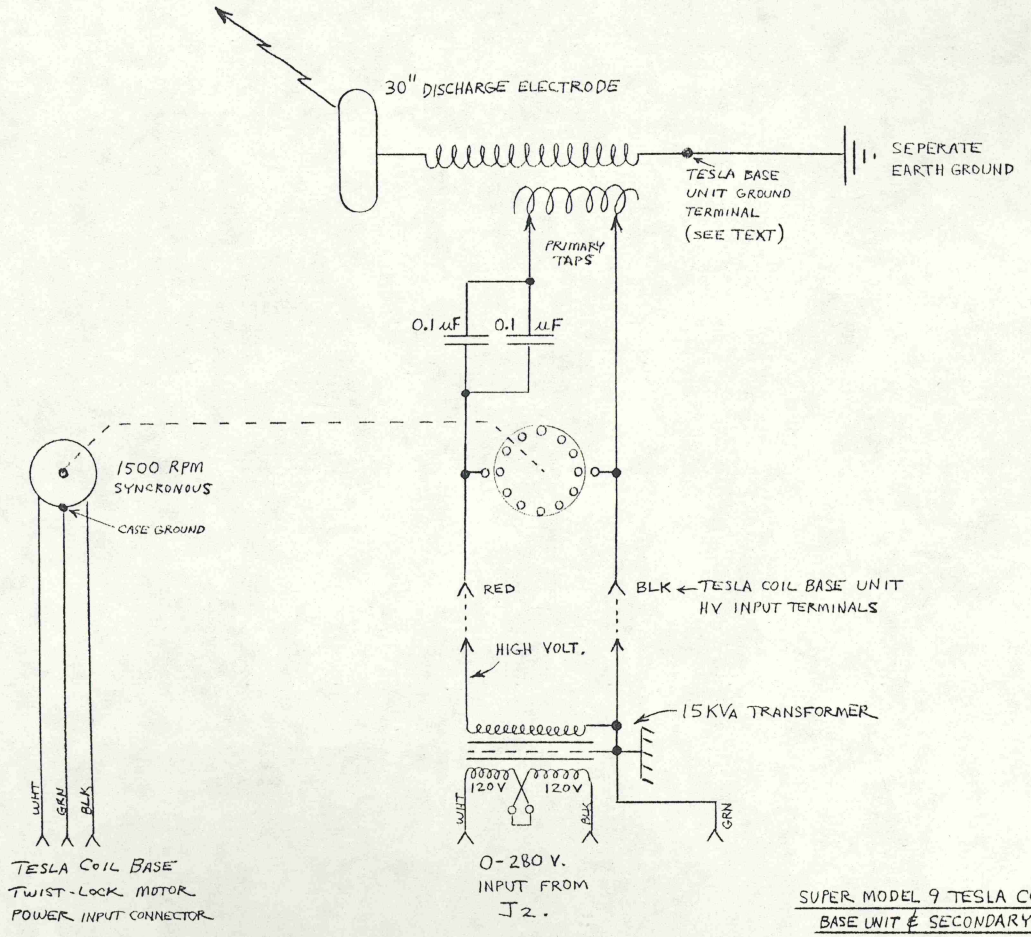
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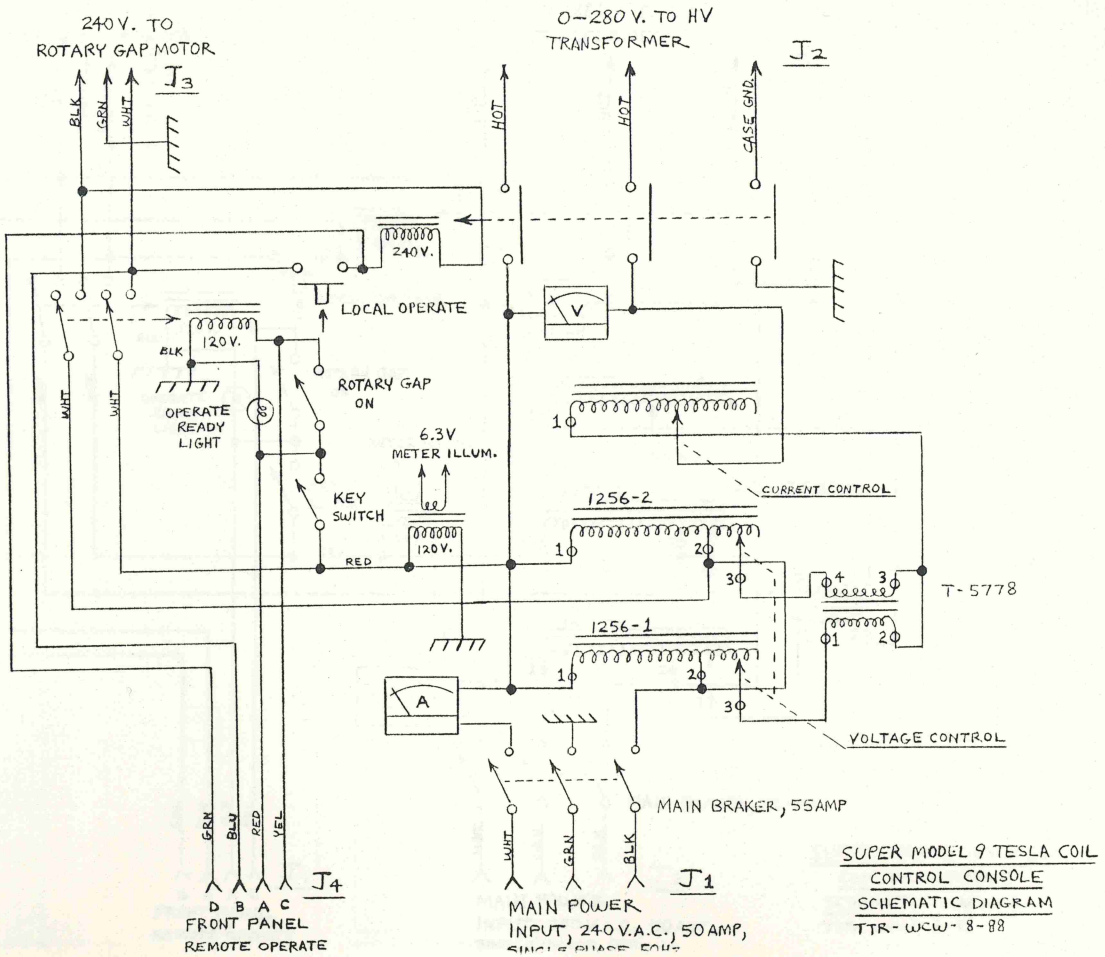
SUPER MODEL 9 TESLA COIL
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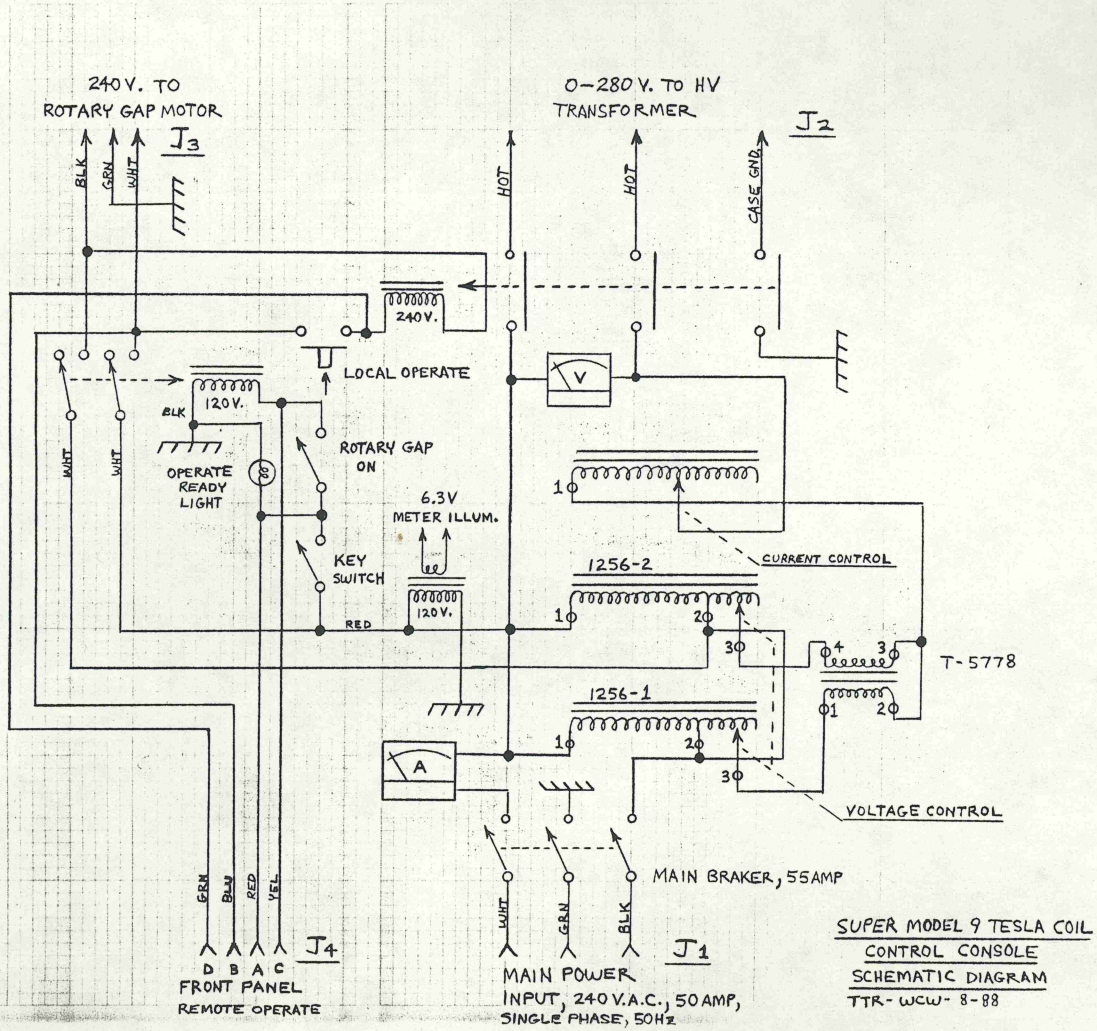


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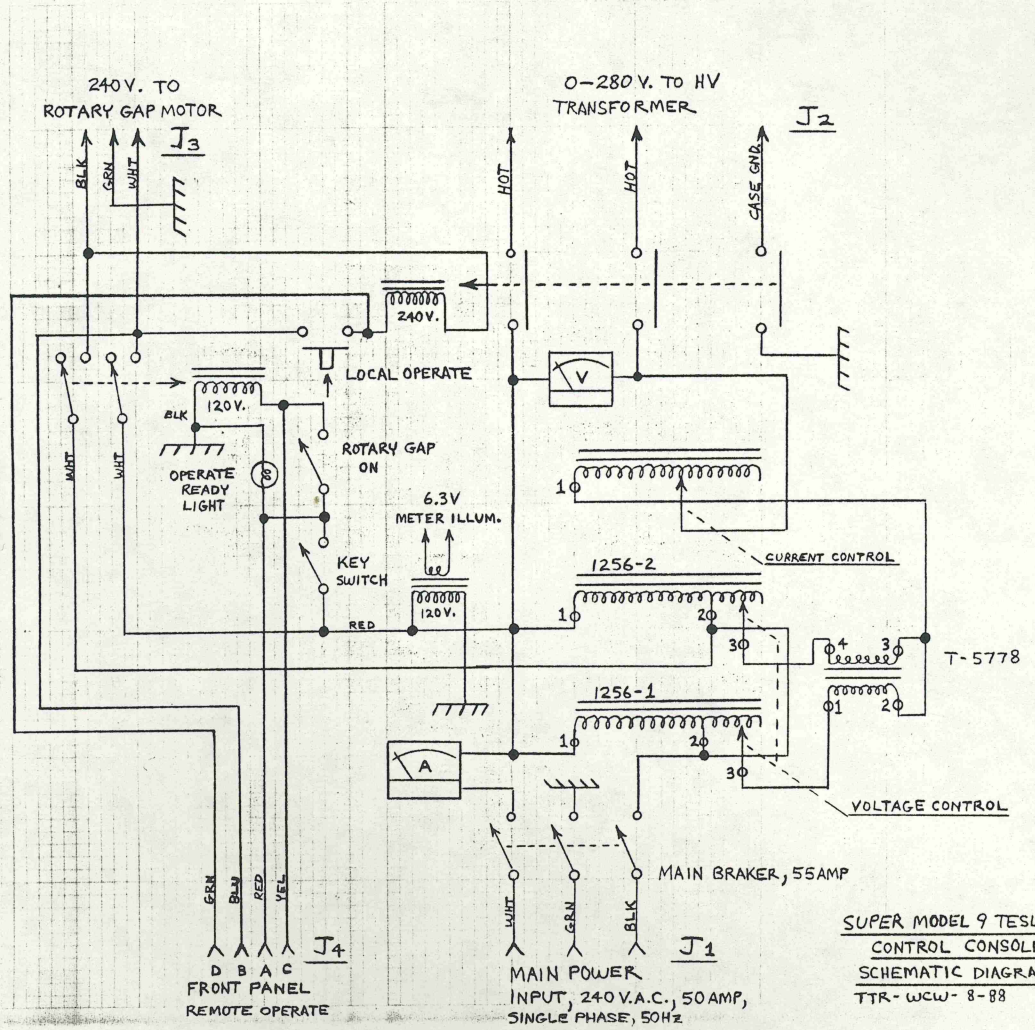


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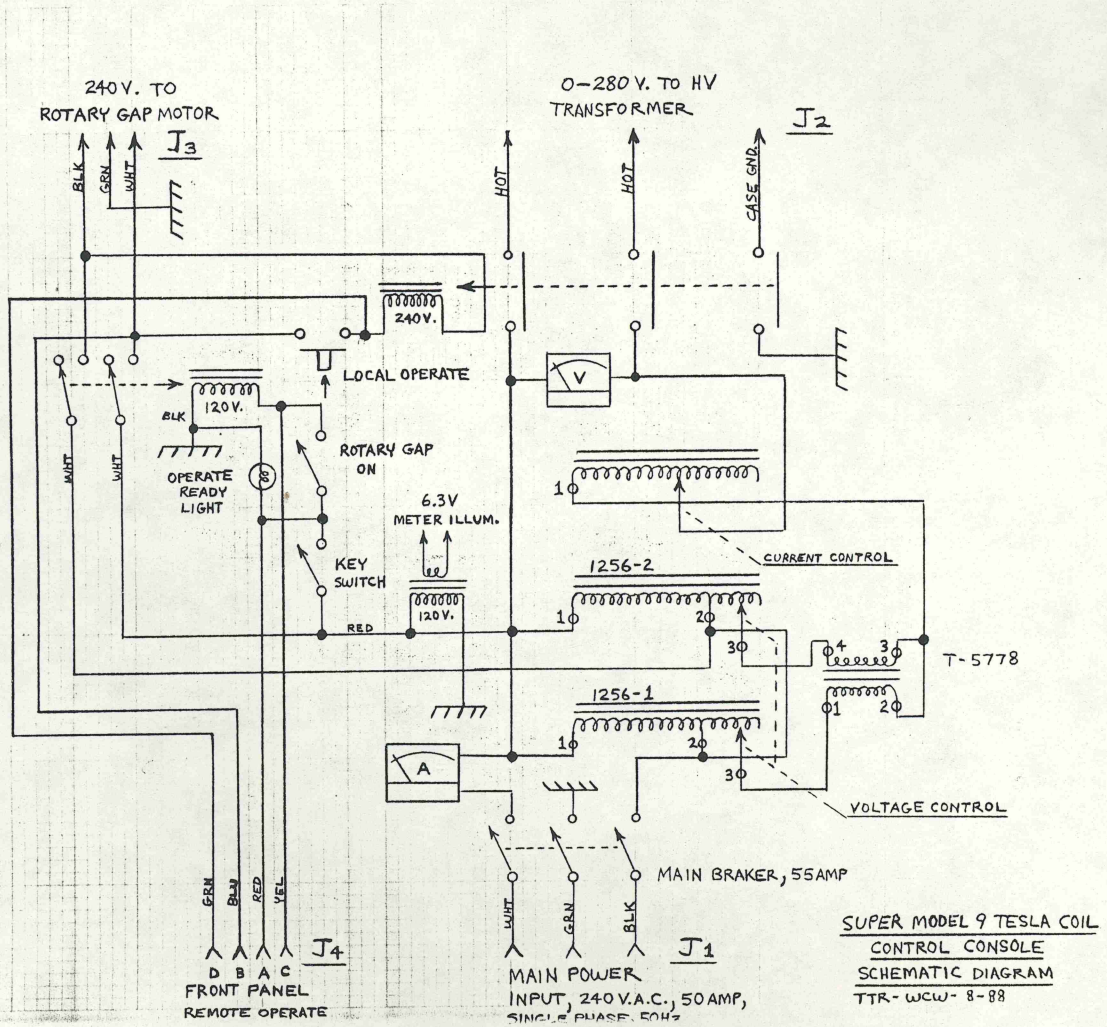
SUPER MODEL 9 TESLA COIL
CONTROL CONSOLE
SCHEMATIC DIAGRAM
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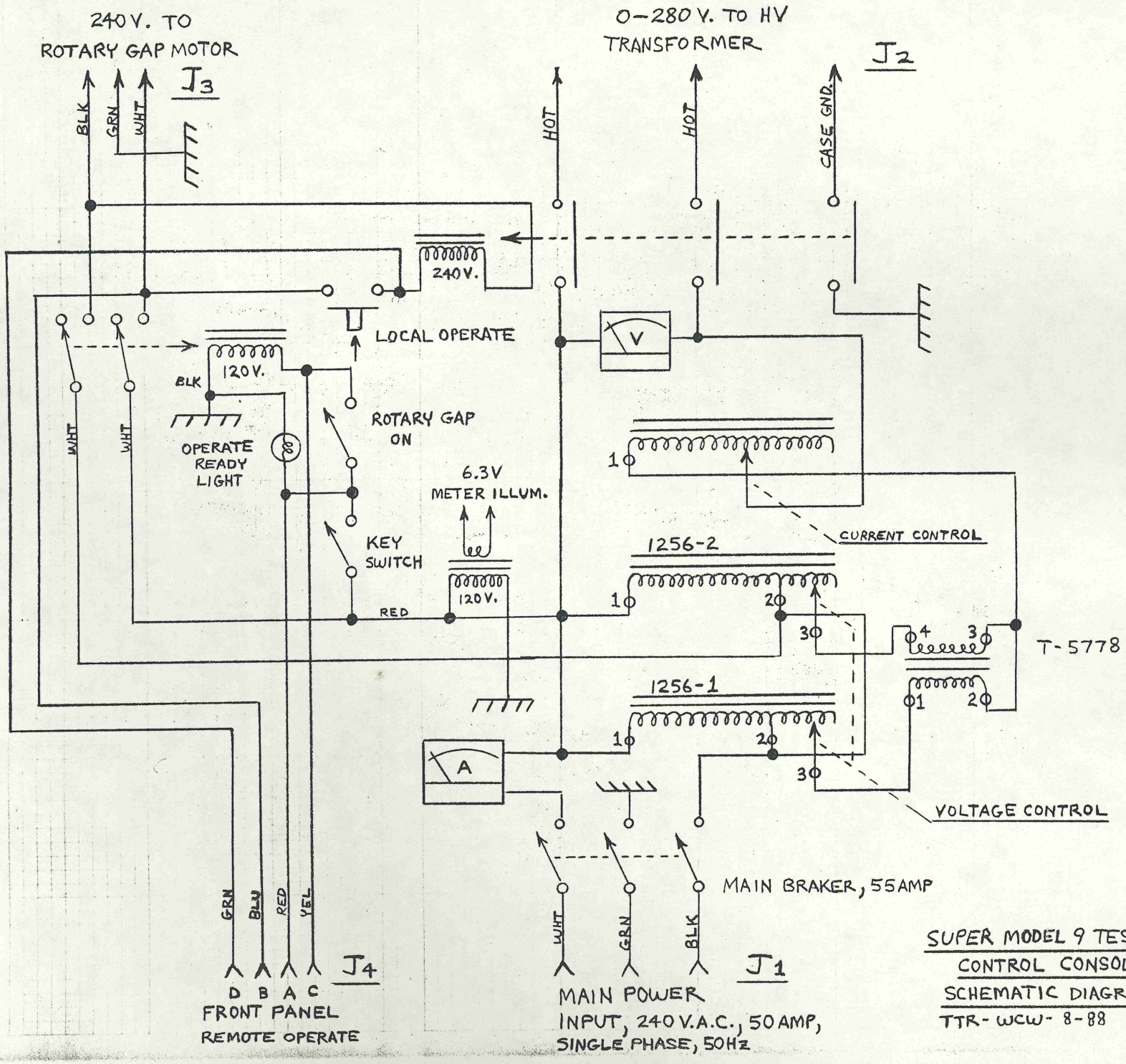
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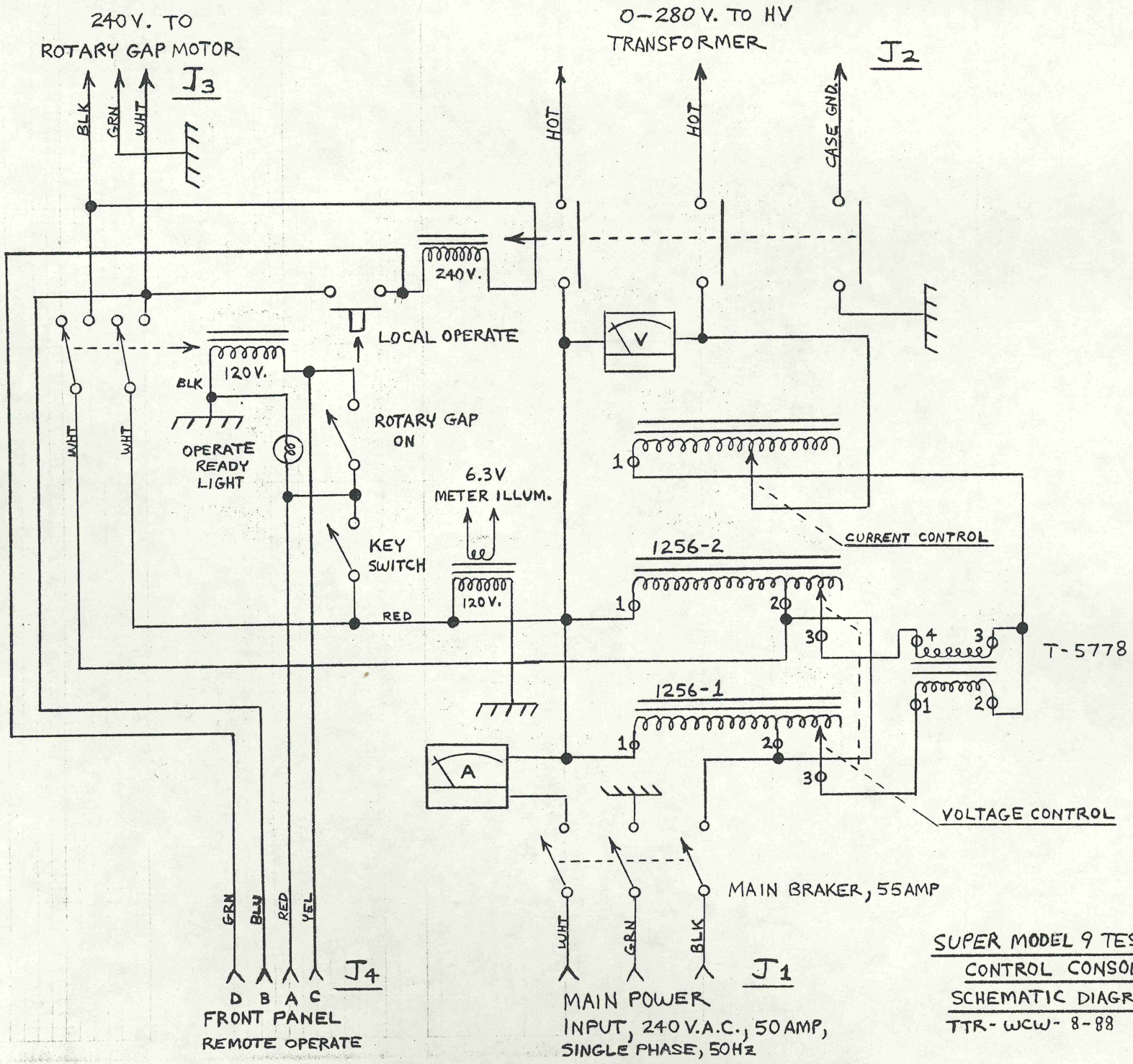


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CONTROL CONSOLE
SCHEMATIC DIAGRAM
TTR- WCW- 8-88

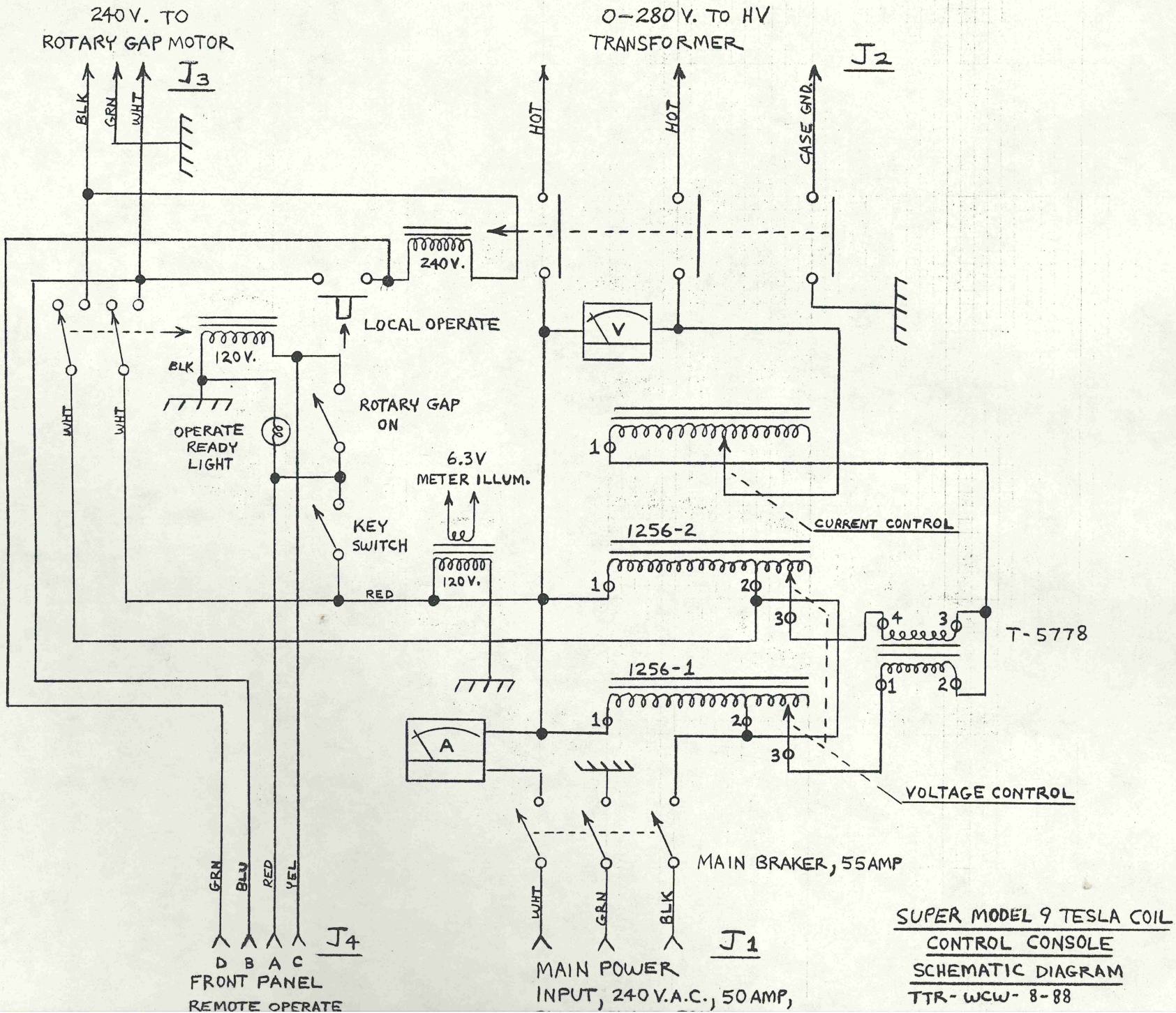
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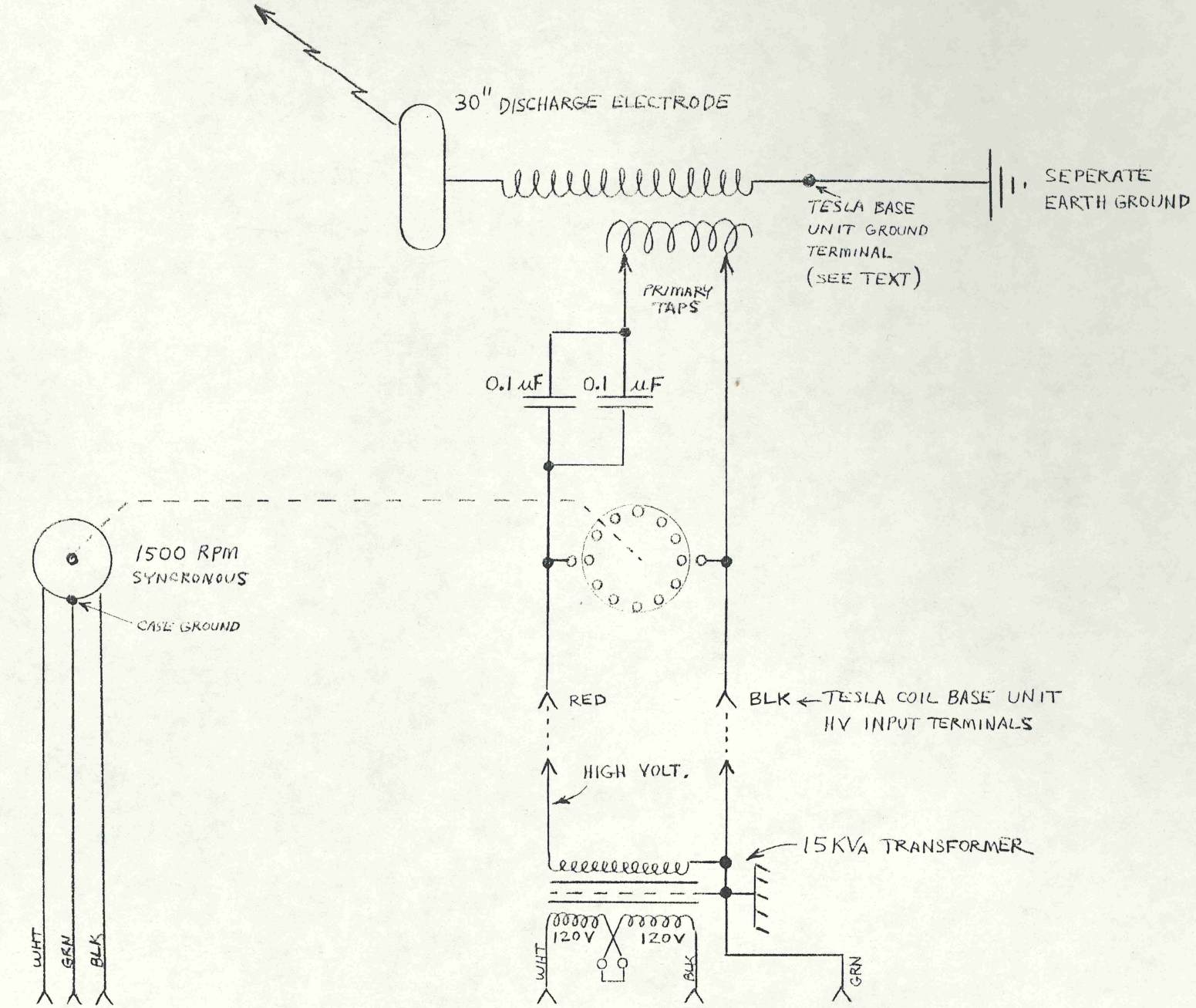
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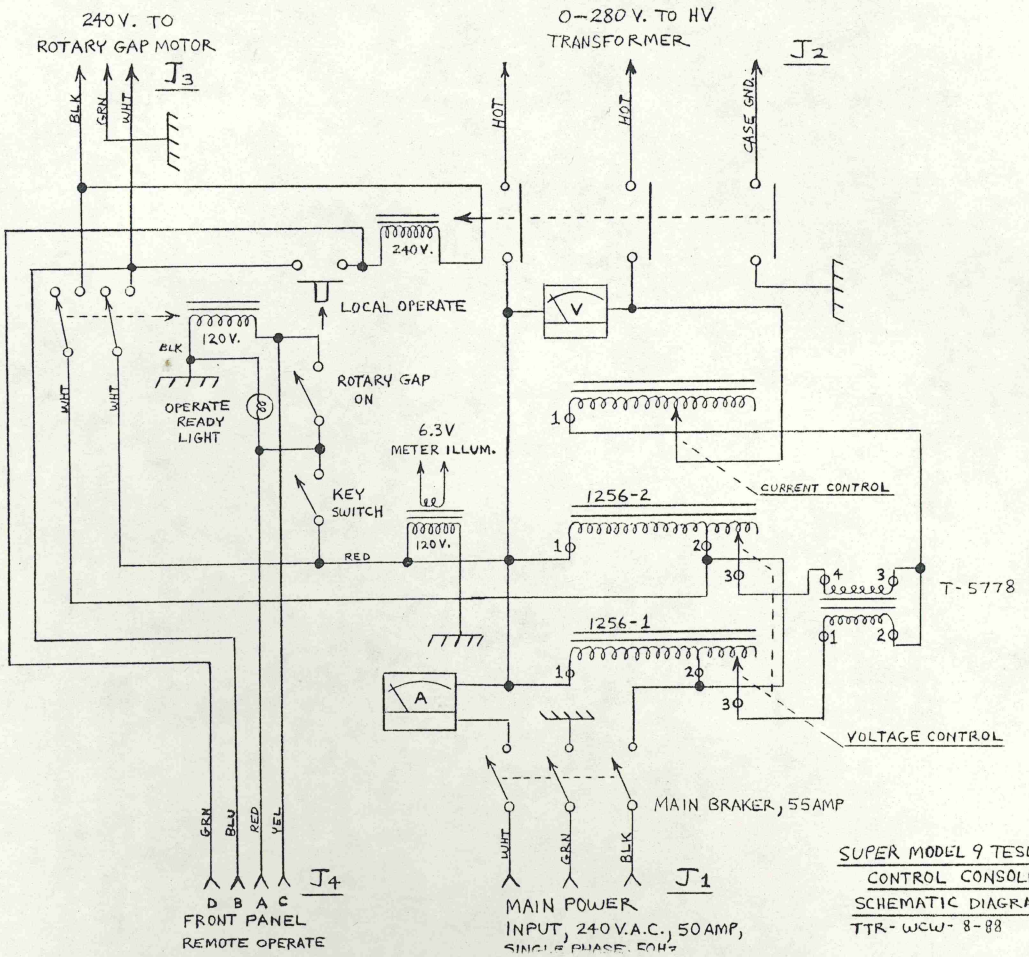


SUPER MODEL 9 TESLA COIL

BASE UNIT & SECONDARY COIL

SCHEMATIC DIAGRAM

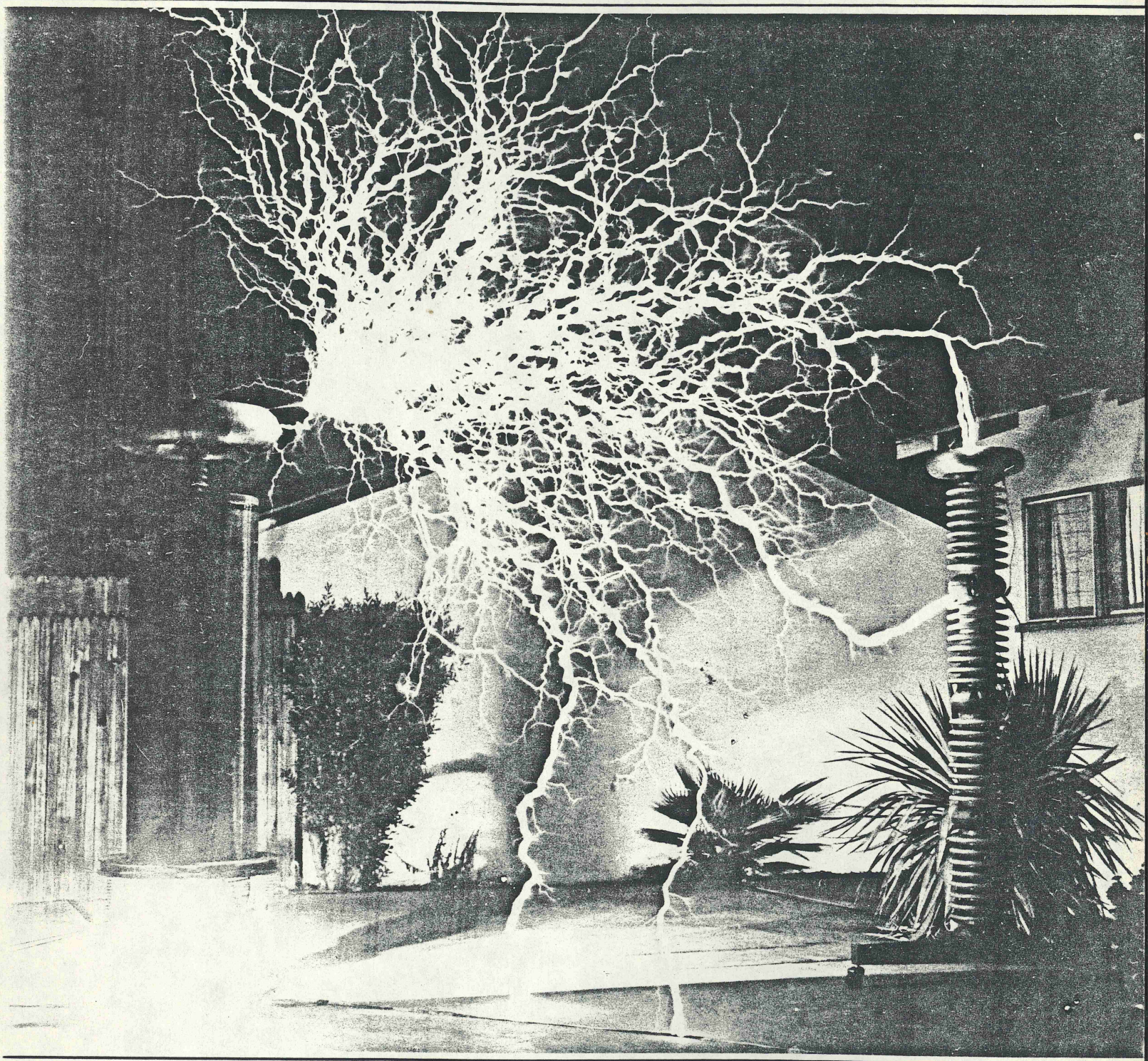
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SUPER MODEL 9 TESLA COIL
CONTROL CONSOLE
SCHEMATIC DIAGRAM
TTR-WCW-8-88

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SUPER MODEL NINE TESLA COIL SYSTEM



OWNER'S MANUAL

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SUPER MODEL NINE TESLA COIL SYSTEM

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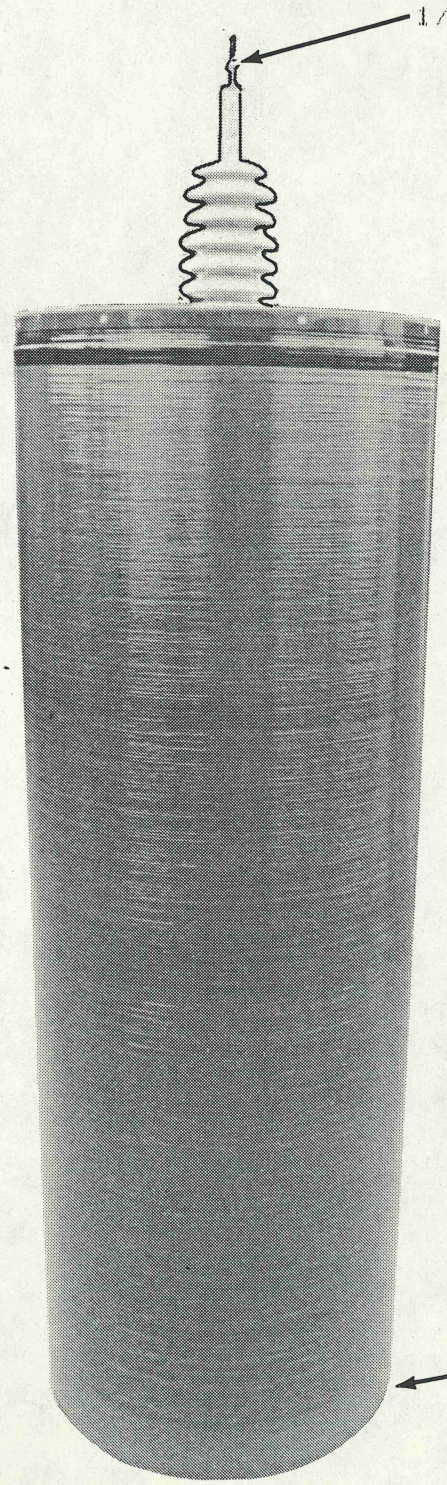
WARNING: READ ALL INSTRUCTIONS BEFORE ATTEMPTING ANY OPERATION OF THE SUPER MODEL NINE TESLA COIL SYSTEM. THIS EQUIPMENT IS EASILY CAPABLE OF DELIVERING A LETHAL ELECTRIC SHOCK.

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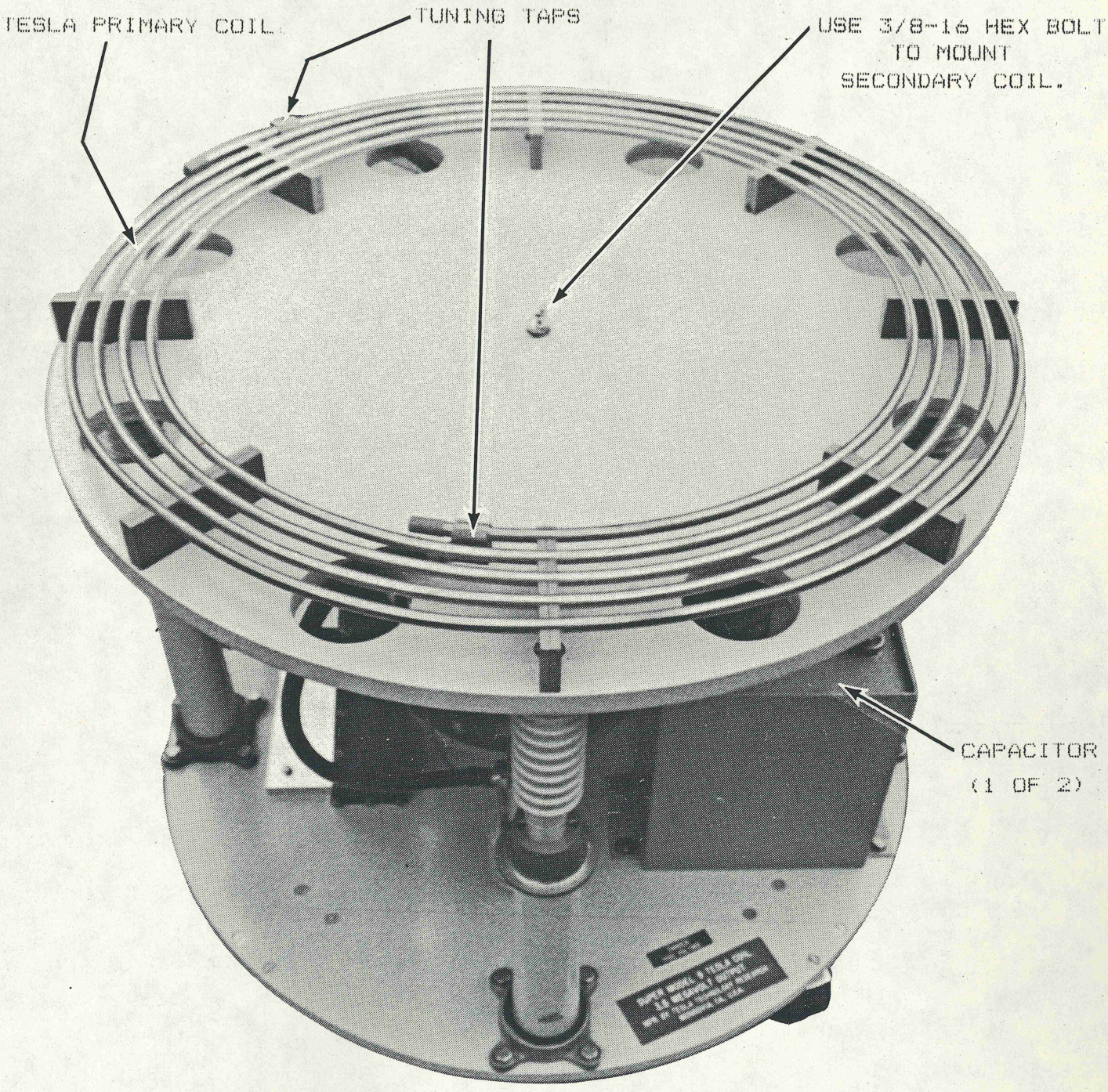
1. PICTORIAL DESCRIPTION - TESLA SECONDARY COIL



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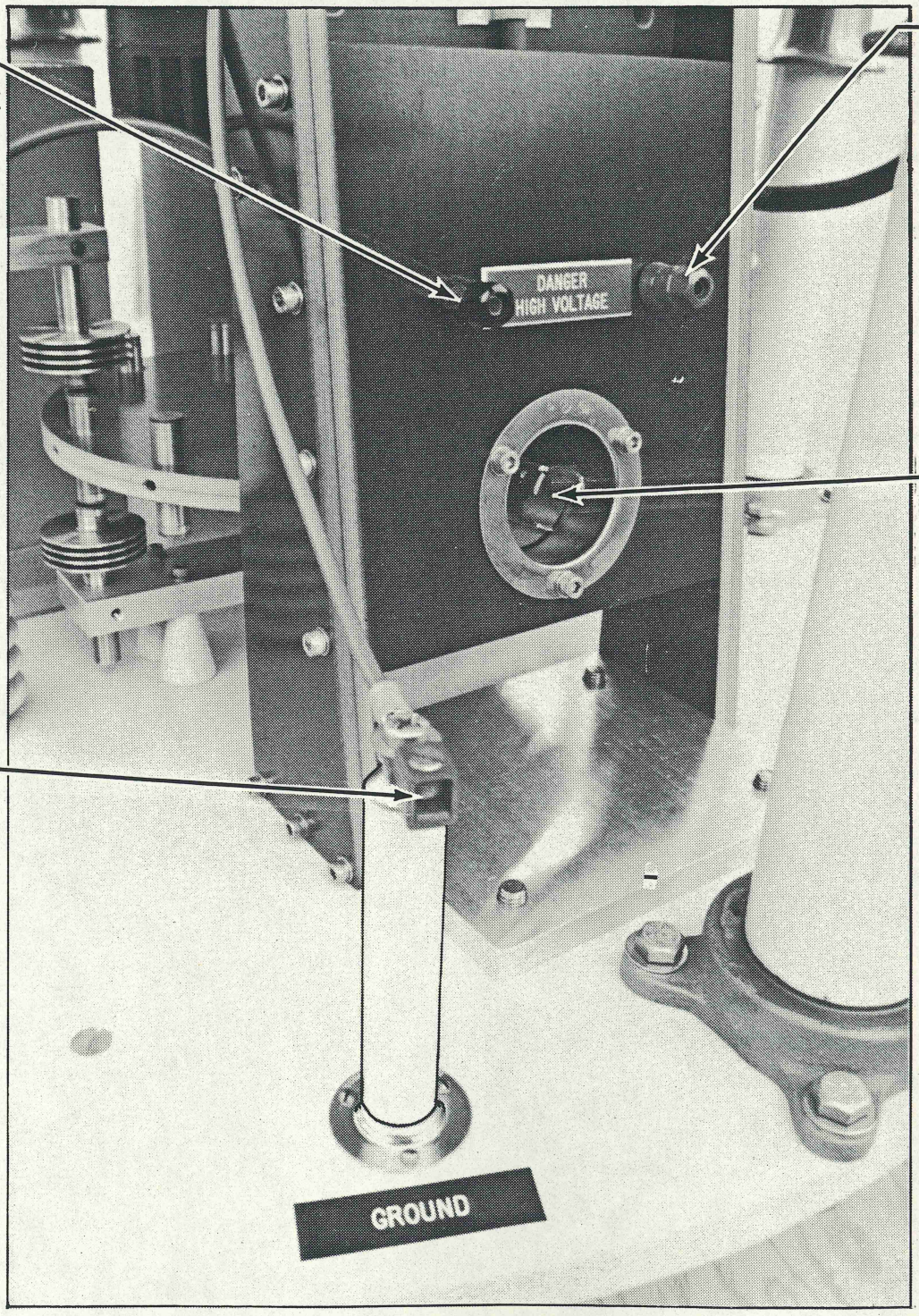
2. PICTORIAL DESCRIPTION - TESLA PRIMARY BASE UNIT



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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.

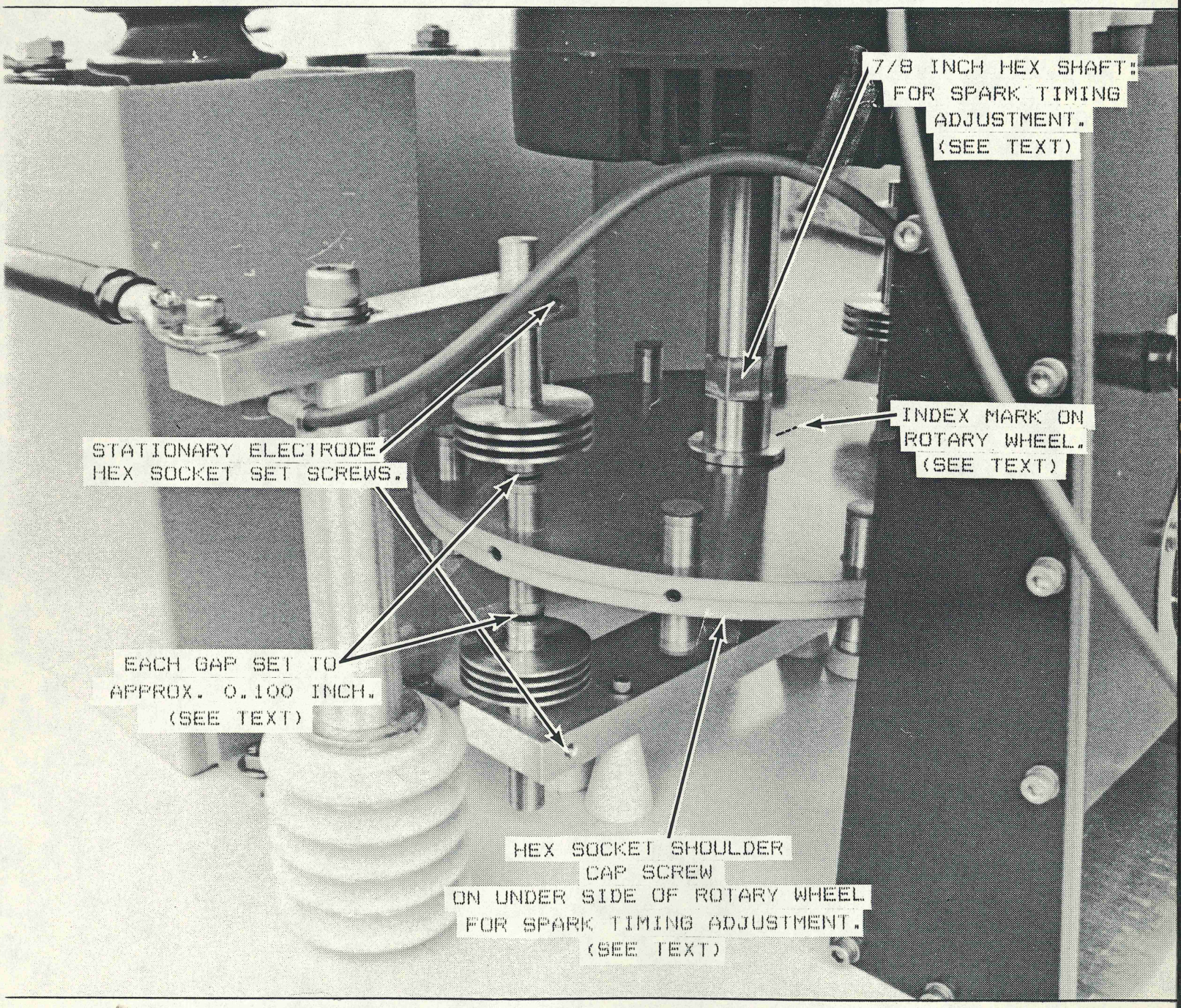
THIS TERMINAL MUST GO TO SEPERATE EARTH GROUND.

(SEE TEXT)

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4. PICTORIAL DESCRIPTION - BASE UNIT ROTARY GAP ASSEMBLY



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5. PICTORIAL DESCRIPTION - CONTROL CONSOLE OPERATING PANEL

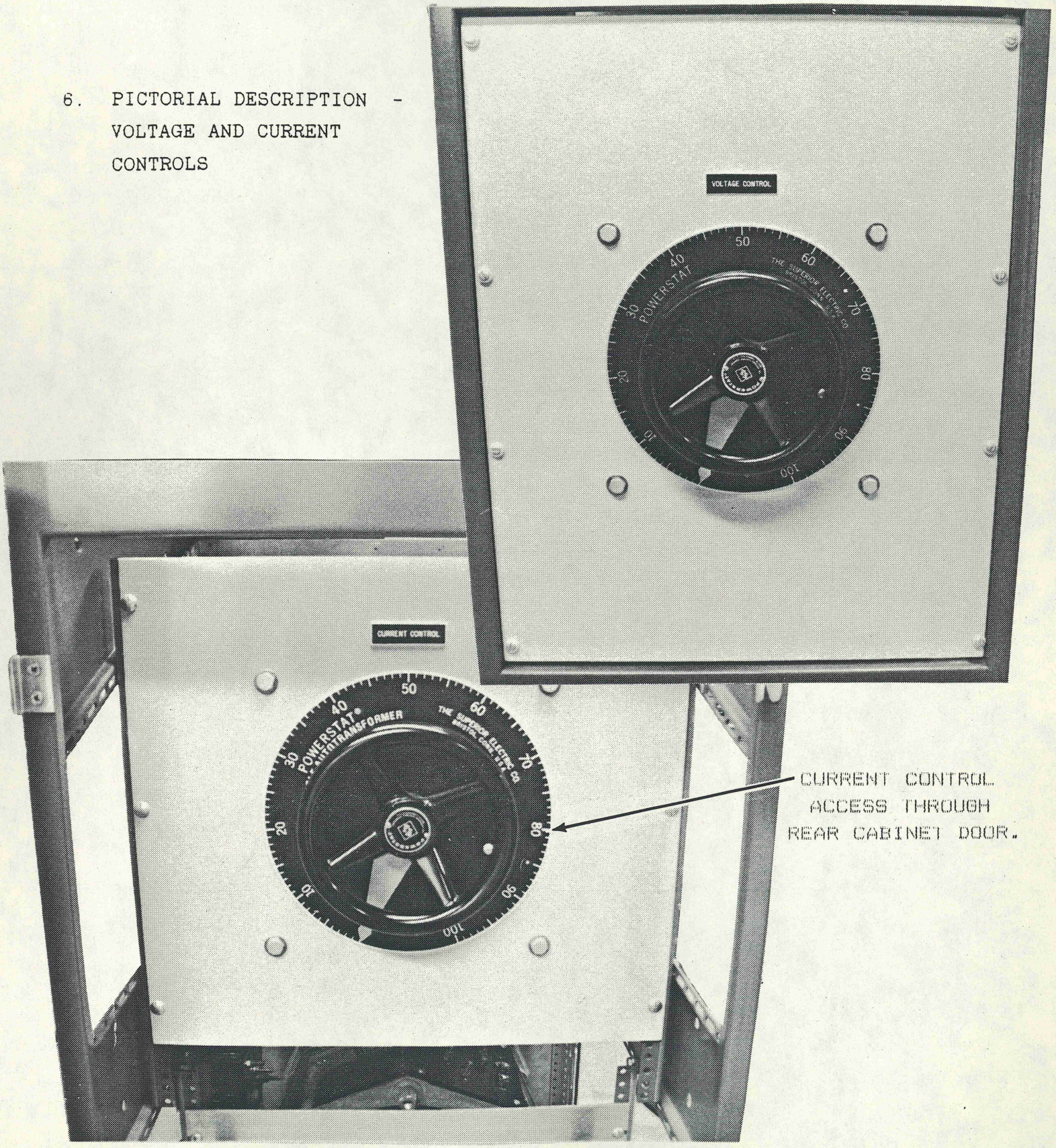


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6. PICTORIAL DESCRIPTION - VOLTAGE AND CURRENT CONTROLS



CURRENT CONTROL ACCESS THROUGH REAR CABINET DOOR.

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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 furter 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 reccomended 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 machanical 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 interconnet 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 labled "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. Initally, 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-SYNCRONOUS, TO 1500 R.P.M. SALIENT-POLE SYNCRONOUS OPERATION. A steady, even sound should be heard from the running of this motor, indicating syncronous 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 dishcarge 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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OPRERATING 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 mimimum 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 REASERCH 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 then 0.050" per gap. Use a machinist's 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 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 mimimum 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 ware 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 seperate 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 guage, re-gap each of the four stationary electrodes to the origional 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 debries 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.

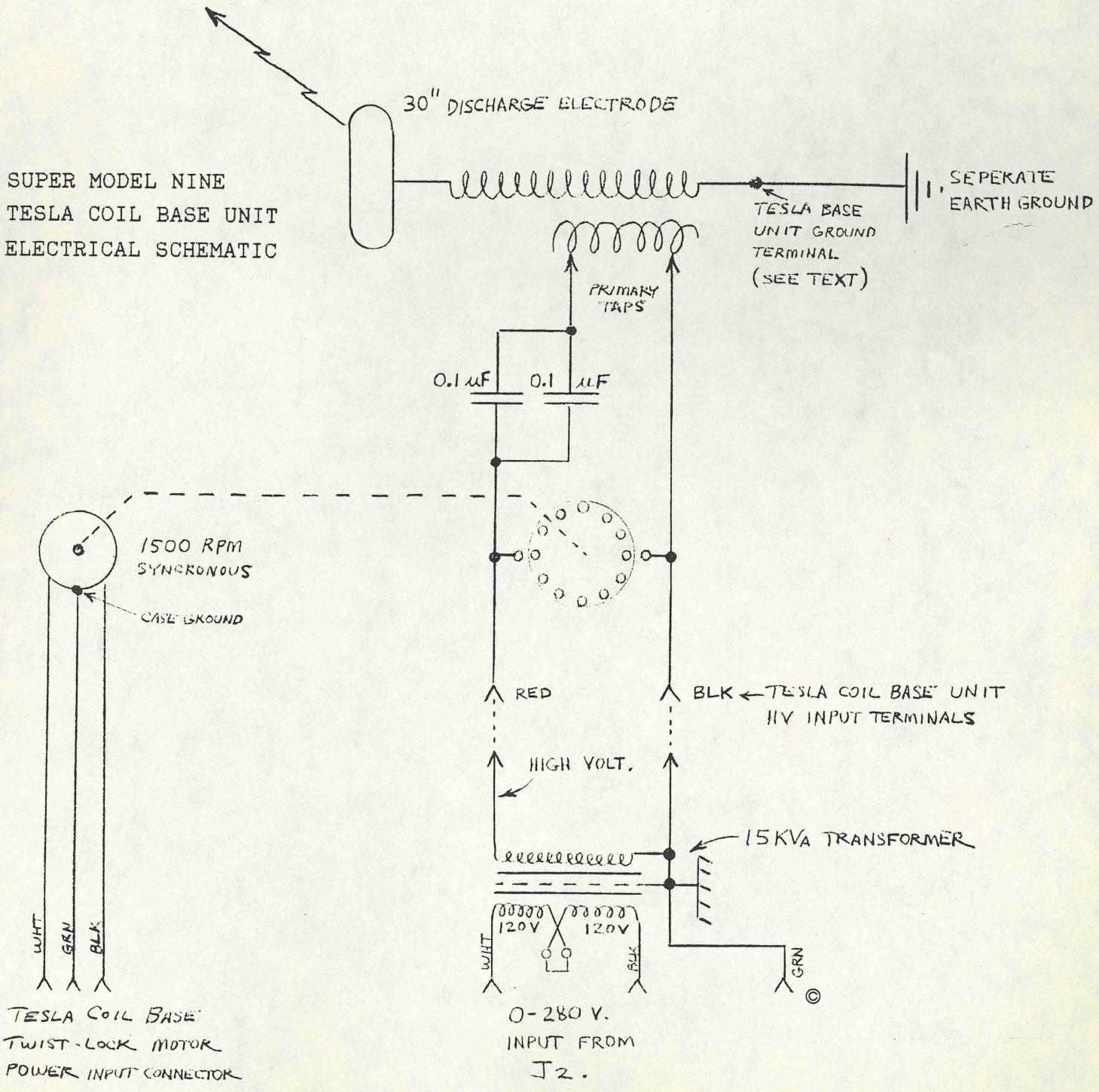
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11. POWER REQUIREMENTS AND SCHEMATIC DIAGRAMS

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

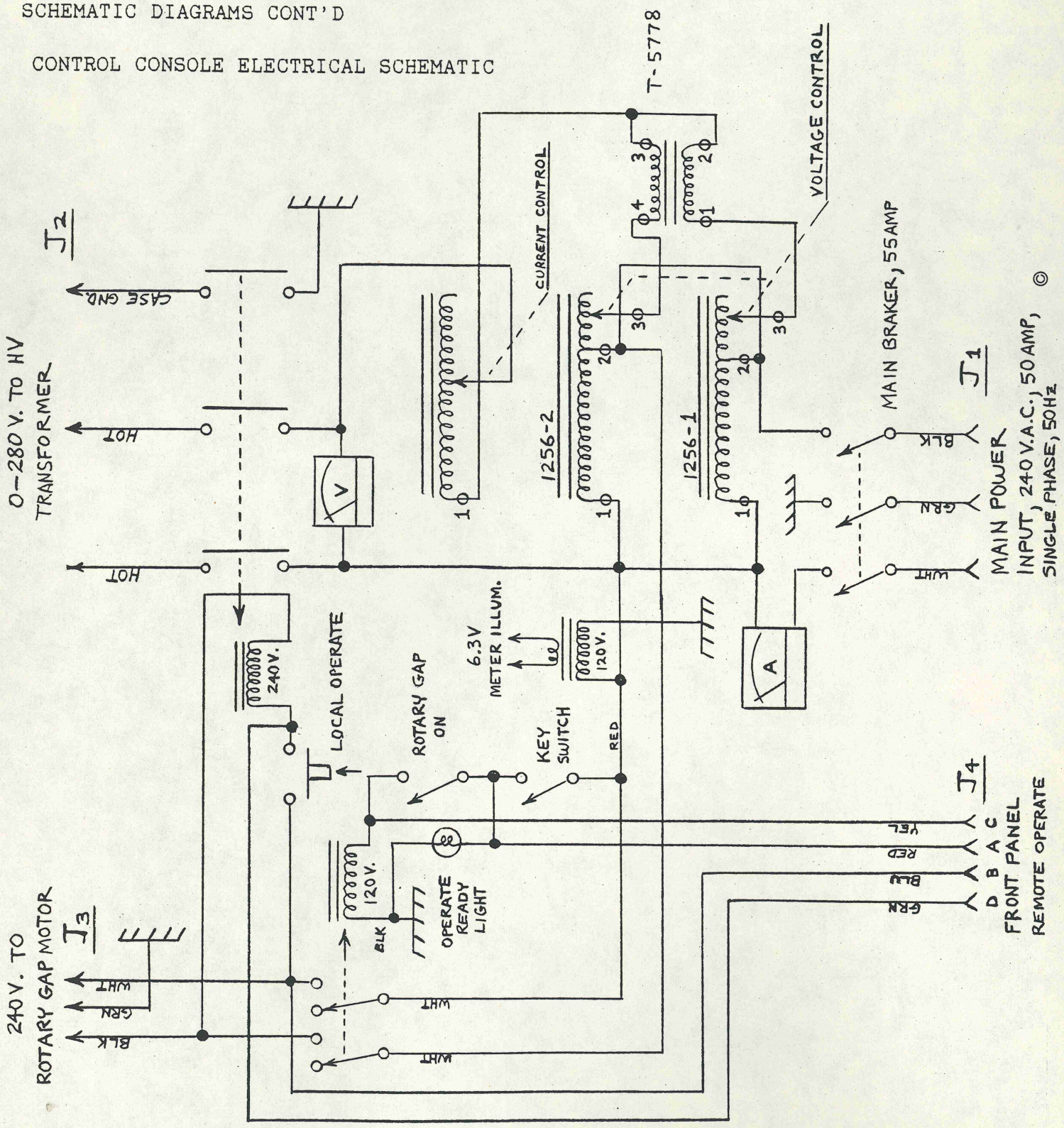
Power input: 208-240 V.A.C., 50 Hz. single phase, 35-50 amps nominal.
Output: 3,500,000 volts (3.5 MV) maximum, 80-95 KHz.



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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 origional 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.

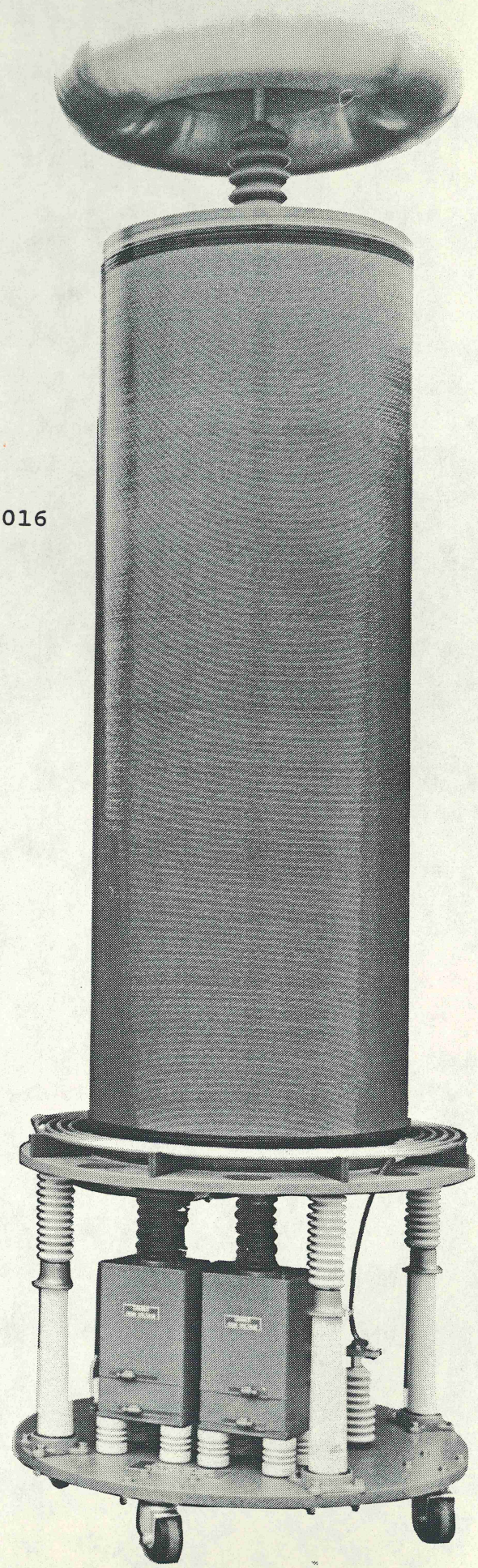
It is understood that a LETHAL ELECTRIC SHOCK HAZARD exists in the components of the Super Model Nine Tesla Coil System, and that the customer assumes all necessary installation and operation safety requirements of this system. Technical supervision assistance is available from Tesla Technology Research.

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.

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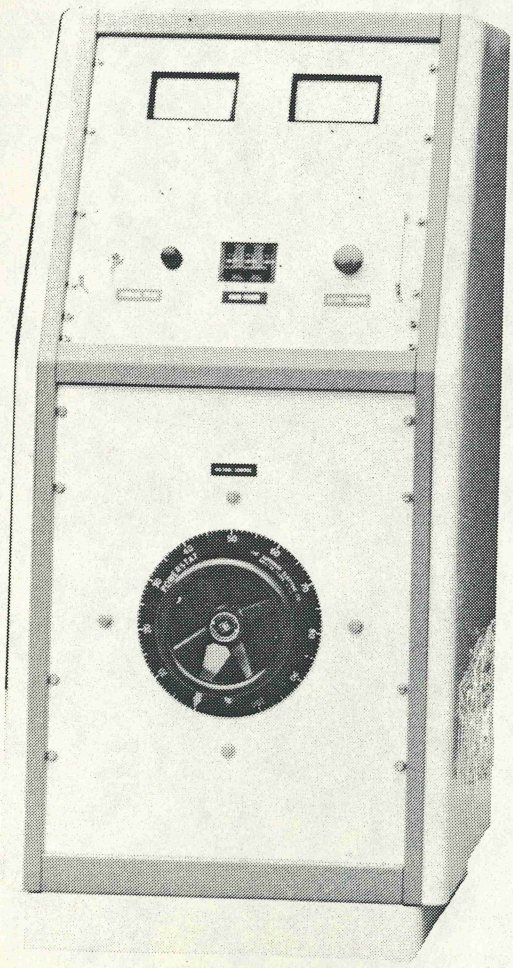
SUPER MODEL NINE TESLA COIL SYSTEM



TESLA TECHNOLOGY RESEARCH

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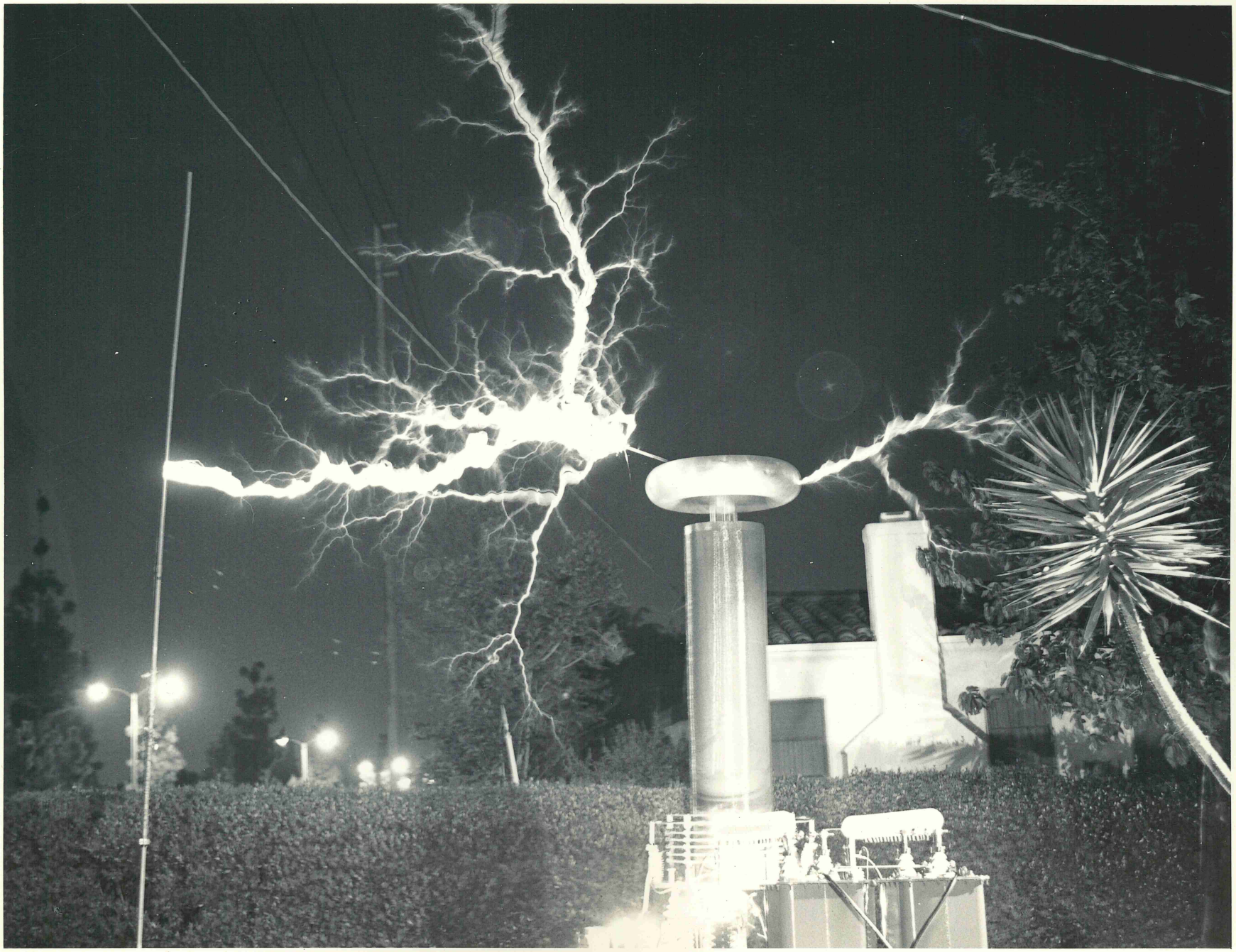
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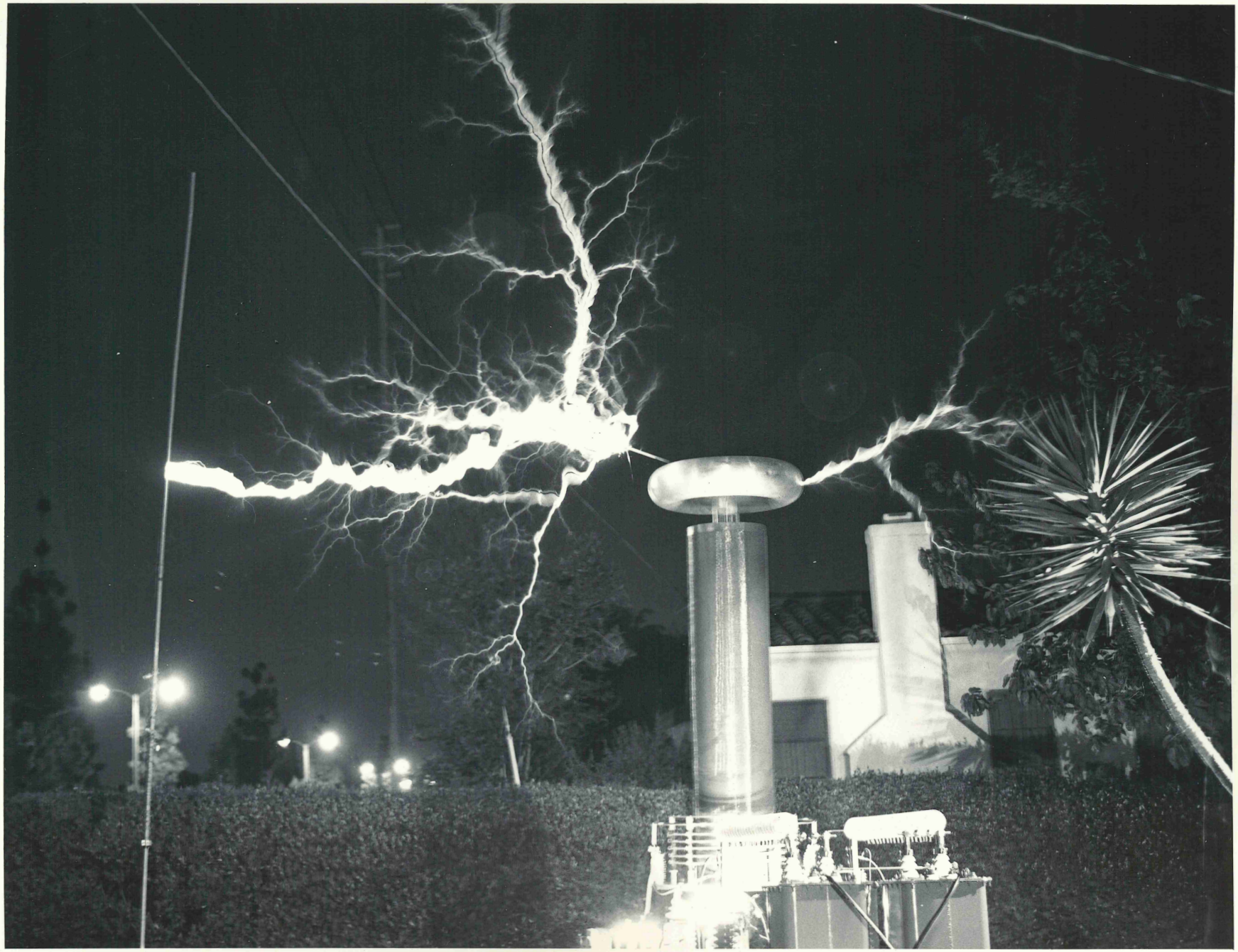
PIX OF

10 COIL

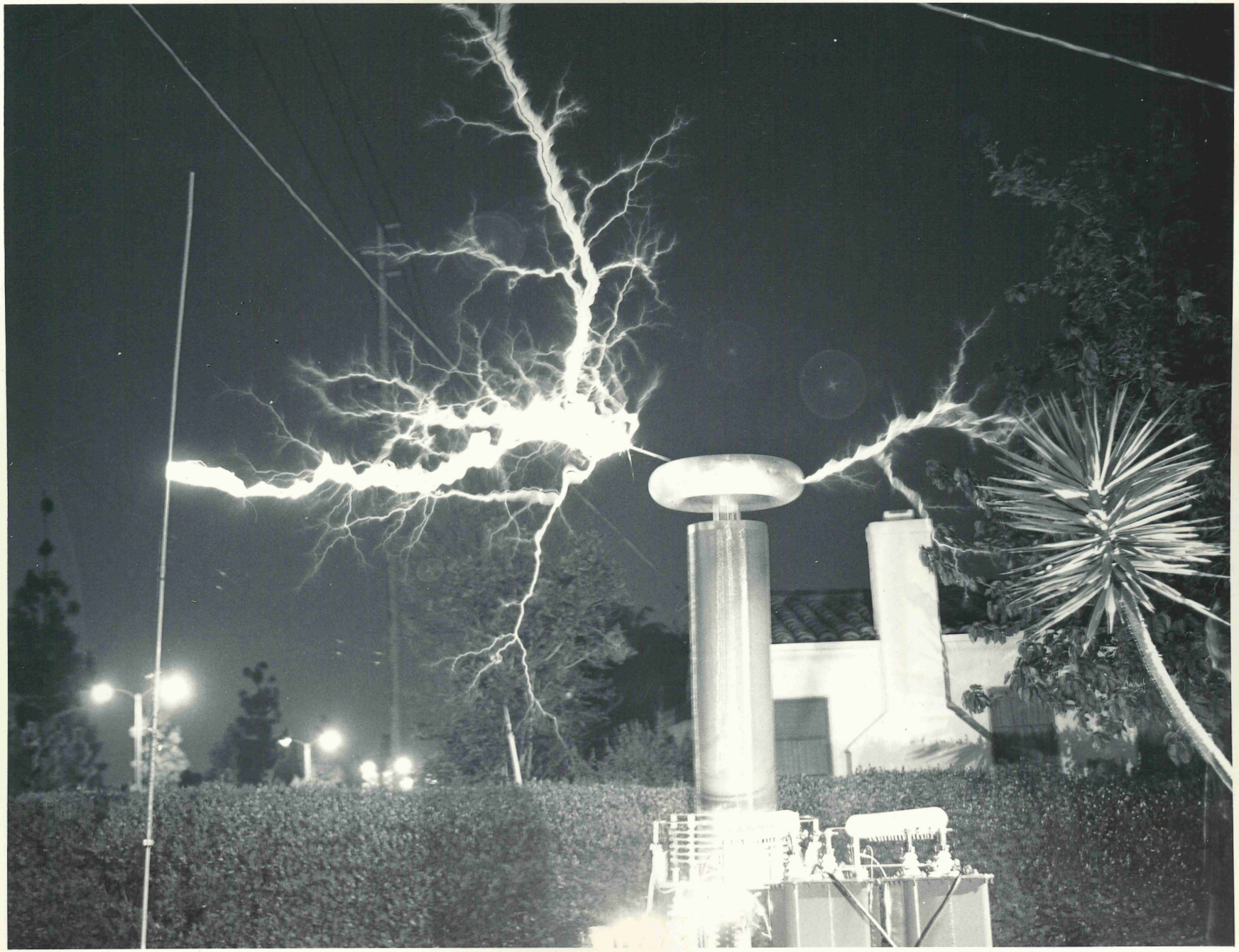
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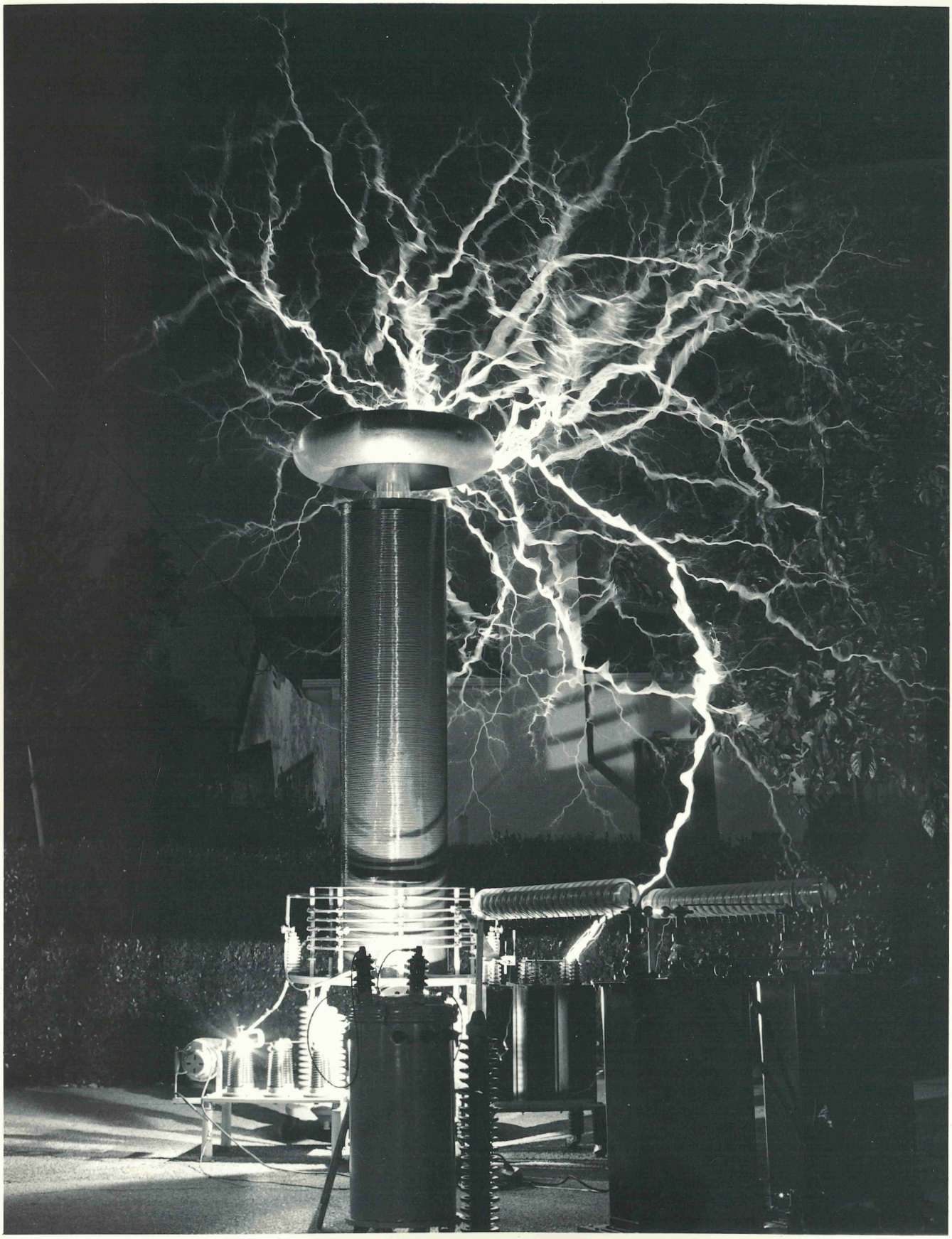
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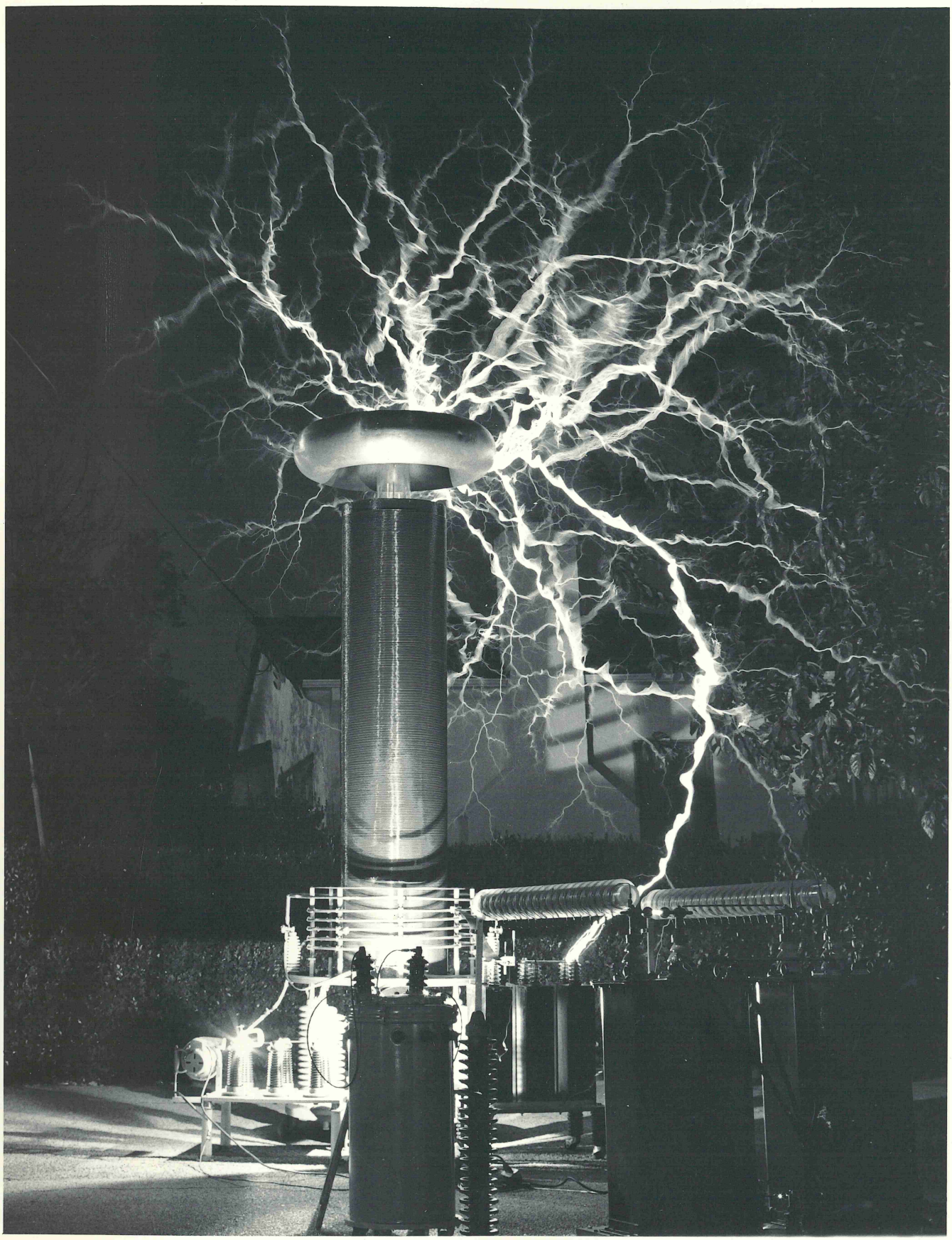
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