User Manual

Capacitor Type Generator

1CBC08AL

Coliseum Electric Corporation
4087 Hearthstone Drive
Sarasota, FL 34238
Tel: (941) 966-9370
Fax: (941) 296-7433
service@coliseumelectric.com

Please read this manual carefully prior to installing and operating this generator.

General Technical Data of the Generators

- Brushless capacitor type generator, single phase
- Rated 8kW 60Hz or 6.5 kW 50Hz, 4 leads, P.F.=1.0
- 4-pole, 60Hz, 1800RPM, P.F.=1.0, Continuous Duty
- 4-pole, 50Hz, 1500RPM, P.F.=1.0, Continuous Duty
- Temp rise 125°C / 40°C ambient temperature
- Insulation Class H
- Single bearing

The use of any spare parts that are not genuine or not expressly authorized shall free Coliseum Electric Corporation from any warranty liability and any responsibility concerning conformity to regulations and relevant consequences.

Installation, after-sales modifications and maintenance must be carried out by adequately trained staff.

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RULES FOR SAFE OPERATION

CAUTION!

FAILURE TO FOLLOW INSTRUCTIONS IN THIS MANUAL MAY LEAD TO SERIOUS INJURY OR EVEN DEATH! THE GENERATOR IS TO BE OPERATED BY TRAINED AND QUALIFIED PERSONNEL ONLY! THE GENERATOR IS FOR INDUSTRIAL USE ONLY.

The following safety guidelines should always be used when operating, servicing, or maintaining the generator.

DO NOT operate or service this generator before reading this entire manual. This generator should not be operated by persons under 18 years of age.

ALWAYS make sure generator installation is in accordance with electrical codes for your location.

ALWAYS have a qualified electrician perform the generator wiring installation.

NEVER operate the generator without proper protective clothing, shatterproof glasses, steel toed boots and other protective devices.

NEVER operate the generator when not feeling well due to fatigue, illness or taking medicine.

NEVER operate the generator under the influence of drugs or alcohol.

NEVER use accessories or attachments, which are not recommended by your local distributor or original manufacturer for the generator. Manufacture does not assume responsibility for any accident due to generator modifications.

ALWAYS check the machine for loosened threads, bolts, or other parts before starting.

NEVER operate the generator in an explosive atmosphere or where fire could result.

ALWAYS allow the generator to cool before performing service and maintenance functions. Contact with **HOT** components can cause serious burns.

NEVER operate the generator in any enclosed or narrow area where free flow of the air is restricted. If the air flow is restricted it will cause serious damage to the generator or engine and may cause injury to people. The generator engine gives off **DEADLY** carbon monoxide gas.

ALWAYS make sure generator is properly grounded.

DO NOT place hands or fingers inside the generator when engine is running (generator is rotating).

NEVER allow power cables or cords to lay in water or any other liquid.

The electrical voltage required to operate the generator can cause severe injury or even death through physical contact with live circuits. Turn all circuit breakers **OFF** before performing maintenance on the generator.

ALWAYS make sure that electrical circuits are properly grounded per the National Electrical Code (NEC) and local codes before operating generator. Severe injury or death by electrocution can result from operating an ungrounded generator. If the unit is sold internationally (outside USA), please make sure that grounding is done according to the local electrical code.

ALWAYS store the generator properly when not being used. The generator should be stored in a clean and dry location.

DANGER!

HAZARDOUS VOLTAGE. Voltage or current hazard sufficient to cause shock, burn, or death. Disconnect and lockout the load before servicing.

NEVER touch output terminals during operation. This is extremely dangerous. ALWAYS stop the machine and place the circuit breaker in the "OFF" position when contact with the output terminals is required. There exists the possibility of electrocution, electrical shock or burn, which can cause severe bodily harm or even death!

Back feed to a utility system can cause electrocution and or property damage. DO NOT connect to any building's electrical system except through an approved device or after building main switch is opened. **ALWAYS** have a licensed electrician perform the installation.

DANGER!

When handling capacitor please use extreme caution as there is possibility for shock, explosion, or burning, even after the engine and generator set have stopped rotating.

Disconnect capacitor from the circuit before doing any work. Make sure that there is an open circuit so that the capacitor is disconnected. Wait for at least 10 minutes after the capacitor is disconnected for self-discharge and then short-circuit (using a shorting stick or screw driver with an insulated handle across the capacitor terminals) and ground the capacitor before handling.

RECEIVING THE GENERATOR

Once the generator is received you should first examine it carefully for any damages during shipping and for missing parts. If there is shipping damage, then please make note of the damage with the carrier, and contact Coliseum Electric immediately.

NOTE: Please note any damage with the carrier and be sure to note this damage on the Bill of Lading document. Take digital photos when available and be sure to properly document the damage.

STORING THE GENERATOR

If the generator is not immediately used, it should be stored indoors in a clean and dry environment.

If the generator is stored for an extended period of time, it should be cleaned and tested before operation. Also, check all bolts for tightness and examine the insulation on lead wires for chafing.

NOTE: Wet windings should be thoroughly dried out before operation otherwise serious damage to the generator can result. Please see the Maintenance section of the User Manual on how to how to dry out the generator windings.

INSTALLATION

Check the generator thoroughly before starting installation. Make sure there is no damage during shipment or during storage.

Perform the Insulation Resistance Test and dry out the generator windings if necessary. Check Maintenance Section of this Manual for additional instructions.

LIFTING THE GENERATOR

WARNING!

THE GENERATOR LIFTING EYE IS DESIGNED FOR LIFTING THE GENERATOR ONLY. IT IS NOT DESIGNED TO USE TO LIFT THE GENERATOR AND ENGINE (GENERATOR SET). USING GENERATOR WITHOUT PROPER LOAD BEARING CAPACITY CAN CAUSE SEVERE INJURY AND DAMAGE.

Do not lift single bearing generators without the rotor anchor bar securely fixed. Remove the rotor anchor bar only when attaching the generator to the engine. Lift the generator horizontally in order to prevent the rotor from slipping out.

LOCATION/ENVIRONMENT

Installation of the generator to the engine must be done in a location that is protected from moisture, dust, dirt, and harmful fumes.

Generator intake and outlet air passages need to be unobstructed during generator operation. Please do not mount any obstructions that would restrict the airflow. The generator needs sufficient air circulation in order to provide proper cooling. Make sure that hot air from radiator or engine does not pass through the generator.

Make sure the mounting surface (generator set base) has sufficient strength, rigidity, and uses the proper anti-vibration mounts in order to keep vibration and noise to a minimum.

MOUNTING GENERATOR TO ENGINE

Generator is mounted to the engine by the use of the generator coupling disc which fits perfectly into the recess on the engine flywheel.

Holes on the coupling disc correspond to threaded holes on the engine's flywheel. The coupling disc will mate with the prime mover's flywheel so that concentricity is obtained.

Coupling to Engine:

1. Make sure that the generator and engine are level.
2. Carefully pull out the main rotor assembly from the generator housing. Be careful not to damage the copper stator, rotor, or capacitor windings.
3. Make sure the generator coupling disc is flat against the engine flywheel and fits perfectly into the recess on the engine flywheel. Use appropriate bolts and hardened washers to mount the coupling disc to the engine flywheel. Tighten with calibrated torque wrench. Split type lock washers should NOT be used due to possible damage to coupling disc.
4. Mount generator housing over rotor and mount to engine housing.
5. Mount the generator SAE housing to the engine housing. If bolted properly there should be no further alignment necessary.

EARTH/GROUND THE GENERATOR

The generator housing has to be connected to ground. If flexible anti-vibration mounts are used, then an earth conductor should be connected in parallel to the base for proper grounding. Generator has an "earthing" bolt

on the generator housing or generator mounting feet.

WARNING!

MAKE SURE THAT GENERATOR EARTHING/GROUNDING IS DONE PROPERLY. NOT DOING SO CAN CAUSE SHOCK AND EVEN DEATH.

HI-POT TEST

The generator end and capacitor are each already hi-pot tested by the manufacturer. If you must perform hi-pot testing of the final system or light tower, please consult manufacturer for proper instructions for proper hi-pot procedures including de-rated hi-pot testing. Not doing so can cause premature failure of the gen end or the capacitor.

During hi-pot testing the generator end capacitor MUST be disconnected. Not doing so will cause failure of the capacitor in the field.

OPERATION

BEFORE STARTUP

The following steps are recommended prior to starting the generator for the first time:

1. Make sure generator and engine are level and bolted securely on a base.
2. Check visually for any foreign materials.
3. Make sure all nuts and bolts are tightened properly.
4. Check all connections against the wiring diagram in Appendix C – especially the generator lead wires. Make sure connections are tight and properly insulated. Vibration can cause connections to loosen, disconnect or rotate causing short circuits.
5. Make sure generator is grounded correctly using generator grounding bolt.

START-UP

1. Make sure generator is in no-load condition - disconnect generator output from load. This can be done by switching the circuit breaker in the OFF position or not connecting a load to the gen set terminals.
2. Check that all engine start-up procedures have been followed.
3. Start engine and adjust engine speed to get desired setting for 1500RPM, 50Hz or 1800RPM, 60Hz operation. (For example, adjust engine speed for no-load operation between 60Hz-62Hz for 60Hz application). Reference engine manual for how to adjust engine speed.
4. Start the engine again (follow Engine Manufacturer's recommended startup procedures). Have voltmeter hooked up to generator terminal board and check the voltage to the rated values.
5. If the there is no voltage or incorrect voltage level, please reference the TROUBLESHOOTING section of this User Manual.
6. Check generator speed (frequency) under load. Adjust as necessary.
7. It is recommended to apply different load levels for 2 to 3 minutes (25% load, 50% load, 75% load, full load, and 110% load) to the generator and test voltage levels for proper adjustment and function.

SHUTDOWN

Shutdown varies based on the engine used. Please reference the engine User Manual for proper shut down procedures.

MAINTENANCE

GENERAL MAINTENANCE

Check generator windings for buildup of dirt, oil, or any other substances. If found, please remove rotor and remove debris. Make sure the generator windings are dry before assembling.

Check generator intake and exhaust venting openings (bearing cover and openings on the housing for air outlet) to ensure airflow is not obstructed. Remove debris.

Periodically check bearings for unusual operation. Unusual operation is defined by excessive vibrations, unusual noise, grease leaking, etc. Replace bearings if unusual operation determined.

Before operation check the resistance of the stator winding by performing the Insulation Resistance Test. The reading should be greater than 2 MΩ otherwise drying out the windings will be necessary.

Check capacitor for any damage to the capacitor housing and the top terminal. Any visible damage or bent terminals warrants replacement of the capacitor.

INSULATION RESISTANCE TEST

1. Disconnect all electronic components, capacitor, etc.
2. Short out the diodes on the rotating diode assembly.
3. Use a MegOhmMeter or Insulation Multimeter and connect between an output lead terminal and ground, and later disconnect the lead wires from the terminal board and measure the resistance between lead wires and ground.
4. Measured value of insulation resistance for all windings to ground. Measured values should be greater than 2 MΩ. If not, then dry out the generator windings.

DRYING OUT THE GENERATOR WINDINGS

One or more of the following methods can be used to dry out the windings.

Push hot air through the generator using heaters and blowers. Make sure the air can flow freely through the generator. Also, be careful not to overheat the windings which could cause permanent damage.

Run the generator set unexcited by disconnecting the capacitor terminals for 15 minutes.

Oven dry the generator for up to 3 hours at 60°C-80°C temperature. Make sure to remove the capacitor during oven drying.

Once the Insulation Resistance is raised to a level of greater than 2 MΩ then the generator can be put into service.

TROUBLESHOOTING

MECHANICAL ISSUES

SYMPTOM	CAUSE	SOLUTION
Generator Overheating	Air vents obstructed, preventing normal air flow required for cooling	Check vents at rear bearing cover and fan intake air vent and make sure obstructions are removed.
	Load exceeds generator rated load	Reduce the load on the generator to equal or below rated load listed on generator name plate.
	High ambient temperature	Improve airflow to generator. Make sure that hot air is not recycled from generator or engine or reduce the ratings / load on the generator.
	High altitude	Altitude reduces the rating and affects the cooling of generator. Reduce load of generator until overheating stops.
Excessive Vibration / Noise	Misalignment of coupling between generator and engine.	Realign and tighten connection between coupling disc and engine flywheel, and generator housing and engine housing. Make sure correct grade bolts are used and are tightened to appropriate torque level using calibrated torque wrench.
	Faulty or damaged bearing	Replace bearing.

ELECTRICAL ISSUES

SYMPTOM	CAUSE	SOLUTION
Generator will not excite, no voltage	Loss of residual magnetism	Flash the Field to restore the residual magnetism.
	Faulty Capacitor	Replace the capacitor.
	Faulty diodes.	Check each diode first. Then replace the faulty diode(s).
	Disconnected or shorted main stator lead wires	Check lead wires for short or disconnection and repair.
	Damaged stator, rotor, or capacitor windings	Check windings (visual check, smell check), measure resistances and compare with the rated values. Replace faulty parts.
	Check engine speed (RPM)	Increase speed on engine slowly to increase voltage. Do not increase speed over 110% of rated RPM.
No load voltage too low	Incorrect or faulty wiring.	Check wiring against the Generator Wiring Diagrams in Appendix C. Check wires for incorrect wiring
	Damaged stator, rotor, or capacitor windings	Check windings (inspect visually for wire damage or check for a burnt or unusual smell), measure resistances and compare with the rated values. Replace faulty parts or consult with the supplier.
	Faulty diodes.	Check each diode first. Then replace the faulty diode(s).

ELECTRICAL ISSUES (continued)

SYMPTOM	CAUSE	SOLUTION
No load voltage too high	Incorrect capacitor or faulty capacitor.	Check capacitance value and function of capacitor.
	Check engine speed (RPM)	Decrease speed until rated voltage is achieved (within acceptable RPM range). Rated voltage is listed on generator name plate.
	Incorrect or faulty wiring	Check wiring against the Generator Wiring Diagrams in Appendix C. Check wires for incorrect wiring, specifically connections 33, 44, 55, and 66 (50Hz vs. 60Hz operation).
	Faulty diodes.	Check each diode first. Then replace the faulty diode(s).
Voltage below nominal, under load	Current too high (excessive load) or speed below nominal	Reduce load and make sure current does not exceed rated current.
	Incorrect capacitor or faulty capacitor.	Check capacitance value and function of capacitor.
	Faulty diodes.	Check each diode first. Then replace the faulty diode(s).
	Incorrect or faulty wiring	Check wiring against the Generator Wiring Diagrams in Appendix C. Check wires for incorrect wiring, specifically connections 33, 44, 55, and 66 (50Hz vs. 60Hz operation).
Voltage above nominal, under load	Incorrect capacitor or faulty capacitor.	Check capacitance value and function of capacitor.
	Incorrect or faulty wiring	Check wiring against the Generator Wiring Diagrams in Appendix C. Check wires for incorrect wiring, specifically connections 33, 44, 55, and 66 (50Hz vs. 60Hz operation).
	Faulty diodes.	Check each diode first. Then replace the faulty diode(s).
Unstable voltage	Non-uniform rotation of engine	Check for uniform rotation of engine. Engine could be at fault. Check with engine User Manual or manufacturer for further troubleshooting.
	Misalignment of generator and engine.	Check for mounting of rotor and stator on engine. Check that air gap is even on all sides. Re-mount rotor and generator housing on engine.
	Faulty capacitor.	Check capacitance value and function of capacitor.
	Faulty diodes.	Check each diode first. Then replace the faulty diode(s).

SERVICE

FLASHING THE FIELD

Residual magnetism of the generator may be lost or weakened if the generator is not operated for long periods of time, during long periods of transport, or due to other situations.

While flashing the field, the generator MUST BE out of operation.

Steps to flashing the field

1. Disconnect the load to the generator. Make sure engine is turned off and generator is not rotating.
2. Remove the rear bearing cover of the generator.
3. Do not disconnect the rotor lead wires from the diode terminals.
4. Take 12V - 36V DC battery and place the negative terminal (-) of the battery on the negative terminal (-) of the diode and the positive terminal (+) of the battery on the positive terminal (+) of the diode. Hold for at least 3 seconds but not more than 5 seconds.
5. Disconnect the battery leads from the diode terminals.
6. Repeat steps 2 and 3 on the other diode.
7. Re-install the bearing cover.
8. Start rotating the generator. Check the generator no –load voltage during operation. It should be normal and within ±10% of rated value.

NOTE: If above still does not excite the generator, then please repeat the above steps with the same battery but with a longer charge time of 7-8 seconds (a little longer than before).

CHECKING THE DIODES

1. Disconnect the load to the generator. Make sure engine is turned off and generator is not rotating.
2. Remove the rear bearing cover.
3. Check on the side of the diode casing / housing where is printed which diode terminal is (+) and which is (-).
4. Disconnect the lead wire from the rotor from the (+) end of the diode terminal. You will need to use solder gun to heat the terminal and disconnect the wire.
5. Set the ohm meter to the lowest setting. Connect the ohm meter (+) probe (usually red color) of the ohm meter to the (+) terminal of the diode and the (–) probe (usually black color) of the ohm meter to the (–) terminal of the diode. You should get infinite resistance or non-continuity.
6. Reverse the ohm meter probes from above and you should get measurement of 0Ω or continuity.
7. If you get the above readings – infinity in one direction and 0Ω in the other, then the diode is good.
8. If you get 0Ω both ways, the diode is shorted. If you get infinity both ways, then diode is open. In both of these cases the diode needs to be replaced.

REPLACING THE DIODES

1. Disconnect the load to the generator. Make sure engine is turned off and generator is not rotating.
2. Remove the rear bearing cover.
3. Disconnect the wires to the diodes. Make sure to mark which wire is connected to (+) terminal and (-) terminal of the diodes for re-connecting to new diode.
4. Remove the diodes by unbolting the diode from the shaft.
5. Replace with new diode. Lock the bolts with thread adhesive (ex. Loctite). Set toque wrench to 25 in-lb and tighten bolt. Please make sure not to over tighten the bolt.
6. Re-connect the diode wires to the new diode as was previously connected (according to Step 3).
7. Re-install the rear bearing cover.
8. Start rotating the generator. Check the generator no-load voltage during operation. It should be normal and within ±10% of rated value.

CHECKING THE CAPACITOR

1. Properly discharge the capacitor and make sure to follow all safety procedures and precautions.
2. Set ohm meter terminals (set to a high ohms scale 10K–1M) and connect across the capacitor terminals.
3. For a non-faulty capacitor the resistance will at first drop (near zero) and then slowly increase towards infinity.
4. If you experience any of the below situations then the capacitor is faulty and should be replaced.

- If the capacitor is shorted, then it will drop to zero and never increase.
- If the capacitor is open, the resistance will be infinite immediately or there will be no ohm meter indication.
- If the resistance never approaches infinity and comes to rest at some value, then the capacitor is leaky.

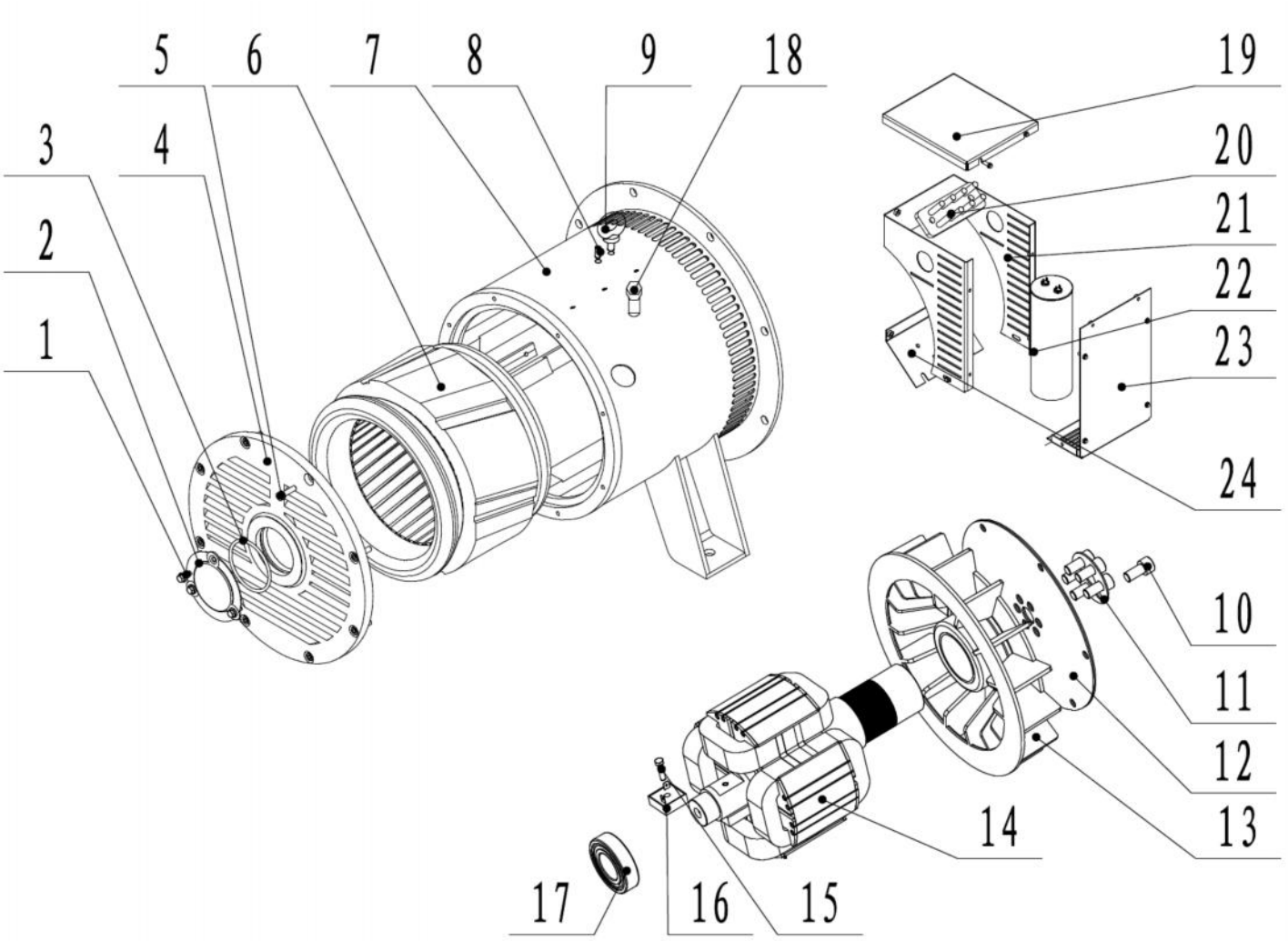
RESISTANCE VALUES FOR WINDINGS

Rating (kW)	Rotor Winding (Ω)	Capacitor Winding (Ω)	Stator Winding 11-22 (mΩ)
8	4.19	1.71	220

Rating (kW)	Stator Winding 33-44 (mΩ)	Stator Winding 11-55 (mΩ)	Stator Winding 33-66 (mΩ)
8	220	255	255

Above values are measured in cool condition at 20°C. Winding measurements can vary depending on ambient temperature and temperature of the windings when taken – please use above values as a guide for troubleshooting purposes.

APPENDIX A – EXPLODED VIEW



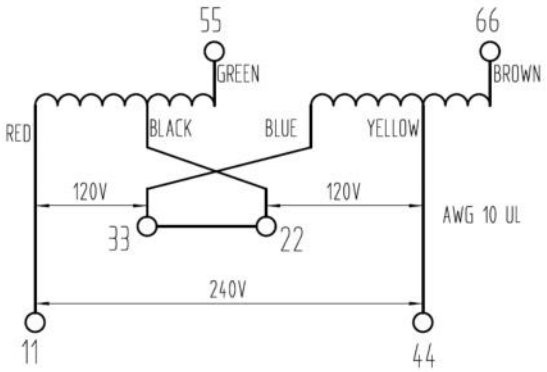
Reference Number	Part Name	Reference Number	Part Name
1	Bolt - GB/T 5789 M5x12	**13**	Fan
2	Bearing cover plate	**14**	Main rotor
3	“O” ring	**15**	Bolt - GB5783 M5*20
4	Rear bearing cover	**16**	Diodes
5	Bolt - GB/T 70.1 M6*16	**17**	Bearing
6	Main stator	**18**	Grounding bolt
7	Housing	**19**	Control box top / cover
8	Bolt - GB/T78 M8*16	**20**	Terminal board
9	Lifting eye - GB/T825 M10	**21**	Control box sides
10	Bolt - GB/T 70.1 M10*20 -12.9	**22**	Capacitor
11	Shaft ring / washer	**23**	Control box front / access plate
12	Coupling Discs (SAE 6 ½)	**24**	Control box base

APPENDIX B – SPARE PARTS LIST

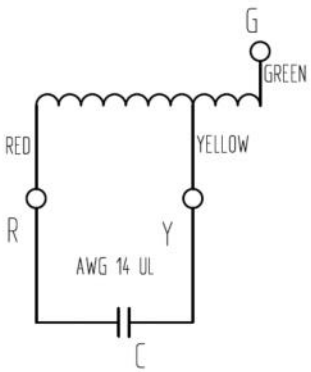
ITEM	Part Name	1CBC08AL Part Number
12	Coupling disc	C250BC41-56-08-AL-10001
13	Fan	C250BC41-56-08-AL-10003
10, 11 12, 13 14, 15 16	Main rotor	C250BC41-56-08-AL-10000
16	Diodes	ZY30-16
17	Bearing	6206RZ
GND	Grounding bolt	CBC-GNDBLT
6, 7, 8 9	Housing with stator and lead wires	C250BC41-56-08-AL-20000
9	Terminal board	CBC-TBD-AL-08
3, 4	Rear bearing cover with “O” ring	C250BC41-56-08-AL-20003
22	Capacitor	CBB65-R65630
19, 21, 23, 24	Complete control box	CBC-CBX-AL-08

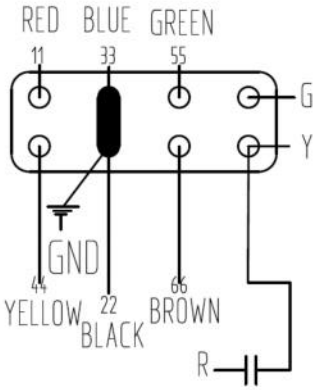
APPENDIX C – WIRING DIAGRAM for 60Hz

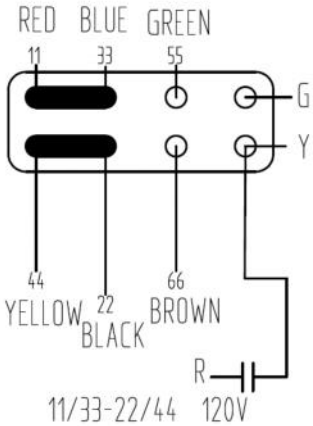
STATOR LEAD WIRES



CAPACITOR LEAD WIRES







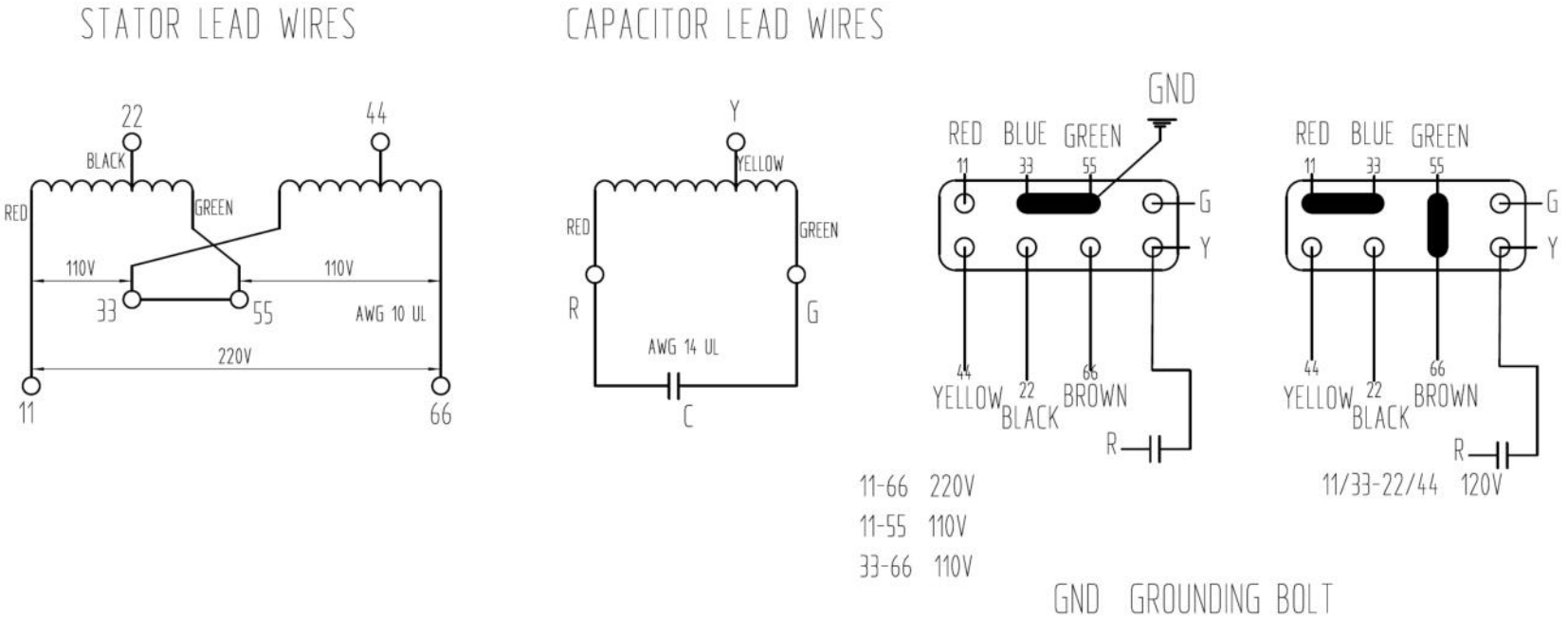
11-44 240V
11-22 120V
33-44 120V

GND GROUNDING BOLT

1ARKS:

nused terminals should be wrapped.
22, 220 milliohm(60Hz windings 240V)
33-44, 220 milliohm(60Hz windings 240V)

APPENDIX D – WIRING DIAGRAM for 50Hz



REMARKS:

1. Unused terminals should be wrapped.
   11-55, 255 milliohm(50Hz windings 220V)
   33-66, 255 milliohm(50Hz windings 220V)

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service@coliseumelectric.com