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Light Tower

LTC 4

REPAIR MANUAL



This manual covers machines with Item Number:

0009375, 0009376, 0620017, 0620018, 0620028

Operating / Parts Information

You must be familiar with the operation of this machine before you attempt to troubleshoot or repair it. Basic operating and maintenance procedures are described in the Operator's Manual supplied with the machine. Keep a copy of the Operator's Manual with the machine at all times. Use the separate Parts Book supplied with the machine to order replacement parts. If you are missing either of the documents, please contact Wacker Corporation to order a replacement.

Damage caused by misuse or neglect of the unit should be brought to the attention of the operator to prevent similar occurrences from happening in the future.

This manual provides information and procedures to safely repair and maintain the above Wacker model(s). For your own safety and protection from injury, carefully read, understand, and observe all instructions described in this manual. THE INFORMATION CONTAINED IN THIS MANUAL IS BASED ON MACHINES MANUFACTURED UP TO THE TIME OF PUBLICATION. WACKER CORPORATION RESERVES THE RIGHT TO CHANGE ANY PORTION OF THIS INFORMATION WITHOUT NOTICE.

CALIFORNIA

Proposition 65 Warning:



WARNING

Diesel engine exhaust, some of its constituents, and certain vehicle components contain or emit chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

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1. Safety Information

This manual contains DANGER, WARNING, CAUTION, and NOTE callouts which must be followed to reduce the possibility of personal injury, damage to the equipment, or improper service.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.



DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION: Used without the safety alert symbol, CAUTION indicates a potentially hazardous situation which, if not avoided, may result in property damage.

Note: *Contains additional information important to a procedure.*

1.1 Laws Pertaining to Spark Arresters

Notice: State Health Safety Codes and Public Resources Codes specify that in certain locations spark arresters be used on internal combustion engines that use hydrocarbon fuels. A spark arrester is a device designed to prevent accidental discharge of sparks or flames from the engine exhaust. Spark arresters are qualified and rated by the United States Forest Service for this purpose.

In order to comply with local laws regarding spark arresters, consult the engine distributor or the local Health and Safety Administrator.

1.2 Operating Safety



WARNING Familiarity and proper training are required for the safe operation of equipment. Equipment operated improperly or by untrained personnel can be dangerous. Read the operating instructions contained in both this manual and the engine manual and familiarize yourself with the location and proper use of all controls. Inexperienced operators should receive instruction from someone familiar with the equipment before being allowed to operate the machine.

1.2.1 The area immediately surrounding the Light Tower should be clean, neat, and free of debris.

1.2.2 ALWAYS be sure the machine is on a firm, level surface and will not tip, roll, slide, or fall while operating.

1.2.3 NEVER start a unit in need of repair.

1.2.4 Lower the tower when not in use, or if high winds or electrical storms are expected in the area.

1.2.5 ALWAYS make certain the machine is well-grounded and securely fastened to a good earthen ground per national and local regulations.

1.2.6 The tower extends up to 9 m (30 ft.). Make sure the area above the trailer is open and clear of overhead wires and obstructions.

1.2.7 The bulbs become extremely hot in use! Allow the bulb and fixture to cool 10–15 minutes before handling.

1.2.8 Keep the area behind the trailer clear of people while raising and lowering the mast! Never raise, lower or turn the mast while unit is operating!

1.2.9 The trailer must be leveled and the outriggers extended before raising the tower. The outriggers must remain extended while the tower is up.

1.2.10 If for any reason any part of the mast hangs up or the winch cable develops slack while raising or lowering the tower, STOP immediately! Contact an authorized WACKER service representative.

1.2.11 NEVER remove the mast locking pin while the tower is up!

1.2.12 NEVER use the machine if the insulation on the electrical cord is cut or worn through.

1.2.13 NEVER operate the lights without the protective lens cover in place or with a lens cover that is cracked or damaged!

1.2.14 NEVER adjust the mast while the unit is operating.

1.2.15 NEVER raise the mast or operate the Light Tower in high winds.

1.3 Operator Safety while using Internal Combustion Engines



DANGER

Internal combustion engines present special hazards during operation and fueling. Read and follow the warning instructions in the engine owner's manual and the safety guidelines below. Failure to follow the warnings and safety guidelines could result in severe injury or death.

1.3.1 NEVER operate the machine indoors unless exhaust fumes can be adequately ventilated.

1.3.2 DO NOT fill or drain the fuel tank near an open flame, while smoking, or while the engine is running.

1.3.3 ALWAYS refill the fuel tank in a well-ventilated area.

1.3.4 DO NOT touch or lean against hot exhaust pipes.

1.3.5 ALWAYS replace the fuel tank cap after refueling.

1.3.6 DO NOT remove radiator cap when the engine is hot. The radiator fluid is hot and under pressure and may cause severe burns!

1.3.7 DO NOT use gasoline or other types of fuels or flammable solvents to clean parts, especially in enclosed areas. Fumes from fuels and solvents can become explosive.

1.3.8 ALWAYS keep the area around the muffler free of debris such as leaves, paper, cartons, etc. A hot muffler could ignite the debris and start a fire.

1.4 Towing Safety



WARNING

Towing a large trailer requires special care. Both the trailer and vehicle must be in good condition and securely fastened to each other to reduce the possibility of an accident.

1.4.1 ALWAYS check that the hitch and coupling on the vehicle are rated equal to, or greater than, the trailer's “gross vehicle weight rating” (GVWR).

1.4.2 ALWAYS inspect the hitch and coupling for wear or damage. DO NOT tow the trailer using defective parts.

1.4.3 ALWAYS make sure the coupling is securely fastened to the vehicle.

1.4.4 ALWAYS check the tires on the trailer for tread wear, inflation, and condition. Replace worn tires.

1.4.5 ALWAYS connect the safety chains.

1.4.6 ALWAYS make sure directional and trailer lights are connected and working properly.

1.4.7 ALWAYS check that the lug nuts holding the wheels are tight and that none are missing.

1.4.8 The maximum recommended speed for highway towing is 72 km/hour (45 MPH). Recommended off-road towing speed is not to exceed 16 km/hour (10 MPH) or less depending on terrain.

1.4.9 ALWAYS refer to the applicable Department of Transportation regulations before towing.

1.5 Service Safety



WARNING

HIGH VOLTAGE! This unit uses high voltage circuits capable of causing serious injury or death. Only a qualified electrician should troubleshoot or repair electrical problems occurring in this equipment.

1.5.1 ALWAYS replace the safety devices and guards after repairs and maintenance.

1.5.2 Before servicing the Light Tower, make sure the engine start switch is turned to OFF, the circuit breakers are open (off), and the negative terminal on battery is disconnected. NEVER perform even routine service (oil/filter changes, cleaning, etc.) unless all electrical components are shut down.

1.5.3 DO NOT allow water to accumulate around the base of the machine. If water is present, move the machine and allow the machine to dry before servicing.

1.5.4 DO NOT service the machine if your clothing or skin is wet.

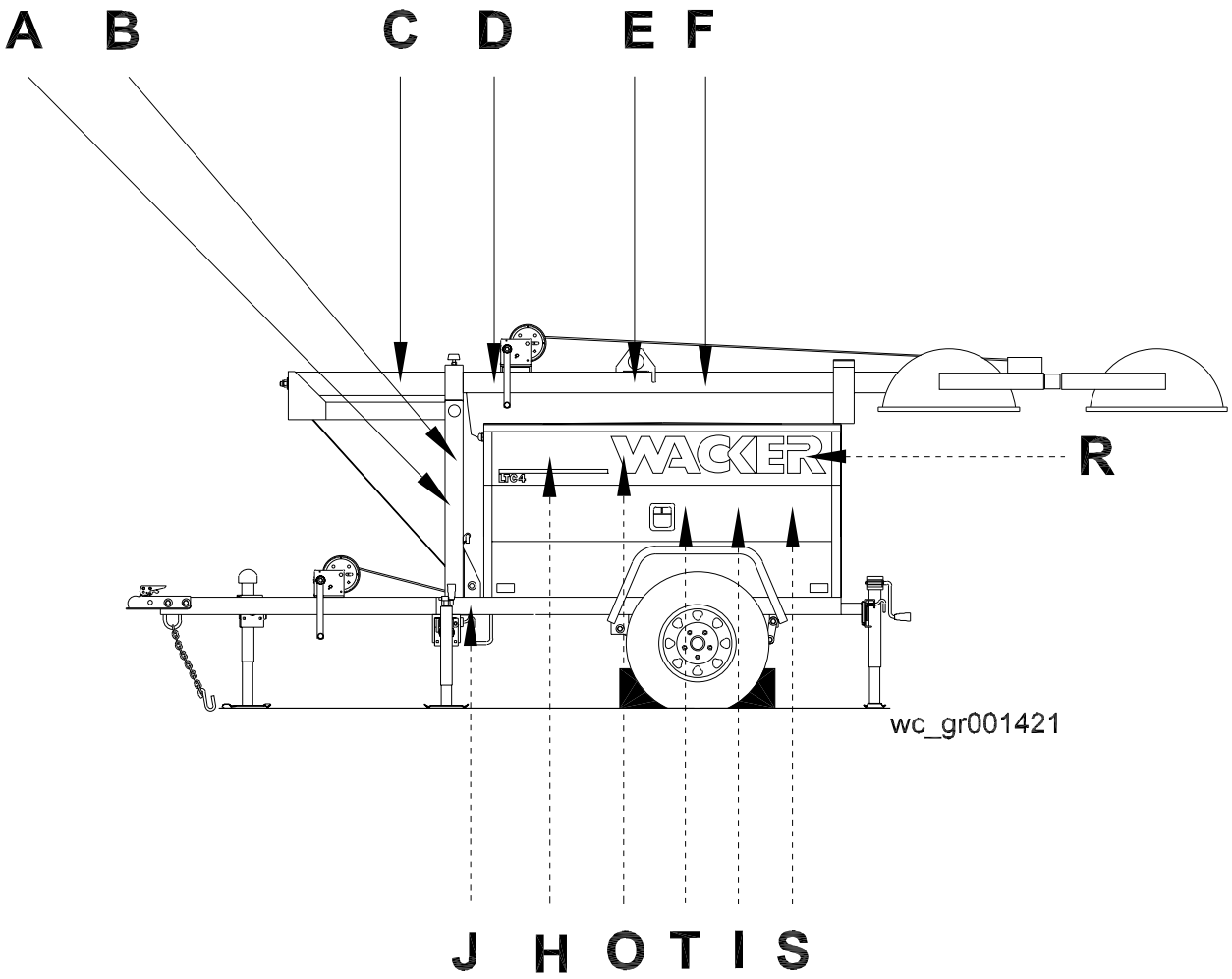
1.5.5 ALWAYS keep hands, feet, and loose clothing away from the moving parts on the generator and engine.

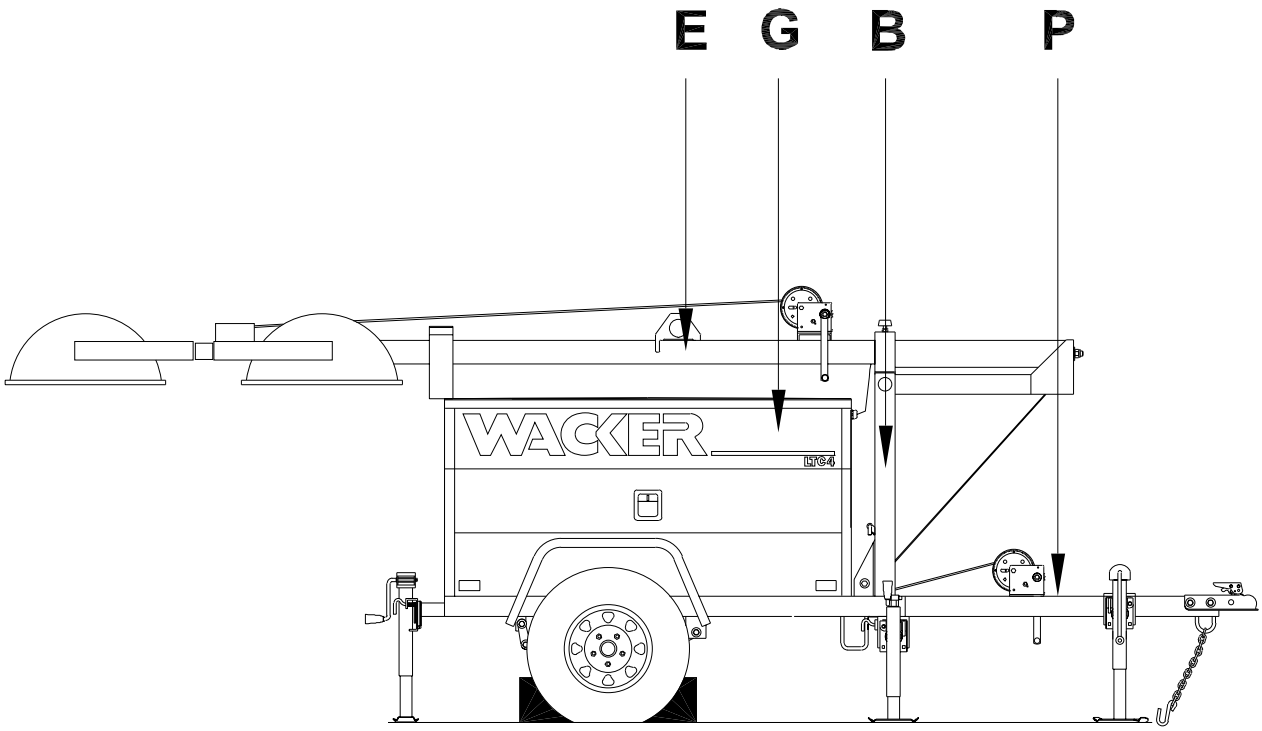
1.5.6 ALWAYS keep the machine clean and labels legible. Replace all missing and hard-to-read labels. Labels provide important operating instructions and warn of dangers and hazards.

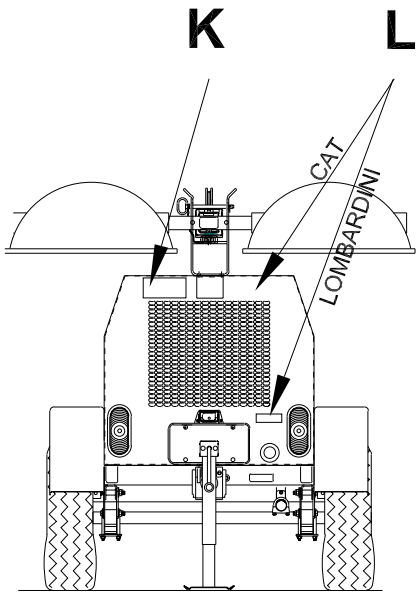
1.5.7 ALWAYS make sure slings, chains, hooks, ramps, jacks and other types of lifting devices are attached securely and have enough weight-bearing capacity to lift or hold the machine safely. Always remain aware of the location of other people around when lifting the machine.

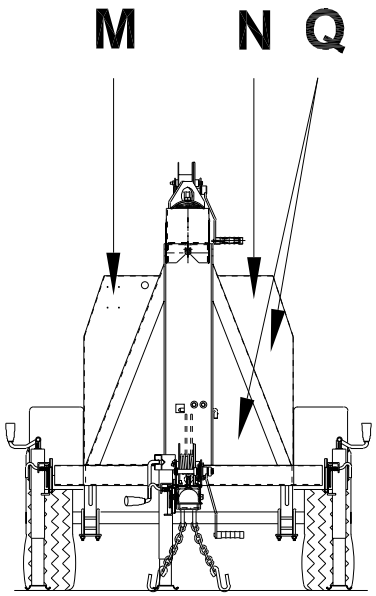
1.5.8 ALWAYS turn off the light circuit breakers and shut down the engine before disconnecting the light fixtures or changing the light bulbs.

1.6 Label Locations









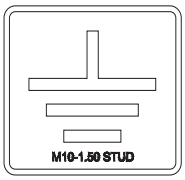
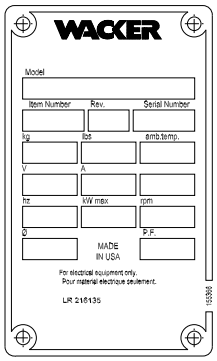
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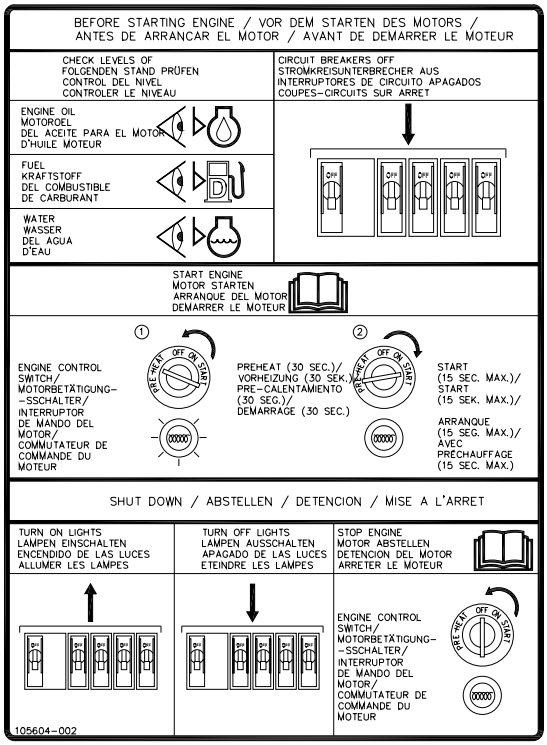
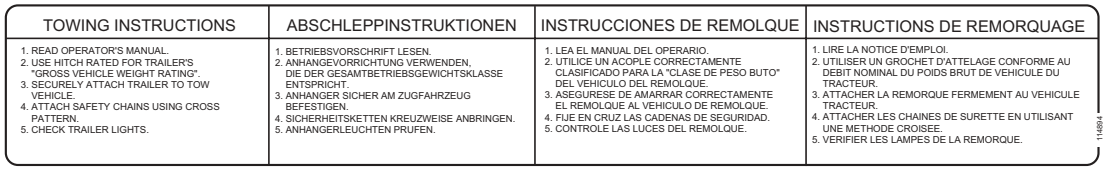
1.7 Safety and Operating Labels

Wacker machines use international pictorial labels where needed. These labels are described below:

Ref.	Label	Meaning
A		DANGER! A non-secured, falling mast will cause serious injury or death if a person is hit. To secure mast, verify automatic locking pin has engaged to secure tower upright.
B		WARNING! Avoid crushing area.
C		WARNING! Completely lower tower before tilting mast. Tilting an extended mast could cause serious injury or death.
D		DANGER! Contact with overhead electrical power lines will cause serious injury or death. Do not position Light Tower under electrical power lines.

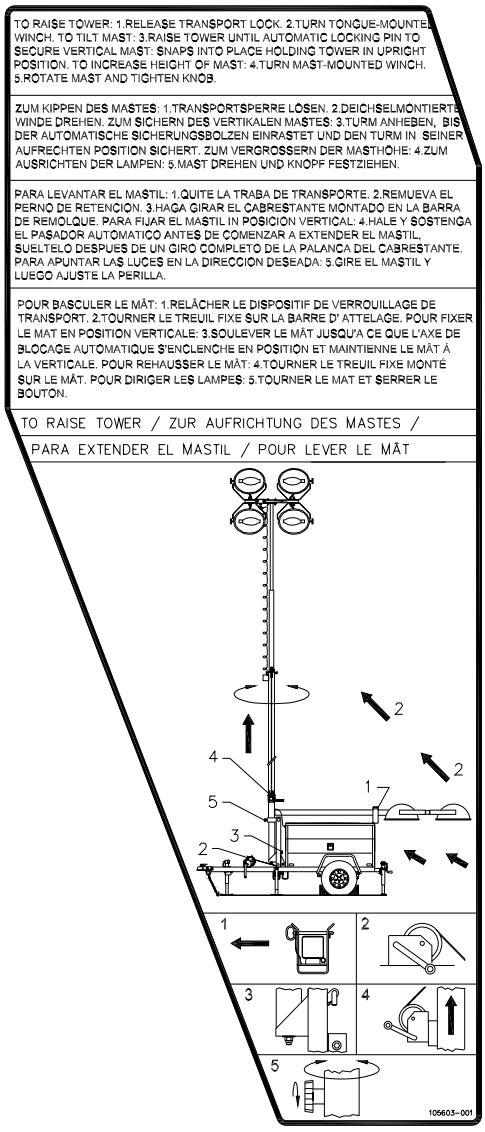
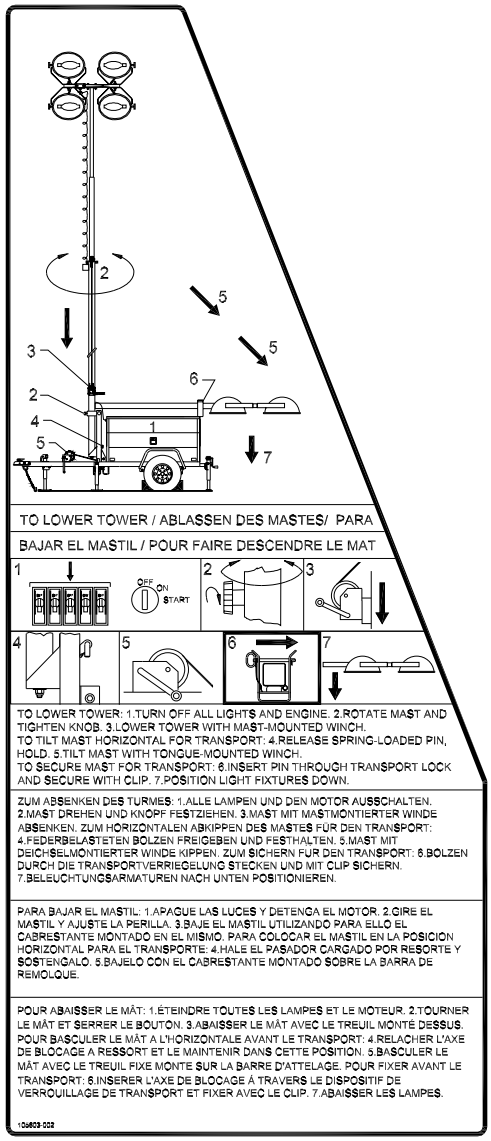
Ref.	Label	Meaning
E		CAUTION! Lifting point
F		WARNING! Secure mast in transport lock before lifting or towing. A loose swinging mast could cause personal injury or machine damage.
G		DANGER! Asphyxiation hazard. Read the Operator's Manual for instructions. No sparks, flames, or burning objects near machine. Stop the engine before adding fuel. Use only diesel fuel.
H		DANGER! Asphyxiation hazard. Read the Operator's Manual for instructions. No sparks, flames, or burning objects near machine. Stop the engine before adding fuel. Use only diesel fuel. DANGER! Contact with overhead electrical power lines will cause serious injury or death. Do not position Light Tower under electrical power lines. WARNING! Completely lower tower before tilting mast. Tilting an extended mast could cause serious injury or death.
I		DANGER! Electrical storage device within. Contact a qualified electrician for service or to open electrical box. Electric shock will cause serious injury or death.

Ref.	Label	Meaning
J		Electrical ground
K		WARNING! Stand clear of front and rear of machine when mast is being tilted up or down.
L		WARNING! Hot surface!
M		A nameplate listing the model number, item number, revision number, and serial number is attached to each unit. Please record the information found on this plate so it will be available should the nameplate become lost or damaged. When ordering parts or requesting service information, you will always be asked to specify the model number, item number, revision number, and serial number of the unit.
N		WARNING! Ultraviolet radiation from lamp can cause serious skin and eye irritation. Use only with provided undamaged lens cover and fixture.

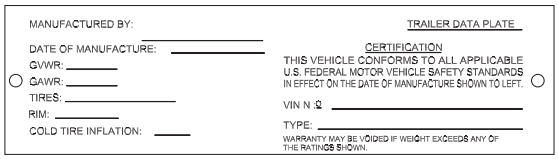
Ref.	Label
O	
P	

TOWING INSTRUCTIONS	ABSCHLEPPINSTRUKTIONEN	INSTRUCCIONES DE REMOLQUE	INSTRUCTIONS DE REMORQUAGE
1. READ OPERATOR'S MANUAL. 2. USE HITCH RATED FOR TRAILER'S "GROSS VEHICLE WEIGHT RATING". 3. SECURELY ATTACH TRAILER TO TOW VEHICLE. 4. ATTACH SAFETY CHAINS USING CROSS PATTERN. 5. CHECK TRAILER LIGHTS.	1. BETRIEBSVORSCHRIFT LESEN. 2. ANHANGEVORRICHTUNG VERWENDEN, DIE DER GESAMTBETRIEBSGEWICHTSKLASSE ENTSPRICHT. 3. ANHANGER SICHER AM ZUGFAHRZEUG BEFESTIGEN. 4. SICHERHEITSKETTEN KREUZWEISE ANBRINGEN. 5. ANHANGERLEUCHTEN PRUFEN.	1. LEA EL MANUAL DEL OPERARIO. 2. UTILICE UN ACOPLE CORRECTAMENTE CLASIFICADO PARA LA "CLASE DE PESO BUTO" DEL VEHICULO DEL REMOLQUE. 3. ASEGURESE DE AMARRAR CORRECTAMENTE EL REMOLQUE AL VEHICULO DE REMOLQUE. 4. FIJE EN CRUZ LAS CADENAS DE SEGURIDAD. 5. CONTROLE LAS LUCES DEL REMOLQUE.	1. LIRE LA NOTICE D'EMPLOI. 2. UTILISER UN GROCHET D'ATTELAGE CONFORME AU DEBIT NOMINAL DU POIDS BRUT DE VEHICULE DU TRACTEUR. 3. ATTACHER LA REMORQUE FERMEMENT AU VEHICULE TRACTEUR. 4. ATTACHER LES CHAINES DE SURETTE EN UTILISANT UNE METHODE CROISEE. 5. VERIFIER LES LAMPES DE LA REMORQUE.

114894

Ref.	Label
Q	 

TO RAISE TOWER: 1.RELEASE TRANSPORT LOCK. 2.TURN TONGUE-MOUNTED WINCH. TO TILT MAST: 3.RAISE TOWER UNTIL AUTOMATIC LOCKING PIN TO SECURE VERTICAL MAST: SNAPS INTO PLACE HOLDING TOWER IN UPRIGHT POSITION. TO INCREASE HEIGHT OF MAST: 4.TURN MAST-MOUNTED WINCH. 5.ROTATE MAST AND TIGHTEN KNOB.
ZUM KIPPEN DES MASTES: 1.TRANSPORTSPERRE LÖSEN. 2.DEICHSELMONTIERTE WINDE DREHEN. ZUM SICHERN DES VERTIKALEN MASTES: 3.TURM ANHEBEN, BIS DER AUTOMATISCHE SICHERUNGSBOLZEN EINRASTET UND DEN TURM IN SEINER AUFRECHTEN POSITION SICHERT. ZUM VERGROSSERN DER MASTHÖHE: 4.ZUM AUSRICHTEN DER LAMPEN: 5.MAST DREHEN UND KNOPF FESTZIEHEN.
PARA LEVANTAR EL MASTIL: 1.QUITE LA TRABA DE TRANSPORTE. 2.REMUEVA EL PERNO DE RETENCION. 3.HAGA GIRAR EL CABRESTANTE MONTADO EN LA BARRA DE REMOLQUE. PARA FIJAR EL MASTIL IN POSICION VERTICAL: 4.HALE Y SOSTENGA EL PASADOR AUTOMATICO ANTES DE COMENZAR A EXTENDER EL MASTIL, SUELTELO DESPUES DE UN GIRO COMPLETO DE LA PALANCA DEL CABRESTANTE. PARA APUNTAR LAS LUCES EN LA DIRECCION DESEADA: 5.GIRE EL MASTIL Y LUEGO AJUSTE LA PERILLA.
POUR BASCULER LE MÂT: 1.RELÂCHER LE DISPOSITIF DE VERROUILLAGE DE TRANSPORT. 2.TOURNER LE TREUIL FIXE SUR LA BARRE D' ATTELAGE. POUR FIXER LE MAT EN POSITION VERTICALE: 3.SOULEVER LE MÂT JUSQU'A CE QUE L'AXE DE BLOCAGE AUTOMATIQUE S'ENCLENCHE EN POSITION ET MAINTIENNE LE MÂT À LA VERTICALE. POUR REHAUSSER LE MÂT: 4.TOURNER LE TREUIL FIXE MONTÉ SUR LE MÂT. POUR DIRIGER LES LAMPES: 5.TOURNER LE MAT ET SERRER LE BOUTON.
TO RAISE TOWER / ZUR AUFRICHTUNG DES MASTES /
PARA EXTENDER EL MASTIL / POUR LEVER LE MÂT
105603-001
TO LOWER TOWER / ABLASSEN DES MASTES/ PARA
BAJAR EL MASTIL / POUR FAIRE DESCENDRE LE MAT
OFF
ON
START
TO LOWER TOWER: 1.TURN OFF ALL LIGHTS AND ENGINE. 2.ROTATE MAST AND TIGHTEN KNOB. 3.LOWER TOWER WITH MAST-MOUNTED WINCH.
TO TILT MAST HORIZONTAL FOR TRANSPORT: 4.RELEASE SPRING-LOADED PIN, HOLD. 5.TILT MAST WITH TONGUE-MOUNTED WINCH.
TO SECURE MAST FOR TRANSPORT: 6.INSERT PIN THROUGH TRANSPORT LOCK AND SECURE WITH CLIP. 7.POSITION LIGHT FIXTURES DOWN.
ZUM ABSENKEN DES TURMES: 1.ALLE LAMPEN UND DEN MOTOR AUSSCHALTEN. 2.MAST DREHEN UND KNOPF FESTZIEHEN. 3.MAST MIT MASTMONTIERTER WINDE ABSENKEN. ZUM HORIZONTALEN ABKIPPEN DES MASTES FÜR DEN TRANSPORT: 4.FEDERBELASTETEN BOLZEN FREIGEBEN UND FESTHALTEN. 5.MAST MIT DEICHSELMONTIERTER WINDE KIPPEN. ZUM SICHERN FUR DEN TRANSPORT: 6.BOLZEN DURCH DIE TRANSPORTVERRIEGELUNG STECKEN UND MIT CLIP SICHERN. 7.BELEUCHTUNGSARMATUREN NACH UNTEN POSITIONIEREN.
PARA BAJAR EL MASTIL: 1.APAGUE LAS LUCES Y DETENGA EL MOTOR. 2.GIRE EL MASTIL Y AJUSTE LA PERILLA. 3.BAJE EL MASTIL UTILIZANDO PARA ELLO EL CABRESTANTE MONTADO EN EL MISMO. PARA COLOCAR EL MASTIL EN LA POSICION HORIZONTAL PARA EL TRANSPORTE: 4.HALE EL PASADOR CARGADO POR RESORTE Y SOSTENGALO. 5.BAJELO CON EL CABRESTANTE MONTADO SOBRE LA BARRA DE REMOLQUE.
POUR ABAISSER LE MÂT: 1.ÉTEINDRE TOUTES LES LAMPES ET LE MOTEUR. 2.TOURNER LE MÂT ET SERRER LE BOUTON. 3.ABAISSER LE MÂT AVEC LE TREUIL MONTÉ DESSUS. POUR BASCULER LE MÂT A L'HORIZONTALE AVANT LE TRANSPORT: 4.RELACHER L'AXE DE BLOCAGE A RESSORT ET LE MAINTENIR DANS CETTE POSITION. 5.BASCULER LE MÂT AVEC LE TREUIL FIXE MONTE SUR LA BARRE D'ATTELAGE. POUR FIXER AVANT LE TRANSPORT: 6.INSERER L'AXE DE BLOCAGE À TRAVERS LE DISPOSITIF DE VERROUILLAGE DE TRANSPORT ET FIXER AVEC LE CLIP. 7.ABAISSER LES LAMPES.
105603-002

Ref.	Label	Meaning
R	COOLANT OVERFLOW BOTTLE ONLY, NOT A RETURN SYSTEM NUR KÜHLMITTELÜBERLAUFFLASCHE -- KEIN RÜCKHOLSYSTEM! BOTELLA DE REBOSE DEL ENFRIADOR -- NO ES UN SISTEMA DE RETORNO BOUTEILLE DE TROP-PLEIN DE L'AGENT RÉFRIGÉRANT SEULEMENT; CE N'EST PAS UN SYSTÈME DE RETOUR	Coolant overflow bottle only, not a return system.
S		WARNING! Pinching hazard. Rotating machinery.
		Certification Label (VIN Number) Also attached to each unit is a Certification Label. This label specifies that the trailer conforms with all Federal Motor Vehicle Standards in effect at the time of manufacture. The label includes the Vehicle Identification Number (VIN) for the trailer.

2. Technical Data

2.1 Engine

Item Number:		**LTC 4L** 0009375 Rev. 102 & lower	**LTC 4L** 0009375 Rev. 103 & above 0620018	**LTC 4C** 0009376 0620017 0620028
Engine				
Make		Lombardini		Caterpillar
Model		LDW903	LDW1003	3003
Type		3-cylinder, 4-cycle, liquid-cooled diesel		
Maximum power rating	kW (Hp)	9.0 (12.1)	10 (13.4)	9.4 (12.6)
Operating power rating	kW (Hp)	8.1 (10.9)	9.1 (12.2)	8.1 (10.9)
Operating speed (no-load)	rpm	1850	1850	1850
Alternator	V / A / W	12 / 45 / 540		
Battery	V/Ah/CCA	12 / 450		
Air cleaner	type	dry-type element		
Fuel	type	No. 2 diesel		
Fuel tank capacity	l (gal.)	114 (30)		
Fuel consumption	l (gal.) / hr.	1.67 (0.44)	1.70 (0.45)	1.70 (0.45)
Running time	hours	68	67	67
Coolant capacity	l (qts.)	4.7 (5.0)		
Oil capacity	l (qts.)	2.4 (2.5)		3.5 (3.7)
Oil weight	SAE	15W40 CD or higher		

2.2 Generator

Item Number:		**LTC 4L - 60 Hz** 0009375 0620018	**LTC 4C - 60 Hz** 0009376 0620017 0620028
Generator			
Frequency	Hz	60 ± 2	
Continuous output	kW	6.0	
Output	volts/phase	120 / 1Ø	
Amps	A	50 / 25	
Excitation type		Capacitor / Brushless	
Power factor		1.0	
Voltage regulation - No load to full load	%	± 5.0	
Speed (no-load)	rpm	1850	

2.3 Machine

		LTC 4L		LTC 4C	
Item Number		0009375	0620018	0009376 0620017	0620028
Machine					
Operating weight (GVWR)	kg (lbs.)	815 (1800)	821 (1811)	817 (1802)	832 (1834)
Dimensions (L x W x H)	cm (in.)	389 x 122 x 160 (153 x 48 x 63)	439 x 162 x 160 (173 x 64 x 63)	389 x 122 x 160 (153 x 48 x 63)	439 x 162 x 160 (173 x 64 x 63)
Height - mast extended	m (ft.)	9 (30)			
Lighting system (1000W)		4			
Ballast		Coil and core			
Max. lighting coverage @ 0.5 ft. candles	m^2 (acres)	30,400 (7)			
Sound level at 7 m (23 ft.)	dB(A)	71	69	72	71
Tires	size	ST175 / 80D13			

Notes

3. Operation

3.1 Information Regarding Operation

3.1.1 The information regarding the operation of the machine included in this manual is condensed. Refer to the Operator's Manual for complete operating instructions. Always read, understand, and follow the procedures in the Operator's Manual when operating the machine.

3.2 Locating Trailer

See Graphic: wc_gr0001420

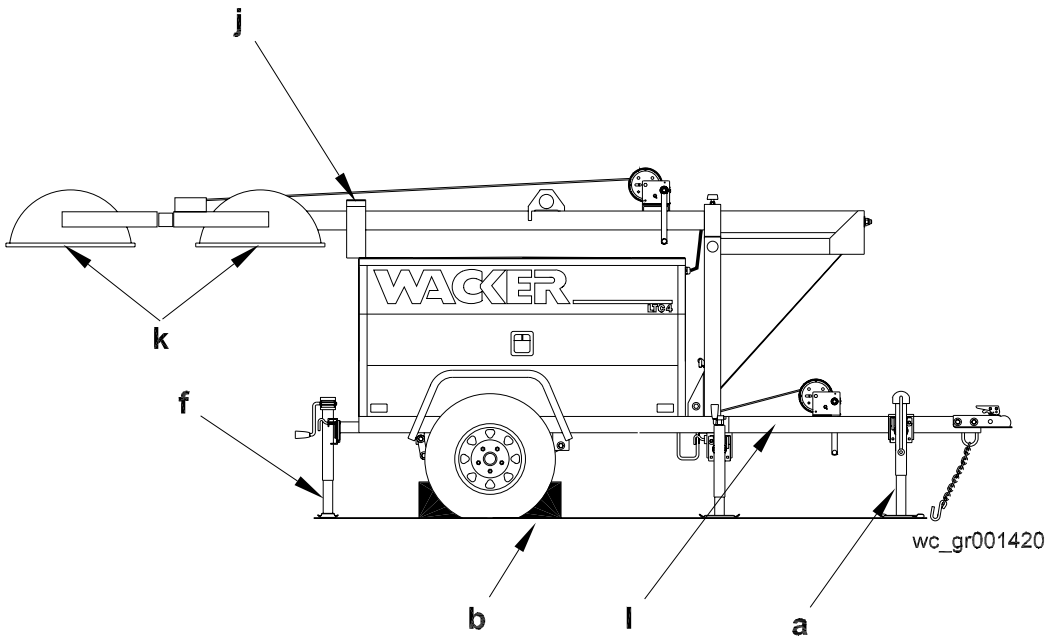
3.2.1 For maximum light coverage locate the Light Tower at ground level or in a spot higher than the area being lighted.

3.2.2 Position the trailer on a firm, flat surface clear of overhead wires and obstructions. Be sure that there is enough area for outrigger extensions to be fully extended.

3.2.3 Connect the ground stud **(l)** located on the trailer frame, to a good earthen ground. Consult local codes for proper grounding techniques.

WARNING

The tower extends up to 9 m (30 ft.). Make sure the area above the trailer is open and clear of overhead wires and obstructions.



3.3 Leveling Trailer

See Graphic: wc_gr001420, wc_gr001423

WARNING

The trailer must be leveled and the outriggers extended before raising the tower. The outriggers must remain extended while the tower is up. Failure to level the trailer or extend the outriggers will severely reduce the stability of the unit and could allow the tower to tip and fall.

3.3.1 Pull the locking pin on the tongue jack **(a)** and rotate the tongue jack 90° as shown. Make sure the tongue jack snaps into position.

Block or chock the trailer wheels **(b)**. Crank the tongue jack down to raise the trailer tongue off the vehicle.

3.3.2 Pull the outrigger lock pin **(c)** to release the outrigger. Pull both outrigger extensions **(d)** out until you feel outrigger lock pin lock back into place. Rotate jacks **(e)** down until they snap into position.

3.3.3 Rotate rear jack **(f)** down, as shown, making sure it snaps into place.

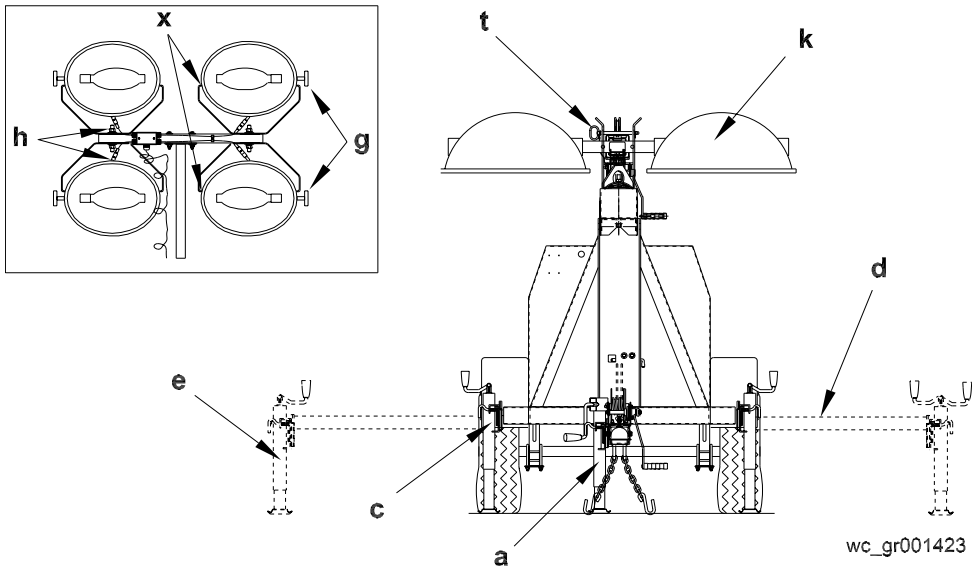
3.3.4 Extend the jack(s) on the highest side(s) of the trailer until they rest firmly on the ground. Extend the remaining jacks until the trailer is level.

3.4 Adjusting Lights

See Graphic: wc_gr001423

Each light fixture can be aimed up, down, left or right. Position each fixture by loosening toolless light adjusters **(g)** and aiming the light up or down. DO NOT loosen the inside nut **(x)**. Loosening this nut could cause damage to the light fixture. Loosen the nut **(h)** to turn light fixtures left or right. Tighten adjusters and nuts after positioning the lights.

Always return the light fixtures to aim at the ground when mast is in the cradle for towing.



3.5 Preparing Trailer for Towing or Lifting

See Graphic: wc_gr001423, wc_gr002166

3.5.1 Check that the mast cradle lock pin **(j)** is in place and secured with the safety pin.

3.5.2 Ensure that the tower is completely nested inside the transport cradle and the pin **(t)** is secure.

3.5.3 Make sure the doors are properly latched.

3.5.4 Return the outriggers to their travel position. Check that the outrigger bars and jacks are locked in place.

3.5.5 Crank the rear jack **(f)** all the way in and rotate it 90°.

The the Light Tower is now ready to lift. For towing, continue.

3.5.6 Use the tongue jack **(a)** to raise the trailer tongue up and then lower it over hitch on towing vehicle. Lock the hitch to coupling and attach the safety chains. Swivel the tongue jack 90° and lock it in place.

3.5.7 Connect the trailer wiring to the towing vehicle. Check the brake, turn, and tail lights for proper operation.

3.5.8 Position the light fixtures down **(k)**. For rough, off-road transportation remove bulbs from fixtures to avoid damage.

3.5.9 Check the tire inflation.

3.5.10 Attach a red flag to the end of mast before towing.

CAUTION: Maximum recommended speed for highway towing is 72 km/hour (45 MPH). Recommended off-road towing speed is not to exceed 16 km/hour (10 MPH) or less depending on terrain.

3.6 Raising Tower (Manual Winch System)

See Graphic: wc_gr002166



WARNING

NEVER raise the mast or operate the Light Tower in high winds.

NEVER raise the mast while the engine is running.



WARNING

HIGH VOLTAGE! DO NOT use the Light Tower if insulation on electrical cord is cut or worn through. Repair or replace the cord before using. Bare wires in contact with the metal frame of the trailer or tower can cause electrocution.

DO NOT position the Light Tower under electrical power lines.



WARNING

NEVER allow anyone to stand near the rear of the unit while raising the mast.

The Light Tower includes two separate winches. One for lifting the mast to the vertical position, the other for raising the tower. Each winch is an automatic brake-type winch that automatically brakes when the handle is released. The handle must be rotated to wind in cable as well as unwind cable.



WARNING

NEVER touch the winch pawl! Releasing the pawl may cause the mast or tower to fall.

3.6.1 Check winch cables **(n)** for wear or damage, and make sure they are resting properly in pulleys. Do not use the Light Tower if either winch cable is damaged.

3.6.2 Remove the cradle locking pin **(j)** from the cradle.

3.6.3 Check the operation of the tongue-mounted winch **(o)** by rotating the winch handle 1/4-turn clockwise (“cable in” direction). The winch pawl must engage winch gear teeth. When operating properly, the winch pawl will make a “clicking” sound when the winch handle is rotated clockwise. Do not attempt to raise the mast if the winch is damaged or not operating properly.

3.6.4 Continue to rotate the winch handle and raise the mast to the vertical position until the vertical mast locking pin **(p)** locks the mast in place. Be certain the vertical mast locking pin is fully engaged in the locking position before raising the tower.

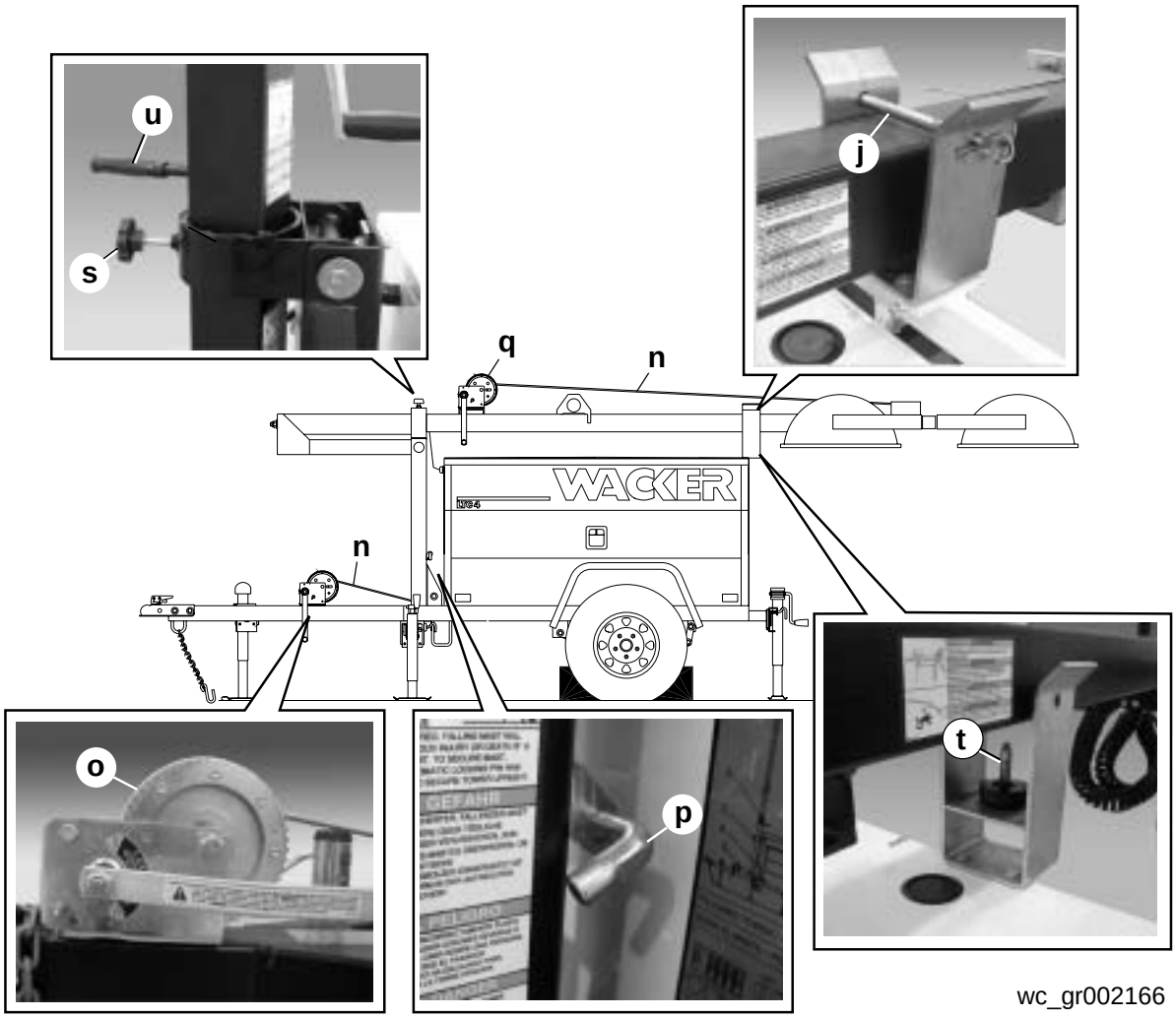
WARNING

NEVER pull the vertical mast locking pin (p) while the tower is raised! Releasing the vertical mast locking pin while the tower is raised may cause the tower to fall or the machine to tip over.

3.6.5 After the mast is in the vertical position, check the operation of the mast-mounted winch **(q)** by rotating the winch handle 1/4-turn clockwise ("cable in" direction). The winch pawl must engage winch gear teeth. When operating properly, it will make a "clicking" sound when the winch handle is rotated clockwise. Do not attempt to raise the mast if the winch is damaged or not operating properly. Continue rotating the winch handle until mast is at the desired height. Do not over crank the winch when the tower is fully extended.

CAUTION: Do not extend the tower beyond the red marking on the mast!

3.6.6 Once the tower is at the desired height, rotate the mast to the desired direction. To rotate, loosen rotation locking knob **(s)**. Then using the handle **(u)**, rotate the mast until the lights face the desired direction, and then retighten the rotation locking knob.



wc_gr002166

3.7 Lowering Tower (Manual Winch System)

See Graphic: wc_gr002166

Be sure to read and understand the operating instructions before lowering the tower!



WARNING

If for any reason a part of the mast hangs up or a winch cable develops slack before mast is fully lowered, **stop immediately!** Continuing to turn the winch handle will increase the slack in the cable. Too much slack could cause the mast to collapse should it suddenly free up. If the mast hangs up, level the trailer. Slightly shake or twist the tower assembly to free the bind. Contact an authorized WACKER service representative immediately.



WARNING

NEVER lower the mast while the unit is operating.



WARNING

NEVER allow anyone to stand near the rear of the unit while lowering the mast.

3.7.1 Turn the lights off. Shut down the engine.

CAUTION: Shutting down the engine before turning off the lights could damage floodlight ballasts or generator capacitor(s).

CAUTION: Observe power cord while lowering the tower. Make sure the coiled cord is not damaged during the lowering process.

3.7.2 Lower the tower by turning the handle on the mast-mounted winch **(q)** counterclockwise (“cable out” direction).



WARNING

NEVER touch the winch pawl! Releasing the winch pawl may cause the mast or tower to fall.

3.7.3 Loosen the rotation locking knob **(s)** and using the handle **(u)**, rotate the mast so the lights face the rear of the trailer and the mast-mounted winch is facing toward the trailer tongue.

3.7.4 Pull and hold the mast locking pin **(p)**. Rotate the handle on the tongue-mounted winch **(o)** counterclockwise (“cable out” direction) until the mast spring begins to pivot the mast down. Release the mast locking pin and continue to rotate the handle until the mast is resting in the transport cradle. Be sure that the secondary locking pin **(t)** penetrates all sections of the mast.



WARNING

NEVER pull the vertical mast locking pin (e) while the tower is raised! Releasing the locking pin while the tower is raised may cause the tower to fall or the machine to tip over.

3.7.5 After the mast is down, secure it in the cradle by inserting the cradle lock pin **(j)**. Insert the clip through the pin to secure it in place.

3.7.6 Position the light fixtures to aim at the ground.

CAUTION: Allow the floodlights to cool 10–15 minutes before moving trailer. Moving the trailer while the lights are still hot could cause the bulbs to break.

3.8 Raising Tower (Power Winch System)

See Graphic: wc_gr002759, wc_gr002758



WARNING

ALWAYS observe the tower while raising and lowering the mast.

NEVER raise the mast or operate the Light Tower in high winds.

NEVER raise the mast while the engine is running.



WARNING

HIGH VOLTAGE! DO NOT use Light Tower if insulation on electrical cord is cut or worn through. Repair or replace cord before using. Bare wires in contact with the metal frame of the trailer or the Light Tower can cause electrocution.

DO NOT position the Light Tower under electrical power lines.



WARNING

NEVER allow anyone to stand near the rear of the unit while raising the mast.

The Light Tower includes two separate winches. One for lifting the mast to the vertical position, the other for raising the tower.

3.8.1 Check the winch cables **(n)** for wear or damage, and make sure they are resting properly in the pulleys. Do not use the Light Tower if either winch cable is damaged.

3.8.2 Remove the cradle locking pin **(j)** from the cradle.

3.8.3 Check the operation of the tongue-mounted winch **(o).** Turn the vertical rotary switch **(v)** on the control panel to the up position. Do not attempt to raise the mast if the winch is damaged or not operating properly.

CAUTION: Continuous running of the winch in excess of 4 minutes will damage the winch motor.

Note: *It is normal for smoke to be produced during the first few operations of a new power winch.*

3.8.4 Hold the switch in the up position and raise the mast to the vertical position until the vertical mast locking pin **(p)** locks the mast in place. Be certain the vertical mast locking pin is fully engaged in the locking position before raising the tower.



WARNING

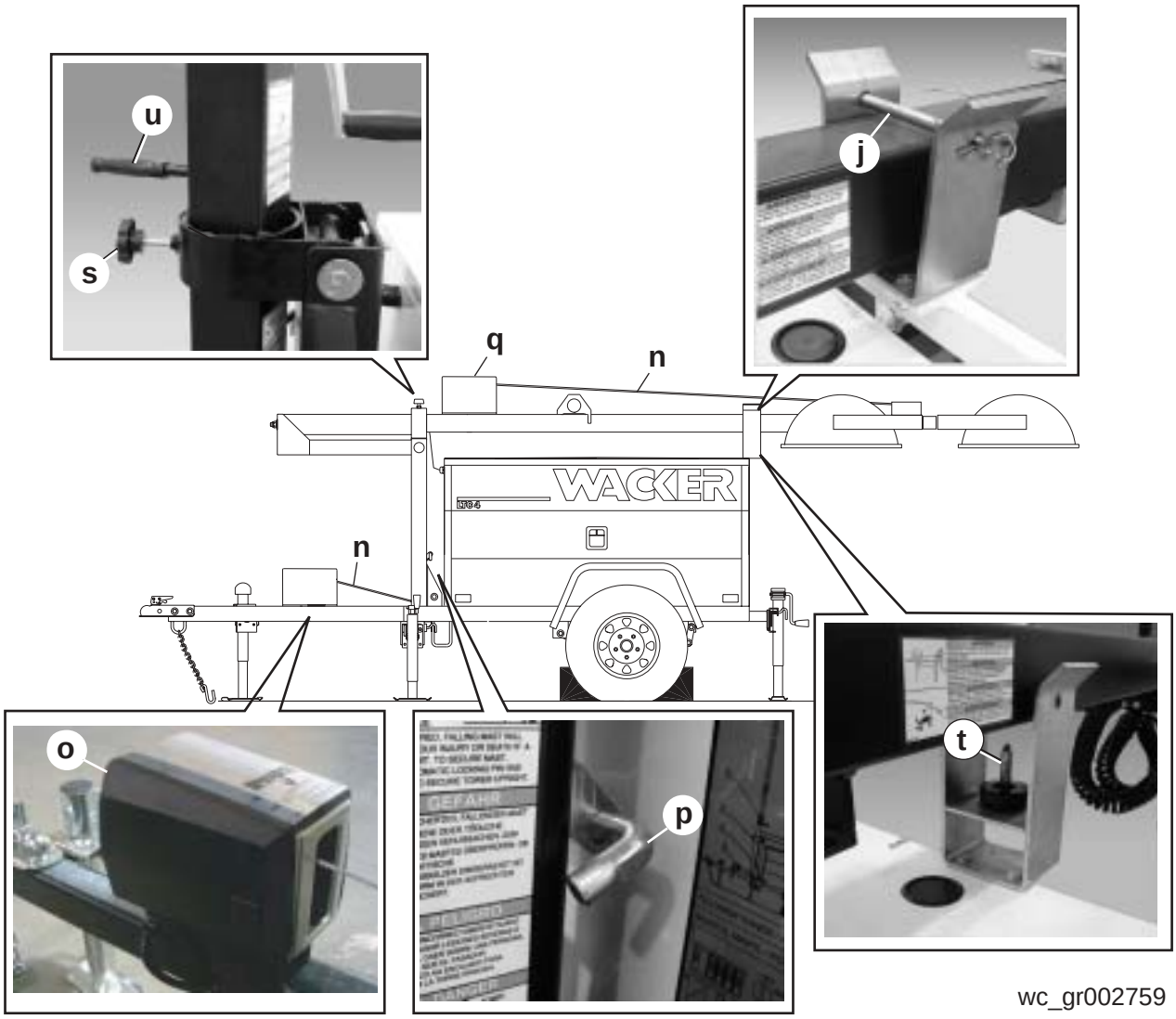
NEVER pull the vertical mast locking pin (p) while the tower is raised! Releasing the vertical mast locking pin while tower is raised may cause the tower to fall or the machine to tip over.

3.8.5 After the mast is in the vertical position, check the operation of the mast-mounted winch **(q).** Turn the telescope rotary switch **(w)** on the control panel to the up position. Do not attempt to raise the mast if the winch is damaged or not operating properly. Continue to hold switch in the up position until mast is at the desired height. Release switch when tower is fully extended.

CAUTION: Continuous running of the winch in excess of 4 minutes will damage the winch motor.

CAUTION: Do not extend tower beyond red marking on mast!

3.8.6 Once the tower is at the desired height, rotate the mast to the desired direction. To rotate, loosen rotation locking knob **(s)**. Then using the handle **(u)**, rotate the mast until the lights face the desired direction and then retighten rotation locking knob.



wc_gr002759

3.9 Lowering Tower (Power Winch System)

See Graphic: wc_gr002759, wc_gr002758

ALWAYS observe the tower while raising and lowering the mast.

Be sure you read and understand the operating instructions before lowering the tower!

WARNING

If for any reason any part of the mast hangs up or the winch cable develops slack before the mast is fully lowered, **stop immediately!** Continuing to power the winch will increase slack in the cable. Too much slack could cause mast to collapse should it suddenly free up. If the mast hangs up, level the trailer. Slightly shake or twist the tower assembly to free the bind. Contact an authorized WACKER service representative immediately.

WARNING

NEVER lower the mast while the unit is operating.

WARNING

NEVER allow anyone to stand near the rear of the unit while lowering the mast.

3.9.1 Turn the lights off. Shut down the engine.

CAUTION: Shutting down the engine before turning off the lights could damage the floodlight ballasts or the generator capacitor(s).

CAUTION: Observe the power cord while lowering the tower. Make sure the coiled cord is not damaged during the lowering process.

3.9.2 Lower the tower by turning and holding the telescope rotary switch **(w)** on the control panel in the down position.

CAUTION: Continuous running of the winch in excess of 4 minutes will damage the winch motor.

Note: *It is normal for smoke to be produced during the first few operations of a new power winch.*

3.9.3 Loosen the rotation locking knob **(s)** and using the handle **(u)**, rotate the mast so the lights face the rear of the trailer and the mast-mounted winch is facing toward the trailer tongue.

3.9.4 Pull and hold the mast locking pin **(p)**. Turn and hold the vertical rotary switch **(v)** on the control panel in the down position until the mast is resting in the transport cradle. Be sure that the secondary locking pin **(t)** penetrates all sections of the mast.

CAUTION: Continuous running of the winch in excess of 4 minutes will damage the winch motor.



WARNING

NEVER pull the vertical mast locking pin (e) while the tower is raised! Releasing the vertical mast locking pin while the tower is raised may cause the tower to fall or the machine to tip over.

3.9.5 After the mast is down, secure it in the cradle by inserting the cradle lock pin **(j)**. Insert the clip through the pin to secure it in place.

3.9.6 Position the light fixtures to aim at the ground.

CAUTION: Allow the floodlights to cool 10–15 minutes before moving the trailer. Moving the trailer while the lights are still hot could cause bulbs to break.

3.10 Emergency Crank Handle (Power Winch System)

An emergency crank handle is provided for use in the event of a power failure.

3.10.1 Remove the electrical power from the winch.

3.10.2 Remove the plug from the side of the winch cover. Insert the handle so that it completely engages with the drive shaft. The handle can be cranked in either direction.

3.10.3 Always remove the handle from the winch after use and replace the plug.



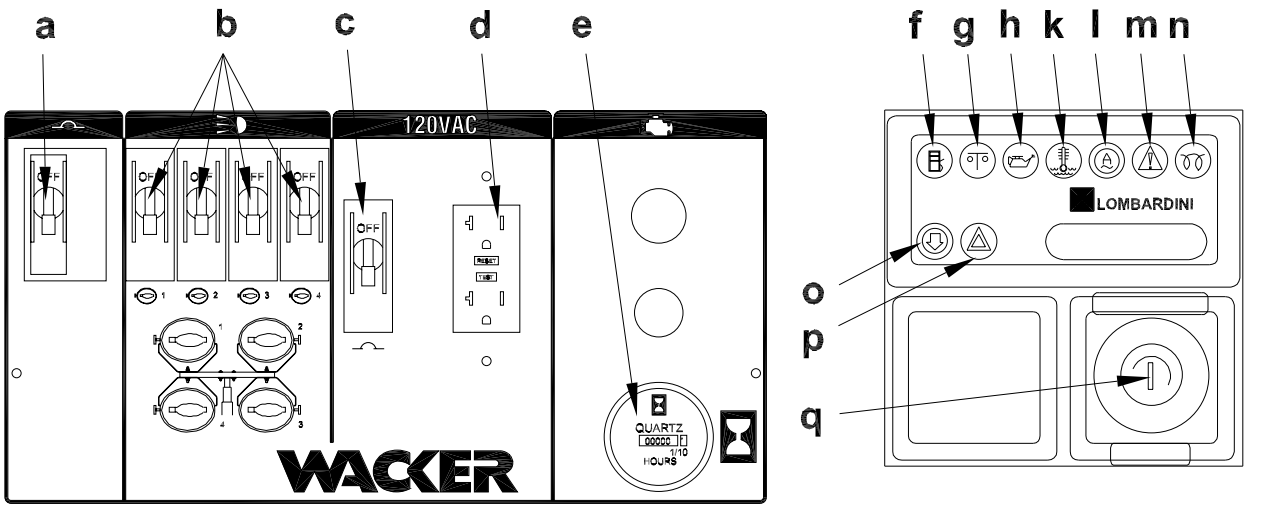
WARNING

NEVER operate the winch electrically with the emergency crank handle in position.

3.11 Control Panels—Lombardini (Manual Winch System)

Floodlight Control Panel

Engine Control Panel

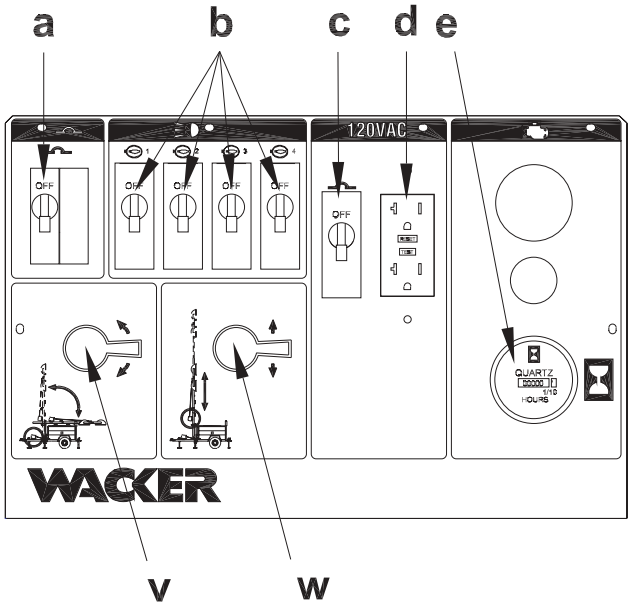


wc_gr001426

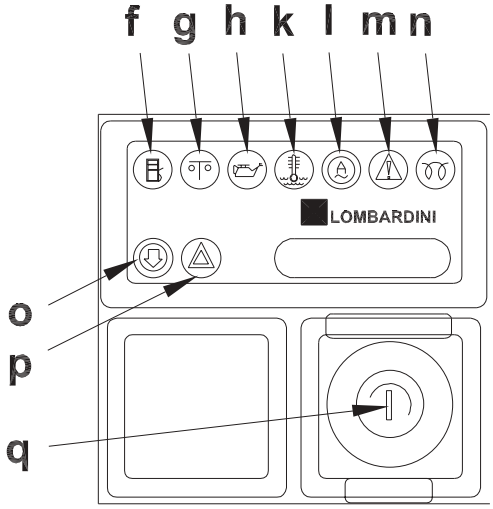
Ref.	Description	Ref.	Description
a	50 Amp circuit breaker	k	High coolant temperature shutdown
b	15 Amp lights circuit breaker	l	Alternator indicator
c	20 Amp GFI circuit breaker	m	Auxiliary light (not used)
d	20 Amp GFI receptacle	n	Glow plug indicator
e	Hour meter	o	Air filter restriction indicator
f	Low fuel indicator (not used)	p	Auxiliary light (not used)
g	Safety shutdown indicator	q	Key access door
h	Low oil pressure shutdown		

3.12 Control Panels—Lombardini (Power Winch System)

Floodlight Control Panel



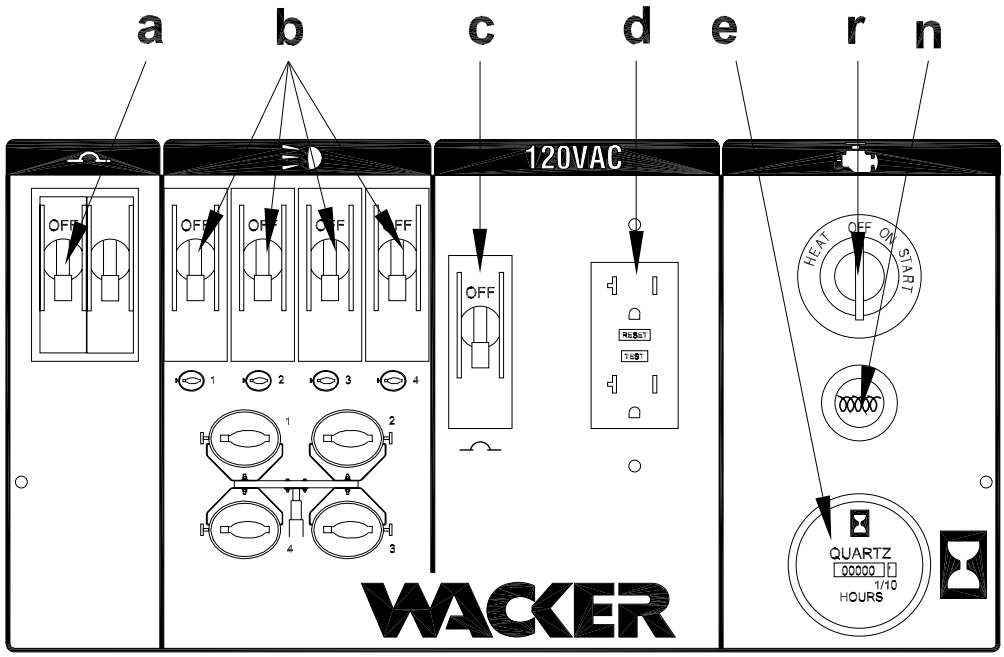
Engine Control Panel



wc_gr002758

Ref.	Description	Ref.	Description
a	50 Amp circuit breaker	l	Alternator indicator
b	15 Amp lights circuit breaker	m	Auxiliary light (not used)
c	20 Amp GFI circuit breaker	n	Glow plug indicator
d	20 Amp GFI receptacle	o	Air filter restriction indicator
e	Hour meter	p	Auxiliary light (not used)
f	Low fuel indicator (not used)	q	Key access door
g	Safety shutdown indicator	v	Tilt rotary switch
h	Low oil pressure shutdown	w	Telescope rotary switch
k	High coolant temperature shutdown		

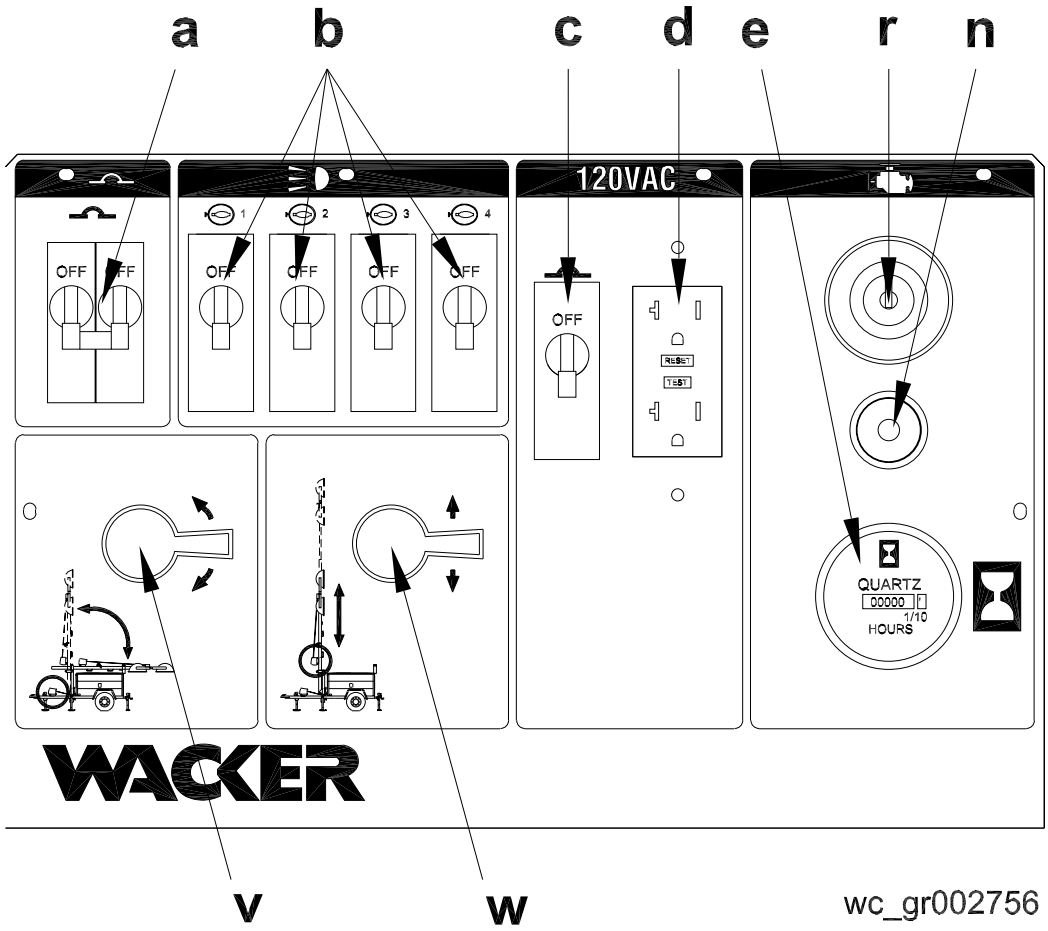
3.13 Control Panels—CAT (Manual Winch System)



wc_gr001670

Ref.	Description	Ref.	Description
a	25 Amp circuit breaker	e	Hour meter
b	15 Amp lights circuit breaker	n	Glow plug indicator
c	20 Amp GFI circuit breaker	r	Key switch
d	20 Amp GFI outlet		

3.14 Control Panel—CAT (Power Winch System)



Ref.	Description	Ref.	Description
a	25 Amp circuit breaker	n	Glow plug indicator
b	15 Amp lights circuit breaker	r	Key switch
c	20 Amp GFI circuit breaker	v	Vertical rotary switch
d	20 Amp GFI outlet	w	Telescope rotary switch
e	Hour meter		

3.15 Starting—Lombardini

See Graphic: wc_gr001426, wc_gr002758

3.15.1 Check the engine oil, fuel and coolant levels.

Note: *If the fuel tank was drained or run dry it may be necessary to bleed the fuel lines. Refer to the Engine Operator's Manual.*

3.15.2 Check the condition of the electrical cable on the mast. Do not start the generator if the insulation on the cable is cut or worn through.

3.15.3 Check that the circuit breakers **(a, b, c)** are in their OFF position.

CAUTION: Starting the engine under load will damage the machine.

3.15.4 On machines equipped with the Lombardini engine, turn the key **(q)** one click to the right. The glow plug indicator **(n)** will illuminate until the engine is properly preheated. This is an automatic timer based on the engine temperature. Crank the engine immediately after the glow plug light goes off.

3.15.5 Turn the key **(q)** to START and hold until the engine starts. Release the key after engine starts.

CAUTION: Do not crank the engine longer than 10 seconds. This could cause starter motor to overheat. Return switch to OFF and wait 15-30 seconds for the starter motor to cool down before attempting to preheat and restart.

Note: *If the oil pressure is not obtained within 30 seconds after the key is turned to RUN, the automatic shutdown system will shut off the fuel supply. You must return the key to the OFF position to restart the 30 second timer before attempting to restart the engine.*

3.15.6 Allow the engine to warm up before operating the floodlights.

3.16 Starting—CAT

See Graphic: wc_gr001670, wc_gr002756

3.16.1 Check the engine oil, fuel and coolant levels.

Note: *If the fuel tank was drained or run dry it may be necessary to bleed the fuel lines.*

3.16.2 Check the condition of the electrical cable on the mast. Do not start the generator if the insulation on cable is cut or worn through.

3.16.3 Check that the circuit breakers **(a, b, c)** are in their OFF position.

CAUTION: Starting the engine under load will damage the machine.

3.16.4 On machines equipped with the Caterpillar engine, turn the key **(r)** one click left to the HEAT position and hold until the glow plug indicator **turns red**. (This will take approximately 30 seconds.)

3.16.5 Turn the key **(r)** to START and hold until the engine starts. Release the key after the engine starts.

CAUTION: Do not crank engine longer than 10 seconds. This could cause starter motor to overheat. Return switch to OFF and wait 15-30 seconds for starter motor to cool down before attempting to preheat and restart.

Note: *If oil pressure is not obtained within 30 seconds after key is turned to RUN, the automatic shutdown system will shut off the fuel supply. You must return the key to the OFF position to restart the 30 second timer before attempting to restart the engine.*

3.16.6 Allow engine to warm up before operating floodlights.

3.17 Automatic Shutdown

This unit is equipped with a low oil, high temperature auto-shutdown system. This system will automatically shut off the fuel supply to the engine if the oil pressure drops too low or the engine exceeds normal operating temperatures. Return the key switch to “OFF” to reset the unit after an engine shutdown.

3.18 Operating Lights

See Graphic: wc_gr001426, wc_gr002758

Turn on the circuit breaker **(a)** first, then turn each circuit breaker **(b)** to “ON”, one at a time.

Metal halide floodlights require a warm-up time of 5–15 minutes before they reach full output. If the floodlights are shut down, a 10-minute cool-down period is required before turning them back on.

High pressure sodium floodlights require 1–2 minutes to start and 2–5 minutes of cooldown time to restart.

3.19 Stopping—Lombardini

See Graphic: wc_gr001426, wc_gr002758

3.19.1 Turn the circuit breakers **(a, b, c)** off and remove any other loads from the generator.

CAUTION: Never shut down the engine without turning off the lights. Damage to the generator will occur.

3.19.2 Turn the key **(q)** to OFF.

3.20 Stopping—CAT

See Graphic: wc_gr001670, wc_gr002756

3.20.1 Turn the circuit breakers **(a, b, c)** off and remove any other loads from the generator.

CAUTION: Never shut down the engine without turning off the lights. Damage to the generator will occur.

3.20.2 Turn the key **(r)** to “OFF”.

3.21 Derating

All generator sets are subject to derating for altitude and temperature. Although derating should not affect operation of the floodlights, it will reduce the available reserve power to the receptacle.

Ratings are typically reduced 3% per 300 m (1000 feet) elevation from sea level, and 2% per 10°F (5.5°C) increase in ambient temperature above 78°F (25°C).

3.22 Receptacles—60 Hz

See Graphic: wc_gr001426, wc_gr002758

The control panel is equipped with a convenience receptacle for running accessories and tools from the generator. Power to this receptacle is available any time the engine is running and the circuit breaker is “ON”.

CAUTION: Do not draw more than 2000 Watts from the receptacle with all of the lights on or the lights will turn off.

A circuit breaker **(c)** protects the Ground Fault Interrupt (GFI) receptacle **(d)**. The GFI receptacle should be tested for proper operation each time it is used.

To test a GFI:

Push the test button in. The reset button should pop out. Power to the receptacle is now off. To restore power to receptacle, push reset button in.

CAUTION: If the reset button does not pop out, the GFI is defective. **Do not** use the receptacle until the problem can be corrected.

If the reset button pops out during use, check the generator and attachments for defects.

4. Maintenance

4.1 Periodic Maintenance Schedule—Lombardini

	Before each use	Every 125 hours	Every 250 hours	Every 500 hours	Every 1000 hours or two years
Check for fluid leaks.	•				
Check engine oil.	•				
Check fuel level.	•				
Replace air filter if indicator light is on.**	•				
Change engine oil.*		•			
Check level of battery electrolyte.		•			
Check condition and tension on fan belt.			•		
Check condition of radiator hoses.			•		
Replace oil filter.*			•		
Replace fuel filter.			•		
Flush radiator.				•	
Replace fan belt.				•	
Check valve clearance.				•	
Remove sediment in fuel tank.					•
Change radiator coolant.					•
Replace battery.					•
Replace radiator hoses and clamps.					•
Replace fuel pipes and clamps.					•

* Change engine oil and filter after first 50 hours of operation.

** Replace air filter after air filter restriction switch indication or one year. Lombardini does not recommend the removal of air filter elements for purposes of inspection.

4.2 Periodic Maintenance Schedule—CAT

	Before each use	Every 100 hours	Every 250 hours	Every 500 hours	Every 1000 hours
Visual walkaround inspection.	•				
Check for fluid leaks.	•				
Check engine oil and coolant level.	•				
Check fuel level.	•				
Replace air filter if indicator light is on.**	•				
Change engine oil and filter.*		•			
Check level of battery electrolyte.			•		
Check condition and tension on fan belt.			•		
Check condition of radiator hoses. Replace radiator hoses and clamps.			•		
Flush radiator.			•		
Replace fuel filter.				•	
Check valve clearance.				•	
Remove sediment in fuel tank.					•
Change radiator coolant.					•
Replace battery.					•
Replace fuel pipes and clamps.					•

* Change engine oil and filter after first 50 hours of operation.
** Replace air filter after air filter restriction switch indication or one year.

4.3 Daily Inspection

4.3.1 Check for fluid leaks. Check fluid levels.

4.3.2 Inspect condition of electrical cords. Do not use light tower if insulation is cut or worn through.

4.3.3 Check that winch cables are in good condition. Do not use a cable that is kinked or starting to unravel.

4.3.4 Check that the vertical mast locking pin and its spring are secured, aligned, and operating properly.

4.4 Installing / Removing Light Fixtures

See Graphic: wc_gr001427, wc_gr000542

WARNING

ALWAYS turn off the light circuit breakers and shut down the engine before disconnecting the light fixtures or changing the light bulbs.

Remove the light fixtures by disconnecting the electrical cords using the quick disconnects **(a)**. Remove the nuts **(b)** from the fixture mounting brackets and remove both fixture and bracket from the stud.

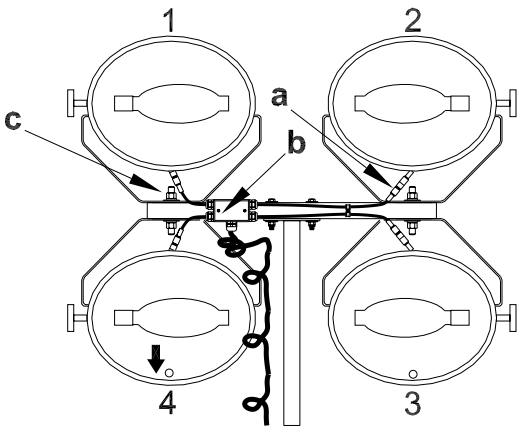
CAUTION: Only a trained technician should be allowed to install and remove the fixture wiring.

Note: *When reinstalling the light fixtures, make sure the drain hole is pointing down.*

WARNING

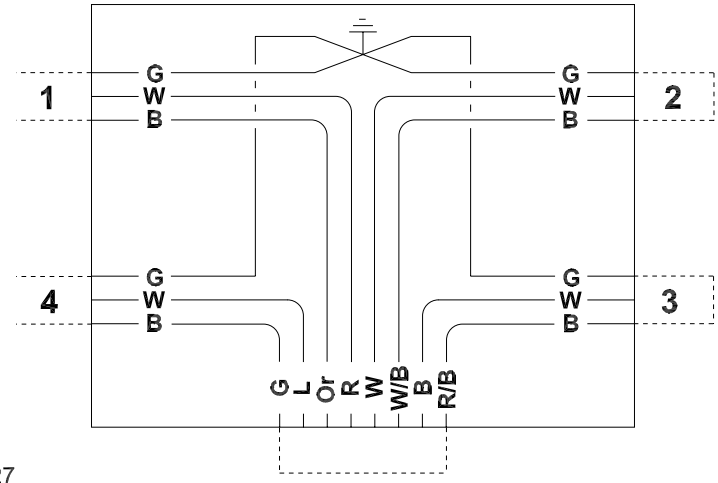
Bulbs become extremely hot in use! Allow the bulb and fixture to cool 10-15 minutes before handling.

Numbering Sequence of Floodlights



wc_gr001427

Connection Box Wiring for Floodlights



wc_gr000542

Wire Colors							
B	Black	R	Red	Y	Yellow	Or	Orange
G	Green	T	Tan	Br	Brown	Pr	Purple
L	Blue	V	Violet	Cl	Clear	Sh	Shield
P	Pink	W	White	Gr	Gray	LL	Light blue

4.5 Precautions When Replacing / Removing Bulbs

The Light Tower uses four 1000W bulbs. When replacing or removing the bulbs, avoid leaving any grease or oil residue on the glass surface. This can create hot spots, reducing the service life of the bulb or causing the outer jacket to burst.



WARNING ALWAYS turn off the light circuit breakers and shut down the engine before disconnecting the light fixtures or changing the light bulbs.

WARNING **Bulbs become extremely hot in use!** Allow the bulb and fixture to cool 10–15 minutes before handling.



WARNING **NEVER operate the lights without the protective lens cover in place or with a lens cover that is cracked or damaged!** The lamps used in the floodlights produce high temperatures and operate under pressure. They are subject to failures where the outer jacket bursts and shatters, resulting in a discharge of extremely hot glass particles. These particles pose a risk of personal injury, property damage, burns and fire.



WARNING Ultraviolet radiation from the lamp can cause serious skin and eye irritation. Use the lamp only with provided undamaged lens cover and fixture.

4.6 Replacing Bulbs

See Graphic: wc_gr0002464

Removal:

4.6.1 Shut down the engine and allow the bulb to cool.

4.6.2 Remove the screws **(a)** securing the flange rings **(b)** and remove the flange rings.

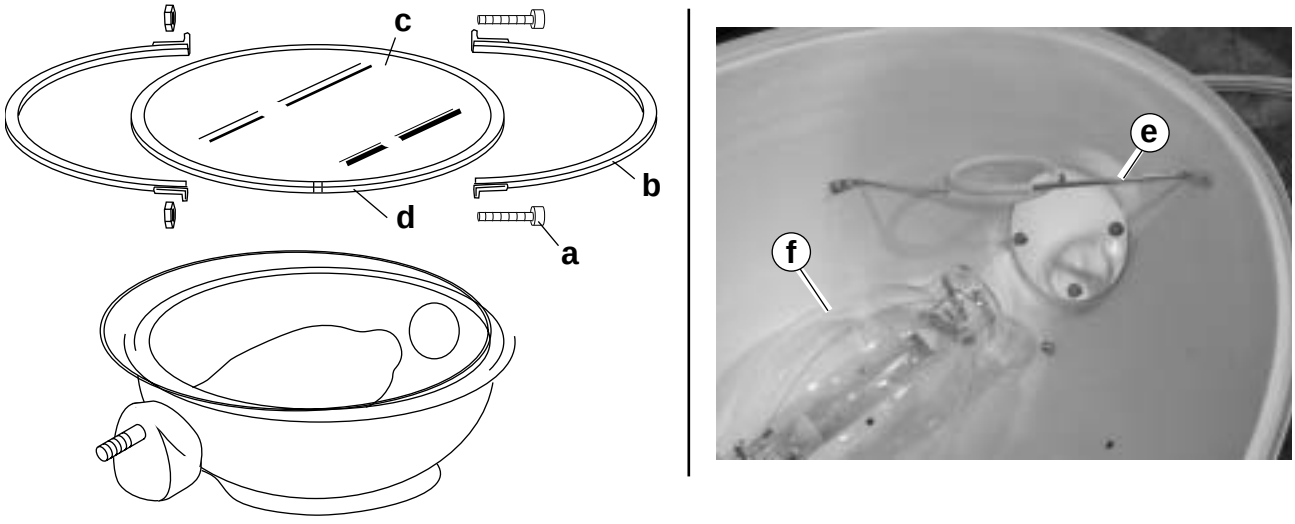
4.6.3 Remove the lens **(c)** with the gasket **(d)** attached.

4.6.4 Remove the hardware securing one side of the bulb stabilizer **(e)**. Once removed, swing the bulb stabilizer to the side and unscrew the bulb **(f)**.

Installation:

4.6.5 Insert the bulb and secure it with the bulb stabilizer **(e)**.

4.6.6 Install the gasket **(d)** around the lens **(c)** and secure the lens to the reflector with flange ring **(b)** and screws **(a)**.



wc_gr002464

4.7 Air Cleaner

See Graphic: wc_gr002478

WARNING

DO NOT attempt to clean or service the machine while it is running.

CAUTION: DO NOT operate the engine without an air cleaner.

Note: *Caterpillar engines are equipped with a filter indicator **(a),** which indicates when a filter change is required. Replace the main paper filter element when the yellow plunger of the indicator appears in or near the red line. Push and hold in the yellow rubber button on top of the indicator to reset it after replacing the main paper filter element. Lombardini engines include a light **(b)** on the engine control panel which, when lit, indicates when a filter change is required.*

4.7.1 Open air the cleaner and remove the element.

4.7.2 Inspect the air filter; replace it as needed.

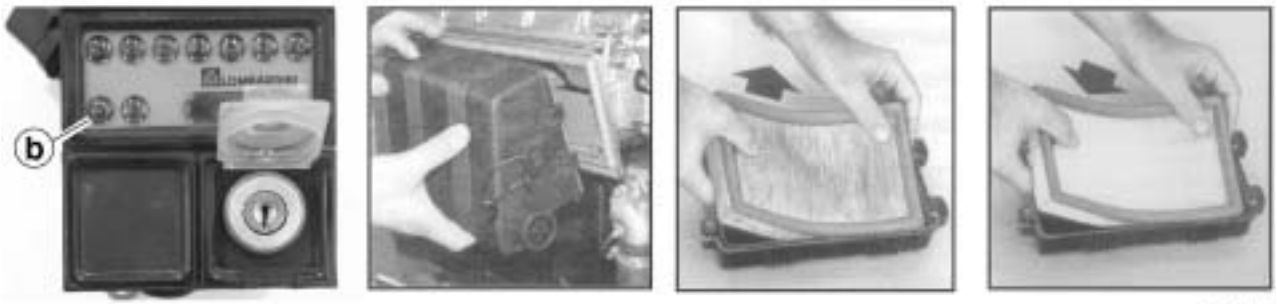
4.7.3 To clean the filter, lightly tap it on a hard surface to eliminate all excess dirt. Do not blow the paper filter element with compressed air to clean. Clean the filter cover and support carefully.

4.7.4 Reassemble the filtering element and the air cleaner.

Caterpillar



Lombardini



wc_gr002478

4.8 Engine Oil

See Graphic: wc_gr002479

Drain the oil while the engine is still warm.

Note: *In the interests of environmental protection, place a plastic sheet and a container under the machine to collect any liquid which drains off. Dispose of this liquid in accordance with environmental protection legislation.*

4.8.1 Remove the oil drain plug.

4.8.2 Allow the oil to drain.

4.8.3 Install the oil drain plug.

4.8.4 Fill the engine crankcase through the oil filler opening, to the upper mark on the dipstick. See *Technical Data* for oil quantity and type.

4.8.5 Install the oil filter cap.

Caterpillar





Lombardini

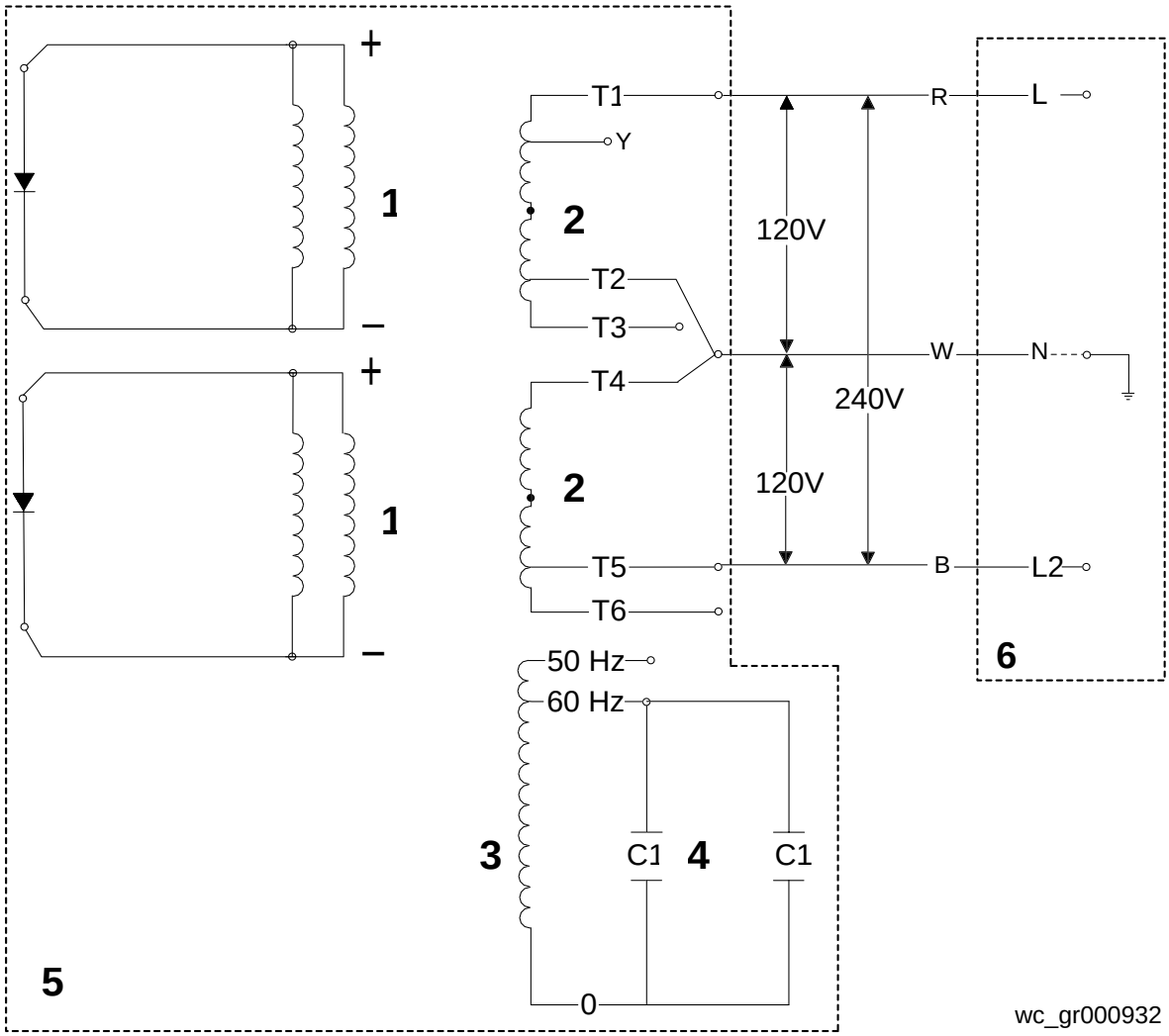






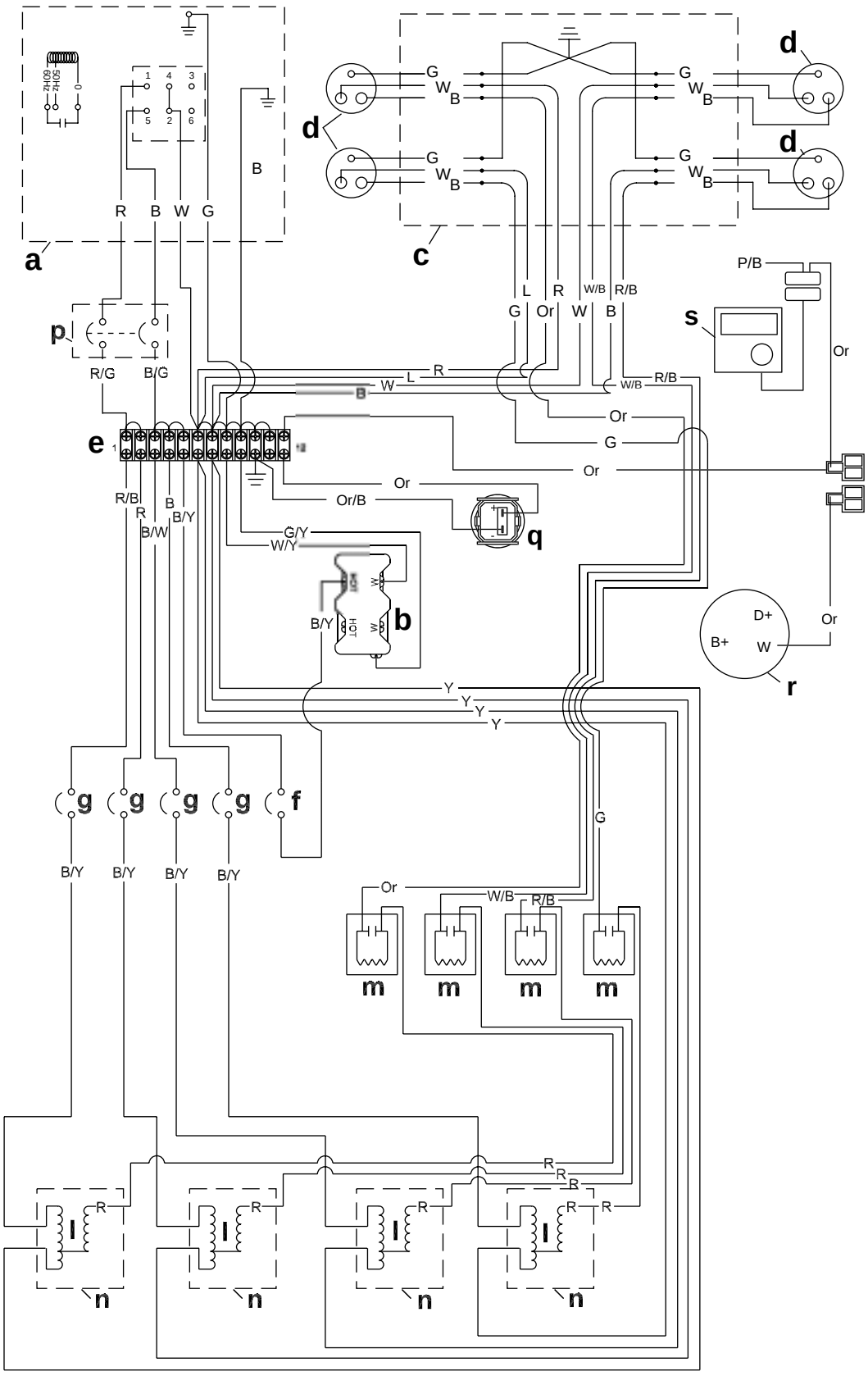
wc_gr002479

4.9 Generator Capacitor Excitation Schematic 60 Hz



Ref.	Description	Ref.	Description
1	Rotor	4	Capacitor
2	Stator	5	Generator/Terminal block
3	Excitation coils	6	Control box-lights

4.10 Schematic for 60 Hz Metal Halide 4-Light Units



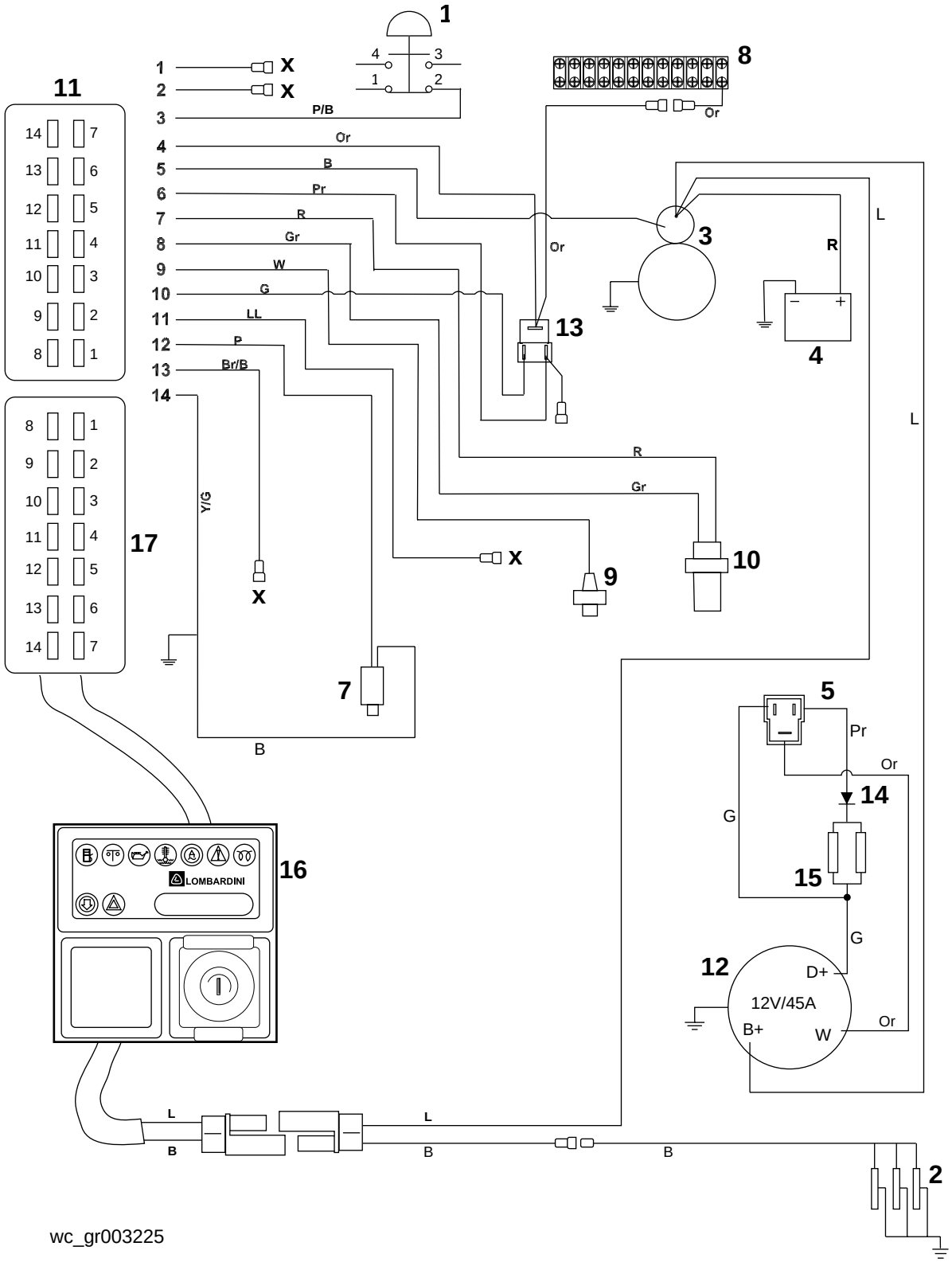
wc_gr002459

4.11 Metal Halide Schematic Components

Ref.	Description	Ref.	Description
a	Generator	l	Transformer
b	20 Amp GFI outlet	m	Capacitor
c	Control box-lights	n	Ballasts
d	Quick disconnects	p	25 Amp 2-pole circuit breaker
e	Terminal strip	q	Hourmeter
f	20 Amp GFI circuit breaker	r	Alternator
g	15 Amp circuit breaker	s	Control panel

Wire Colors							
B	Black	R	Red	Y	Yellow	Or	Orange
G	Green	T	Tan	Br	Brown	Pr	Purple
L	Blue	V	Violet	Cl	Clear	Sh	Shield
P	Pink	W	White	Gr	Gray	LL	Light blue

4.12 Engine Wiring—Lombardini 1003

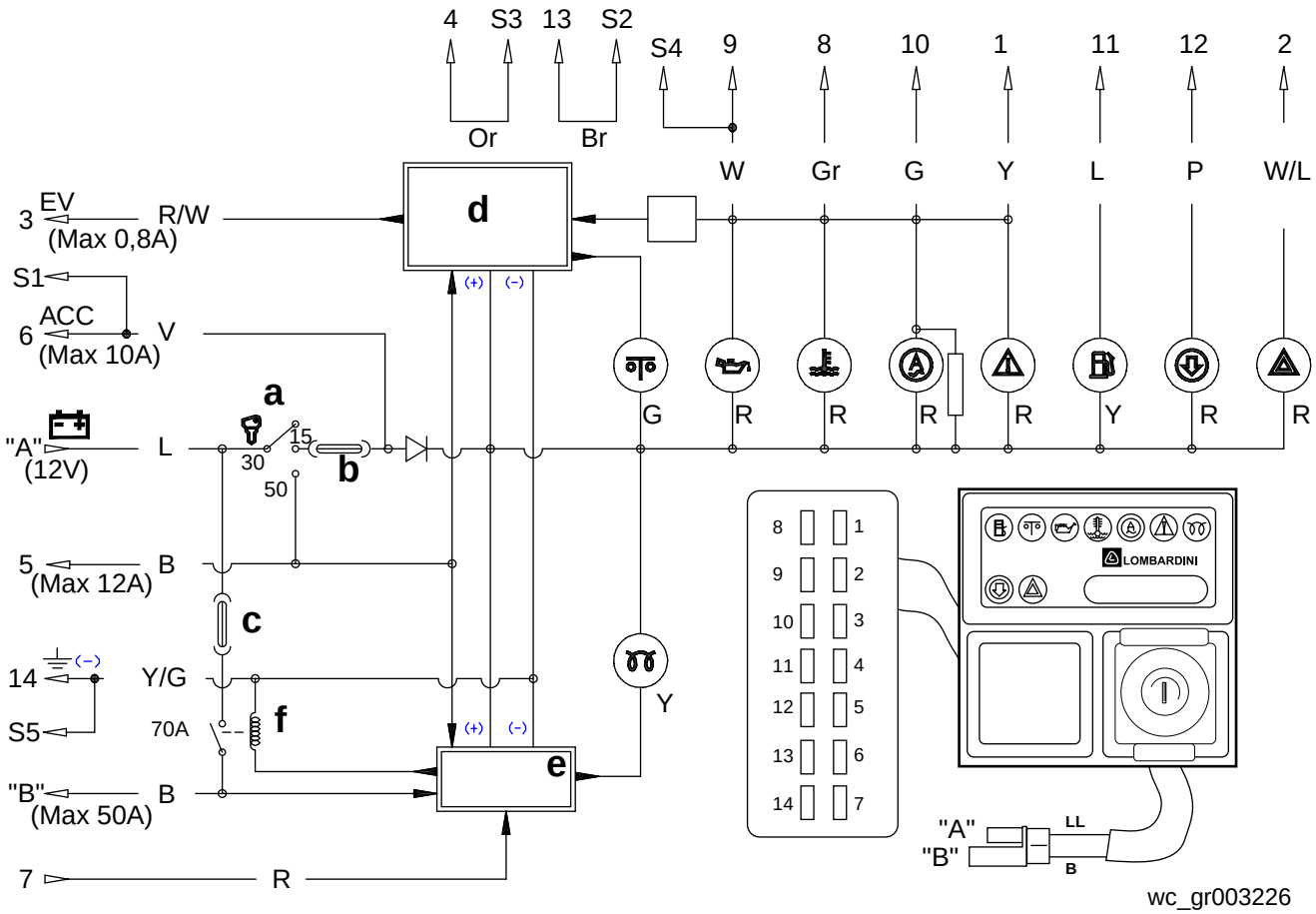


wc_gr003225

4.13 Engine Wiring Components—Lombardini 1003

Ref.	Description	Ref.	Description	Ref.	Description
1	Emergency stop switch	7	Air filter restriction indicator (normal open type)	13	Harness connector (alternator)
2	Glow plugs	8	Terminal strip	14	Diode
3	Starter motor	9	Low oil pressure switch	15	Resistors (2x220 Ohm, 0.6 W)
4	Battery	10	High coolant temperature switch (normal open type)	16	Control panel
5	Alternator connector	11	Harness connector (control panel)	17	Control panel connector
-	---	12	Alternator	x	Not used

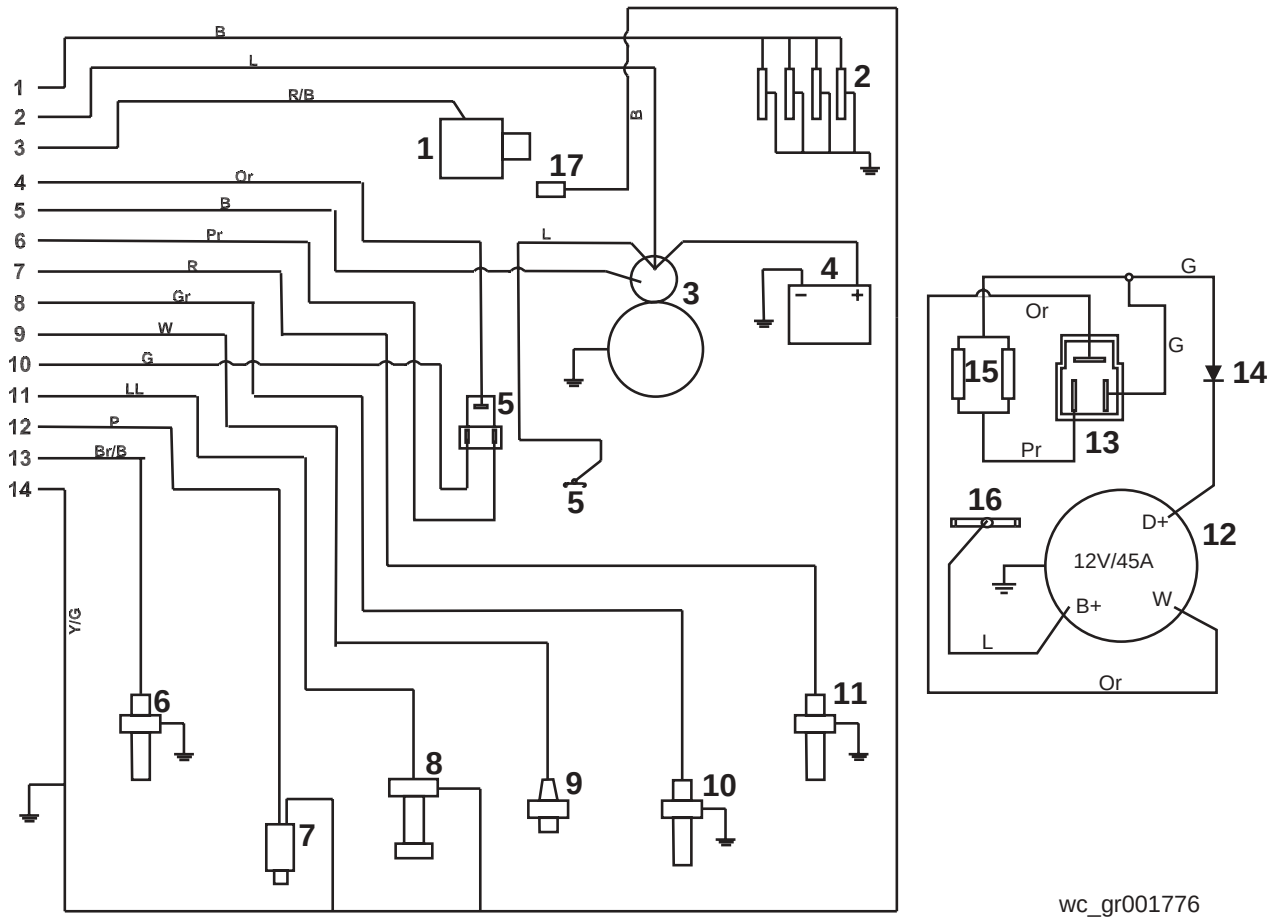
4.14 Engine Control Panel Internal Wiring—Lombardini 1003



Ref.	Description	Ref.	Description
a	Key switch	d	Engine protection
b	15A fuse	e	Preheating
c	80A fuse	f	Relay

Wire Colors							
B	Black	R	Red	Y	Yellow	Or	Orange
G	Green	T	Tan	Br	Brown	Pr	Purple
L	Blue	V	Violet	Cl	Clear	Sh	Shield
P	Pink	W	White	Gr	Gray	LL	Light blue

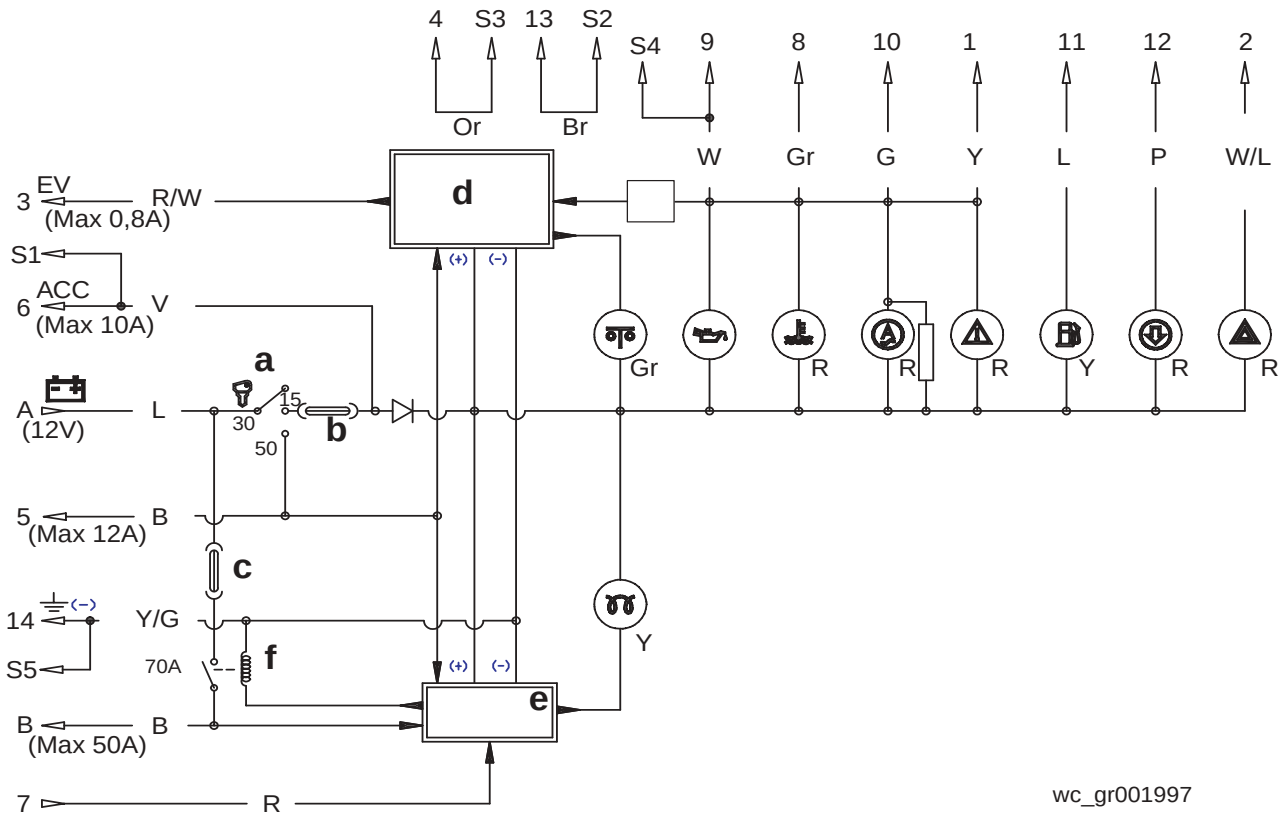
4.15 Engine Wiring—Lombardini 903



wc_gr001776

Ref.	Description	Ref.	Description	Ref.	Description
1	Fuel solenoid	7	Air filter restriction indicator (normal open type)	13	Harness connector
2	Glow plugs	8	Low fuel level switch (not used, normal open type)	14	Diode
3	Starter motor	9	Low oil pressure switch (normal closed type)	15	Resistors (2x220 Ohm, 0.6 W)
4	Battery	10	Coolant high temperature switch (normal open type)	16	Blade connector
5	Alternator connector	11	Coolant temperature thermistor (for preheat relay)	17	Spade ground connector (Not used. Provided for possible replacement fuel solenoid.)
6	Coolant temperature sending unit (Not used. Provided for remote temperature gauge or LED.)	12	Alternator		

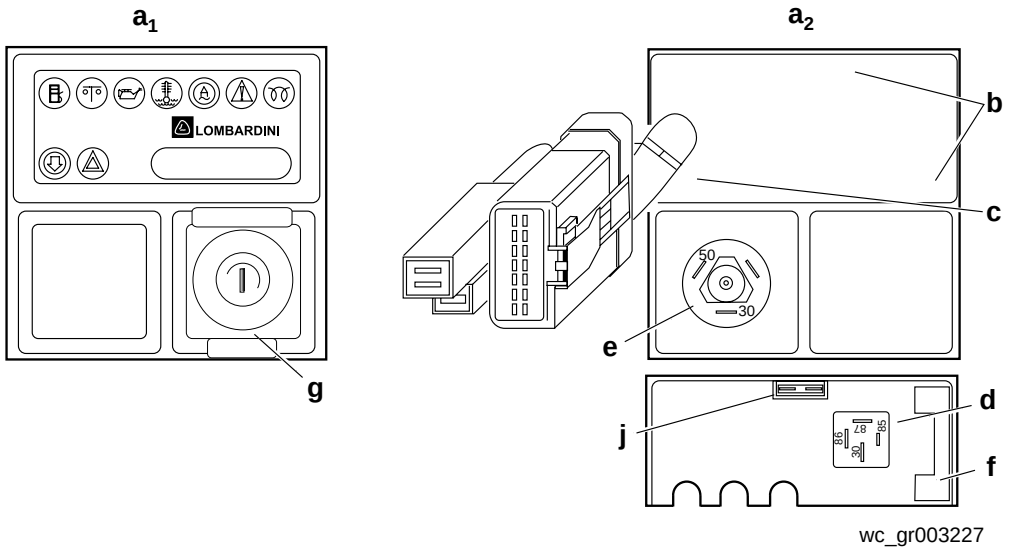
4.16 Engine Control Panel Internal Wiring—Lombardini 903



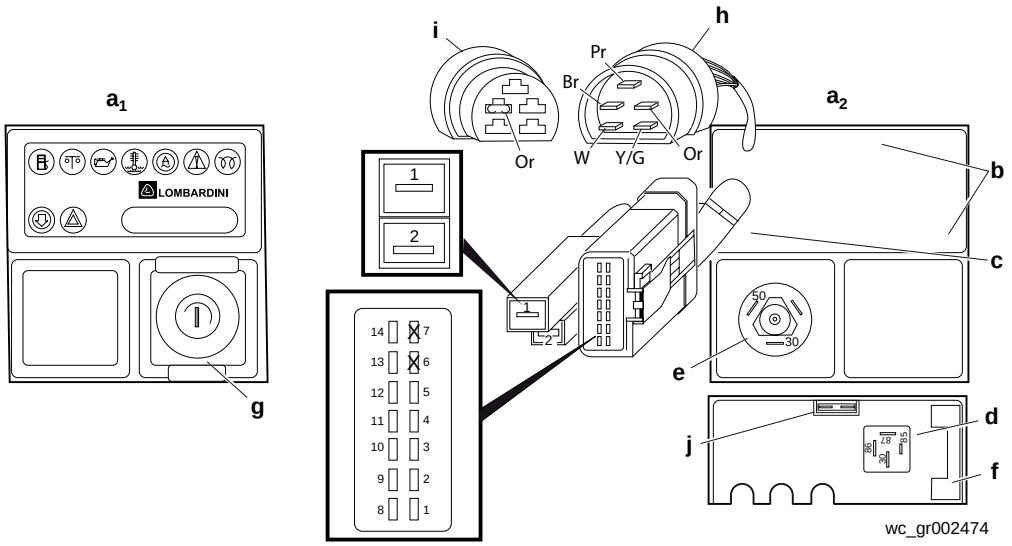
Ref.	Description	Ref.	Description
a	Key switch	d	Engine protection
b	15A fuse	e	Preheating
c	80A fuse	f	Relay

Wire Colors							
B	Black	R	Red	Y	Yellow	Or	Orange
G	Green	T	Tan	Br	Brown	Pr	Purple
L	Blue	V	Violet	Cl	Clear	Sh	Shield
P	Pink	W	White	Gr	Gray	LL	Light blue

4.17 Engine Control Panel Components—Lombardini



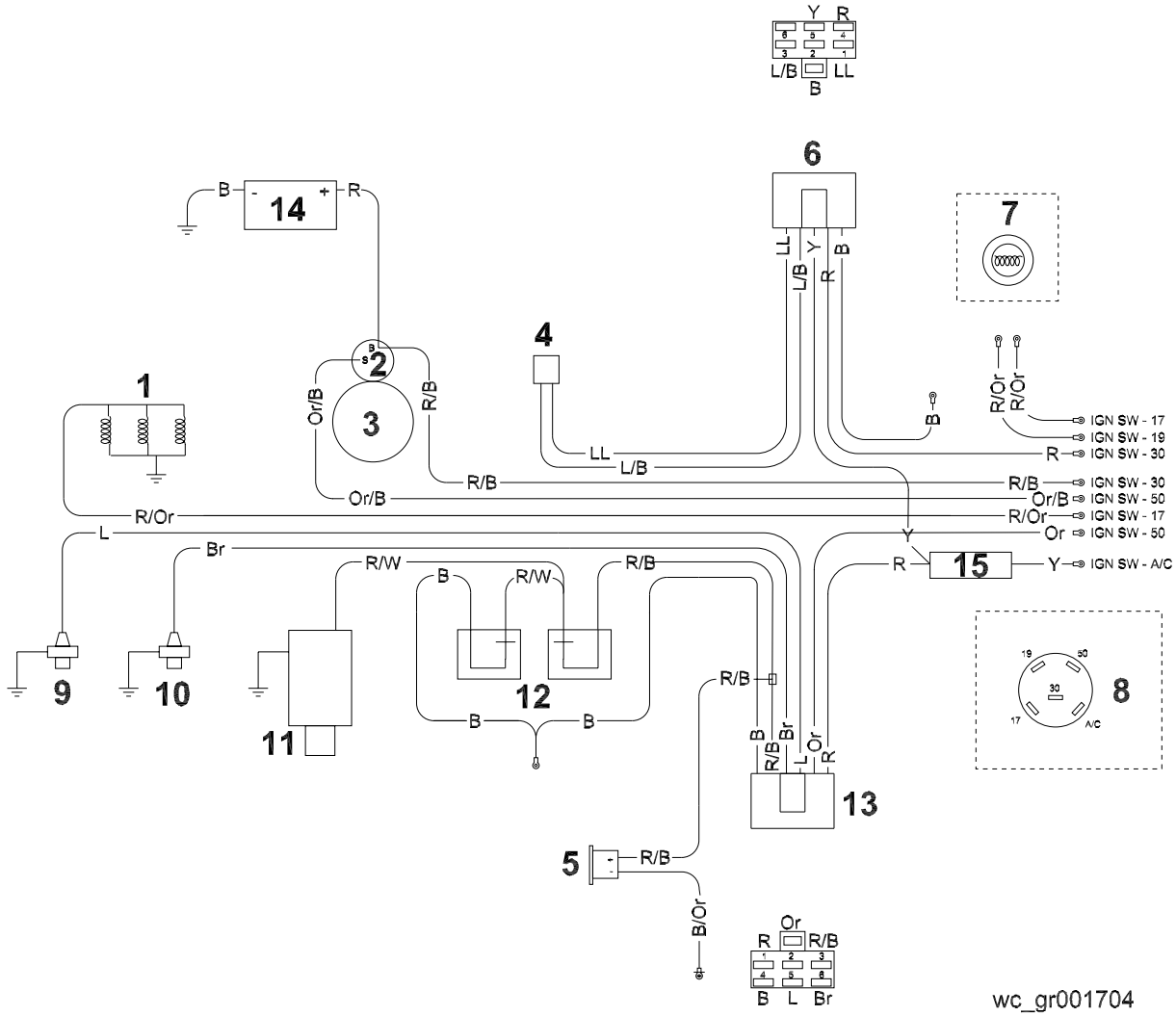
wc_gr003227



wc_gr002474

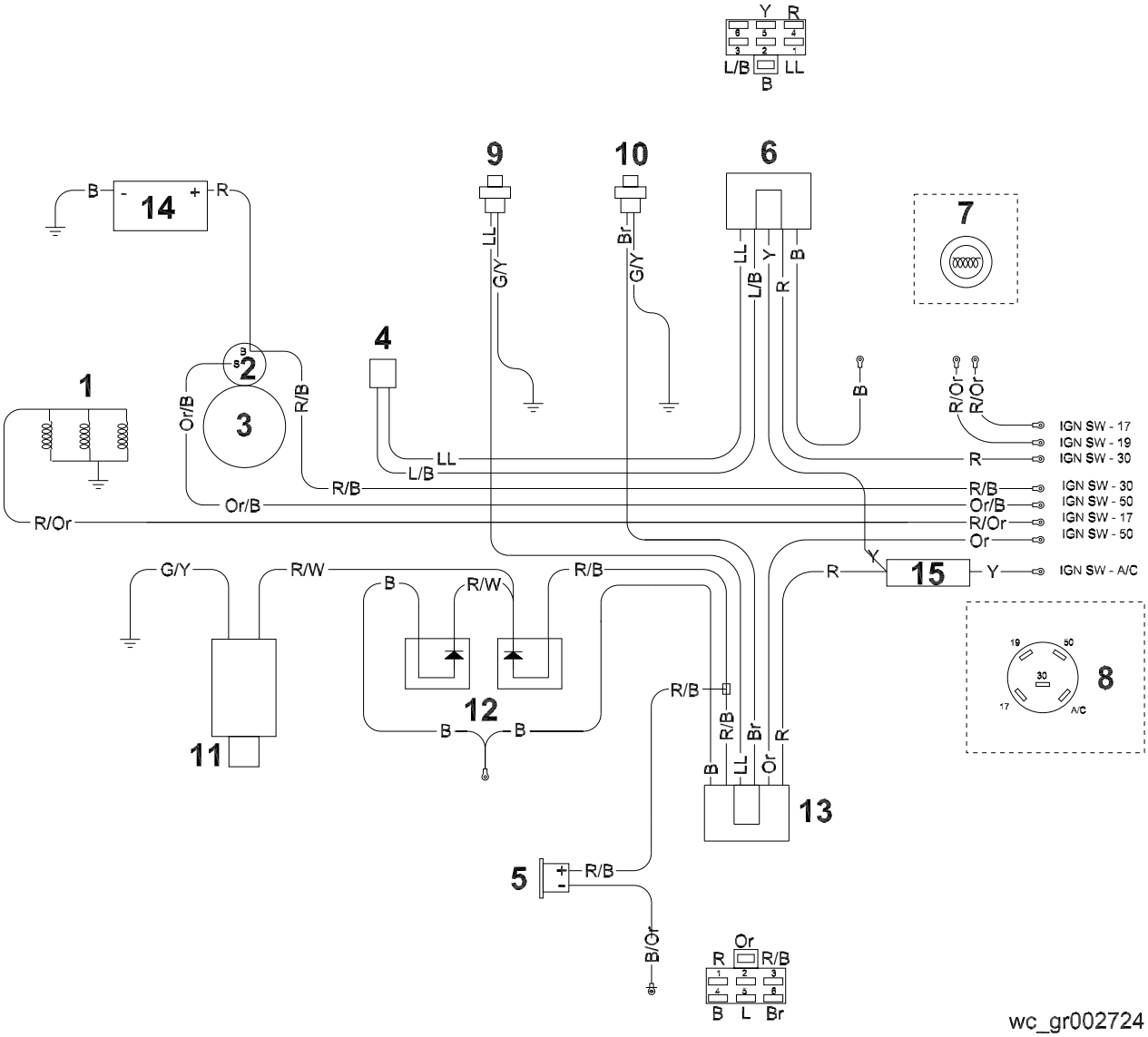
Ref.	Description	Ref.	Description
a1	Engine control panel, front view	f	System fuse—80A
a2	Engine control panel, rear view	g	Key access door
b	Solid-state glow plug controller and indicating lamps	h	Auxiliary connections
c	Shutdown relay location	i	Light switch panel connection
d	Glow plug relay	j	15 A fuse
e	Key switch	-	--

4.18 Engine Wiring—Item Number: 0009376



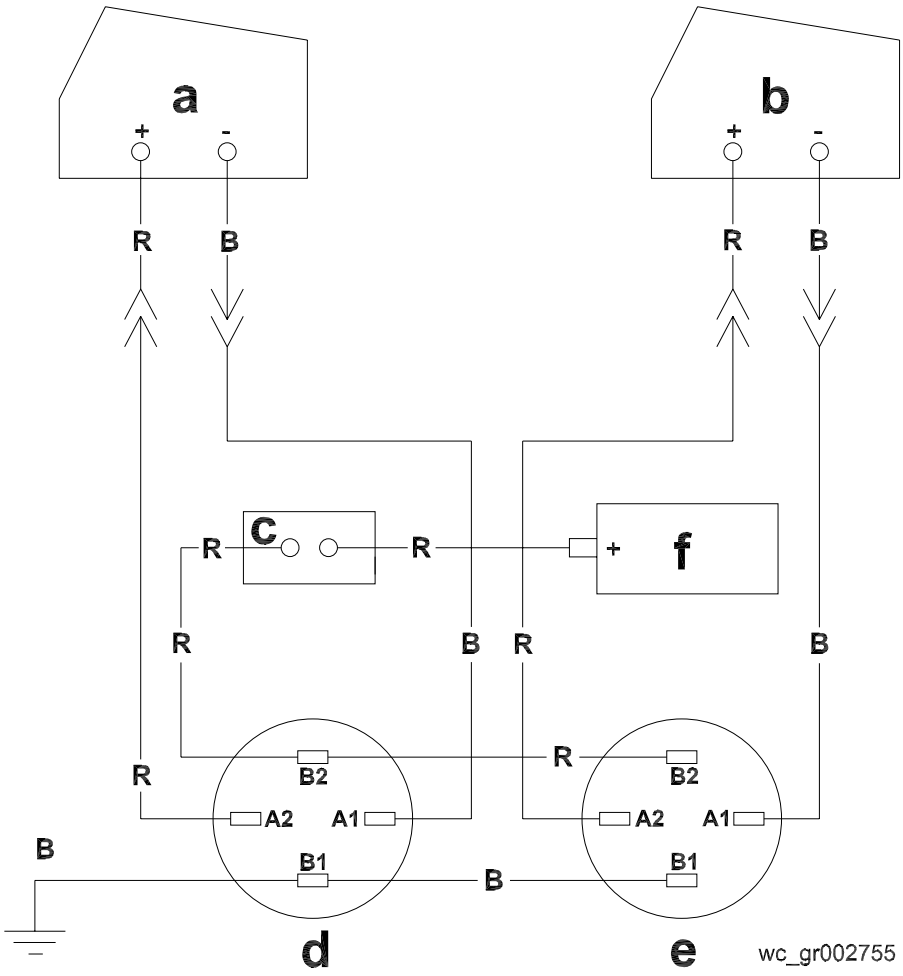
Ref.	Description	Ref.	Description
1	Glow plugs	9	Water temperature sensor
2	Starter solenoid	10	Low-oil pressure indicator
3	Starter	11	Fuel solenoid
4	Alternator	12	Diode
5	Hour meter	13	Automatic shutdown
6	Automatic voltage regulator	14	Battery
7	Glow plug indicator	15	15 Amp fuse
8	Ignition switch		

4.19 Engine Wiring—Item Number: 0620017, 0620028



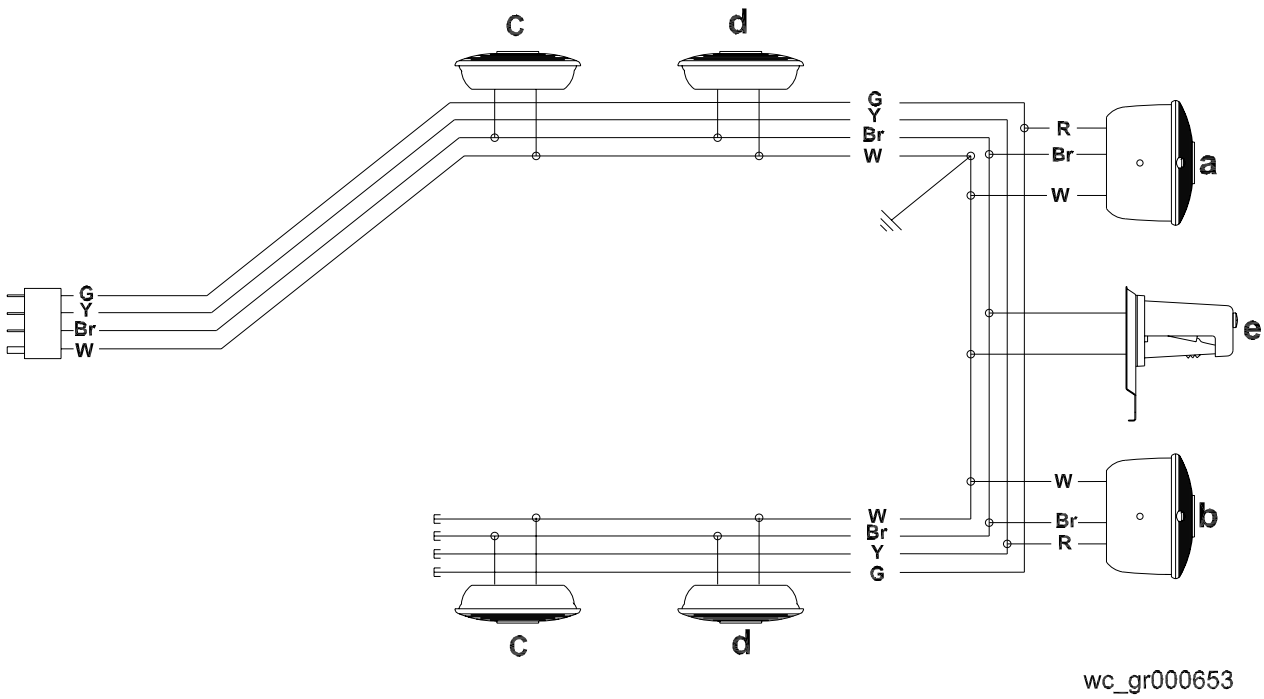
Ref.	Description	Ref.	Description
1	Glow plugs	9	Water temperature sensor
2	Starter solenoid	10	Low-oil pressure indicator
3	Starter	11	Fuel solenoid
4	Alternator	12	Diode
5	Hour meter	13	Automatic shutdown
6	Automatic voltage regulator	14	Battery
7	Glow plug indicator	15	15 Amp fuse
8	Ignition switch		

4.20 Power Winch Schematic



Ref.	Description	Ref.	Description
a	Vertical winch	d	Vertical rotary switch
b	Telescope winch	e	Telescope rotary switch
c	Fuse / breaker	f	Starter

4.21 Trailer Wiring



Ref.	Description	Ref.	Description
a	Right stop, turn and tail light	d	Side light, red
b	Left stop, turn and tail light	e	License plate light
c	Side light, amber		

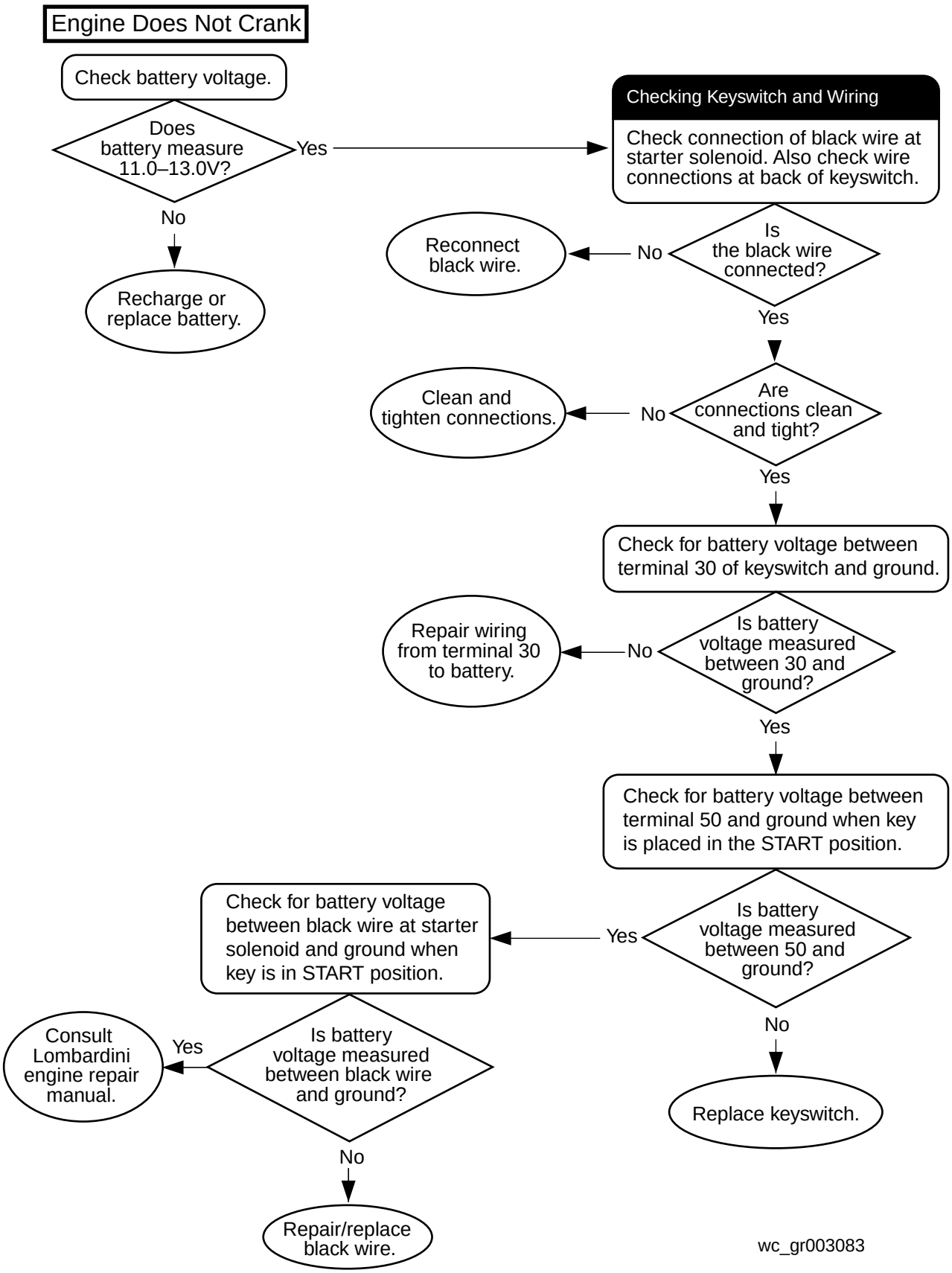
Wire Colors		
G	Green	Right stop and turn light
Y	Yellow	Left stop and turn light
Br	Brown	License plate, tail and side light
W	White	Ground

5. Lombardini Engine Troubleshooting

5.1 Troubleshooting Flowcharts

The troubleshooting flowcharts are designed to take you through the process of determining the source of a problem with engine starting or machine operation. Many of the tests involve live voltages and therefore should only be attempted by qualified personnel. Detailed procedures for carrying out the tests are included in this manual. All highlighted text within the flowcharts have matching sections in this manual.

5.2 Engine Does Not Crank—Flowchart 3A



5.3 Checking Keyswitch and Wiring

See Graphic: wc_gr003228



WARNING

Electric shock hazard. Only qualified personnel should conduct these tests.

5.3.1 When troubleshooting Lombardini engines that do not crank, check that the B (black) wire **(a)** is connected to the starter solenoid.

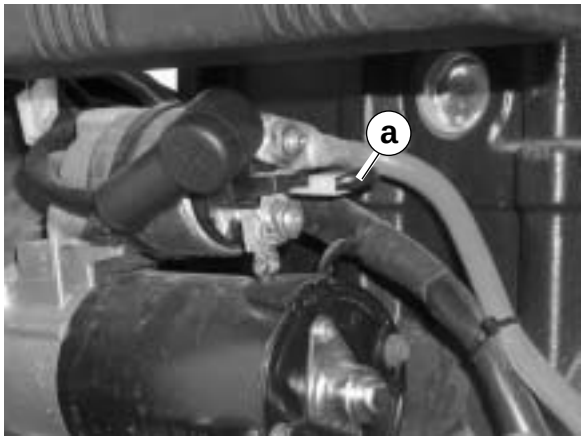
5.3.2 Remove the screws securing the control panel **(b)** to the mounting bracket and remove the control panel from the bracket.

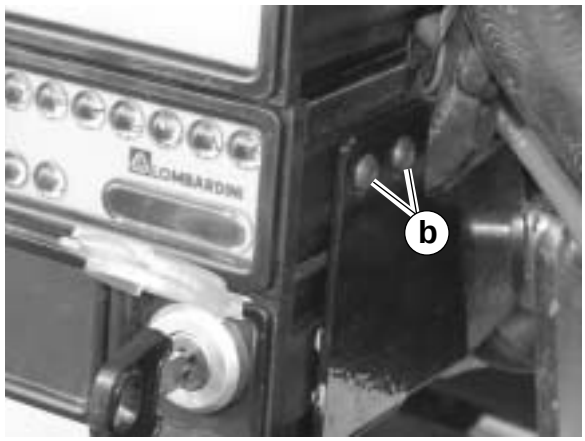
5.3.3 Remove the back cover **(c)** of the control panel box and check that the the wiring to the keyswitch **(d)** is clean and tight. Check that the appropriate wires are connected to the proper terminals of the keyswitch.

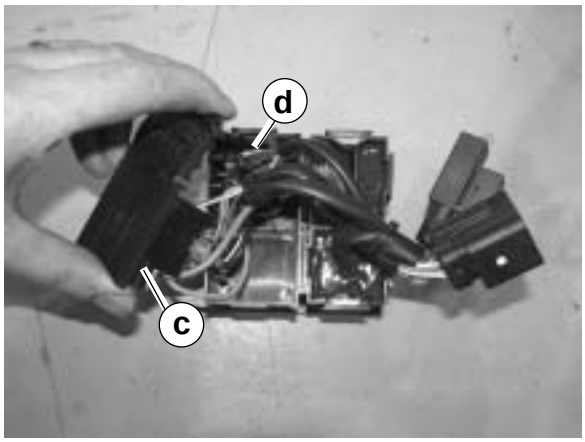
5.3.4 Check for 12V (battery voltage approximately 12) between terminal 30 of keyswitch and ground. If no voltage is measured, repair wiring back to battery. If voltage is measured, continue.

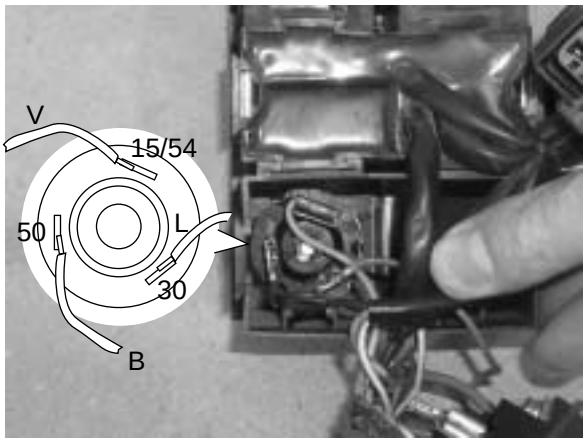
5.3.5 Place the keyswitch in the START position and check for 12V (battery voltage) between terminal 50 of the keyswitch and ground. If no voltage is measured, replace the keyswitch. If voltage is measured, continue.

5.3.6 Place the keyswitch in the START position and check for 12V (battery voltage approximately 12) between the B (black) wire **(a)** and ground at the starter solenoid. If no voltage is measured, repair the wiring between terminal 50 of the keyswitch and the starter solenoid. If voltage is measured and the engine still won't crank, there is a problem with the starter motor. See the Lombardini engine repair manual for further information.









wc_gr003228

5.4 Replacing Keyswitch

See Graphic: wc_gr002469

Disassembly:

5.4.1 Shut down the engine and disconnect the battery.

5.4.2 Remove the six screws securing the control panel cover to the control panel.

5.4.3 Make note of the wire connections on the keyswitch and remove the wires **(a)** from the keyswitch.

5.4.4 Unscrew the locking ring **(b)** and remove the keyswitch from the panel.

Reassembly:

5.4.5 Insert the replacement keyswitch into the control panel and secure it with the locking ring **(b)**.

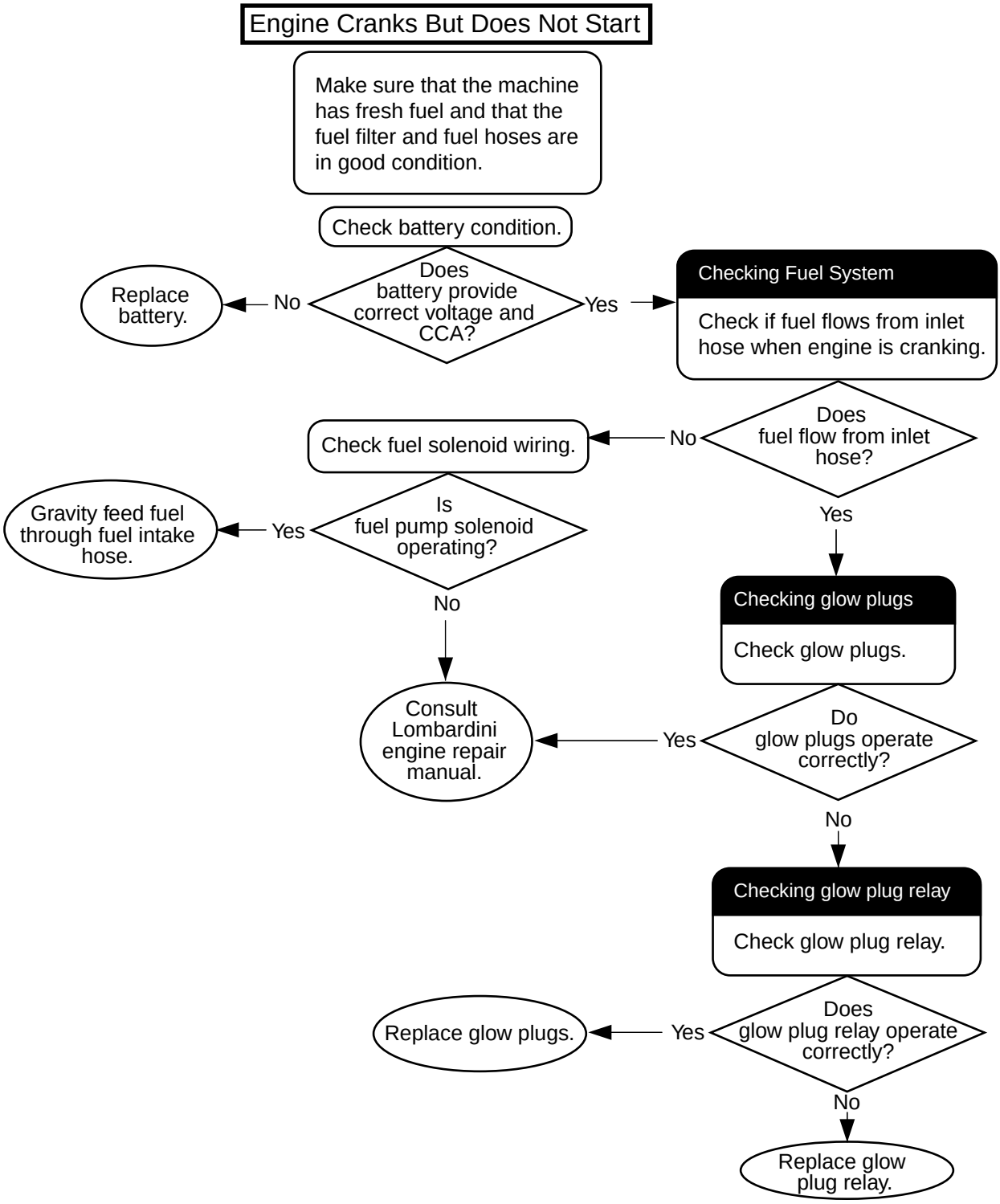
5.4.6 Attach the wires **(a)** to the appropriate terminals of the keyswitch.

5.4.7 Secure the control panel cover to the control panel with the six screws.



wc_gr002469

5.5 Engine Cranks But Does Not Start—Flowchart 4A



wc_gr003084

5.6 Checking Fuel System

See Graphic: wc_gr002470

WARNING

Electric shock hazard. Only qualified personnel should conduct these tests.

When troubleshooting Lombardini engines that crank but do not start, make the following checks.

5.6.1 Check that the battery is in good condition and that all connections are clean and tight. If the battery voltage falls below 11.5V, replace the battery.

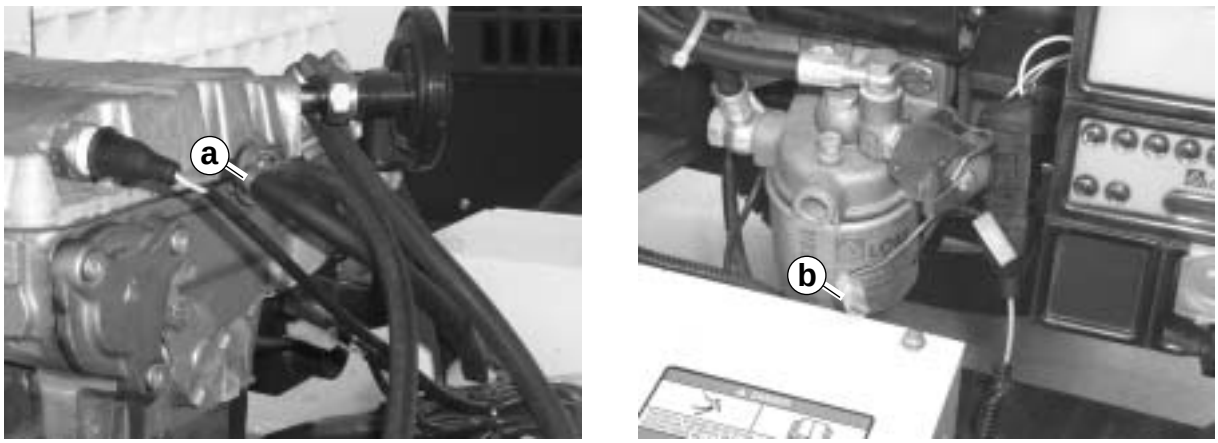
5.6.2 Fill the fuel tank with fresh fuel and check that the fuel hoses and fuel filter are clean and in good condition.

5.6.3 Disconnect the fuel intake hose **(a)**. Have a suitable container ready to catch fuel. Place the keyswitch in the START position and check if fuel flows from the hose.

- If fuel flows from the hose, reconnect the hose.
- If fuel does not flow from the hose, continue.

5.6.4 Disconnect the power lead **(b)** to the fuel solenoid. Place the keyswitch in the START position and check for battery voltage between the lead and ground.

- If battery voltage is not measured, check the continuity of wiring. See the Lombardini repair manual for further information.
- If battery voltage is measured, check power to glow plugs.



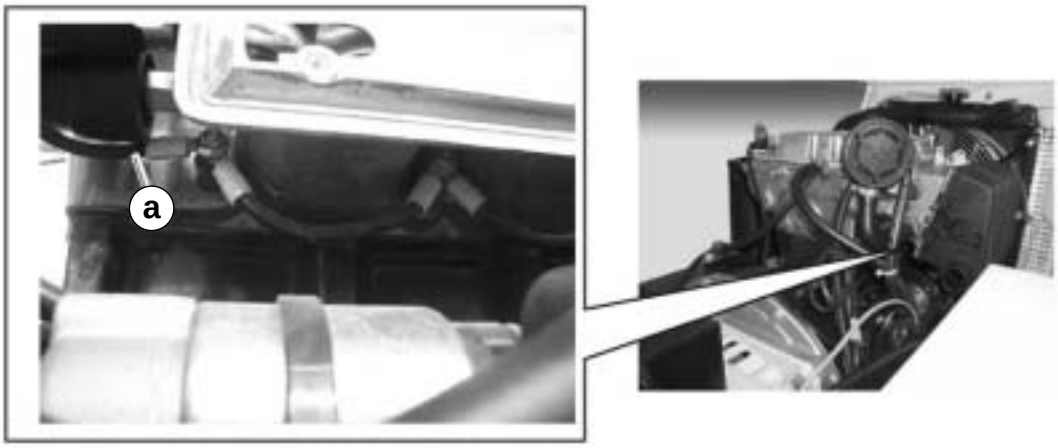
wc_gr002470

5.7 Checking Voltage to Glow Plugs (Lombardini 903 engines)

See Graphic: wc_gr003314

5.7.1 Place the keyswitch in the ON position.

5.7.2 Check for battery voltage between the R/Or glow plug wire **(a)** and ground.
If battery voltage is not measured, check the continuity and connections of wiring.
If battery voltage is measured, check the function of the glow plugs.



wc_gr003314

5.8 Checking Voltage to Glow Plugs (Lombardini 1003 engines)

See Graphic: wc_gr003229

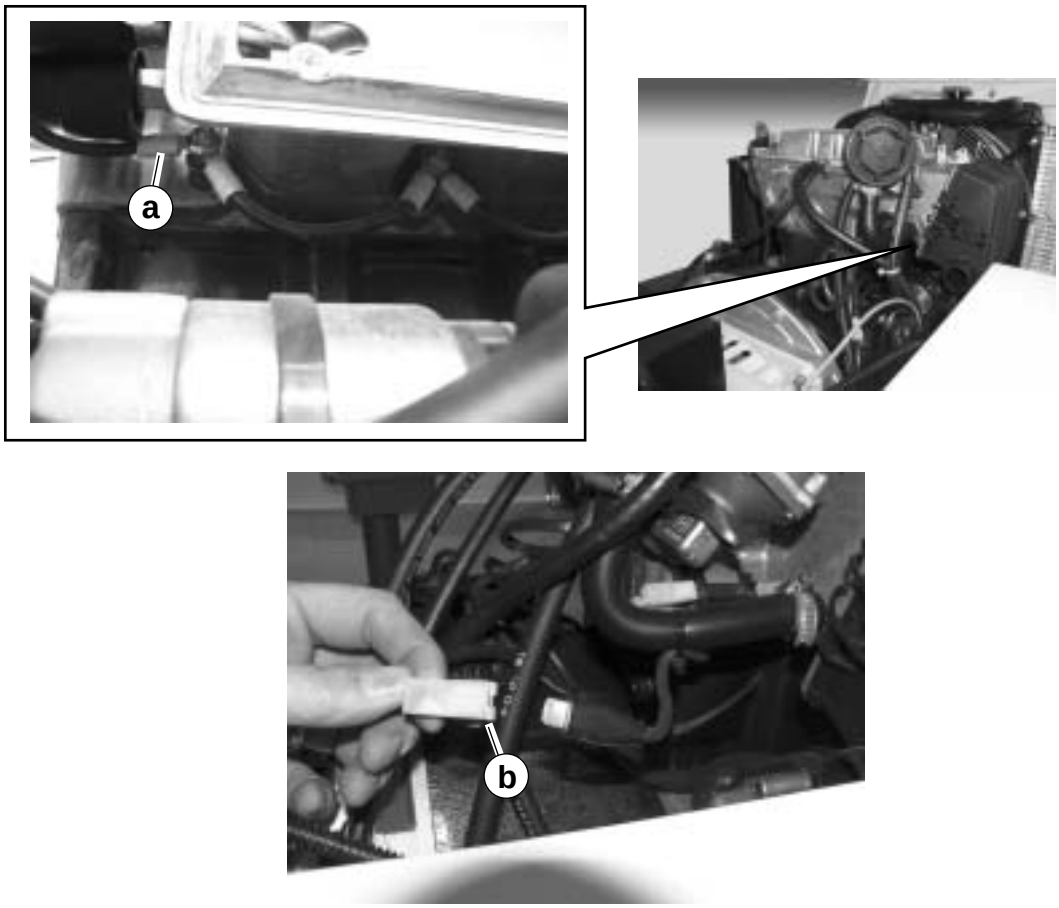
To check the voltage to the glow plugs, carry out the following procedure:

5.8.1 Disconnect the B (black) wire **(a)**, place the keyswitch in the START position, and measure the voltage between the black wire and ground. There should be 12V (battery voltage approximately 12) measured.

- If 12V is measured, check the function of the glow plug.
- If 12V is not measured, continue.

5.8.2 Disconnect the B (black) wire **(b)** and measure the voltage between it and ground. There should be 12V (battery voltage approximately 12) measured.

- If 12V is measured, clean the connection points of the wires. Reconnect the wires and check the function of the glow plug.
- If 12V is not measured, check the glow plug relay.



wc_gr003229

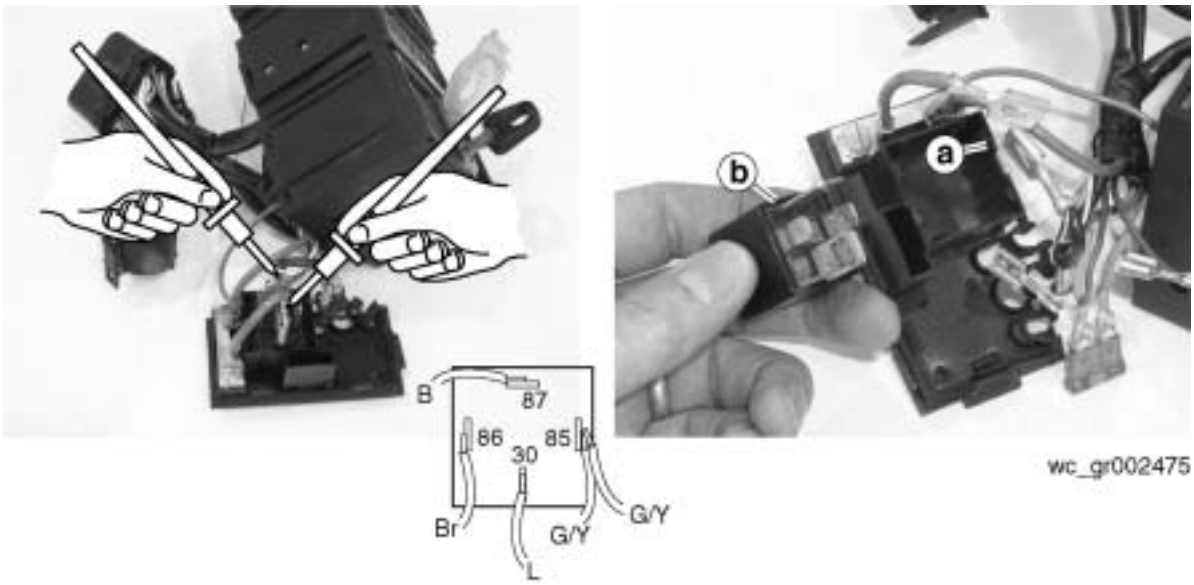
5.9 Checking Glow Plug Relay

See Graphic: wc_gr002475

5.9.1 Remove the screws securing the engine control panel. Leave all wiring connected to the control panel.

5.9.2 Rotate the control panel to gain access to the rear of the control panel. Remove the enclosure cover to access the glow plug relay.

5.9.3 Place the keyswitch in the START position. A working relay will “click” when the keyswitch is in the START position.
Check the continuity across the blue (L) and black (B) wires when the keyswitch is in the START position. If there is no continuity, the relay is faulty; replace it.



5.10 Replacing Glow Plug Relay

See Graphic: wc_gr002475

5.10.1 Make note of the wire positions and disconnect all wires from the glow plug relay.

5.10.2 Bend back the tabs **(a)** securing the glow plug relay **(b)** and pull the glow plug relay from the enclosure.

5.11 Checking Glow Plugs

See Graphic: wc_gr002033

5.11.1 Remove the glow plug from the engine.

WARNING

Burn hazard. Glow plugs can reach temperatures up to 1200°F (649°C). Do not touch the element of the glow plug. Be extremely careful when testing the glow plug.

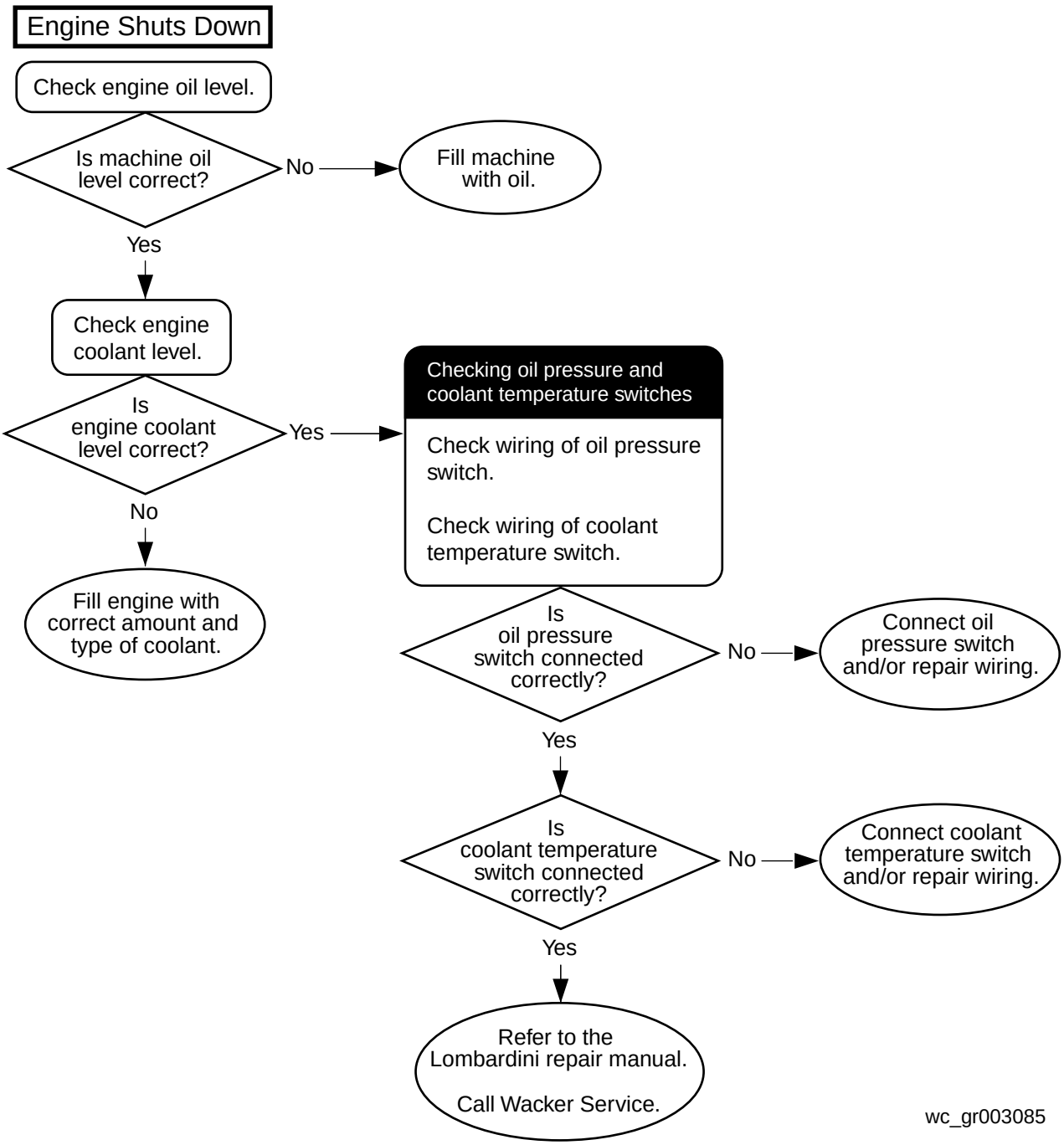
5.11.2 Using 10-gauge wire, apply 12VDC to the glow plug—positive on the upper portion and ground the base. If the glow plug does not heat (glow) within five seconds, replace the glow plug.

Note: *If any one of the glow plugs needs replacing, replace all of them.*



wc_gr002033

5.12 Engine Shuts Down—Flowchart 5A



5.13 Checking Oil Pressure and Coolant Temperature Switches

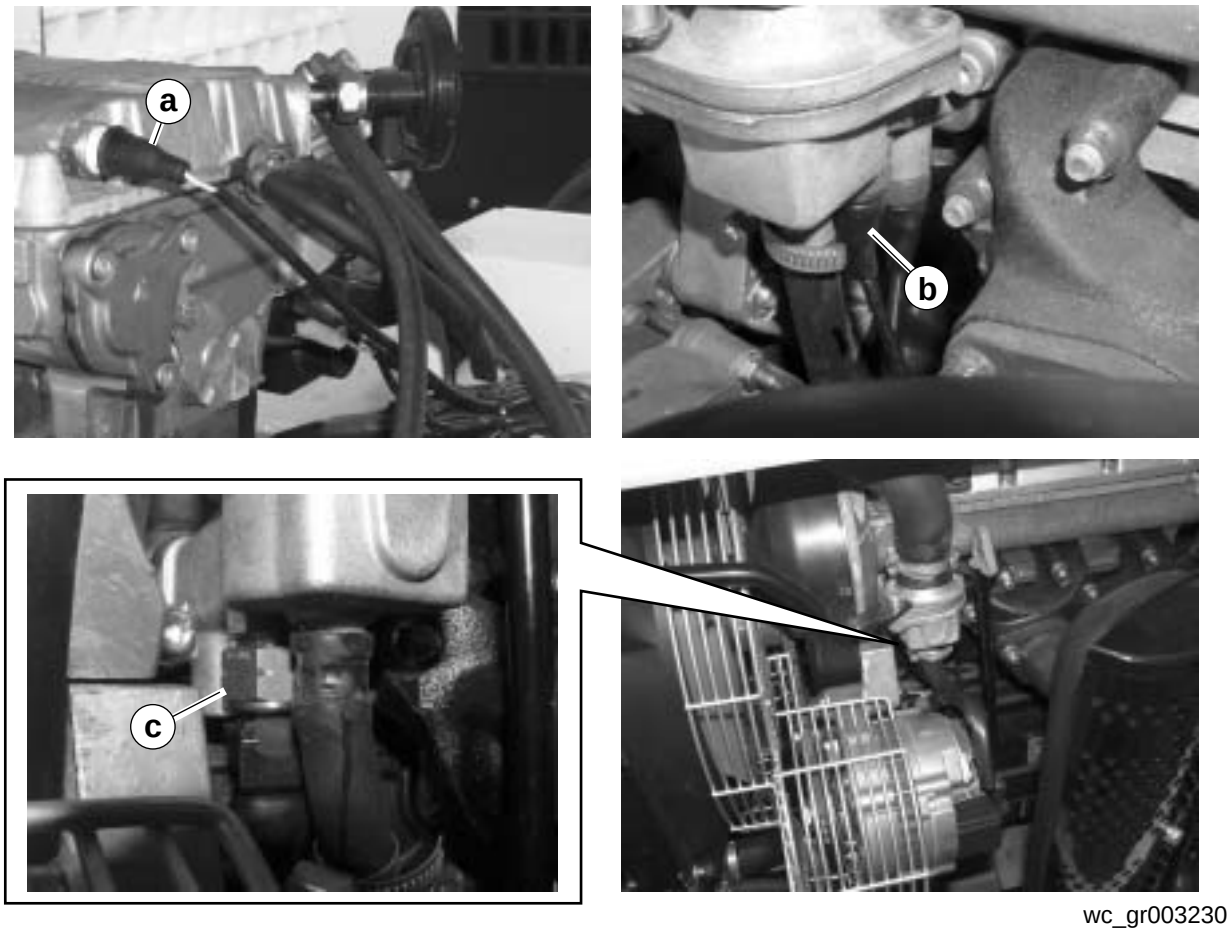
See Graphic: wc_gr003230

5.13.1 If the engine starts but shuts down after approximately 10 seconds, check the following.

5.13.2 Check the engine oil level and add oil if necessary. Also check the coolant temperature. If the coolant temperature is high, allow the engine to cool. Flush and fill the radiator with the correct coolant.

5.13.3 Check the wiring of oil pressure switch **(a)** and the coolant temperature switch **(b)** (903 engines) or **(c)** (1003 engines). If the wiring of either switch is shorted to ground, the engine will shut down. Be sure the switches are functioning—check each for continuity. The oil pressure switch is a normally closed (NC) switch that should have continuity when the engine is off. If the switch has no continuity when the engine is off, the switch is faulty; replace it.

The high coolant temperature switch is a normally open (NO) switch. This switch should have no continuity when the engine is off. If this switch has continuity when the engine is off, it has shorted and is faulty; replace it.



wc_gr003230

5.14 General Engine Troubleshooting

Possible Cause	Symptom													
	Engine will not crank	Engine does not start	Engine starts, but stops	Poor acceleration	Unsteady rpm	Black smoke	White smoke	Blue smoke	Low oil pressure	Oil level rising	Excessive oil consumption	Wet exhaust	Overheating	Engine knocks
Low fuel level		•	•		•									
Fuel supply/return lines clogged		•	•	•	•									
Clogged fuel tank vent			•		•									
Fuel pump faulty		•	•							•				
Fuel contaminated with air		•	•	•	•									
Unit injector(s) faulty/worn		•		•	•	•	•			•		•		
Unit injector settings incorrect		•		•		•	•					•	•	•
Injection pump rack sticking		•		•	•									
Oil level too high				•	•	•		•				•	•	•
Improper oil viscosity											•	•	•	
Oil diluted by fuel									•	•	•	•	•	
Oil pressure relief valve faulty									•					
Oil pick-up tube clogged									•					
Oil pump air contaminated at pick-up tube									•					
Glow plugs faulty		•					•							
Glow plug controller faulty		•												
Glow plug relay inoperable		•												
Starter defective	•													

Possible Cause	Symptom													
	Engine will not crank	Engine does not start	Engine starts, but stops	Poor acceleration	Unsteady rpm	Black smoke	White smoke	Blue smoke	Low oil pressure	Oil level rising	Excessive oil consumption	Wet exhaust	Overheating	Engine knocks
Battery voltage too low	•													
Battery/battery cable connections corroded	•													
Key switch defective	•													
Air filter clogged		•		•	•	•					•	•	•	
Excessive idle/light load operation							•	•			•	•		
Incomplete engine run-in								•			•		•	
Engine overloaded		•	•	•	•	•								
Excessive secondary load	•	•				•								
Valve lash insufficient/ excessive		•					•	•						•
Injection timing out of spec - advanced		•					•	•			•			•
Injection timing out of spec - retarded		•		•		•								
Governor linkage adjustment incorrect		•	•	•	•									
Governor spring fatigued or defective		•		•	•									
Idle rpm too low		•	•											
Piston rings worn or stuck		•					•	•			•	•		
Piston worn or damaged		•					•	•			•	•	•	•
Cylinders worn or damaged		•					•	•			•	•	•	•
Valve/valve guides worn		•					•	•			•	•		

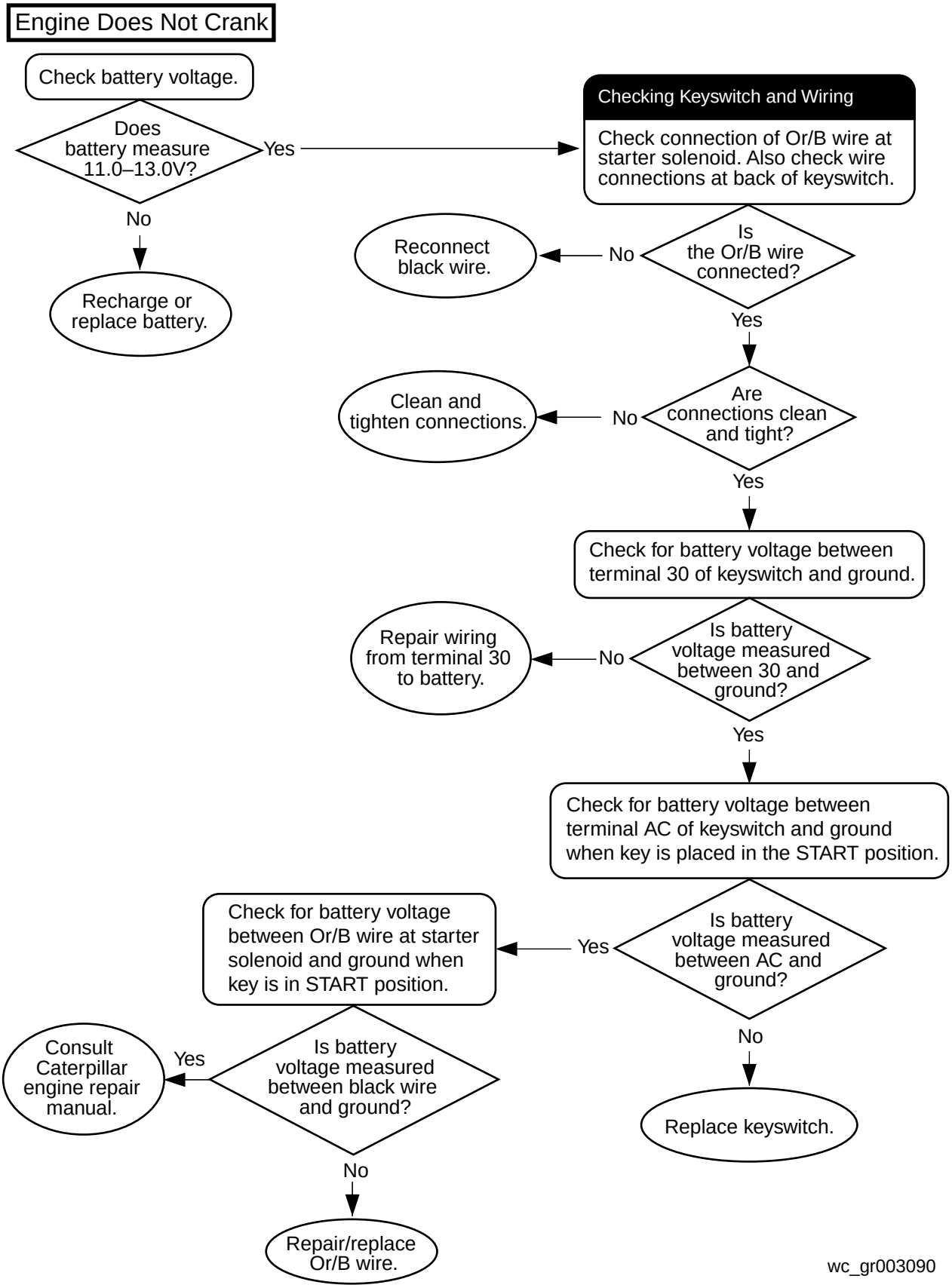
Possible Cause	Symptom													
	Engine will not crank	Engine does not start	Engine starts, but stops	Poor acceleration	Unsteady rpm	Black smoke	White smoke	Blue smoke	Low oil pressure	Oil level rising	Excessive oil consumption	Wet exhaust	Overheating	Engine knocks
Valves sticking		•	•	•	•		•				•	•		
Bearings (main/rod) worn									•				•	•
Governor/governor linkage malfunctioning		•	•	•	•	•								
Cylinder head gasket damaged		•					•						•	
Thermostat stuck or malfunctioning													•	
Engine seized	•													
Radiator clogged (external or internal)													•	
Coolant pump faulty													•	
Turbocharger faulty				•	•	•		•			•	•	•	

6. Caterpillar Engine Troubleshooting

6.1 Troubleshooting Flowcharts

The troubleshooting flowcharts are designed to take you through the process of determining the source of a problem with engine starting or machine operation. Many of the tests involve live voltages and therefore should only be attempted by qualified personnel. Detailed procedures for carrying out the tests are included in this manual. All highlighted text within the flowcharts have matching sections in this manual.

6.2 Engine Does Not Crank—Flowchart 6A



6.3 Checking Keyswitch and Wiring

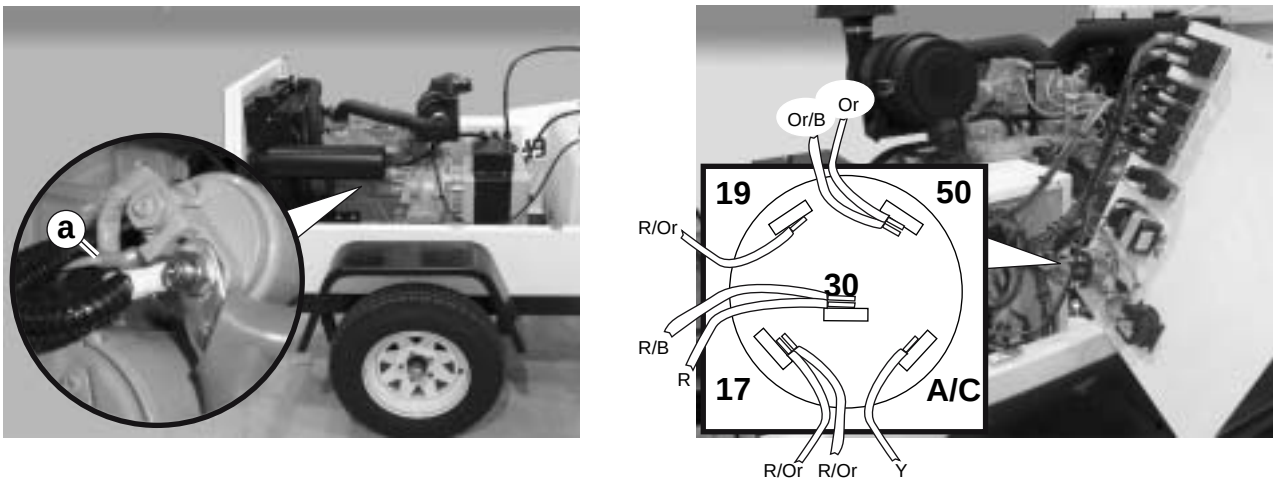
See Graphic: wc_gr002463

WARNING

Electric shock hazard. Only qualified personnel should conduct these tests.

6.3.1 When troubleshooting CAT engines that do not crank, check that the Or/B wire **(a)** is connected to the starter solenoid.

6.3.2 Open the control panel and check that the wiring to the keyswitch is clean and tight. Check that the appropriate wires are connected to the proper terminals on the back of the keyswitch.



wc_gr002463

6.4 Replacing Keyswitch

See Graphic: wc_gr002443

Disassembly:

6.4.1 Shut down the engine and disconnect the battery.

6.4.2 Remove the six screws securing the control panel cover to the control panel.

6.4.3 Make note of the wire connections on the keyswitch and remove the wires **(a)** from the keyswitch.

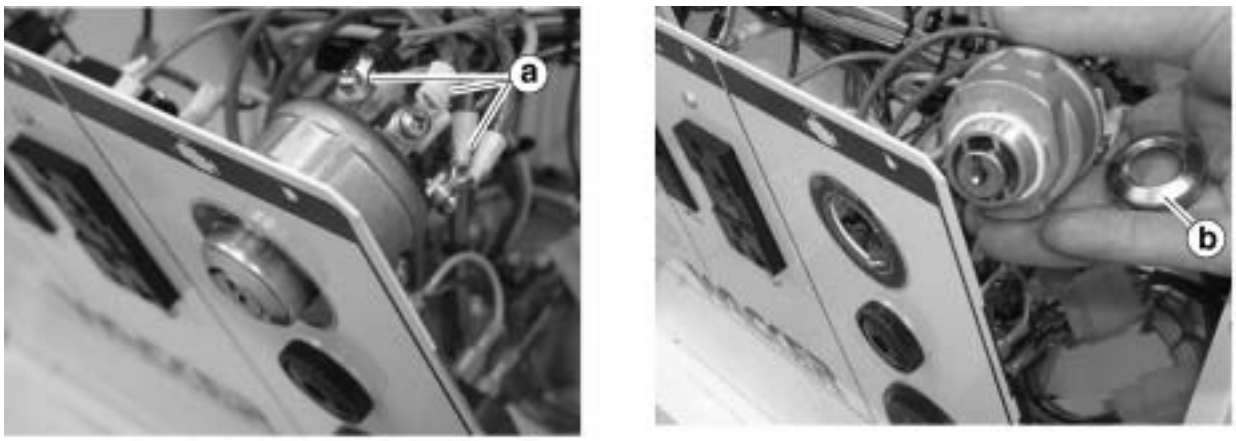
6.4.4 Unscrew the locking ring **(b)** and remove the keyswitch from the panel.

Reassembly:

6.4.5 Insert the replacement keyswitch into the control panel and secure it with the locking ring **(b)**.

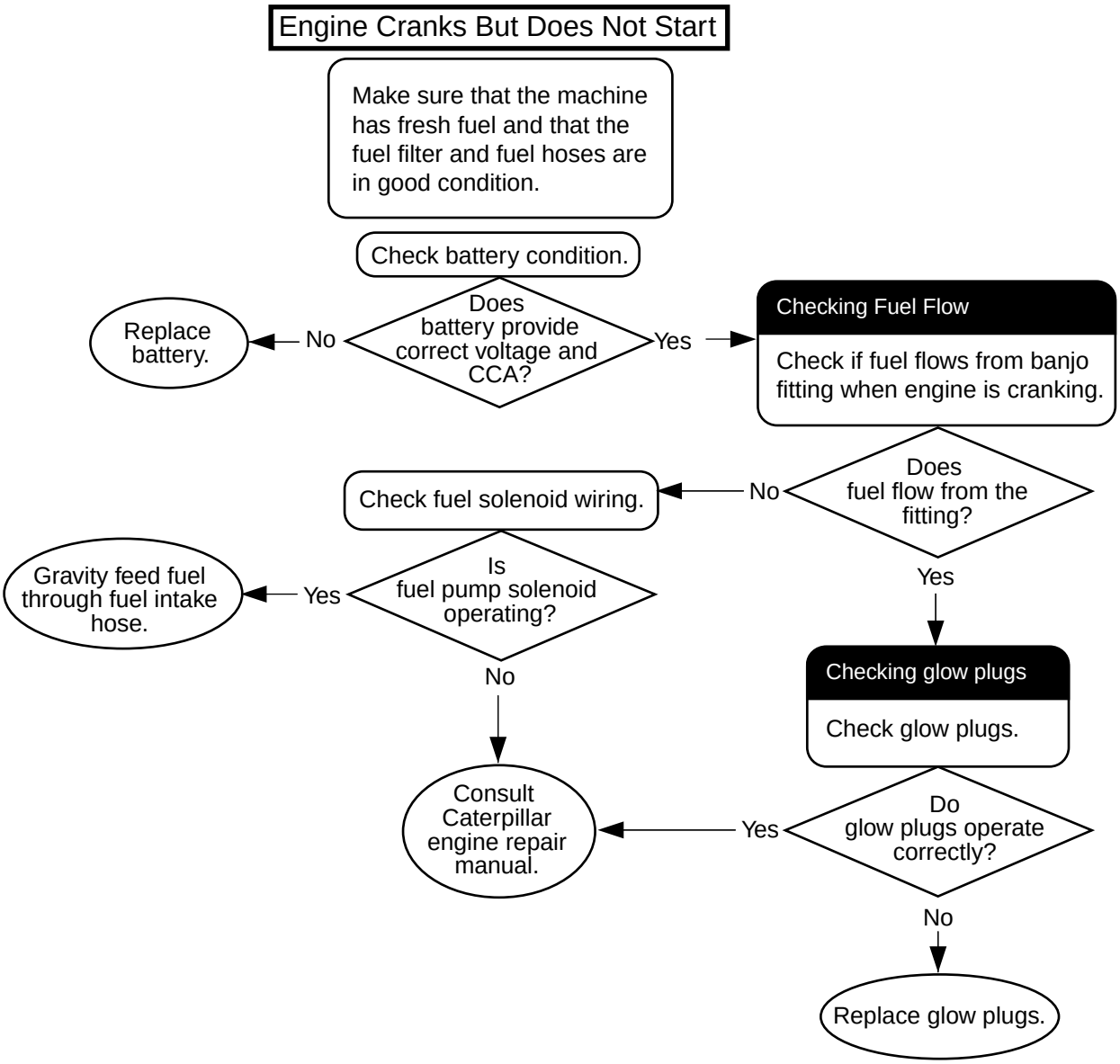
6.4.6 Attach the wires **(a)** to the appropriate terminals of the keyswitch.

6.4.7 Secure the control panel cover to the control panel with the six screws.



wc_gr002443

6.5 Engine Cranks But Does Not Start—Flowchart 7A



wc_gr003091

6.6 Checking Fuel Flow

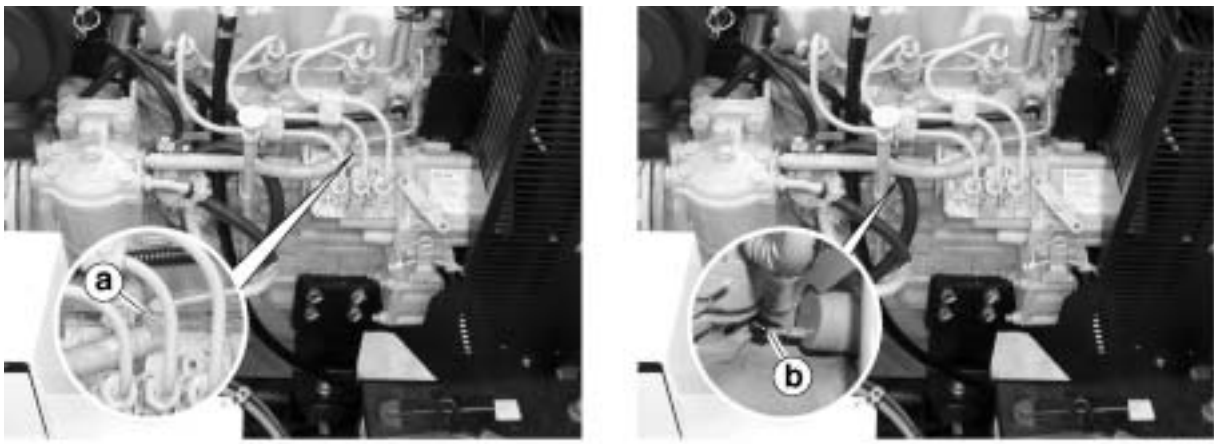
See Graphic: wc_gr002476

To check the fuel flow on Caterpillar engines, carry out the following procedures.

6.6.1 Loosen the screw securing the banjo fitting **(a)**.

6.6.2 Place the keyswitch in the START position and check for fuel flow from the banjo fitting.
If fuel flows from the banjo fitting, retighten the screw and check the operation of glow plugs.
If fuel does not flow from the banjo fitting, continue.

6.6.3 Place the keyswitch in the START position and check for battery voltage between the fuel solenoid R/W wire **(b)** and ground.
If battery voltage exists between the R/W wire and ground, gravity feed fuel through fuel intake line while cranking the engine using a 20-second on, 30-second rest sequence. Do this until fuel flows from the banjo fitting—tighten the fitting as soon as fuel is seen flowing through it. Continue this process until the engine starts. After the engine starts, reconnect the fuel intake line to the tank.
If battery voltage does not exist between the fuel solenoid R/W wire and ground, check the continuity of the wire. Repair or replace the wiring as needed. Refer to the Caterpillar engine repair manual for further procedures.



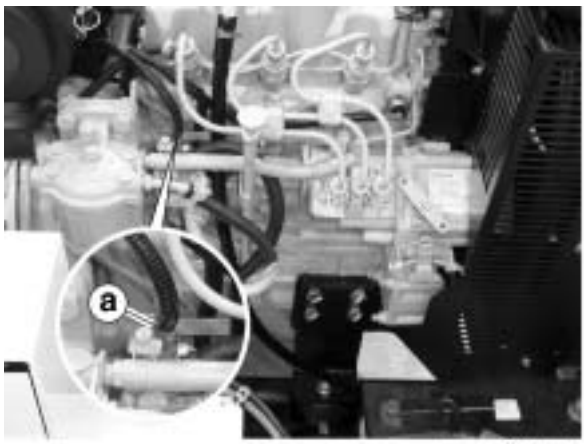
wc_gr002476

6.7 Checking Glow Plug Wiring

See Graphic: wc_gr002477

6.7.1 Place the keyswitch in the ON position.

6.7.2 Check for battery voltage between the R/Or glow plug wire **(a)** and ground.
If battery voltage is not measured, check the continuity and connections of wiring.
If battery voltage is measured, check the function of the glow plugs.



wc_gr002477



wc_gr002033

6.8 Checking Glow Plugs

See Graphic: wc_gr002033

6.8.1 Remove the glow plug from the engine.

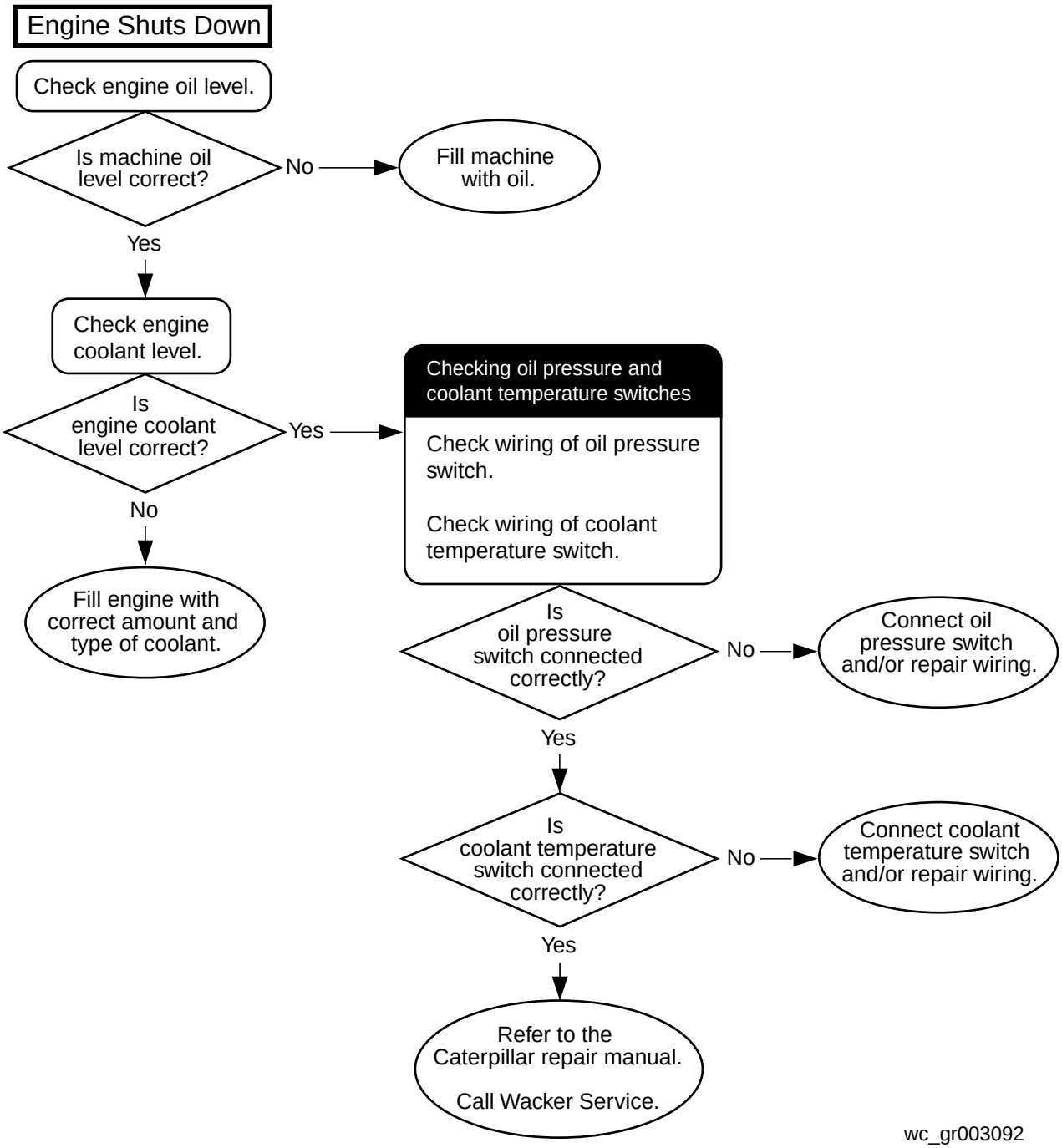
WARNING

Burn hazard. Glow plugs can reach temperatures up to 1200°F (649°C). Do not touch the element of the glow plug. Be extremely careful when testing the glow plug.

6.8.2 Using 10-gauge wire, apply 12VDC to the glow plug—positive on the upper portion and ground the base. If the glow plug does not heat (glow) within five seconds, replace the glow plug.

Note: *If any one of the glow plugs needs replacing, replace all of them.*

6.9 Engine Shuts Down—Flowchart 8A



6.10 Checking Oil Pressure and Coolant Temperature Switches

See Graphic: wc_gr002480

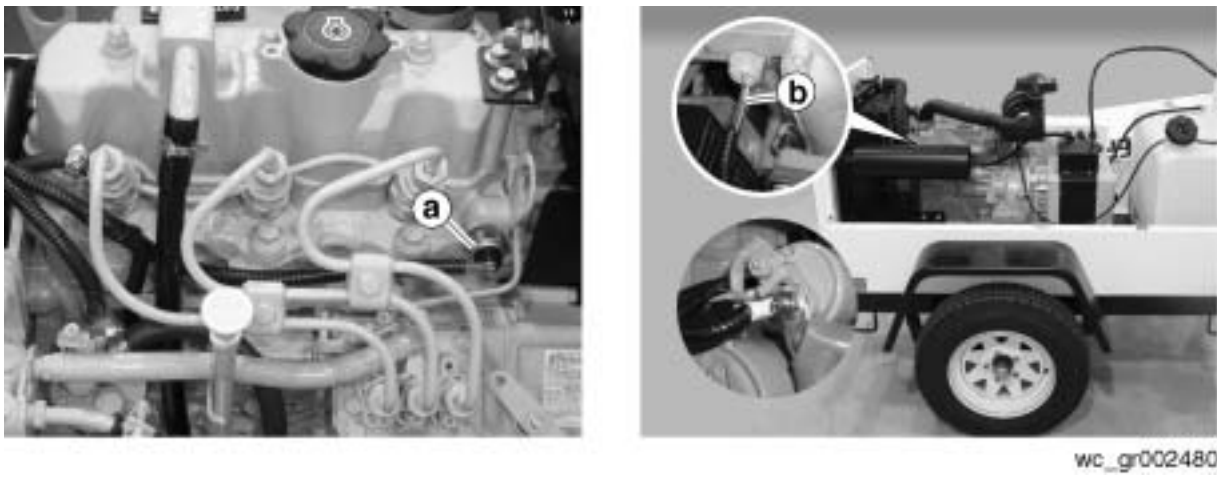
6.10.1 If the engine starts but shuts down after approximately 10 seconds, check the following.

6.10.2 Check the engine oil level and add oil if necessary. Also check the coolant temperature. If the coolant temperature is high, allow the engine to cool. Flush and fill the radiator with the correct coolant.

6.10.3 Check the oil pressure switch **(a)** and coolant temperature switch **(b)** wiring. If the wiring of either switch is shorted to ground, the engine will shut down.

Be sure the switches are functioning—check each for continuity. The oil pressure switch is a normally closed (NC) switch that should have continuity when the engine is off. If the switch has no continuity when the engine is off, the switch is faulty; replace it.

The high coolant temperature switch is a normally open (NO) switch. This switch should have no continuity when the engine is off. If this switch has continuity when the engine is off, it has shorted and is faulty; replace it.



wc_gr002480

6.11 General Engine Troubleshooting

Possible Cause	Symptom									
	Excess black smoke	Blue smoke	White smoke	Increased oil consumption	Unusual noises	Lack of power	Increased fuel consumption	Overheating	Hard starting/engine missing	Debris in oil filter
Dirty primary/secondary air cleaner	•					•	•	•		
Overfueling	•									
Overloading	•									
Worn rings/liners		•								
Worn seals		•		•						
Worn valve products		•								
Leaking head gasket			•							
Cracked head or liners			•							
Faulty injector			•							
Incorrect starting procedure			•							
Incorrect fuel injection timing			•							
Low quality fuel			•			•				
Worn or broken rings/liners				•						
Worn valve guides				•						
Malfunctioning fuel nozzle/injectors					•	•	•		•	
Worn piston pin bushings					•					
Worn rod/main bearings					•					
Too much valve lash					•					
Dirty fuel filter						•				

Possible Cause	Symptom									
	Excess black smoke	Blue smoke	White smoke	Increased oil consumption	Unusual noises	Lack of power	Increased fuel consumption	Overheating	Hard starting/engine missing	Debris in oil filter
Incorrect adjustment of governor linkage						•				
Slipping torque converter						•		•		
Improper set point						•	•			
Fuel leak							•			
Plugged radiator core								•		
Incorrect adjustment or worn belts/ pulleys								•		
Low coolant level								•		
Malfunctioning temperature regulators								•		
Worn fuel injector pump									•	
Low octane level or water in fuel									•	
Low cranking speed									•	
Dirty entry										•
Damaged bearings										•
Coolant/fuel leakage into crankcase										•
Extended oil change period										•
Incorrect oil used										•

7. Electrical Troubleshooting Procedures

7.1 Troubleshooting Methodology

See Graphic: wc_gr002459

If a lighting problem is not an obvious burnt bulb, engine speed, or wire fault, the cause of the problem will be associated with one of two things: a malfunctioning generator or faults in the circuit supplying voltage to the lights. By starting the troubleshooting procedures with the main circuit breaker you can determine whether the problem lies within the generator or the circuit supplying the lights. **Note:** *You can quickly determine if the generator is functioning by measuring voltage at the receptacle. However, if voltage is not measured at the receptacle, it does not automatically mean the generator is not functioning - there may be problems with the receptacle. Therefore, it is best to start troubleshooting at the main circuit breaker.*

For troubleshooting a malfunctioning generator, you'll need to rule out a demagnetized rotor or problems with: the generator's capacitors, the stator windings, the rotor diodes, and finally the rotor windings.

For troubleshooting the lighting circuit, you'll need to rule out problems with: the main circuit breaker, the terminal strip, the individual circuit breakers, the ballast, the control panel capacitors, and the wiring that connects all the components.

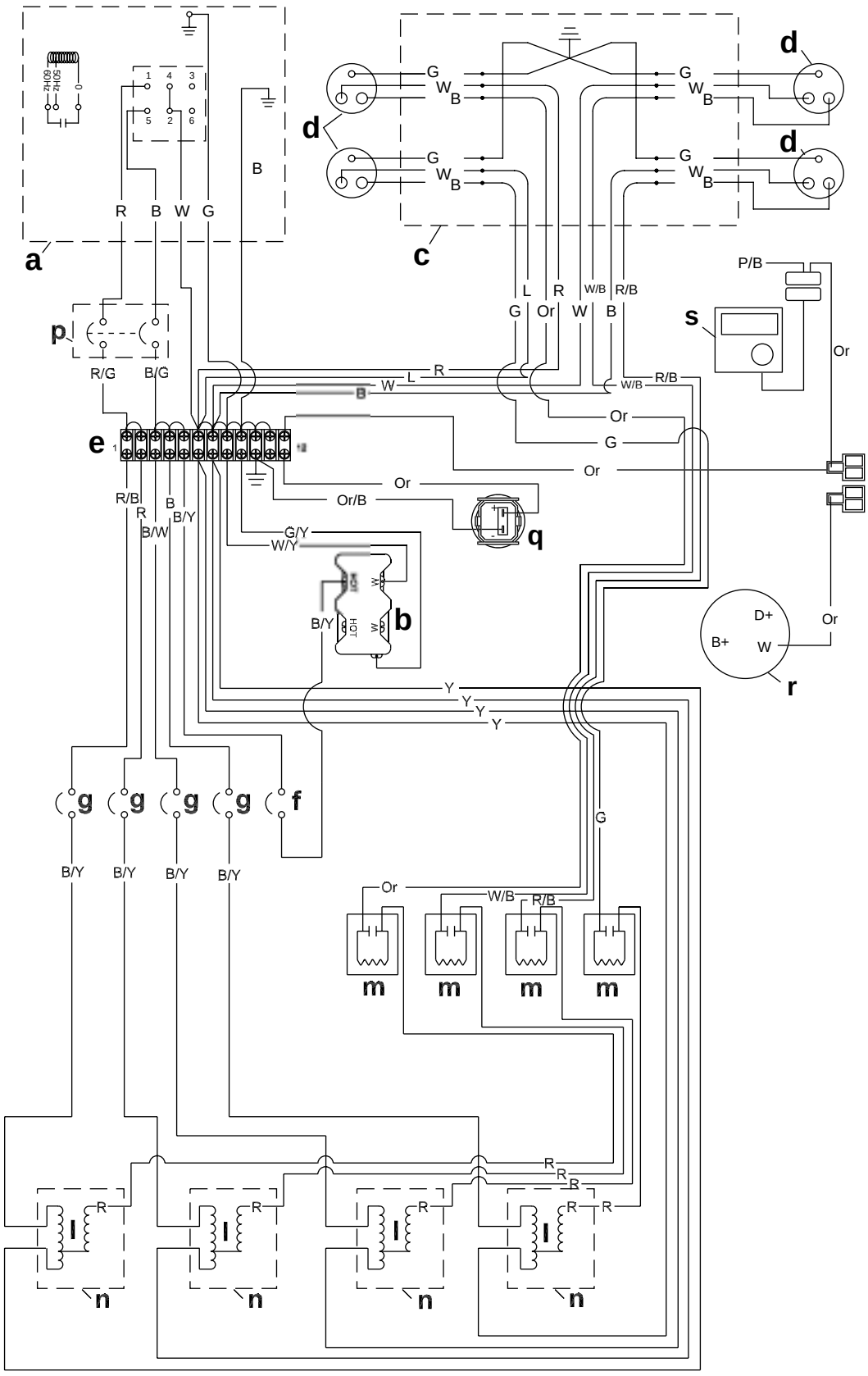
Detailed procedures for making the tests are included in the upcoming sections of this manual.

7.2 Schematic Components

See Graphic: wc_gr002459

Ref.	Description	Ref.	Description
a	Generator	l	Transformer
b	20 Amp GFI outlet	m	Capacitor
c	Control box-lights	n	Ballasts
d	Quick disconnects	p	25 Amp 2-pole circuit breaker
e	Terminal strip	q	Hourmeter
f	20 Amp GFI circuit breaker	r	Alternator
g	15 Amp circuit breaker	s	Control panel

7.3 Schematic for 60 Hz Metal Halide 4-Light Units



7.4 Checking Continuity

Conduct continuity tests when the engine is shutdown.

When checking continuity, use the Ohm setting on your multimeter. Place a lead of the multimeter on one end of the wiring or component and the other lead on the opposite end. If your meter reads “OL” or “OPEN”, there is no continuity and the wiring or component must be repaired or replaced.
Note: *Some multimeters also have an audio signal setting for determining continuity. This setting may also be used.*

- If your meter reads less than 1.0 Ohm, or the audio signal sounds, the wiring or component has continuity and should be OK.
- If your meter reads more than 1.0 Ohm, the wiring is faulty and must be repaired or replaced.

7.5 Checking resistance

Conduct resistance checks when the engine is shut down.

Use the Ohm setting on your multimeter.

Most digital multimeters have some internal resistance. To obtain your multimeter’s internal resistance, simply cross the two leads of your multimeter and read the display. When conducting a resistance check, subtract your multimeter’s internal resistance from the value you measure to obtain the true resistance of the component you are checking.

7.6 Checking voltage

Conduct voltage checks when the engine is running.

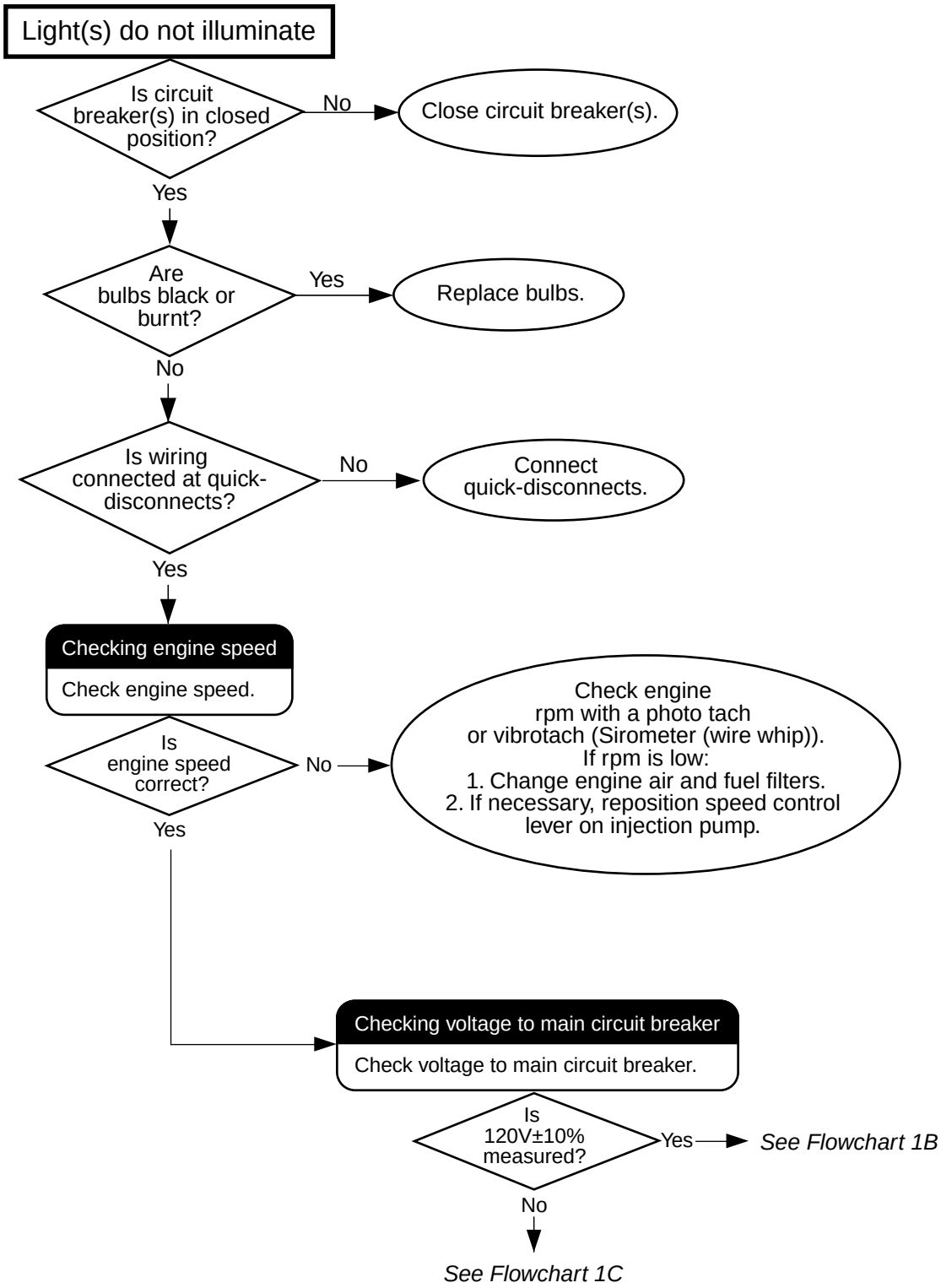
Use the Volt setting on your multimeter. To prevent damage to your instrument, start with the highest scale available on your multimeter. Adjust to a lower scale as readings dictate.

Use extreme caution when checking voltage to reduce the risk of electric shock.

7.7 Troubleshooting Flowcharts

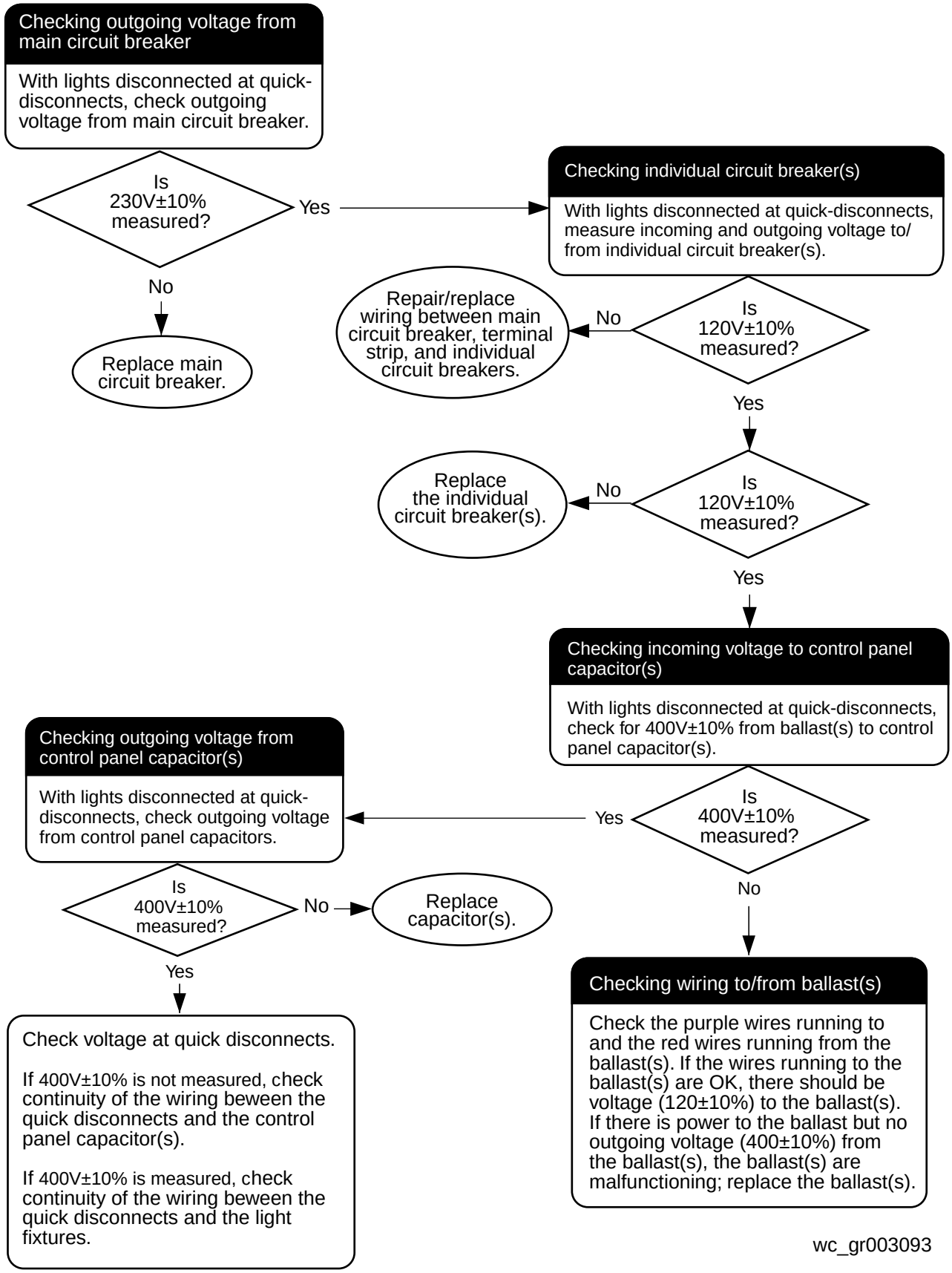
The troubleshooting flowcharts are designed to take you through the process of determining the source of a problem with engine starting or machine operation. Many of the tests involve live voltages and therefore should only be attempted by qualified personnel. Detailed procedures for carrying out the tests are included in this manual. All highlighted text within the flowcharts have matching sections in this manual.

7.8 Lights do not Illuminate—Flowchart 1A

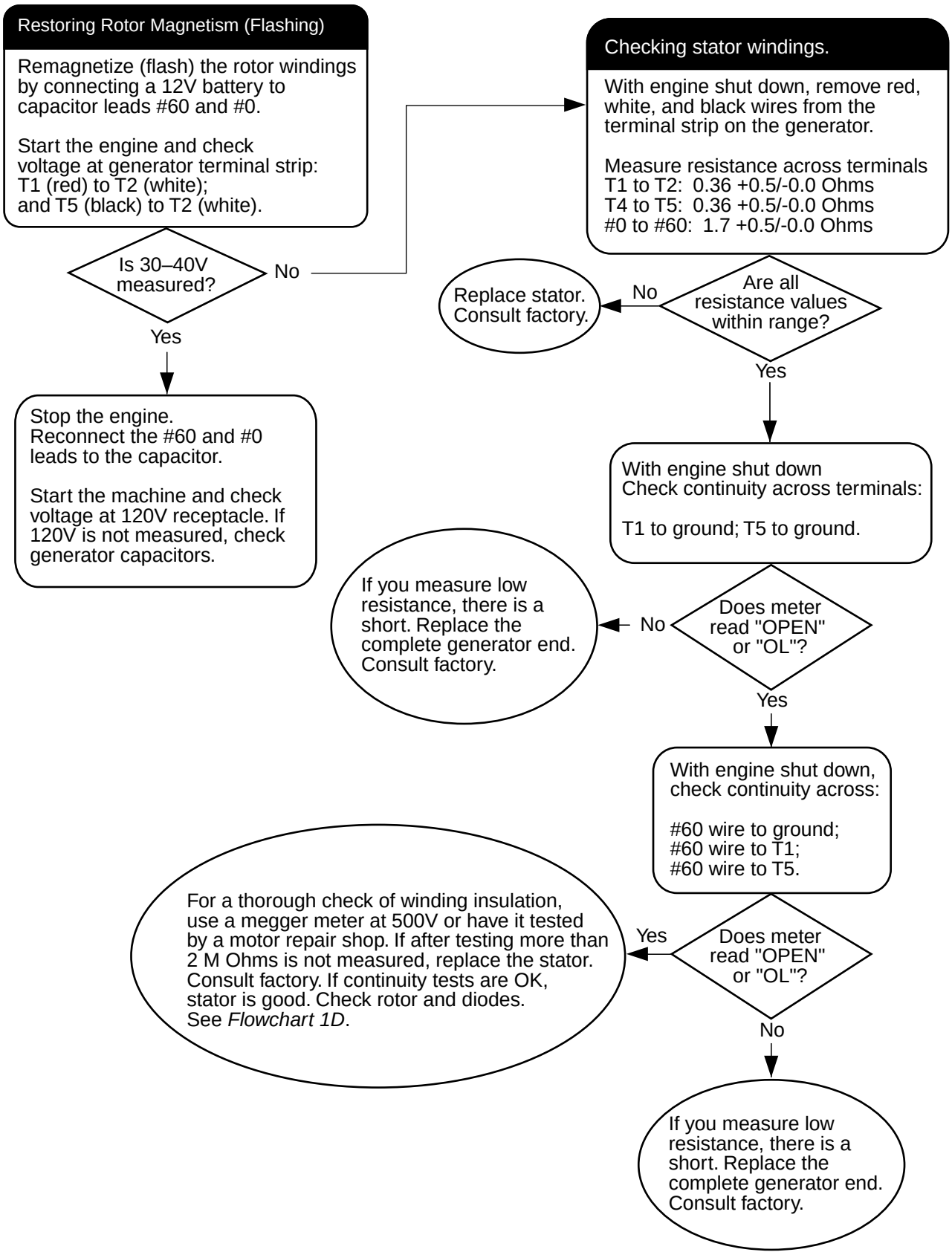


wc_gr003099

7.9 Lights do not Illuminate—Flowchart 1B

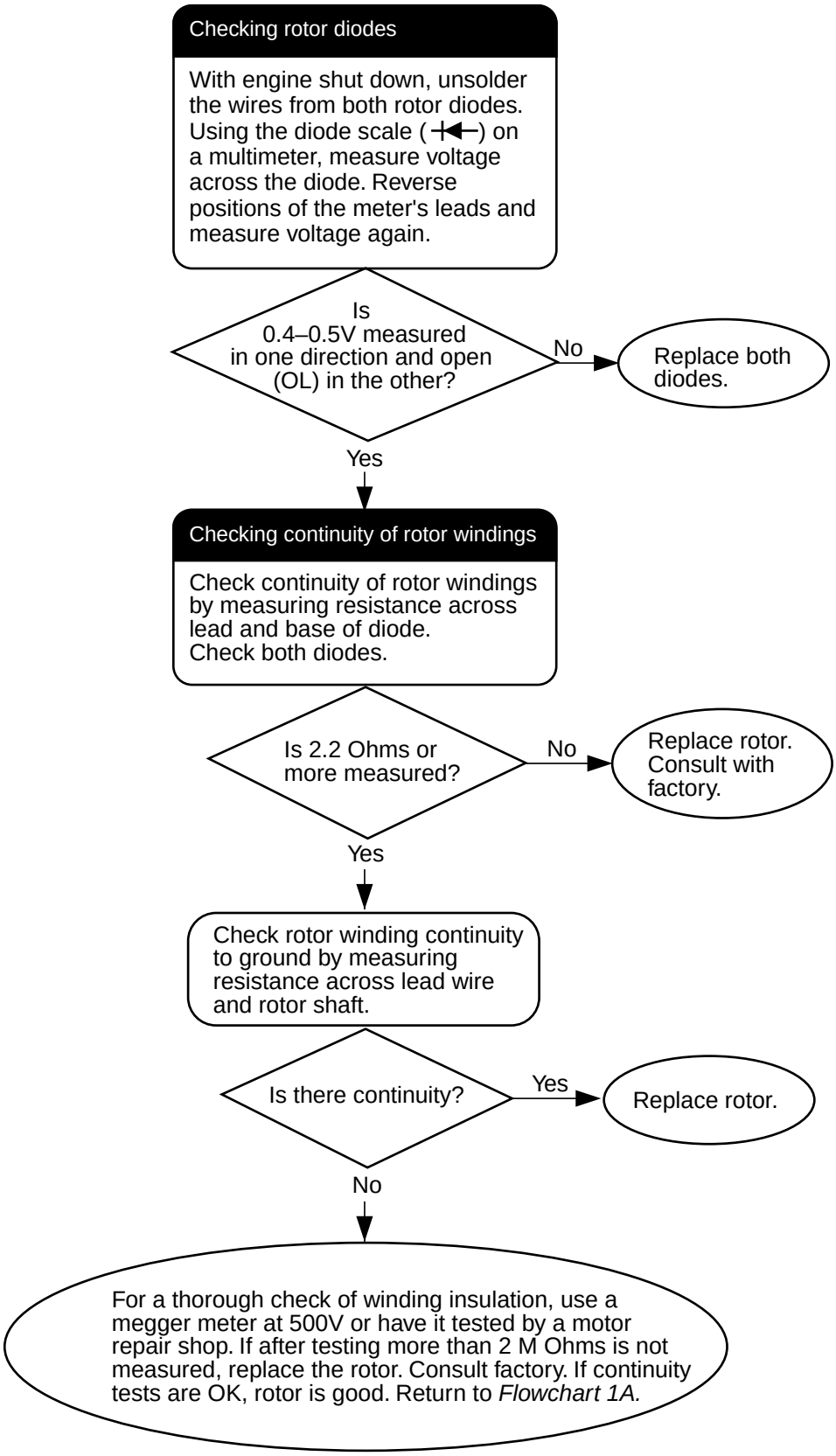


7.10 Lights do not Illuminate—Flowchart 1C



wc_gr003094

7.11 Lights do not Illuminate—Flowchart 1D



wc_gr003068

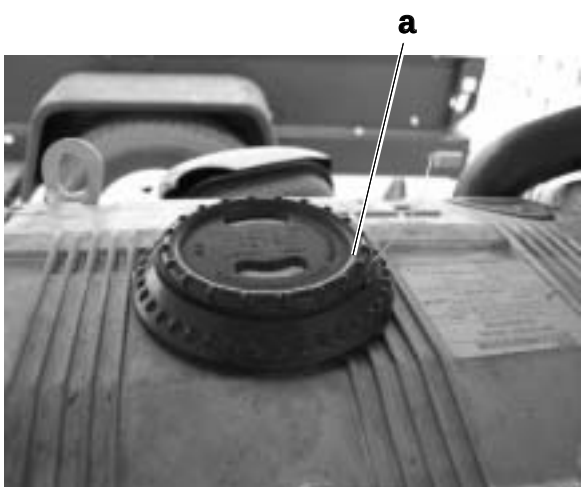
7.12 Checking Engine Speed

See Graphic: wc_gr001625, wc_gr001634, and wc_gr002441

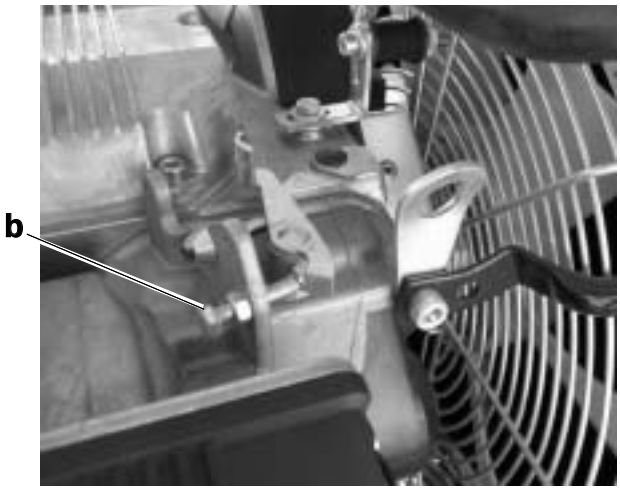
Using either a photo (strobe) tachometer, a frequency meter (60Hz = 1800 rpm; 50Hz = 1500 rpm), or a vibration tachometer such as a Sirometer **(a)** (Wacker P/N 0053397), check engine rpm. Refer to the instrument instructions. If necessary, adjust engine rpm using adjusting screw [**(b)** Lombardini engines, **(c)** CAT engines]. No load engine speed should be 1850 rpm for 60Hz and 1550 rpm for 50Hz models.

CAUTION: Do not adjust the engine speed to be higher than that listed above. The electrical components are frequency sensitive. Running at higher speeds will lead to component damage.

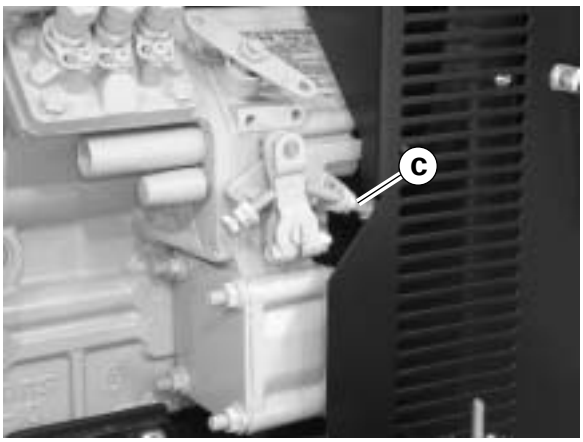
Also check the condition of the engine air, fuel, and oil filters. Change the filters if necessary. See maintenance section.



wc_gr001625



wc_gr001634



wc_gr002441

7.13 Checking Generator Voltage at Receptacle

See Graphic: wc_gr003075

WARNING

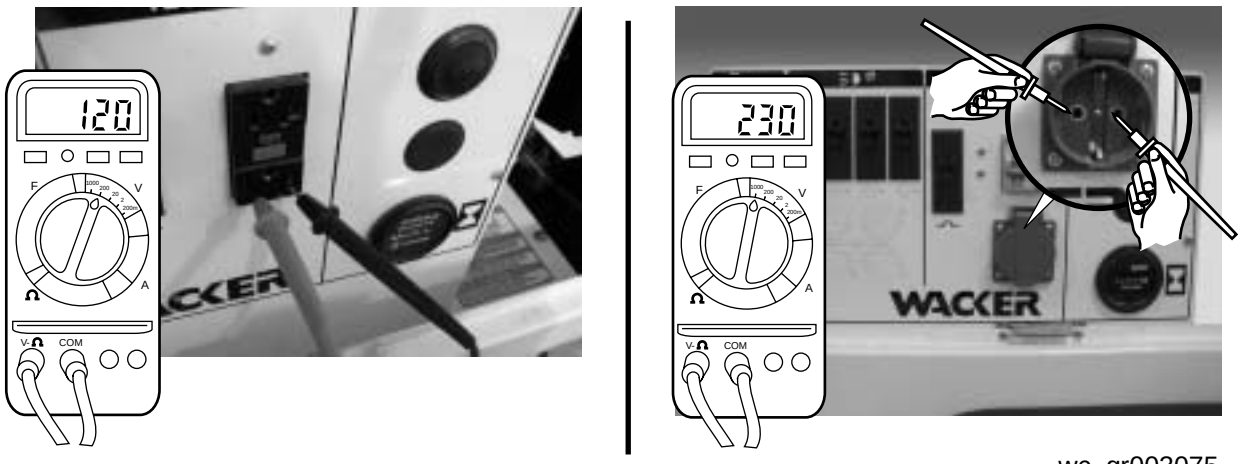
Electric shock hazard. Only qualified personnel should conduct this test.

A quick way to check the function of the generator is to check voltage at the receptacle. If the correct voltage is present, problems with the lights not functioning will be associated with the circuit from the main circuit breaker to the lights.

Complete this test with the machine running and both the main circuit breaker and the receptacle circuit breaker in the ON position. If your machine includes an earth-leakage circuit breaker, also place it in the ON position.

7.13.1 Using the AC voltage setting on the multimeter, test the receptacle for 120V±10% on 60Hz models; 115V or 230V±10% on 50Hz models.

- If zero (0) volts is measured, it indicates there may be a problem with the generator. Before checking the generator, check the receptacle reset button if equipped on your machine model. Depress the button if it has “popped out”. If the reset button will not stay depressed, check the condition of the wiring to the receptacle. See section *Checking Receptacle.*
- If the correct voltage is measured, the generator is functioning. See the troubleshooting flowcharts for troubleshooting sequence.



wc_gr003075

7.14 Replacing Receptacle

See Graphic: wc_gr002453

Carry out this procedure with the engine shut down.

Removal:

7.14.1 Remove the screws **(a)** securing the control panel cover and remove the cover.

7.14.2 Make note of the wire connections on the back of the receptacle. Loosen the screws securing the wires and remove the wires.

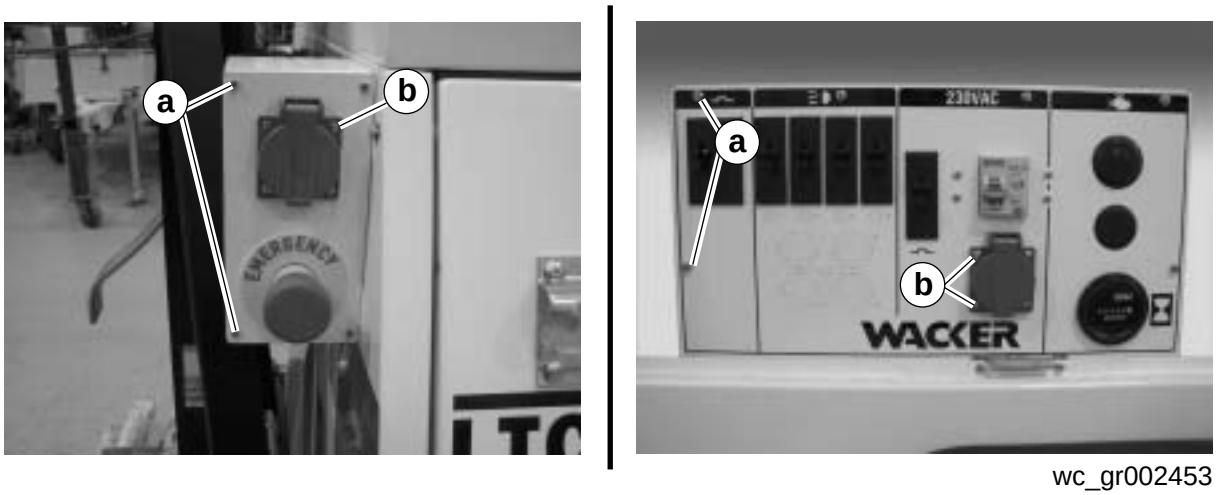
7.14.3 Remove the screws **(b)** securing the receptacle to the control panel cover and remove the receptacle.

Installation:

7.14.4 Mount the receptacle to the control panel cover.

7.14.5 Attach the wires to the appropriate terminals on the back of the receptacle.

7.14.6 Attach the control panel cover to the control panel.



wc_gr002453

7.15 Checking Voltage to the Main Circuit Breaker

See Graphic: wc_gr003095



WARNING

Electric shock hazard. Only qualified personnel should conduct this test. Do not perform this test if you or the machine are wet.

Complete this test with the machine running.

7.15.1 Remove the control panel front cover.

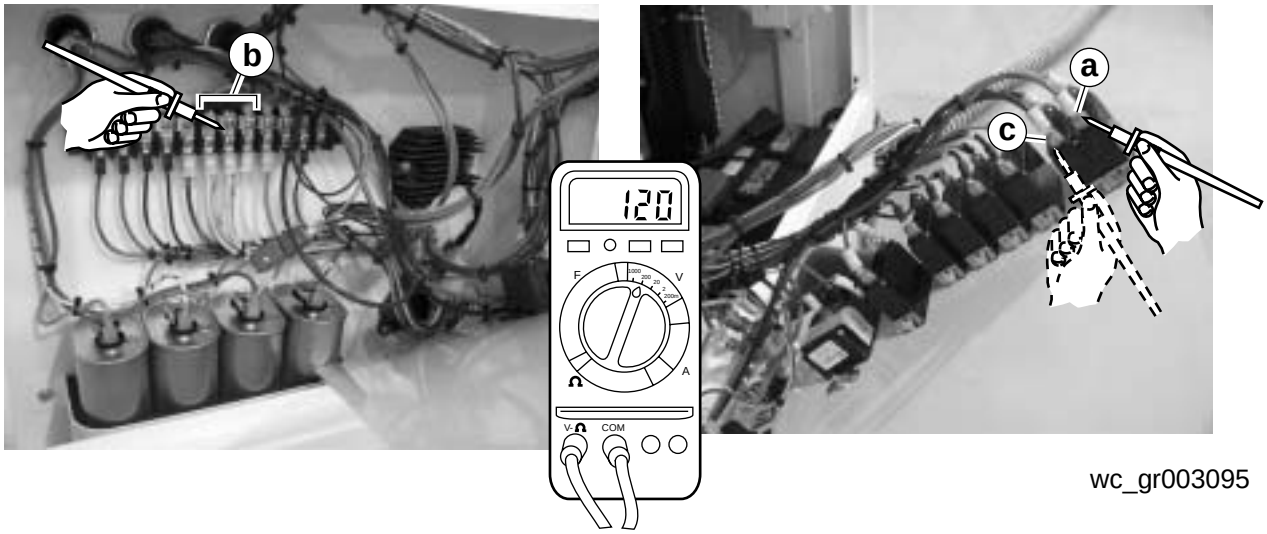
7.15.2 Using the AC voltage setting on the multimeter, measure the voltage between the main circuit breaker at the red wire **(a)** and any of the neutral wires at the terminal strip **(b)**. There should be 120V±10%.

- If 120V±10% was not measured, check the continuity of the red wire back to the generator. Then, check the condition of the generator by remagnetizing the rotor (flashing). See section *Restoring Rotor Magnetism/(Flashing)/Checking Rotor Winding.*
- If 120V±10% was measured, continue.

7.15.3 In the same manner, check the voltage between the main circuit breaker at the black wire **(c)** and any of the neutral wires at the terminal strip **(b)**.

- If 120V±10% was not measured, check the continuity of the red wire back to the generator. Then, check the condition of the generator by remagnetizing the rotor (flashing). See section *Restoring Rotor Magnetism/(Flashing)/Checking Rotor Winding.*
- If 120V±10% was measured, the generator is functioning.

7.15.4 Continue troubleshooting by checking the voltage to the terminal strip and the function of the main circuit breaker.



wc_gr003095

7.16 Checking Voltage Between Main Circuit Breaker and Terminal Strip

See Graphic: wc_gr003096



WARNING

Electric shock hazard. Only qualified personnel should conduct this test. Do not perform this test if you or the machine are wet.

Complete this test with the machine running and the main circuit breaker in the ON position.

7.16.1 Remove the control panel front cover.

7.16.2 Using the AC voltage setting on the multimeter, measure the voltage between the R/G wire **(a)** and the B/G wire **(c)**. There should be 240V±10%.

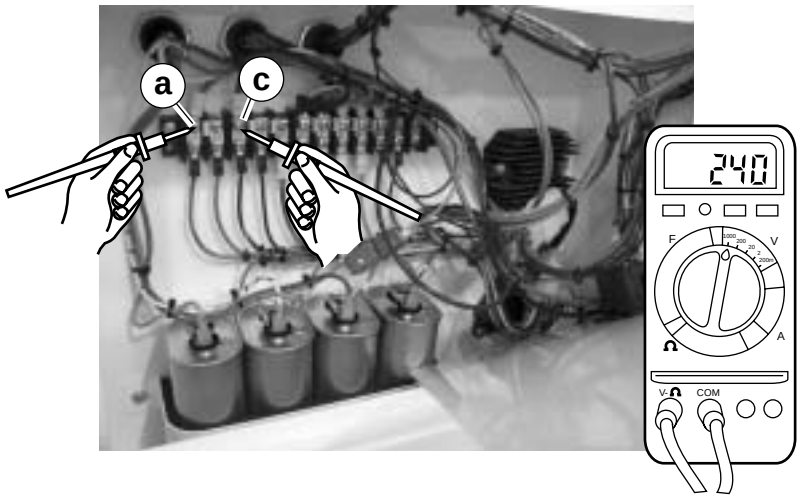
- If 240V±10% is measured, the proper voltage is reaching the terminal strip.
- If 240V±10% was not measured, continue.

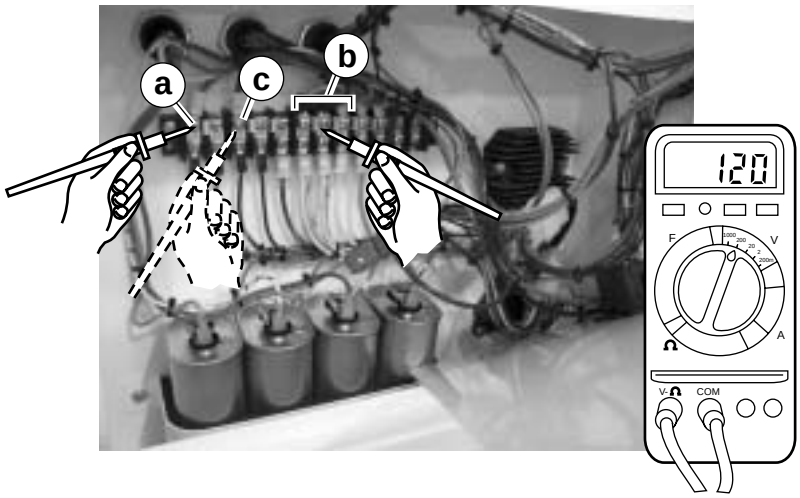
7.16.3 Measure the voltage between the R/G wire **(a)** of the terminal strip and the neutral wires at the terminal strip **(b)**. There should be 120V±10%.

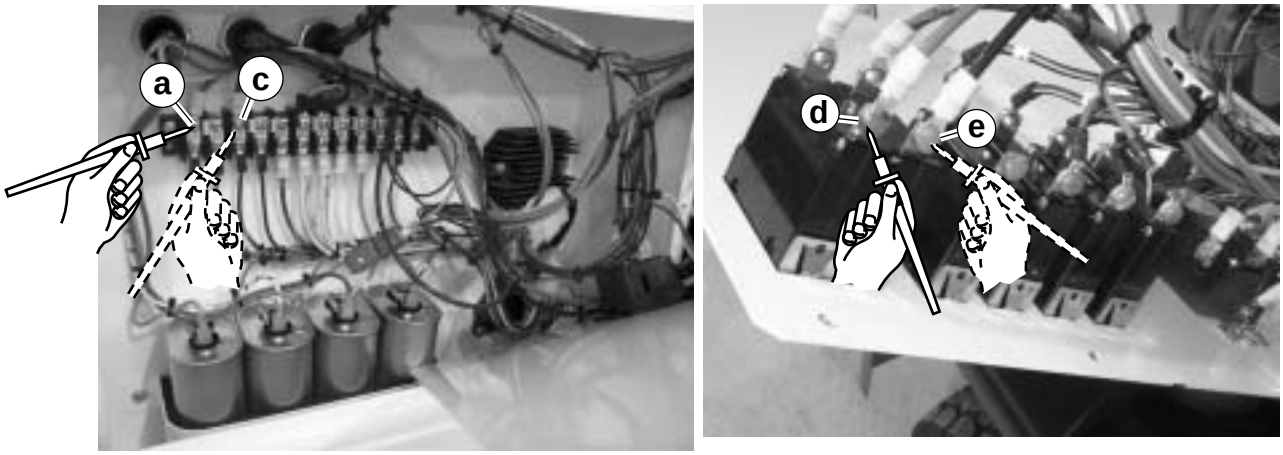
- If 120V±10% is measured, the R/G wire is carrying the proper voltage.
- If 120V±10% was not measured, check the continuity of the R/G wire between the circuit breaker **(d)** and the terminal strip **(a)**. Repair/replace the wire as needed.

7.16.4 Measure the voltage between the B/G wire **(c)** of the terminal strip and the neutral wires at the terminal strip **(b)**. There should be 120V±10%.

- If 120V±10% is measured, the B/G wire is carrying the proper voltage.
- If 120V±10% was not measured, check the continuity of the B/G wire between the circuit breaker **(e)** and the terminal strip **(c)**. Repair/replace the wire as needed.







wc_gr003096

7.17 Checking Individual Circuit Breakers

See Graphic: wc_gr002472



WARNING

Electric shock hazard. Only qualified personnel should conduct this test. Do not perform this test if you or the machine are wet.

Complete this test with the machine running. Test power to all circuit breakers or just the circuit breaker in question.

7.17.1 Unplug the light(s) at the upper mast quick-disconnect plugs.

7.17.2 Remove the control panel front cover.

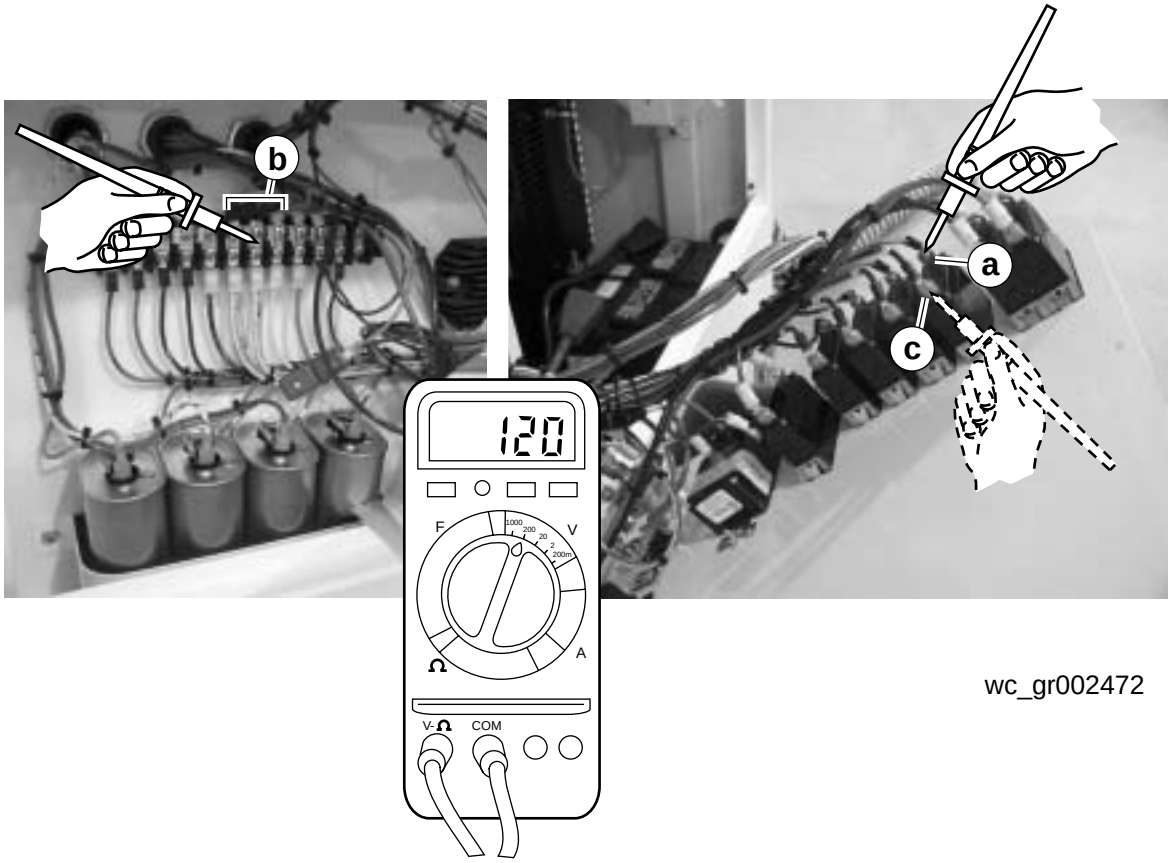
7.17.3 Place the main circuit breaker in the “ON” position.

7.17.4 Using the AC voltage setting on the multimeter, test for 120V±10% incoming voltage by measuring across the input wires **(a)** (R/B, R, B/W, or B) at the back of the circuit breaker(s) and neutral wires at the terminal strip **(b)**.

- If 120V±10% is not measured, it indicates a problem with voltage reaching the circuit breaker. Check the continuity of the wiring between the terminal strip and the circuit breaker. Repair or replace the wiring as needed.
- If 120V±10% is measured at the circuit breaker, continue.

7.17.5 Place the circuit breaker being tested in the “ON” position and measure the voltage between the outgoing side of the circuit breaker **(c)** and neutral wires at the terminal strip **(b)**.

- If 120V±10% is not measured, it indicates a problem with the circuit breaker. Check the continuity of the circuit breaker. Replace the circuit breaker if needed.
- If 120V±10% is measured, voltage is being supplied through the circuit breaker. Continue troubleshooting by checking the function of control panel capacitors. See section *Checking Incoming Voltage to Control Panel Capacitor(s).*



wc_gr002472

7.18 Confirming a Malfunctioning Circuit Breaker

See Graphic: wc_gr002458

WARNING

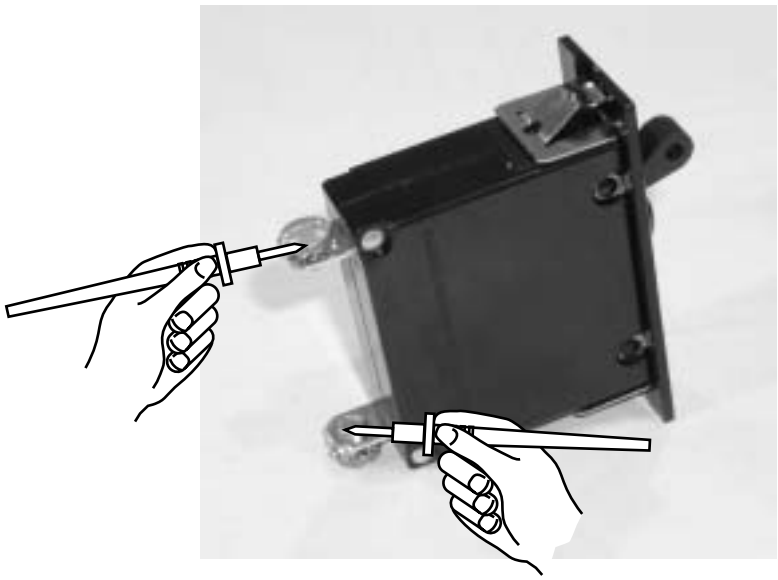
Electric shock hazard. Only qualified personnel should conduct this test.

Complete this test with the engine shut down.

7.18.1 Remove the circuit breaker(s) from the control panel.

7.18.2 Place the circuit breaker ON-OFF switch in the ON position.

7.18.3 Using the Ohms scale on the multimeter, test the circuit breaker for continuity. If you measure no continuity (“OL” or “OPEN”), replace the breaker. If the breaker has continuity, re-install it. Place ON-OFF switch in the OFF position.



wc_gr002458

7.19 Checking Incoming Voltage to Control Panel Capacitor(s)

See Graphic: wc_gr002456

WARNING

Electric shock hazard. Only qualified personnel should conduct this test.

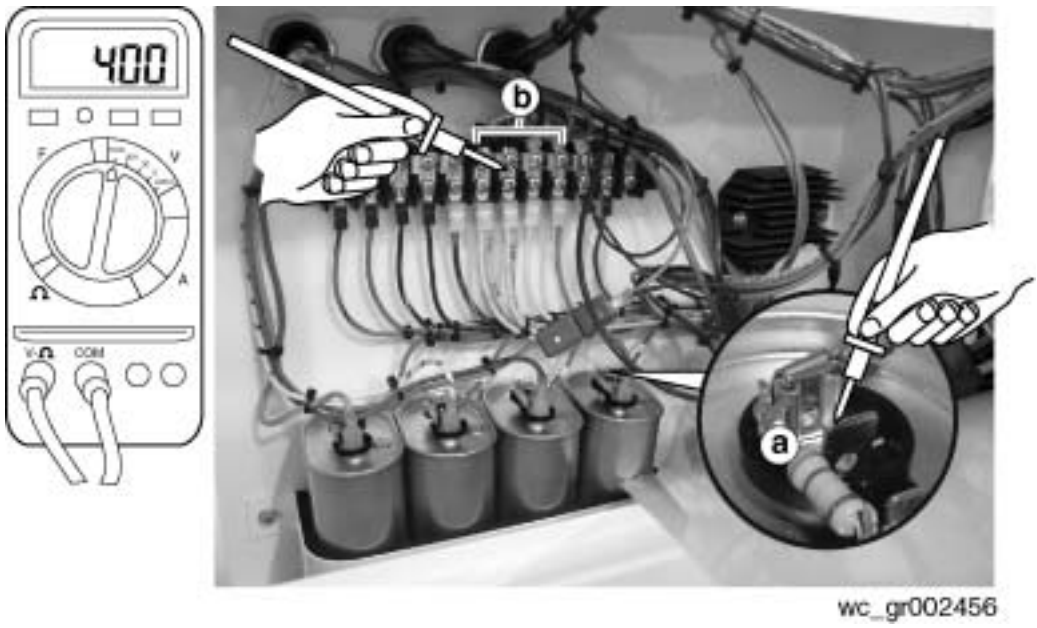
Complete this test with the lights disconnected at the quick-disconnects (or disconnected at the junction box), the machine running, and the main circuit breaker in the ON position.

7.19.1 Remove control panel front cover.

7.19.2 Place the individual circuit breaker(s) to the light(s) in the ON position.

7.19.3 Using the AC voltage setting on the multimeter, test for 400V±10% incoming to the control panel capacitor(s) by measuring across the input wire **(a)** at the control panel capacitor(s) and the wires **(b)** of the terminal strip.

- If 400V±10% is not measured, it indicates faulty wiring to the ballast(s), faulty wiring to the control panel capacitors, or a failed ballast. See section *Checking Wiring to/from Ballast(s).*
- If 400V±10% is measured, the ballast(s) is functioning. Continue troubleshooting by checking the control panel capacitors. See section *Checking Outgoing Voltage from Control Panel Capacitor(s).*



7.20 Checking Outgoing Voltage from Control Panel Capacitor(s)

See Graphic: wc_gr002454

WARNING

Electric shock hazard. Only qualified personnel should conduct this test.

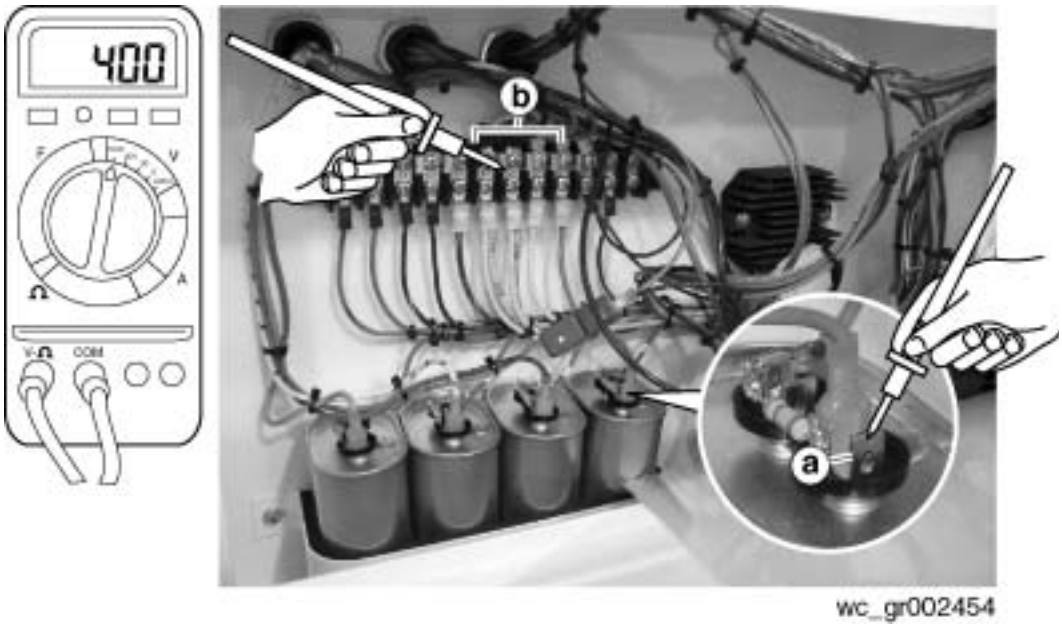
Complete this test with the lights disconnected, the machine running, and the main circuit breaker in the ON position. Test all capacitors or just the capacitor in question.

7.20.1 Remove the control panel front cover.

7.20.2 Place the individual circuit breaker(s) to the light(s) in the ON position.

7.20.3 Using the AC voltage setting on the multimeter, test for 400V±10% coming from the control panel capacitor(s) by measuring across the output terminal **(a)** of the control panel capacitor and the wires **(b)** of the terminal strip.

- If 400V±10% is measured, the control panel capacitor(s) is functioning. Continue troubleshooting by checking the wiring between the control panel capacitor(s) and the quick-disconnect(s).
- If 400V±10% is not measured, replace the capacitor(s).



7.21 Confirming a Faulty Control Panel Capacitor

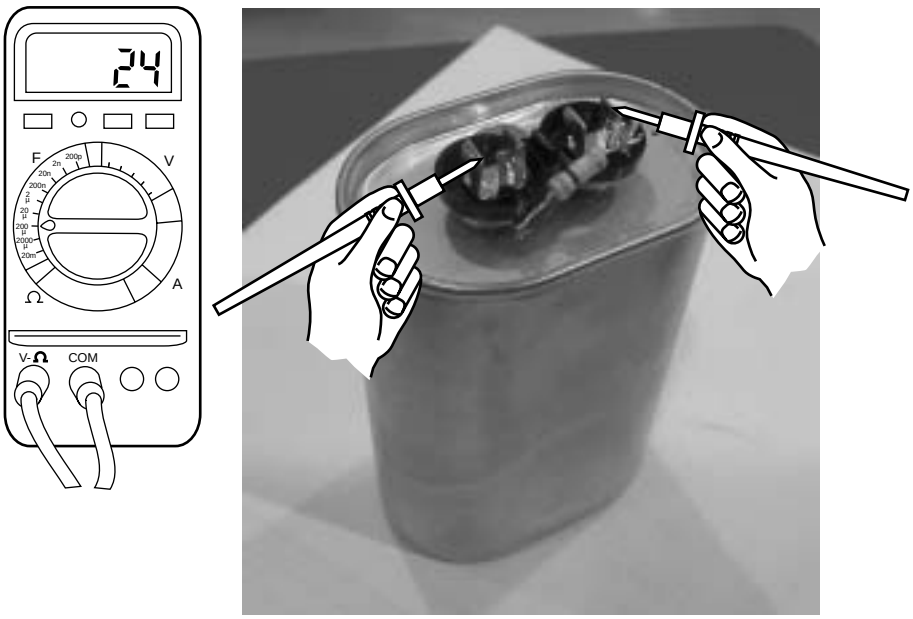
See Graphic: wc_gr002455

Carry out this procedure with the engine shut down.

7.21.1 Remove the input and output wires from the capacitor.
Note: *The capacitor is shown with the resistor disconnected; the resistor may be left connected if desired.*

7.21.2 Discharge the capacitor by placing the blade of an insulated screwdriver across the two spades of the capacitor.

7.21.3 Using a multimeter set to the Farad (F) or capacitance (C) scale (200 µF), measure the capacitor's capacitance. Each capacitor should measure 24±2 µF. If the reading is not within this range, replace the capacitor.



wc_gr002455

7.22 Checking Wiring to/from Ballast(s)

See Graphic: wc_gr003072

WARNING

Electric shock hazard. Only qualified personnel should conduct this test. Complete this test with the machine shut down.

At this stage, you should have measured voltage (120V±10%) to the circuit breaker(s) and no incoming voltage (400V±10%) to the control panel capacitors. Therefore, if the wiring to the ballast from the circuit breaker(s) is OK, the same voltage should be incoming to the ballast. In addition, if the wires from the ballast to the control panel capacitor(s) are OK, there should be voltage incoming to the control panel capacitors. If there is not, the ballast has failed; replace it.

To check the wiring:

7.22.1 Turn off the engine.

7.22.2 Remove the control panel front cover.

7.22.3 Remove the screws **(a)** which secure the control panel and the cover of the ballast box. Position the control panel/cover of the ballast box **(b)** so you can access the wiring to the ballast.

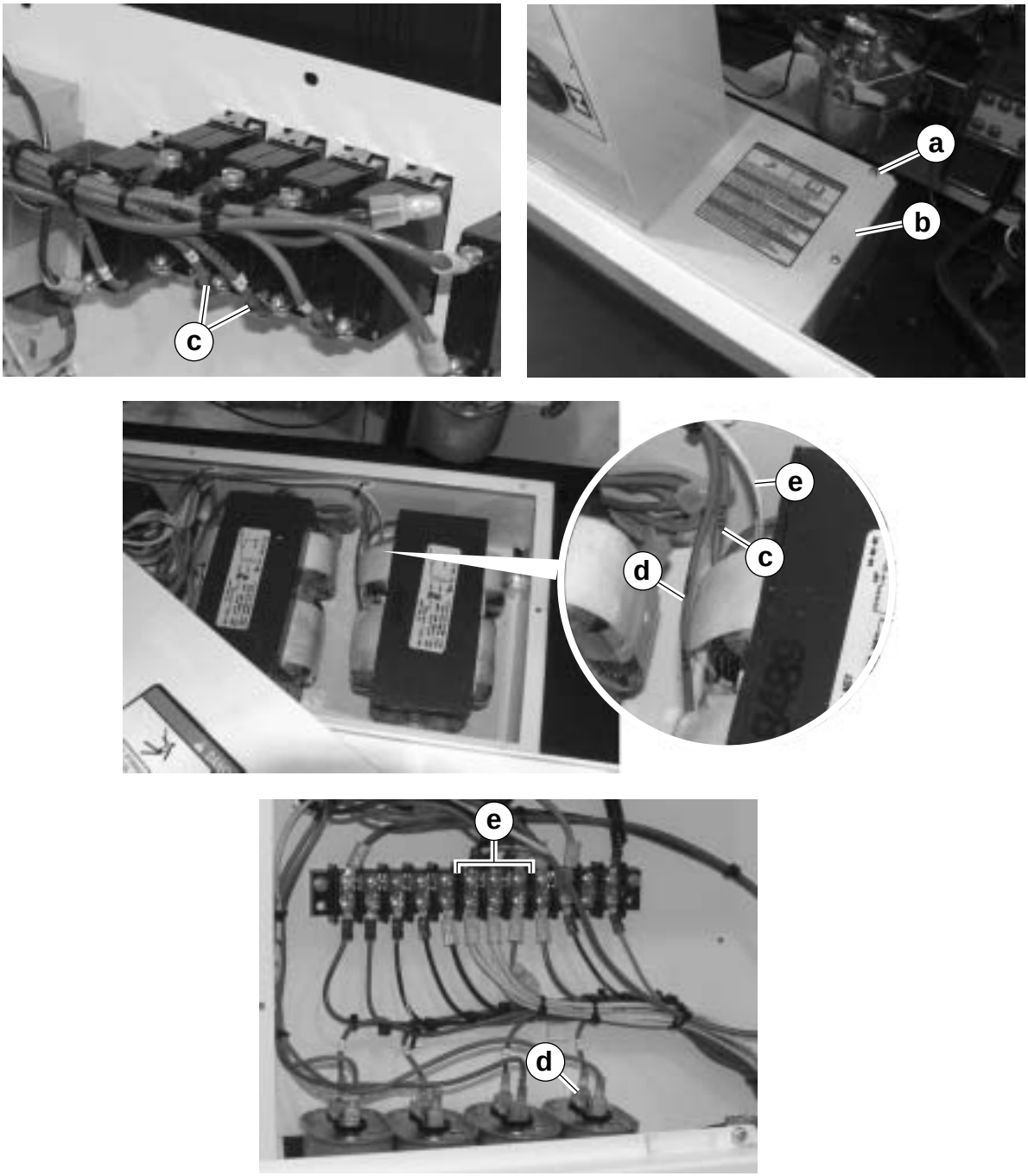
7.22.4 Check the B/Y (black-yellow) wire(s) **(c)** that run from the circuit breaker(s) to the ballast. Repair the wiring as needed.

7.22.5 Check the R (red) wire(s) **(d)** that run from the ballast to the control panel capacitor(s). Repair the wiring as needed.

7.22.6 Check the Y (yellow) wire(s) **(e)** that run from the ballast to the neutral of the terminal strip. Repair the wiring as needed.

7.22.7 If all wiring is OK, the ballast has failed; replace it.

7.22.8 If you had to repair any wiring, recheck the voltage incoming to the control panel capacitors. See section *Checking Incoming Voltage to Control Panel Capacitor(s).*



wc_gr003072

7.23 Replacing Ballast

See Graphic: wc _gr002442

Removal:

7.23.1 Shut down the engine and disconnect the battery.

7.23.2 Open the control panel and snip the wire ties **(a)** holding the ballast wires to the control panel.

7.23.3 Remove the six screws securing the control panel/ballast box cover. Pull the control panel/ballast box cover **(b)** off the ballast box just enough to allow access to the ballasts.

7.23.4 Remove the wiring **(c, d, e)** for each ballast being replaced.

7.23.5 Remove the hardware **(f)** securing the ballast **(g)** and remove the ballast from the ballast box.

Reassembly:

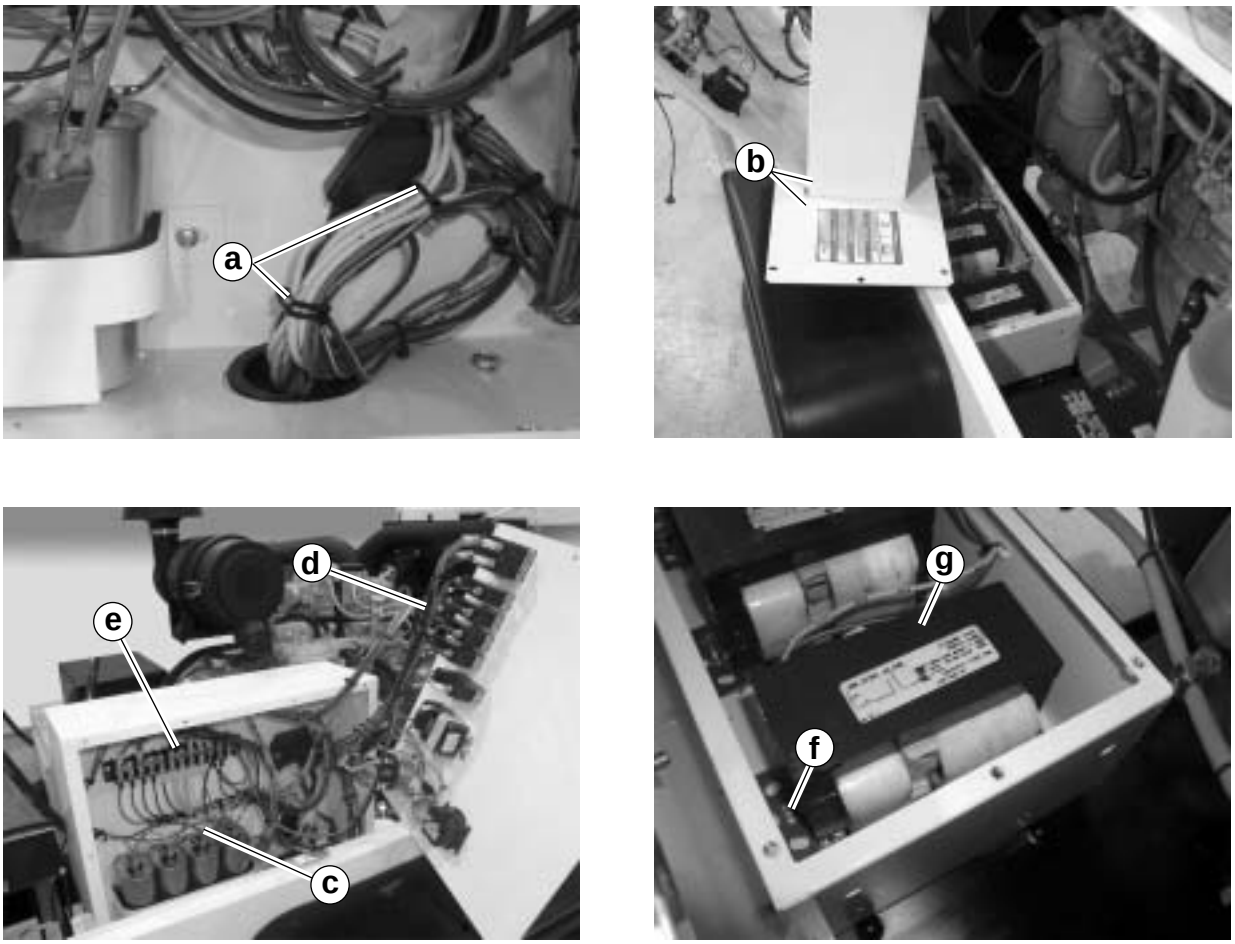
7.23.6 Secure the replacement ballast **(g)** in the ballast box with the hardware **(f).**

7.23.7 Run the wires **(c, d, e)** up through the control panel and secure them to the proper locations.

7.23.8 Secure the control panel/ballast box cover **(b)** to the ballast box with the six screws.

7.23.9 Gather and organize the wires with new wire ties **(a)**.

7.23.10 Secure the control panel cover to the control panel with six screws.



wc_gr002442

7.24 Restoring Rotor Magnetism (Flashing) / Checking Rotor Winding

See Graphic: wc_gr002171



WARNING

Electric shock hazard. Only qualified personnel should conduct this test.

These procedures require two 14-gauge jumper wires and a fully-charged 12V battery.

If you measured 0 (zero) volts at the main circuit breaker, the generator may have lost its residual magnetism. Try restoring the magnetism (flashing) to the generator before conducting in-depth tests. Flashing the generatior serves two purposes: 1) it restores rotor magnetism and 2) it confirms a working rotor (winding and diodes). By flashing the generator with a known DC voltage, a predictable output voltage is produced. For example, using a 12-volt battery, produces an output voltage of 30–40 volts. Flash the generator before disassembly to confirm a malfunctioning rotor.

Start this test with the engine shut down.

7.24.1 Unplug the #60 and #0 leads from the generator capacitor.

7.24.2 Using 14 gauge or larger wire, connect two jumper wires to the battery, one to each terminal. Once connected to the battery, do not allow the two jumpers to touch each other.



WARNING

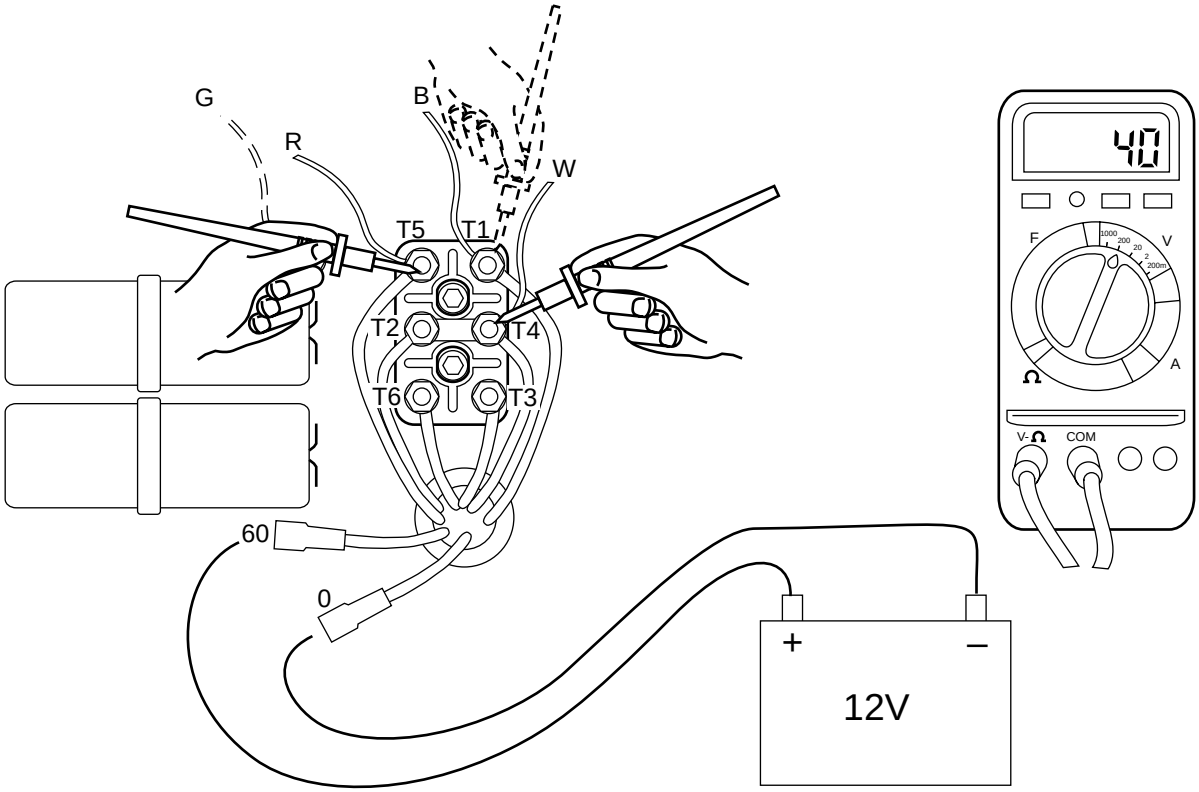
Explosion hazard. Do not create sparks near battery.

7.24.3 Start the engine.

7.24.4 Connect the opposite end of the jumper wires to the #60 and #0 leads—connect either wire to either lead. This is a non-polar connection.

7.24.5 Using the AC voltage setting on the multimeter, check the voltage across the terminal strip mounted on the generator: red (T5) to white (T4); black (T1) to white (T4). There should be 30–40 volts measured in both cases.

- If you measure 30–40 volts, the generator is functioning. Shut down the machine and disconnect the jumpers, first at the capacitor wires, then at the battery.
- If you do not measure 30–40 volts, there is a problem. Shut down the engine and continue troubleshooting. See section *Checking Stator Windings.*



wc_gr002171

7.25 Checking Generator Capacitors

See Graphic: wc_gr002170

Carry out this procedure with the engine shut down.

The capacitors of the electrical system are mounted to the top of the generator underneath the protective cover **(a)**.

7.25.1 With the unit off, remove the screws securing the protective cover and remove the cover.

7.25.2 Remove the leads from the capacitor and discharge it by placing the blade of an insulated screwdriver across the two spades of the capacitor.

7.25.3 Using a multimeter set to the Farad (F) or capacitance (C) scale (200 µF), measure the capacitor's capacitance. On systems with dual capacitors, each capacitor should measure 18±2 µF. If the reading is not within this range, replace the capacitor. Also see *Alternative Capacitor Check.*



7.26 Alternative Capacitor Check

See Graphic: wc_gr001607 and wc_gr001783

An alternative capacitor check is to set the multimeter to the 10,000 Ohm scale when checking the capacitor. Observe the reading. If the reading starts out very low (5.0 Ohms) and continues to climb to an overload or open reading, the capacitor may be OK. Double check by installing the capacitor in a known-to-be-working Light Tower. If the known-to-be-working Light Tower operates correctly, the capacitor is OK. A second alternative check would be to try a known-to-be-working capacitor in the original Light Tower. If the Light Tower still does not produce power, the problem is within the generator. Check the stator and rotor.



wc_gr001607

7.27 Replacing Generator Capacitor(s)

See Graphic: wc_gr002460

Carry out this procedure with the engine shut down.

Removal:

7.27.1 Note the connection points of the #60 (#50 on 50Hz machines) and #0 wires and remove the wires **(a)** from the capacitor **(b)**.

7.27.2 Remove the jumper wire **(c)** connecting the two capacitors.

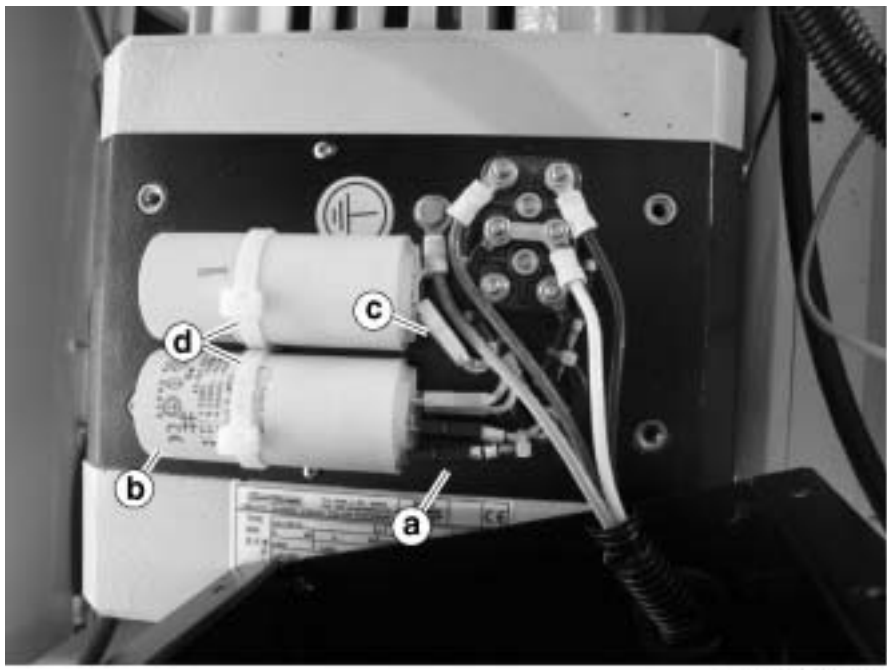
7.27.3 Cut the wire ties **(d)** and remove the capacitor(s).

Installation:

7.27.4 Insert the capacitors **(b)** and secure with new wire ties **(d)**.

7.27.5 Attach the #60 (#50 on 50Hz machines) and #0 wires to the appropriate terminals on the capacitor.

7.27.6 Attach the jumper wire **(c)**.



wc_gr002460

7.28 Checking Stator Windings

See Graphic: wc_gr003097

The generator terminal block is located on top of the generator. When checking the stator windings at the terminal block, if there is any evidence of burned windings (such as melted wire insulation or odor), replace the generator.

Carry out the following tests with the engine shut down.

Note: *Before making resistance measurements, determine the value of your meter's internal resistance by touching the meter's leads. Subtract this value from the values you measure.*

7.28.1 Remove the RED, BLACK, and WHITE wires from the generator terminal block.

7.28.2 Remove the leads from the capacitors and place an insulated screwdriver across the capacitors to discharge them.

7.28.3 Using the Ohm (resistance) setting on the multimeter, measure the resistance T1 to T2. Also measure resistance T4 to T5. In both cases the resistance measured should be 0.36 +0.5/-0.0 Ohms. Measure the resistance #60 lead to #0 lead. The resistance measured should be 1.7 +0.5/-0.0 Ohms. If there is no continuity (meter reads "OPEN" or "OL"), replace the stator.

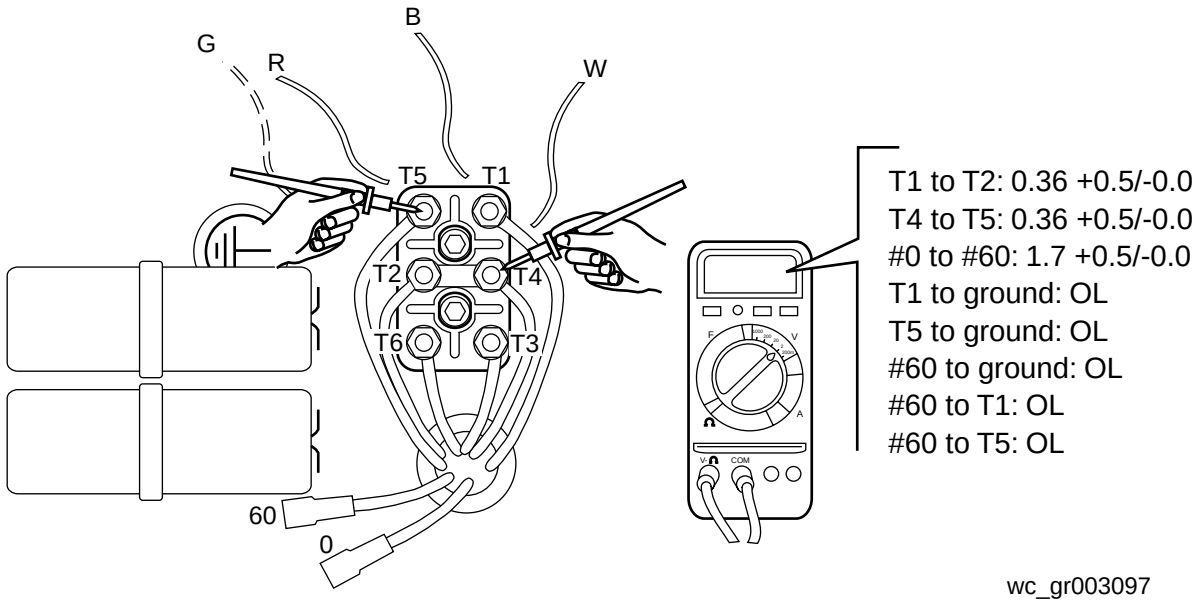
7.28.4 Using the Ohm setting on the multimeter, measure the resistance T1 to ground, and T5 to ground. The multimeter should read "OPEN" or "OL" for both tests. If the meter does not read "OPEN", replace the entire generator.

7.28.5 Using the Ohm scale on the multimeter, measure resistance #60 lead to ground, #60 lead to T1, and #60 lead to T5. The multimeter should read "OPEN" or "OL" for all three tests. If the meter does not read open, replace the entire generator. Consult with factory to confirm.

Note: *Do not touch the machine frame when making this test. A reading error will occur.*

Note: *A meter reading of 2 megohms (2 M Ohms) or larger is acceptable.*

For a more thorough insulation test, use a megger meter capable of 500 Volts or have a motor repair shop test it. If readings are 2 megohms or greater, the stator is good. If readings are less than 2 megohms, replace the generator end. Consult factory to confirm.


G
R
B
W
T5
T1
T2
T4
T6
T3
60
0
T1 to T2: 0.36 +0.5/-0.0
T4 to T5: 0.36 +0.5/-0.0
#0 to #60: 1.7 +0.5/-0.0
T1 to ground: OL
T5 to ground: OL
#60 to ground: OL
#60 to T1: OL
#60 to T5: OL
wc_gr003097

7.29 Removing/Installing Caterpillar Engine with Generator

See Graphic: wc_gr002446

Removal:

7.29.1 Shut down the engine and disconnect the battery.

7.29.2 Remove the top enclosure cover. See section *Replacing Fuel Tank*.

7.29.3 Remove the four screws **(a)** securing the capacitor cover **(b)** and remove the capacitor cover.

7.29.4 Note the position of the wiring **(c)** and remove the wiring from the capacitor terminal strip. Also remove the screw securing the ground wire **(d)**.

7.29.5 Remove the four bolts **(e)** securing the muffler **(f)** and remove the muffler.

7.29.6 Disconnect the ground wires **(g)** from the engine.

7.29.7 Disconnect the wiring harness from the glow plugs **(h)**, fuel pump **(i)**, and the oil pressure sensor **(j)**. Also disconnect the wiring harness from the coolant temperature sensor **(k)**, the connector plug **(l)**, and the starter motor **(m)**.

7.29.8 Disconnect the coolant overflow reservoir tube at the radiator **(n)**.

7.29.9 Remove the four nuts and washers located underneath the frame that secure the shock mounts to the frame.

7.29.10 Using an appropriate crane or hoist, lift the engine/generator assembly from the machine.

Reassembly:

7.29.11 Using an appropriate crane or hoist, position the engine/generator assembly into the machine.

7.29.12 Secure the engine/generator assembly to the machine frame.

7.29.13 Connect the coolant overflow reservoir tube to the radiator **(n)**.

7.29.14 Connect the wiring harness to the glow plugs **(h)**, fuel pump **(i)**, and the oil pressure sensor **(j)**. Also connect the wiring harness to the coolant temperature sensor **(k)**, the connector plug **(l)**, and the starter motor **(m)**.

7.29.15 Connect the ground wires **(g)** to the engine.

7.29.16 Secure the muffler with four bolts **(e)**.

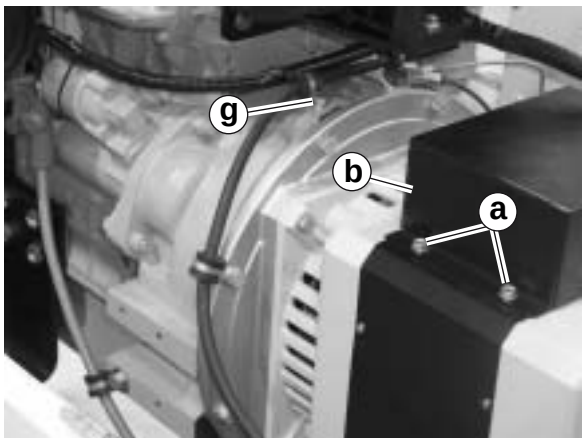
7.29.17 Connect the wiring **(c)** to the capacitor terminal strip. Also connect the screw securing the ground wire **(d)**.

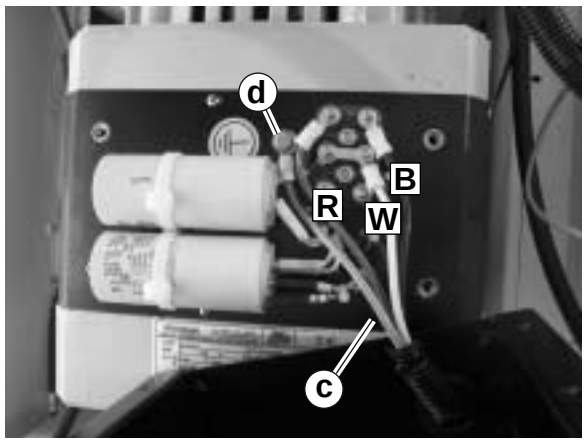
7.29.18 Secure the capacitor cover **(b)** to the generator.

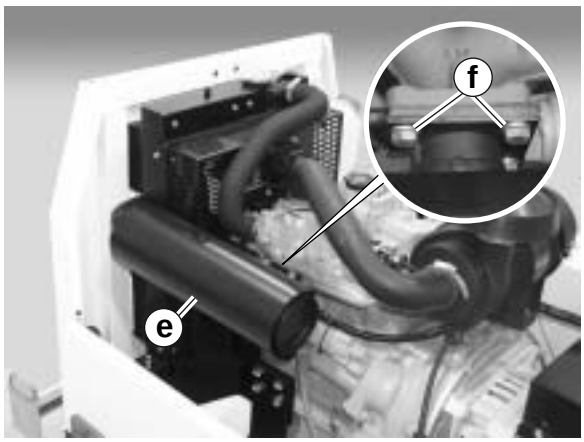
7.29.19 Re-install the fuel tank. See section *Replacing Fuel Tank*.

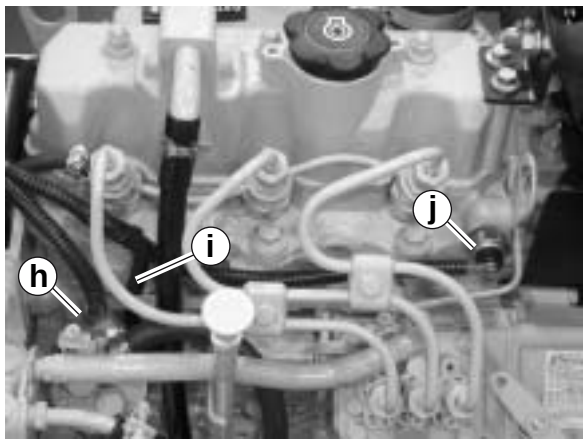


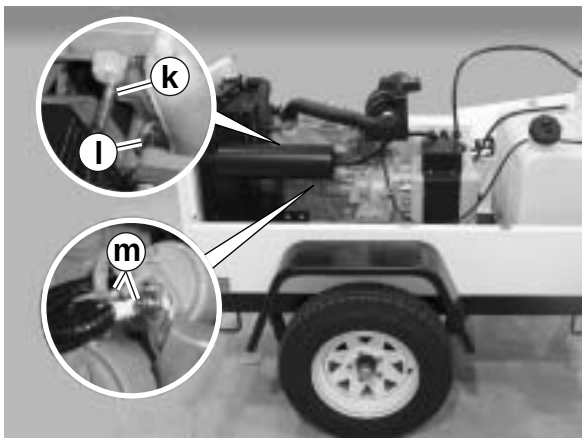
wc_gr000843

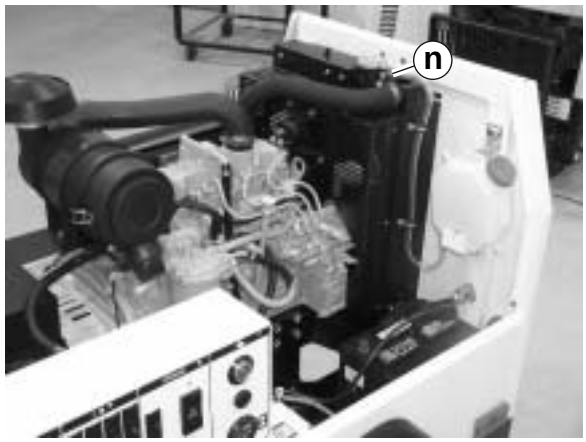












wc_gr002446

7.30 Removing/Installing Lombardini Engine with Generator

See Graphic: wc_gr002451

Removal:

7.30.1 Shut down the engine and disconnect the battery.

7.30.2 Remove the top enclosure cover. See section *Replacing Fuel Tank*.

7.30.3 Remove the four screws **(a)** securing the capacitor cover **(b)** and remove the capacitor cover.

7.30.4 Note the position of the wiring **(c)** and remove the wiring from the capacitor terminal strip. Also remove the screw securing the ground wire **(d)**.

7.30.5 Remove the three bolts **(e)** securing the muffler **(f)** and remove the muffler.

7.30.6 Disconnect the ground wires **(g)** from the engine.

7.30.7 Disconnect the orange wire **(h)** from the connector near the engine control box. Disconnect the wiring harness from the coolant high temperature switch **(i)** and the coolant temperature thermistor **(j)**. Also disconnect the wires **(k & l)** at the alternator.

7.30.8 Disconnect the coolant overflow reservoir tube at the radiator.

7.30.9 Remove the four nuts and washers located underneath the frame that secure the shock mounts to the frame.

7.30.10 Using an appropriate crane or hoist, lift the engine/generator assembly from the machine.

Reassembly:

7.30.11 Using an appropriate crane or hoist, position the engine/generator assembly into the machine.

7.30.12 Secure the engine/generator assembly to the machine frame.

7.30.13 Connect the coolant overflow reservoir tube to the radiator.

7.30.14 Connect the orange wire **(h)** to the connector near the engine control box. Connect the wiring harness to the coolant high temperature switch **(i)** and the coolant temperature thermistor **(j)**. Also connect the wires **(k & l)** at the alternator.

7.30.15 Connect the ground wires **(g)** to the engine.

7.30.16 Secure the muffler with three bolts **(e)**.

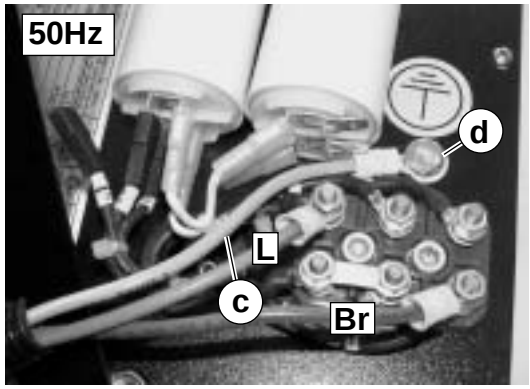
7.30.17 Connect the wiring **(c)** to the capacitor terminal strip. Also connect the screw securing the ground wire **(d)**.

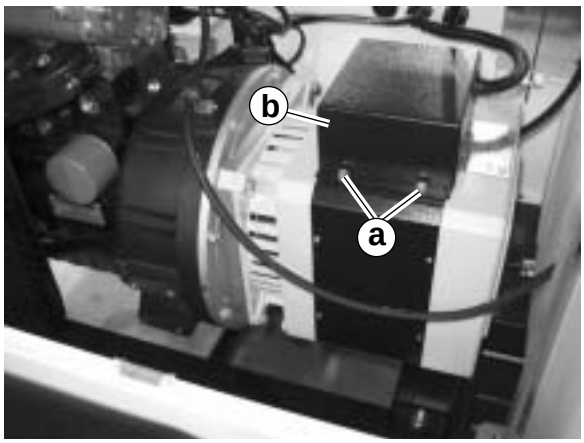
7.30.18 Secure the capacitor cover **(b)** to the generator.

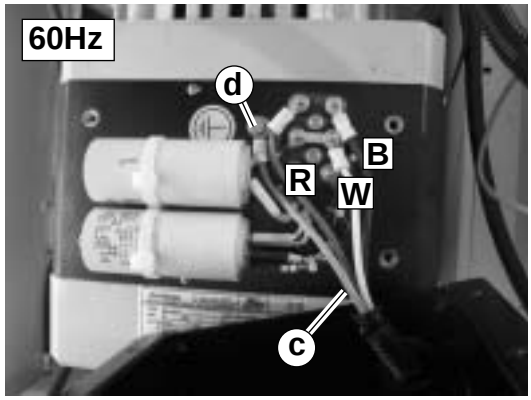
7.30.19 Re-install the top enclosure cover. See section *Replacing Fuel Tank*.

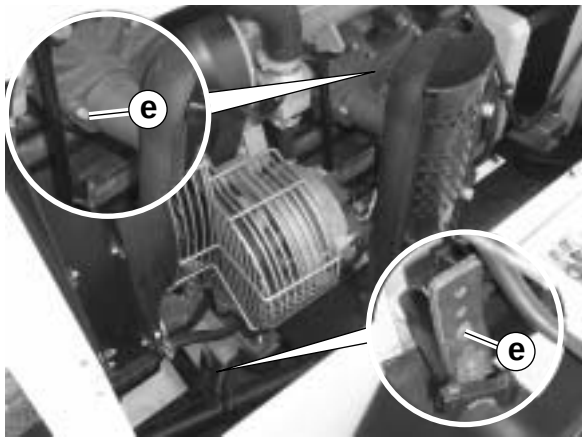


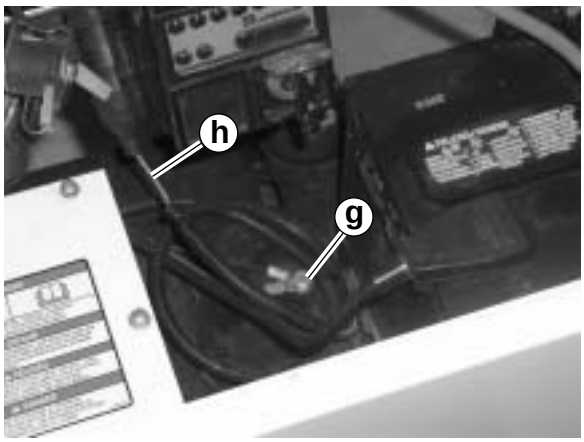
wc_gr000843

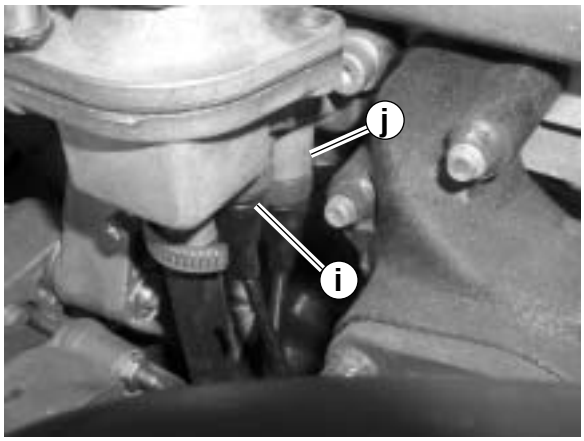


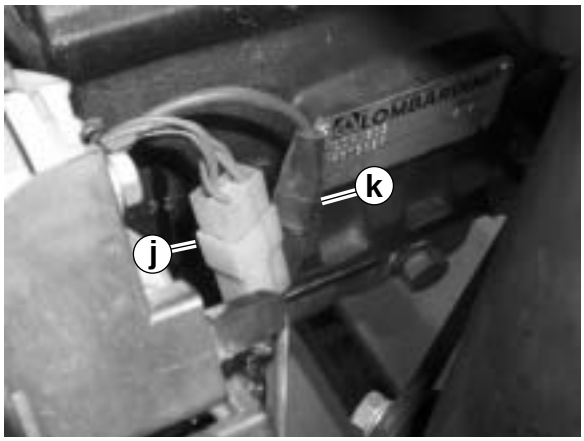












wc_gr002451

7.31 Separating Stator Assembly from Engine/Rotor Assembly

See Graphic: wc_gr001640

Note: *The fit between the rotor bearing and the stator housing is tight. The tight fit prevents the bearing from spinning in the housing.*

7.31.1 There are two methods to separate the stator assembly from the engine/rotor assembly. The first method involves creating a special pusher tool. When using either method, support the stator assembly with an appropriate strap and hoist.

Method 1

7.31.2 Using an appropriate strap **(a)** and hoist, support the generator end.

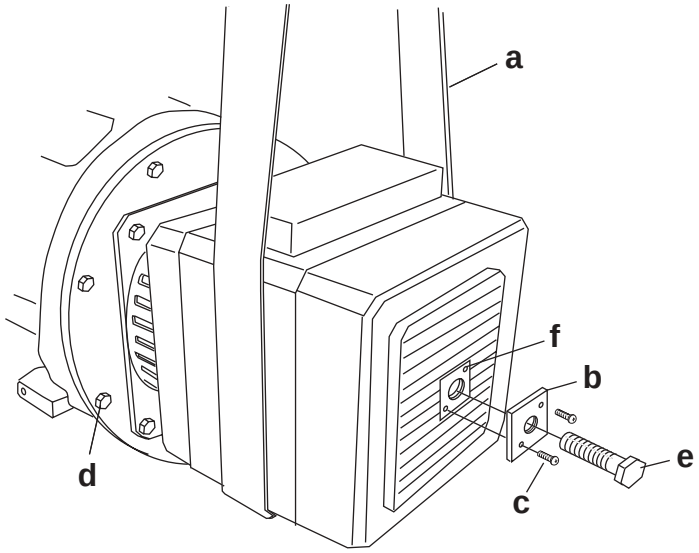
7.31.3 Using an approximately 3" x 3" (8cm x 8cm) piece of steel or aluminum plate **(b)**, drill a pilot hole in the center of the plate to accommodate an M14 thread. Tap the hole in the plate with M14 threads.

7.31.4 Drill two holes in the plate whose placement matches those in the stator housing **(f)**.

7.31.5 Tap the holes **(f)** in the stator housing and using two screws **(c)** of the same thread, secure the 3" x 3" plate to the stator housing.

7.31.6 Remove the M8 bolts **(d)** securing the engine adapter flange to the engine.

7.31.7 Using an M14 bolt **(e)**, thread it into the M14 threaded hole of the plate and slowly pull the stator assembly from the engine/rotor assembly.



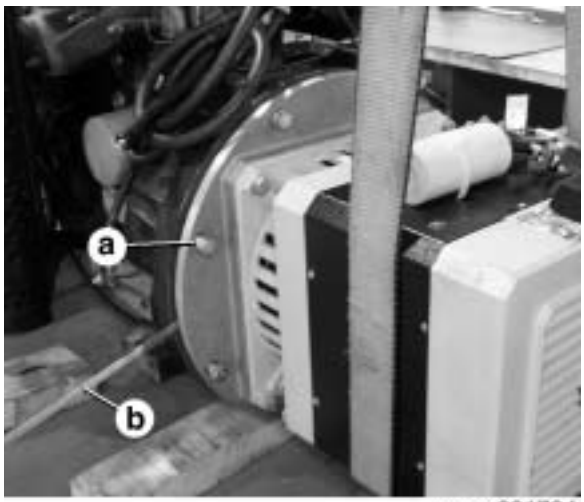
wc_gr001640

See Graphic: wc_gr001784

Method 2

7.31.8 Remove the M8 bolts **(a)** securing the engine adapter flange to the engine.

7.31.9 Using two screwdrivers **(b)** or equivalent pry bars, carefully pry the stator assembly from the engine/rotor assembly.



wc_gr001784

7.32 Remounting Stator Assembly to Rotor/Engine Assembly

See Graphic: wc_gr001638 and wc_gr001642

Note: *The fit between the rotor bearing and the stator housing is tight. The tight fit prevents the bearing from spinning in the housing.*

7.32.1 While supporting the stator assembly with an appropriate strap and hoist, slide the stator assembly over the rotor/engine assembly.

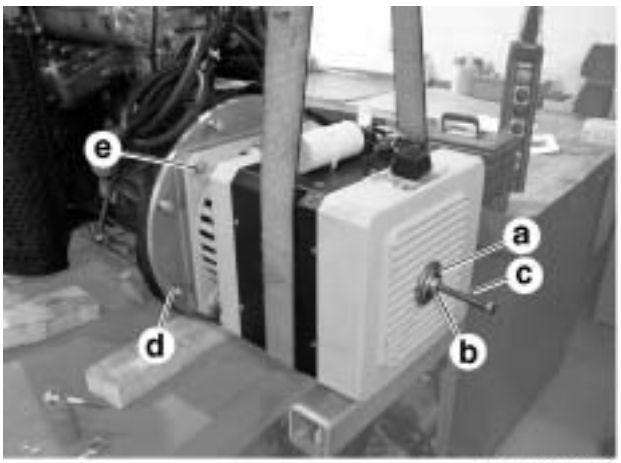
7.32.2 Assemble an M10 nut **(a)** and washer **(b)** to an M10x80 bolt **(c)**.

7.32.3 Thread the bolt into the rotor through the hole in the stator housing.

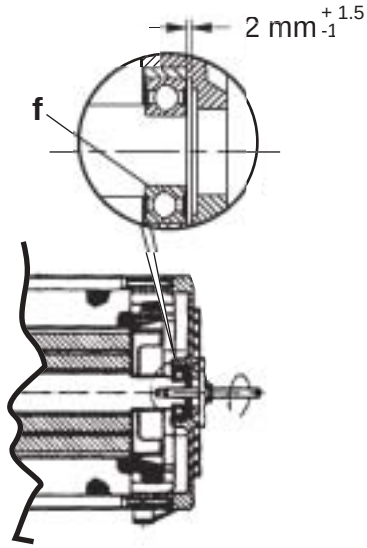
7.32.4 Thread the nut against the stator housing and slowly tighten the nut to push the stator housing onto the rotor and bearing assembly **(f).** Continue until engine adapter flange comes into contact with engine. **Do not overtighten.**

7.32.5 Secure the engine adapter flange to the engine with M8 bolts **(d)**. Torque the bolts to 25 ft.lbs. (35 Nm).

Note: *Failure to install the stator in the above manner may result in a cocked rotor bearing which can result in premature bearing wear or engine bearing wear. If there is any doubt that the bearing is seated correctly, place a block of wood over the end of the stator housing and strike it firmly with a hammer; this will release the bearing.*



wc_gr001638



wc_gr001642

7.33 Checking Rotor Diodes

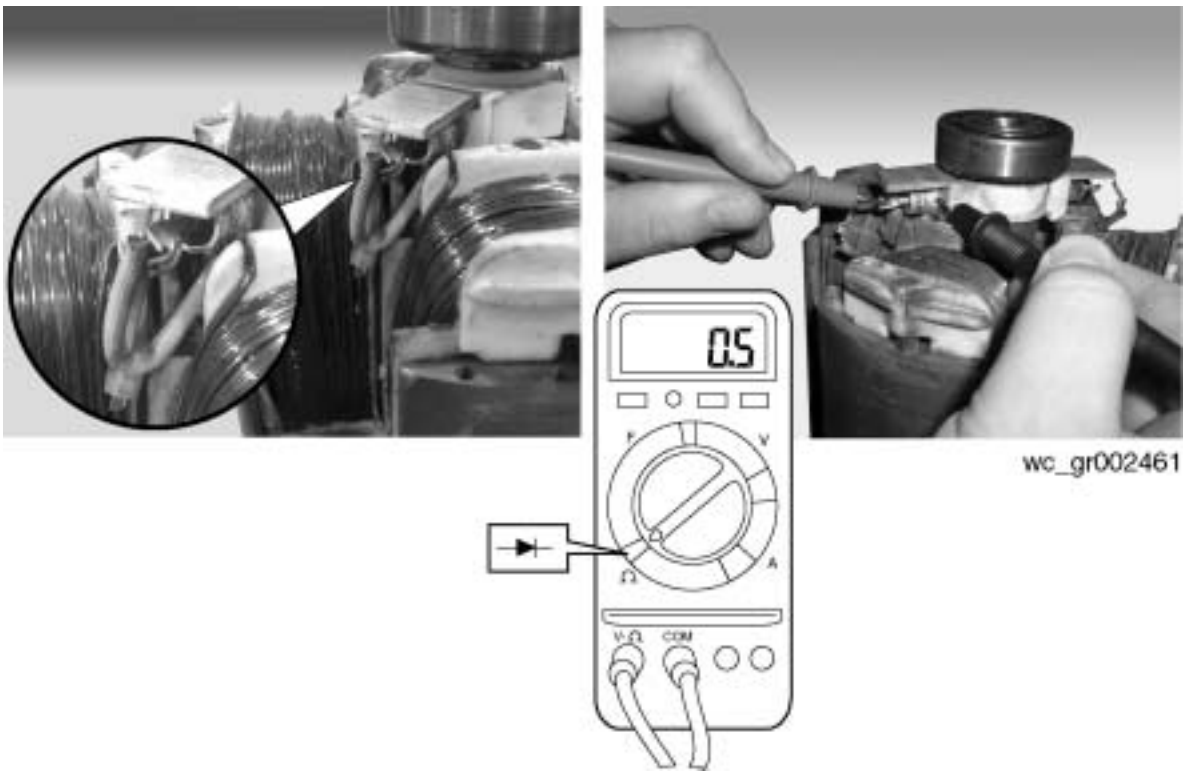
See Graphic: wc_gr002461

There are two diodes on the rotor assembly. The engine/generator assembly must be removed and the stator must be separated from the rotor to check the function of the diodes. When checking, be sure to check both diodes.

7.33.1 Unsolder the two wires from the terminal end of each diode.

7.33.2 Using the diode setting on the multimeter, measure the voltage across the diode terminal and the base of the diode. Reverse the leads of the meter and measure the voltage again. One of the readings should be between 0.4–0.5V. With the meter leads reversed, the other reading should be OL or a very large reading (for example, 2.0 MV).

7.33.3 If your readings do not match those listed here, replace both diodes. Unscrew the diode to remove.



wc_gr002461

7.34 Checking Rotor Windings

See Graphic: wc_gr002462

After checking the two rotor diodes, check the rotor windings. The engine/generator assembly must be removed and the stator must be separated from the rotor to check the rotor windings.

7.34.1 Unsolder the two rotor winding wires from the terminal end of each diode.

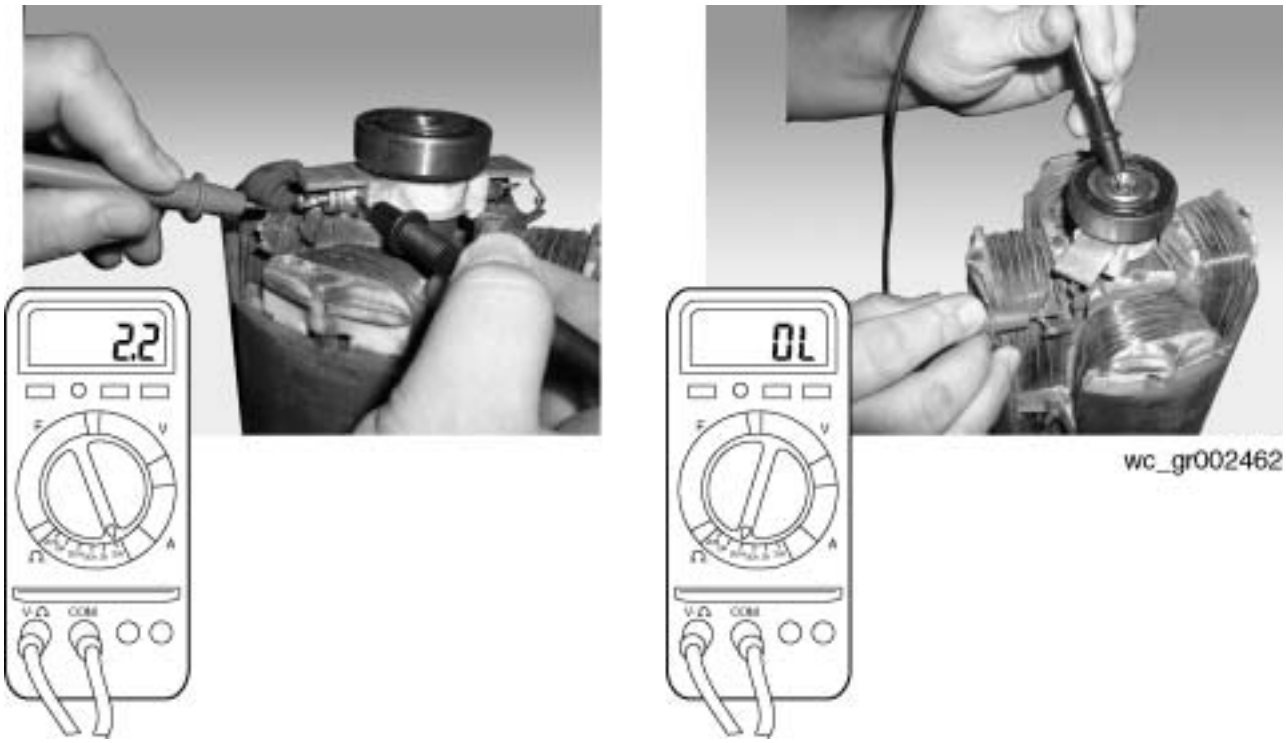
7.34.2 Using the Ohms setting on the multimeter, measure the resistance across the wires and the base of the corresponding diode. Each wire reading should be 2.2+0.5/-0.0 Ohms or greater. If your readings are not 2.2+0.5/-0.0 Ohms or greater, replace the generator.

7.34.3 Check the resistance of all four rotor windings in this manner.

7.34.4 Also check the resistance across the wires and the rotor shaft. If your readings are not OL, or greater than 2 megohms (2M Ohms), replace the generator. Confirm with factory before replacing.

7.34.5 Check all four wires in this manner.

For a more thorough insulation test, use a megger meter capable of 500 Volts or have a motor repair shop test it. If readings are 2 megohms (2M Ohms) or greater, rotor is good. If readings are less than 2 megohms, replace the generator end. Consult factory to confirm.



wc_gr002462

7.35 Removing/Installing Rotor

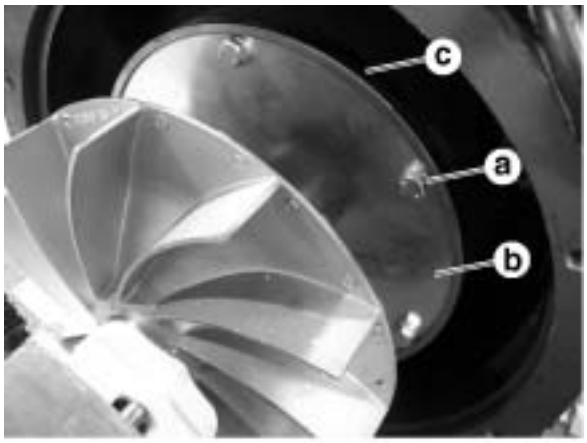
See Graphic: wc_gr001641

Removal

7.35.1 Remove the M8 bolts **(a)** securing the rotor flex discs **(b)** to the engine flywheel **(c)** and remove the rotor assembly.

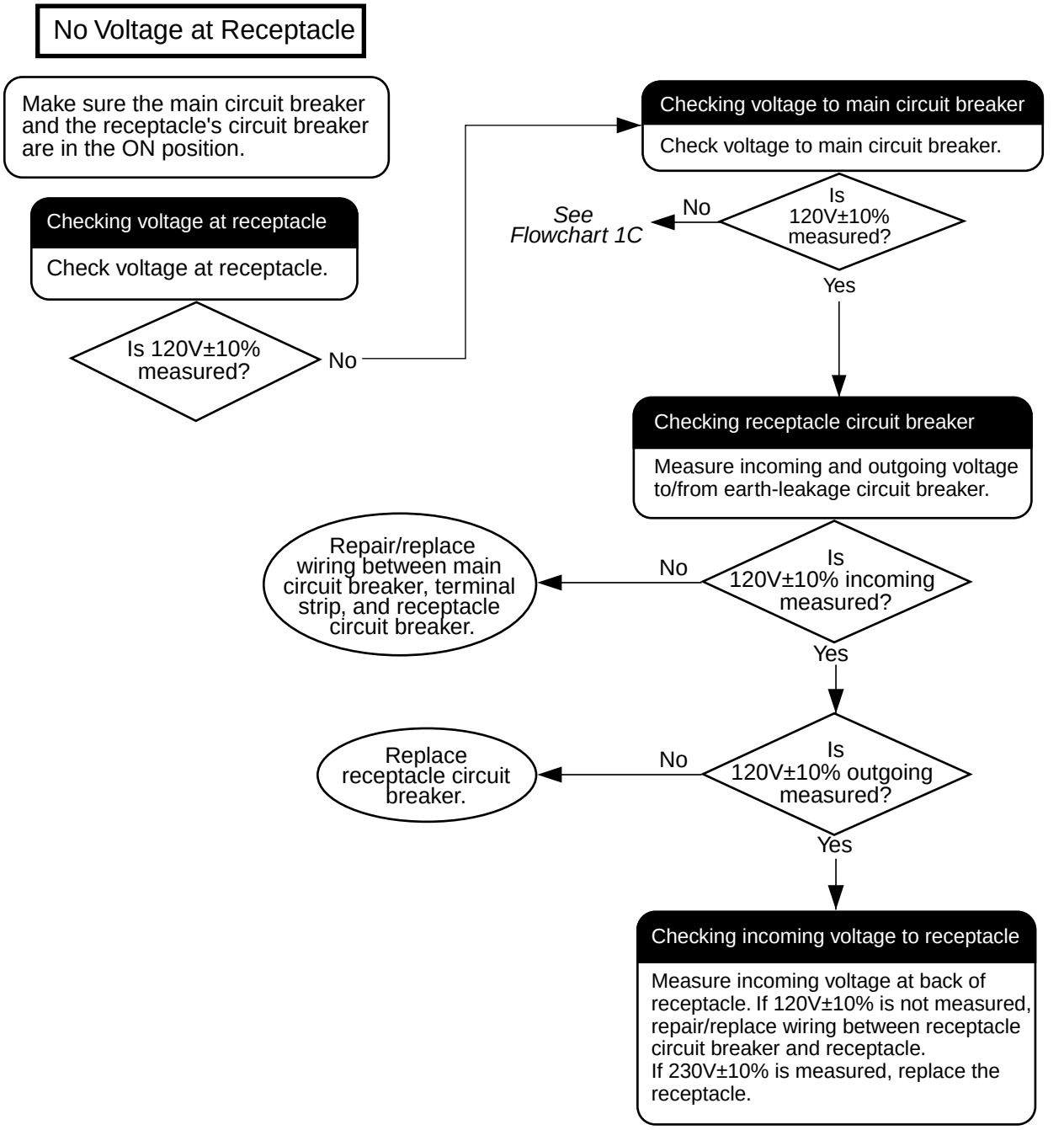
Installation

7.35.2 Secure the rotor flex discs to the engine using M8 bolts. Torque the bolts to 15 ft.lbs. (21 Nm). Make sure the discs are seated completely and evenly into the engine flywheel.



wc_gr001641

7.36 No Voltage at Receptacle—Flowchart 2A



wc_gr003098

7.37 Checking Voltage at Receptacle

See Graphic: wc_gr002452

WARNING

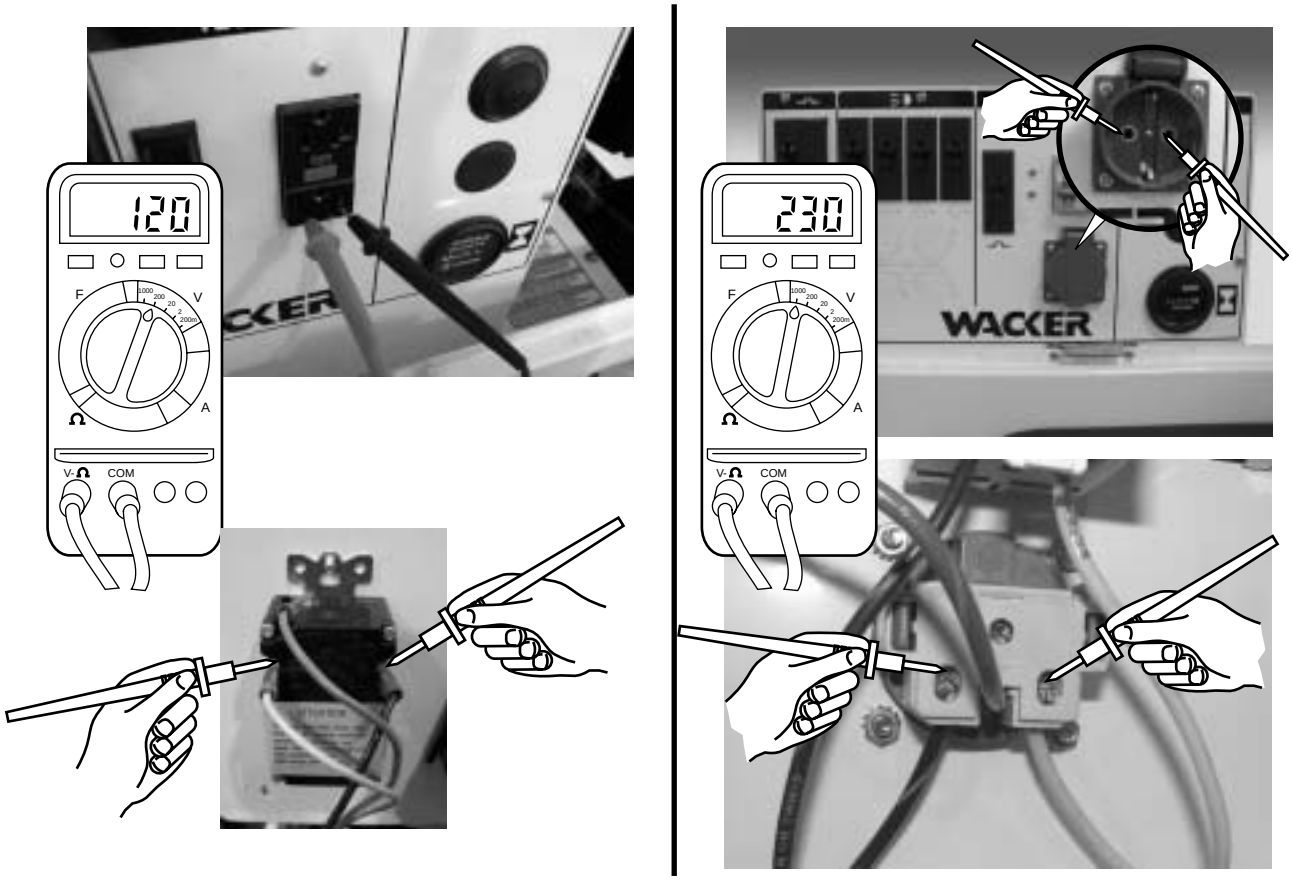
Electric shock hazard. Only qualified personnel should conduct this test.

Complete this test with the machine running and both the main circuit breaker and the receptacle circuit breaker in the “ON” position.

7.37.1 Using the AC voltage setting on the multimeter, test the receptacle for 120V±10% on 60Hz models; 230V±10% on 50Hz models.

7.37.2 If zero (0) Volts is measured, check the receptacle reset button if equipped on your machine model. Depress the button if it has “popped out”. If the reset button will not stay depressed, check the condition of the wiring to the receptacle.

7.37.3 If the wiring is OK, test for voltage at the back of the receptacle. If 120V±10% on 60Hz machines or 230V±10% on 50Hz machines is measured, replace the receptacle.



wc_gr002452

7.38 Checking Receptacle's Circuit Breaker

See Graphic: wc_gr003100



WARNING

Electric shock hazard. Only qualified personnel should conduct this test.

Complete this test with the machine running.

7.38.1 Using the AC voltage setting on the multimeter, measure the incoming voltage to the receptacle's circuit breaker by measuring between the black-yellow wire **(a)** and the neutral wires **(b)** of the terminal strip. There should be 120V±10%.

- If 120V±10% is not measured, the receptacle's circuit breaker is not receiving voltage. Check the condition of the wiring between the receptacle's circuit breaker and the terminal strip. Repair/ replace the wiring as needed.
- If 120V±10% is measured, continue.

7.38.2 Make sure the receptacle's circuit breaker is in the "ON" position.

7.38.3 Measure the outgoing voltage from the receptacle's circuit breaker by measuring between the black-yellow wire **(c)** and the neutral wires **(b)** of the terminal strip. There should be 120V±10%.

- If 120V±10% is not measured, the receptacle's circuit breaker is not functioning. Confirm that receptacle's circuit breaker is mal-functioning by checking its continuity. Replace the circuit breaker if needed.
- If 120V±10% is measured, continue troubleshooting by checking the earth-leakage circuit breaker.



wc_gr003100

7.39 Troubleshooting the Power Winch

See Graphic: wc_gr003160

7.39.1 Lower the tower.

7.39.2 Lower the mast assembly into the cradle.

7.39.3 Turn off the engine.

7.39.4 Be sure the machine's battery is fully charged (approximately 12V).

7.39.5 Remove the four screws **(a)** which secure the cover of the winch and remove the cover.



CAUTION

Pinching hazard. Use extreme care when operating the winch with its cover removed.

7.39.6 Disconnect the red and black wires at the motor **(b)**.

7.39.7 Place the appropriate winch switch **(c)** in the up or down position, and check for battery voltage (approximately 12) between the red and black wires.

- If 12V is measured the power winch is receiving the correct voltage. Thus, the power winch should operate. If it does not operate, replace it.
- If 12V is not measured, continue.

7.39.8 Remove the control panel **(d)** from the control box.

7.39.9 Check for battery voltage (approximately 12) between terminals B1 and B2 of the winch switch **(e)**.

- If 12V is measured, the winch switch is receiving the correct voltage. Thus, the power winch switch should operate. Check for battery voltage between terminals A1 and A2 for both the up and the down positions of the winch switch. If the winch switch does not operate, replace it.
- If 12V is not measured, continue.

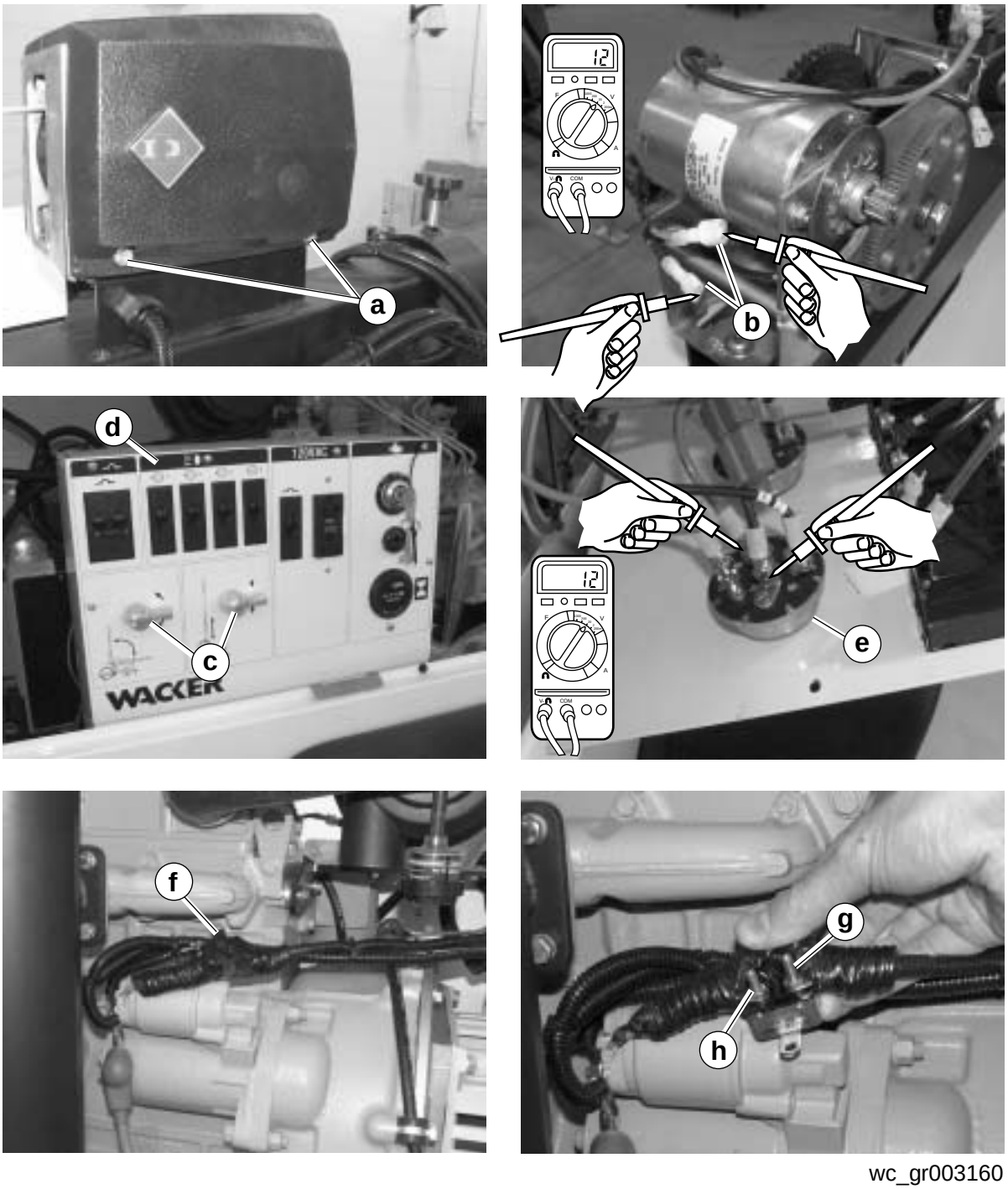
7.39.10 Locate the circuit breaker **(f)**. Remove the tape and check for battery voltage between the output side **(g)** of the circuit breaker and ground.

- If 12V is measured at the output side of the circuit breaker but not at the winch switch, the wiring between the circuit breaker and the winch switch has failed; repair or replace the wiring.
- If 12V is not measured, continue.

7.39.11 Check for battery voltage between the input side of the circuit breaker and ground.

- If 12V is measured between the input side and ground but not the output side and ground, the circuit breaker has failed; replace it.

- If 12V is not measured, the wiring from the starter solenoid or the wiring from the battery to the starter solenoid has failed. Check the wiring and repair or replace it as necessary.



wc_gr003160

Notes

8. Disassembly/Assembly Procedures

8.1 Tools

Because all possible problems encountered while repairing the equipment cannot be anticipated, it is up to the mechanic to use common sense and good judgement in tool selection.

The use of any special tools is recommended only for those operations where the use of conventional tools proves inadequate.

Before substituting another tool or procedure, you should be satisfied that neither personal injury nor damage to the component will result.

8.2 Ordering Parts

The repair procedures contained in this manual do not include part numbers. For parts replacement information, refer to the Parts Book originally supplied with the unit.

If the original Parts Book has been lost, a replacement may be ordered from Wacker Corporation. When ordering a replacement Parts Book, please list the model number, item number, revision level, and serial number of the machine. Parts Books are also available on the Wacker Corporation Web site. See www.wackergroup.com. Enter the site as a visitor.

8.3 Reference Numbers ( )

Repair procedures contain reference numbers enclosed in parentheses ( ). These numbers refer to the item numbers shown on the assembly drawings and other detailed drawings. They are included to aid the mechanic in identifying parts and assembling components.

8.4 Weight Block

See Graphic: wc_gr000843

The weight block symbol gives an approximate weight measurement to aid the mechanic when lifting/hoisting larger components.



wc_gr000843

8.5 Light Assembly

See Graphic: wc_gr002430

Removal:

8.5.1 Unplug the light at the quick disconnect **(a)**.

8.5.2 Remove the T-handle **(b)** and the cone washer **(c).** Also remove the nut **(d)** and the washer **(e)** securing opposite end.

8.5.3 Pull the light assembly **(f)** from the bracket **(g)**.

8.5.4 Remove the screws **(h)** securing the flange rings **(i)** and remove the flange rings.

8.5.5 Remove the lens **(j)** with the gasket **(k)** attached. Remove the gasket from the glass if replacing the gasket or lens.

8.5.6 Remove the hardware securing the bulb stabilizer **(l)** on one side. Once removed, swing the bulb stabilizer to the side and unscrew the bulb **(m)**.

8.5.7 Remove the four screws **(n)** and the flange **(t)** securing the ceramic fixture assembly **(o)** to the reflector and remove the ceramic fixture assembly including the gasket **(s)**.

8.5.8 Remove the two screws securing the cover to the connector box and cut the black **(p)** and white wires **(q)** near the crimp nuts.

8.5.9 Remove the two screws **(r)** securing the ceramic fixture to the housing and remove the ceramic fixture.

Installation:

8.5.10 Slide the wiring of the replacement ceramic fixture through the housing and into the connector box. Secure the ceramic fixture to the housing with the two screws **(r)**.

8.5.11 Connect the black wire **(p)** from the new ceramic fixture to the black wire in the connector box. Connect the white wire **(q)** from the new light fixture to the white wire of the connector box. Secure the wires with new crimp nuts.

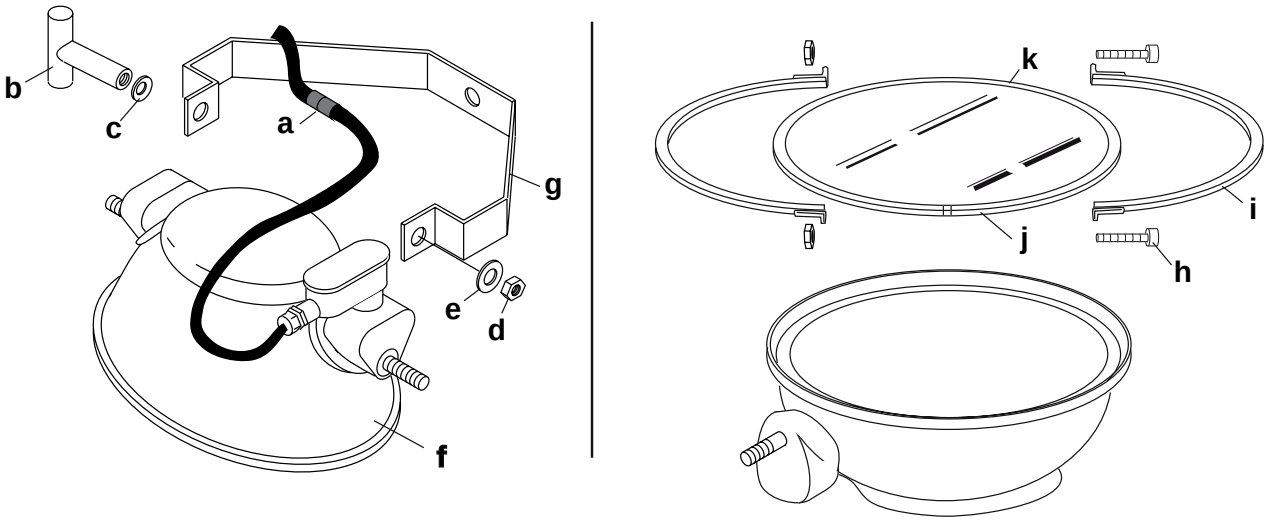
8.5.12 Replace the cover of the connector box and secure it with two screws.

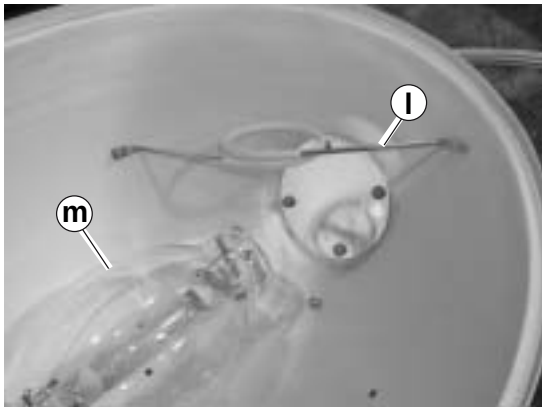
8.5.13 Secure the ceramic fixture assembly **(o)**, the gasket **(s)**, and the flange **(t)**, to the reflector using four screws **(n)**.

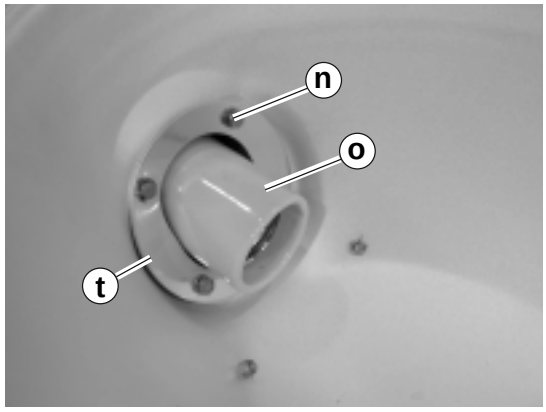
8.5.14 Insert the bulb and secure it with the bulb stabilizer **(l)**.

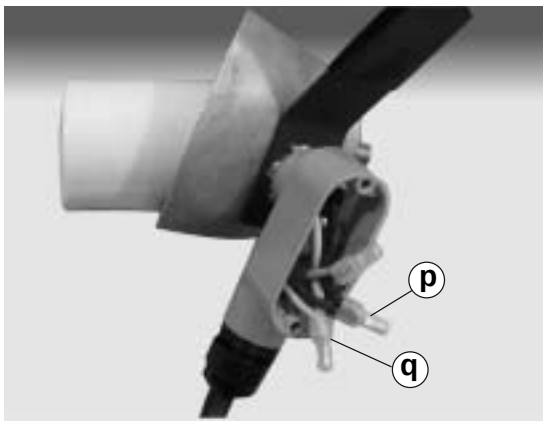
8.5.15 Install the gasket **(k)** around the lens **(j)** and secure the lens to the reflector with the flange ring **(i)** and screws **(h)**.

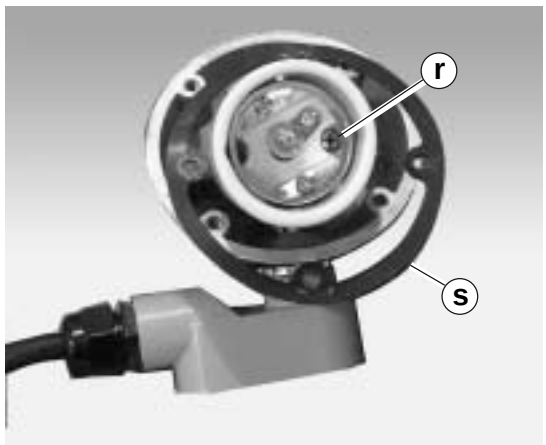
8.5.16 Mount the light assembly **(f)** to the bracket **(g)** and mount the assembly to the upper mast. Connect wiring at the quick disconnect **(a)**.





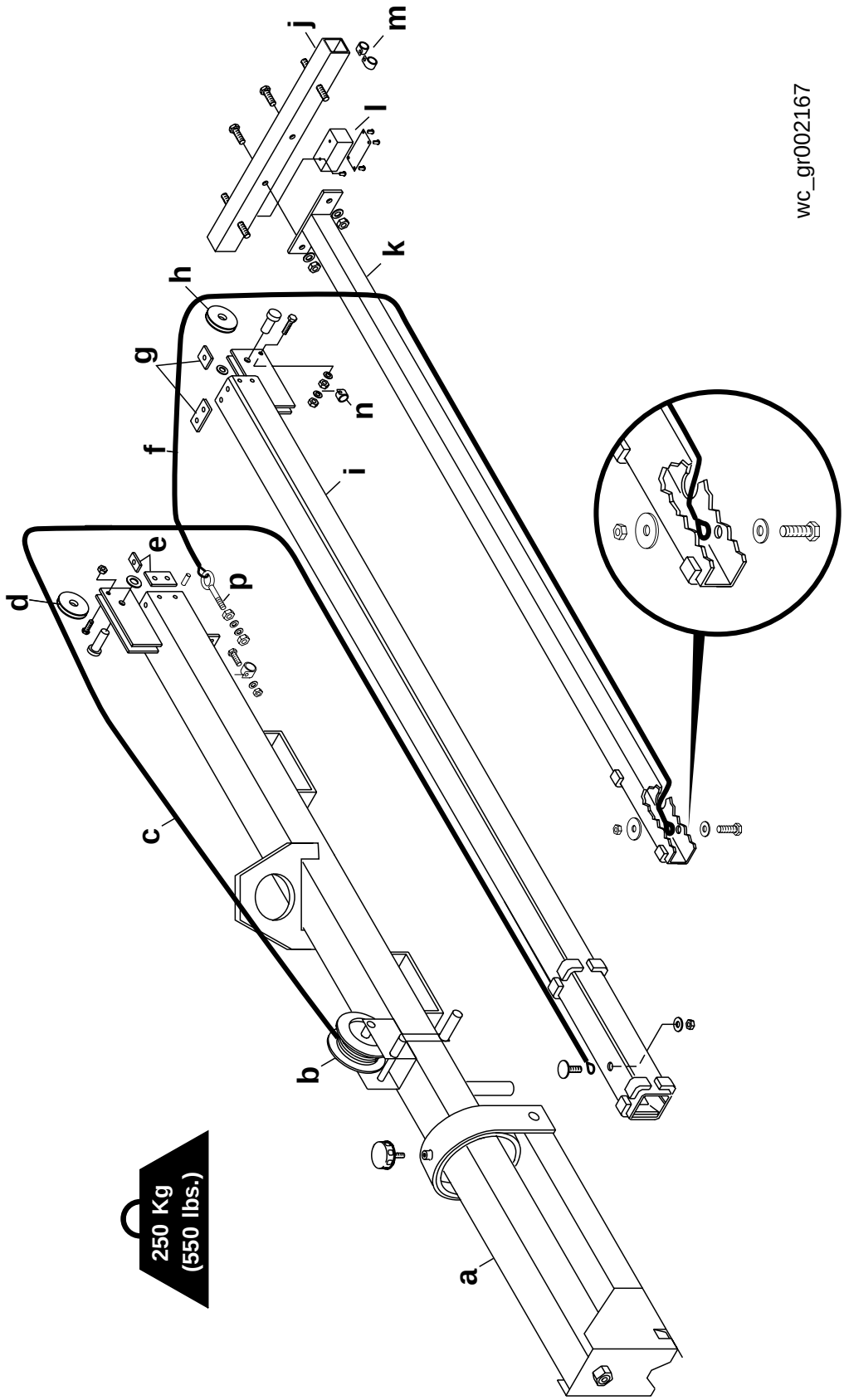






wc_gr002430

8.6 Tower Assembly Exploded View



8.7 Tower Assembly List of Parts

Ref.	Description	Ref.	Description
a	Main mast (4-inch tube)	i	Mid mast (3-inch tube)
b	Winch	j	Cross member
c	Main mast cable	k	Upper mast (2-inch tube)
d	Main mast pulley	l	Junction box
e	Main mast guide	m	Cross member wiring cable clamps
f	Upper mast cable	n	Mid-mast wiring cable clamps
g	Mid-mast guide	o	Retaining bolt
h	Mid-mast pulley	p	Eyebolt or U-bolt

8.8 Upper Mast

See Graphic: wc_gr002167 and wc_gr002432

Disassembly:

Turn the lights off, turn the unit off, and lower the mast assembly into the cradle before performing this procedure. Place the Light Tower in a position with enough room so that the masts may be extended fully while in the down position.

The mast cable system consists of two cables: one **(c)** connected to the winch mounted on the main mast that raises the mid mast, and a second **(f)** that is connected to both the upper mast and the lower mast. This second cable raises the upper mast as the mid mast is being raised.

8.8.1 Disconnect the wiring at each light fixture's quick-disconnect or at the junction box. Then, remove each light fixture. Store the light fixtures in a safe place.

8.8.2 When replacing the upper mast cross member **(j)** only, disconnect the wiring cable clamps **(m)** and the junction box **(l)**, then simply replace the cross member. When replacing cables or portions of the mast, the junction box may remain mounted to the cross member. Disconnect the wiring cable clamp **(n)** from the mid mast, then disconnect the cross member with the box attached and place it near the trailer.

8.8.3 Using the tongue-mounted winch, raise the tower so that the masts are approximately two inches (5 cm) above the cradle locking pin **(aa)**.

8.8.4 On machines using rivets*, drill out the rivets **(bb)** securing the five guides **(g)** to the mid mast. On machines using screws, remove the screws securing the five guides to the mid mast.

***Note:** *Replacement screws will be required for reassembly.*

8.8.5 Pull the upper mast partially (2–6 feet (1–2 m)) out of the mid mast.

8.8.6 Make note of the upper mast cable **(cc)** as it passes around the mid-mast pulley **(dd)** then between the mid-mast pulley and the guide hardware **(ee)**. Remove the mid-mast pulley. Remove the guide hardware only if it requires replacement.

8.8.7 Remove the upper mast **(k)** completely from the mid mast.

8.8.8 Remove the hardware securing the cable eyebolt **(p)** to the main mast.

8.8.9 Remove the hardware securing the cable to the upper mast. Once free from the upper mast, run the cable back through the opening near the guide screw in the mid mast and remove cable completely from the machine.

Reassembly:



WARNING

Replacement cables must be of the exact length of the original equipment. Using shorter cables may cause severe personal injury.

8.8.10 Mount the mid-mast pulley **(dd)**. Run the upper mast cable **(cc)** around the mid-mast pulley **(dd)** and between the pulley and the guide hardware **(ee)**. Attach the cable to upper mast **(k)**.

8.8.11 Slide the upper mast into the mid mast **(i)**.

8.8.12 Attach the five guides **(g)** using new self-tapping screws. Position the guides so that the self-tapping screws thread themselves into the smaller side of the tapered hole in the guide.

Note: *Limit reuse of the guides to one time.*



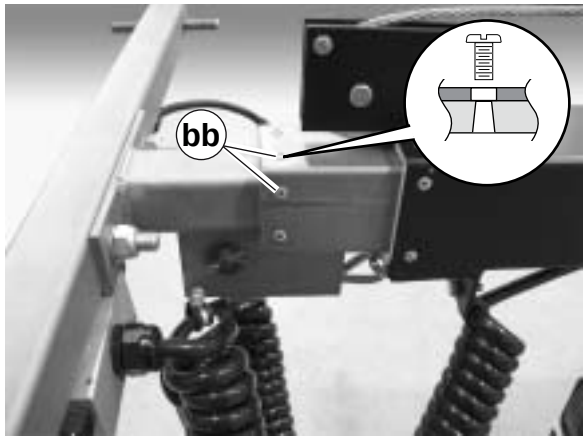
WARNING

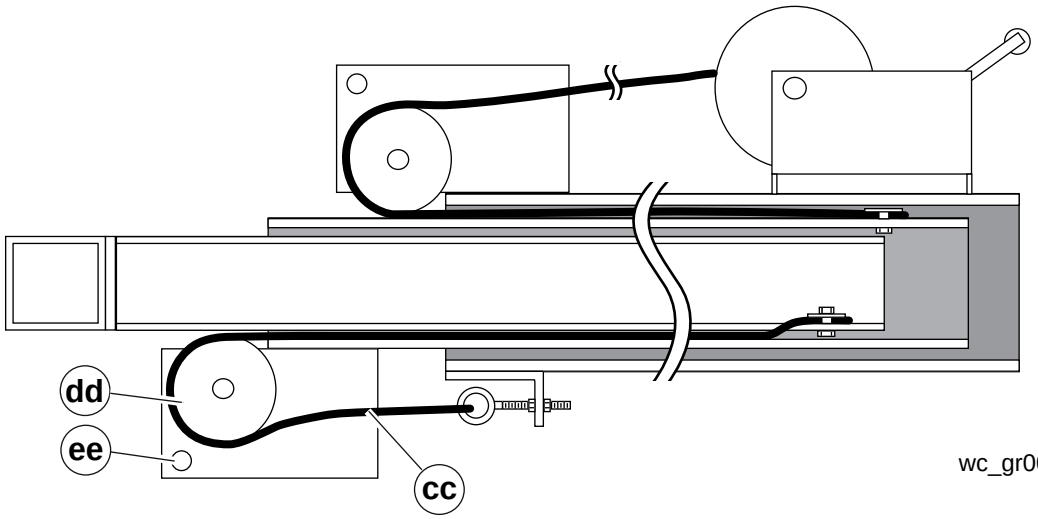
The guides must be installed because they serve as safety stops. Without them properly installed, the upper mast section could be pulled out of the mid-mast section, possibly causing severe bodily harm.

8.8.13 Secure the cable eyebolt **(p)** to the main mast.

8.8.14 Mount the light fixtures and reconnect the wiring.

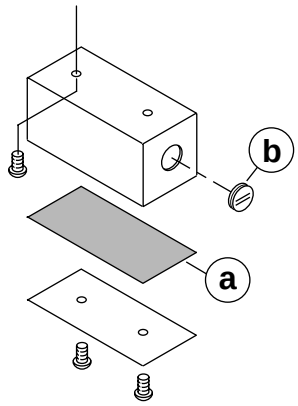






wc_gr002432

When installing the junction box, be sure to include the gasket **(a)** and use a silicon-based sealant on all hardware and plugs **(b)**.



wc_gr003161

8.9 Mid Mast

See Graphic: wc_gr002167 and wc_gr002433

Disassembly:

Turn the lights off, turn the unit off, and lower the mast assembly into the cradle before this performing procedure. Place the Light Tower in a position with enough room so that the masts may be extended fully while in the down position.

The mast cable system consists of two cables: one **(c)** connected to the winch mounted on the main mast that raises the mid mast; and a second **(f)** that is connected to both the upper mast and the main mast. This second cable raises the upper mast as the mid mast is being raised.

8.9.1 Disconnect the wiring at each light fixture's quick-disconnect or at the junction box. Then, remove each light fixture. Store the light fixtures in a safe place.

8.9.2 Using the tongue-mounted winch, raise the tower just so that the masts are free from the cradle locking pin.

8.9.3 Remove the upper-mast cross member **(j)** with the junction box attached.

8.9.4 Remove the upper-mast cable eyebolt **(p)**.

8.9.5 Using the mast-mounted winch, back off the tension of the cable until the cable may be unwound from the mast-mounted winch. Unwind and remove the cable from the mast-mounted winch.

8.9.6 On machines using rivets*, drill out the rivets **(ww)** securing the five guides to the main mast. On machines using screws, remove the screws to remove the five guides.
***Note:** *Replacement screws will be required for reassembly.*

8.9.7 Remove the stop screw **(xx)**.

8.9.8 Remove the main mast pulley **(cc)**.

8.9.9 Using the aid of an assistant or appropriate hoist, pull both the upper and mid-mast sections from the main mast.

8.9.10 Remove the hardware securing the cable to the mid mast and remove the cable from the mid mast.

If the mid mast requires replacement, continue.

8.9.11 Remove the five guides **(g)** from the inside of the end of the mid mast **(i)**.

8.9.12 Remove the mid-mast pulley **(h)**.

8.9.13 Pull the upper mast **(k)** free of the mid mast.

Reassembly:

WARNING

Replacement cables must be of the exact length of the original equipment. Using shorter cables may cause severe personal injury.

8.9.14 Attach the cable to the mid mast.

8.9.15 Hold the cable snug to upper side of the mid mast and insert it into the main mast **(a)** 3/4 of the way, approximately 7 feet (2.3 m).

8.9.16 Attach the five guides **(g)** using new self-tapping screws. Position the guides so that the self-tapping screws thread themselves into the smaller side of the tapered hole in the guide.
Note: *Limit reuse of the guides to one time.*

WARNING

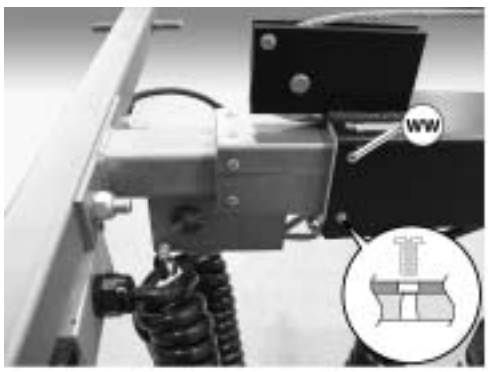
The guides must be installed because they serve as safety stops. Without them properly installed, the mid-mast section could be pulled out of the main mast section, possibly causing severe bodily harm.

8.9.17 Route cable **(yy)** around main mast pulley **(zz)** and install the main mast pulley.

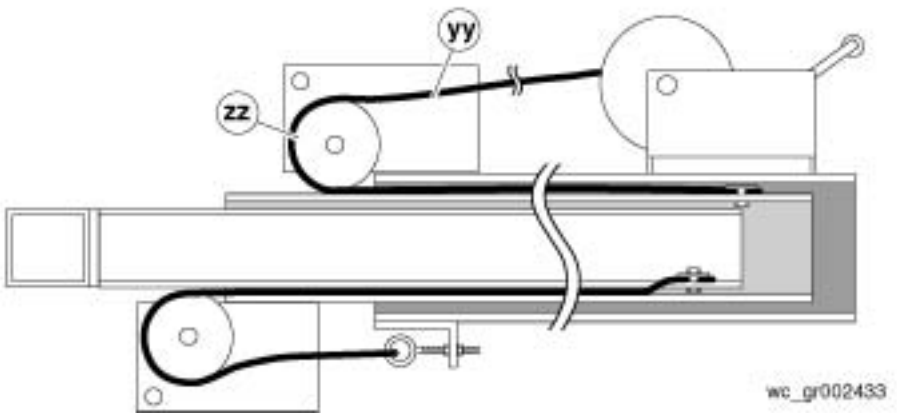
8.9.18 Slide the mid mast completely into the main mast.

8.9.19 Attach the cable to the winch.

8.9.20 See section *Upper Mast* for installing the upper mast.







8.10 Main Mast

See Graphic: wc_gr02434

Disassembly:

Turn the lights off, turn the unit off, and lower the mast assembly into the cradle before performing this procedure. Place the Light Tower in a position with enough room so that the masts may be extended fully while in the down position.

The mast cable system consists of two cables: one connected to the winch mounted on the main mast that raises the mid mast; and a second that is connected to both the upper mast and the main mast. This second cable raises the upper mast as the mid mast is being raised.

8.10.1 Remove the upper mast and the mid mast from the main mast. See section *Mid Mast.*

8.10.2 Disconnect the wiring from the control panel by:

- Snipping the wire ties **(a)**.
- Disconnecting the wires from the capacitors **(b)**.
- Disconnecting the wires from terminal strip **(c)**.

8.10.3 Loosen the clamps **(d & e)** securing the tower supply cable. One is located on the control box and the other is on the front enclosure panel.

8.10.4 Remove the cable clip **(f)** from the underside of the enclosure top.

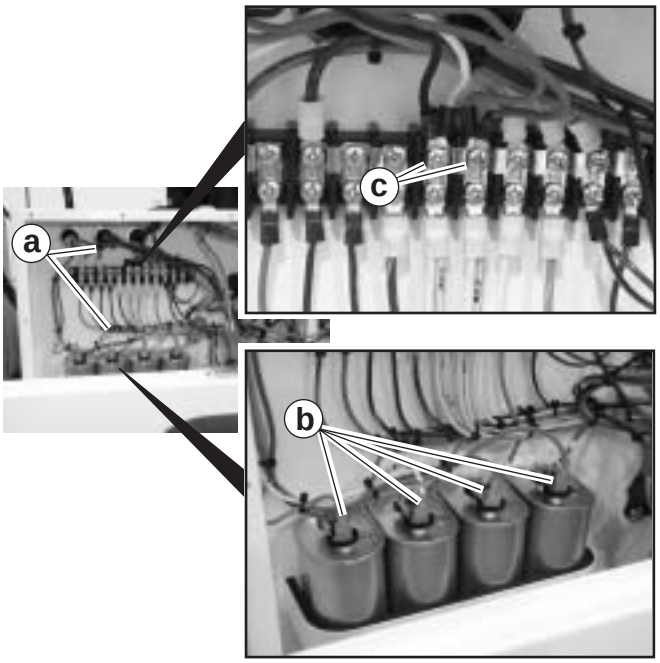
8.10.5 Thread the tower supply cable through the eyes **(g)** on the side of the main mast.

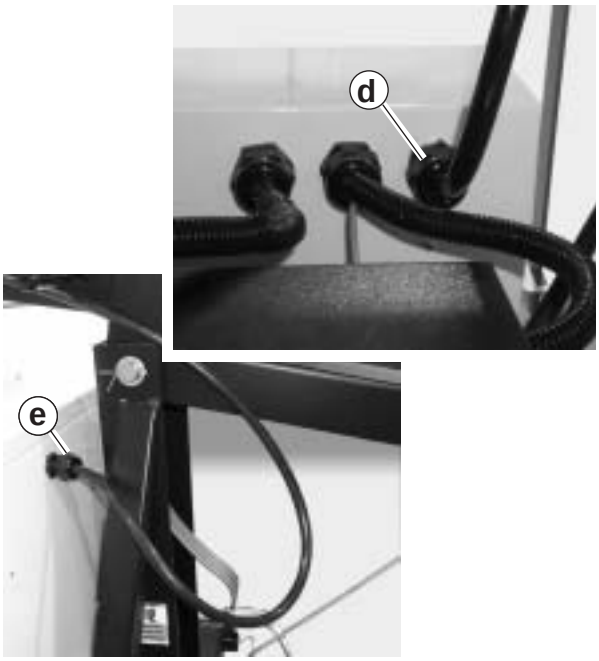
8.10.6 Remove the cable clip **(h)** attached to the end of the main mast.

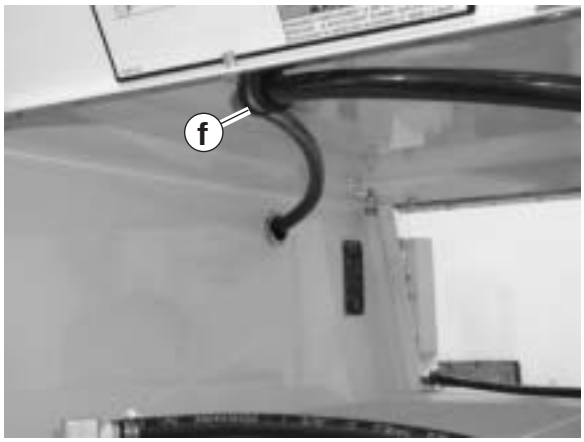
8.10.7 Tighten the adjusting knob **(i)** so that the main mast will not spin when loosening the nut **(j)** securing the main mast to the main cradle. Remove the nut securing the main mast to the main cradle.

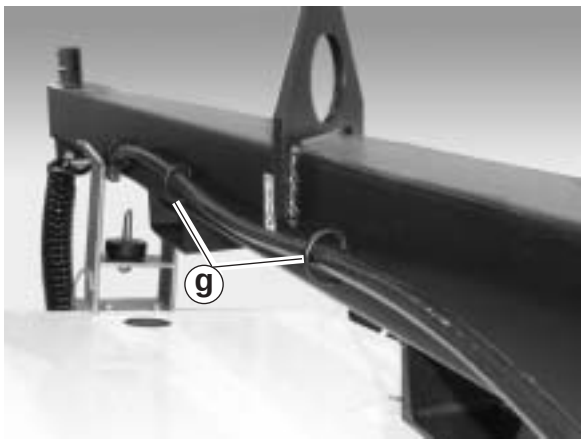
8.10.8 Loosen the adjusting knob.

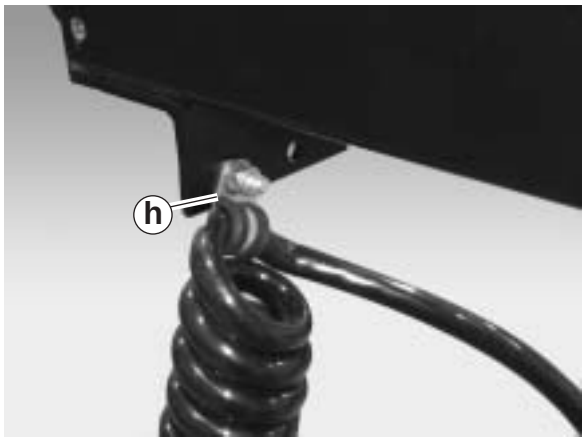
8.10.9 Using an appropriate crane or hoist, lift the main mast up and out of the main cradle and free from the machine.

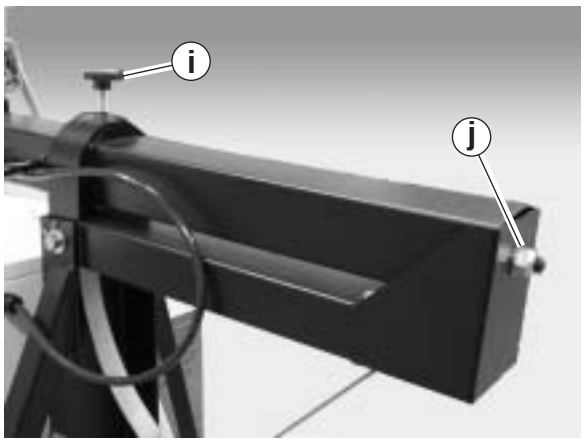












wc_gr002434

See Graphic: wc_gr002435

Reassembly:

8.10.10 Grease the adjusting point circle **(a)** of the main cradle and the bottom pivot point **(b)** of the main mast.

8.10.11 Using an appropriate crane or hoist, lift the main mast onto the top of the generator enclosure. Slide the bottom of the main mast into the main cradle.

8.10.12 Secure the main mast to the main cradle with the washer and nut **(c)**.

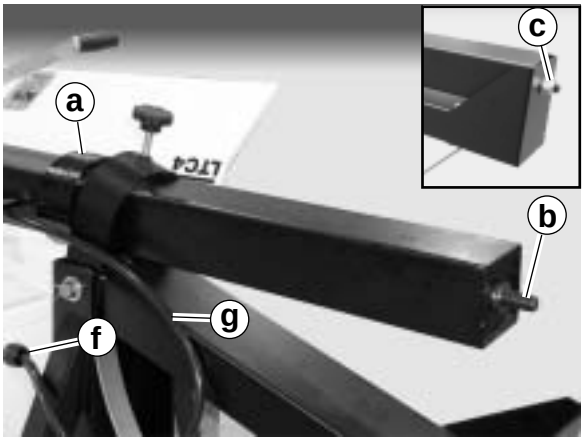
8.10.13 Position the cable clip **(d)**, on the tower supply cable, just below the lower curled portion of the cable. Then, secure the cable clip to the end of the main mast.

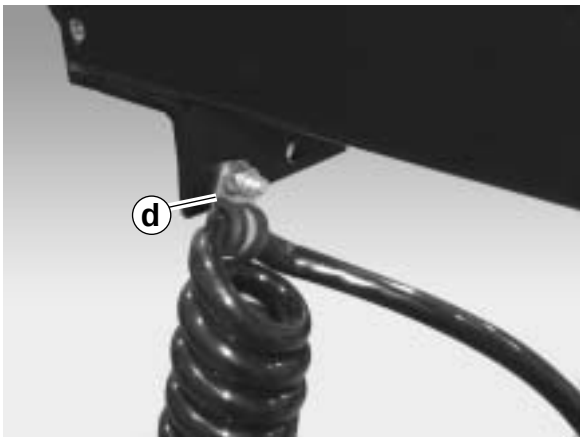
8.10.14 Thread the tower supply cable through the eyes **(e)** on the main mast.

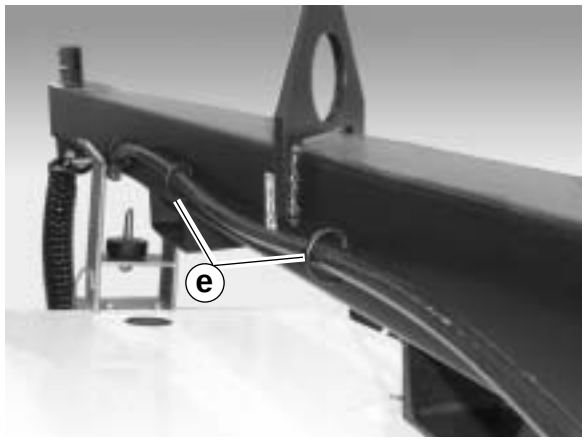
8.10.15 Thread the tower supply cable through the clamp **(f)** at the front of the machine; leave a loop **(g)** of cable large enough so there is enough slack in the cable to raise the mast.

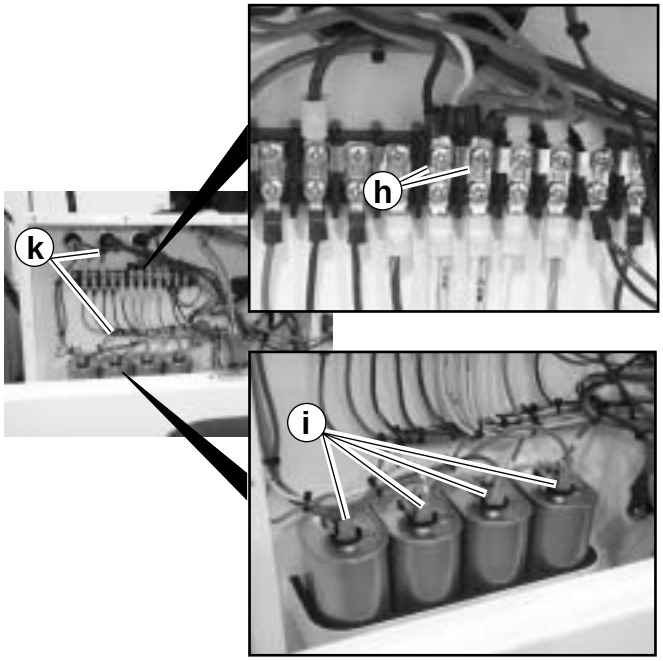
8.10.16 Feed the tower supply cable into the control box and connect the wires to the appropriate locations **(h & i)**. Refer to the wiring diagram. Tighten the cable clamp **(j)**, organize the wires with new wire ties **(k)**, and re-install the control panel cover.

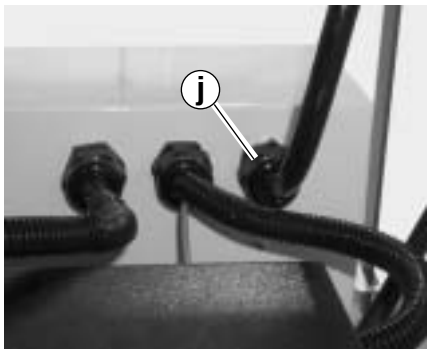
8.10.17 Secure the tower supply cable in the cable clip **(l)** and secure the cable clip to the underside of the top enclosure panel.

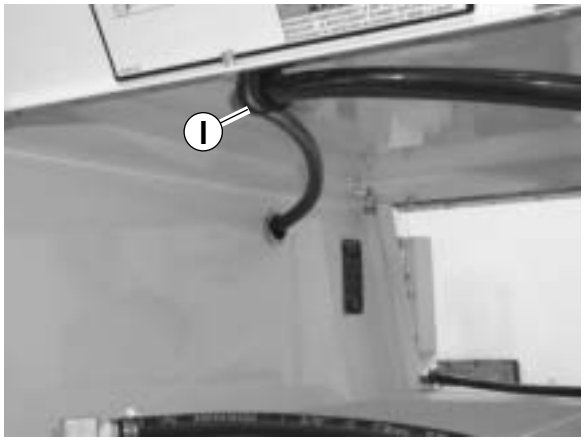












wc_gr002435

8.11 Replacing Cable and Winch on Power Winch Models

See Graphic: wc_gr003159

Removal:

8.11.1 Lower the tower.

8.11.2 Lower the mast assembly into the cradle.

8.11.3 Turn off the engine.

8.11.4 Remove the four screws **(a)** which secure the cover of the winch and remove the cover.



CAUTION

Pinching hazard. Use extreme care when operating the winch with its cover removed.

8.11.5 Using the appropriate switch **(b)** (or the auxiliary handle **(c)**), run the winch so that all remaining cable is unwound from the spool. Do not run the winch for periods of longer than four minutes. Allow winch to cool if necessary.

8.11.6 Position the spool so that the retaining clamp **(d)** is accessible.

8.11.7 Loosen the screw which secures the clamp and the cable, and remove the cable from the spool.

8.11.8 To remove the winch, disconnect the motor wires **(f)**. Then, remove the screws **(g)** which secure the winch to the machine and remove the winch.

Installation:

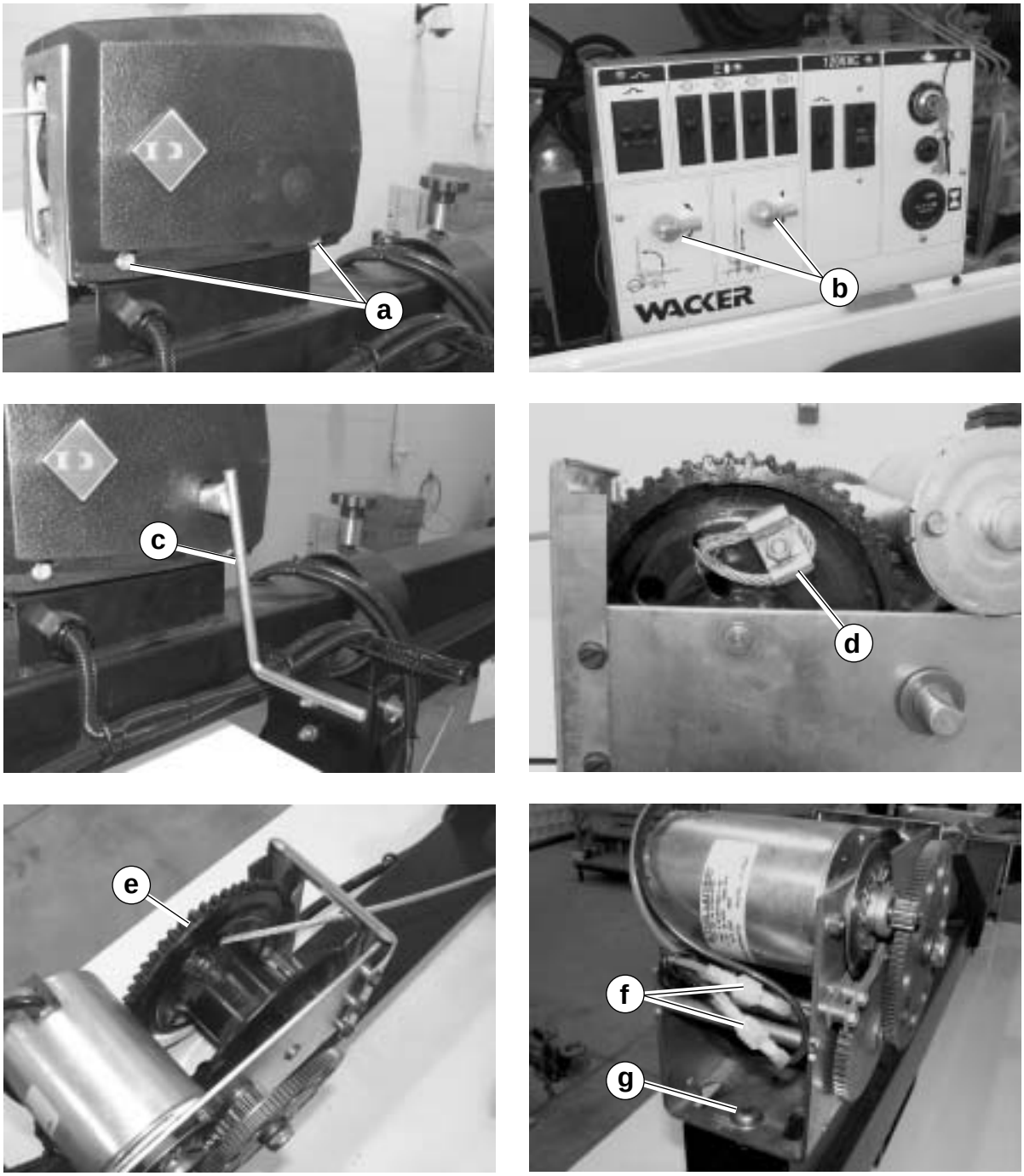
8.11.9 To install the winch, position the winch on the machine and secure it with screws **(g)**. Then, connect the motor wires **(f).**

8.11.10 Thread the cable through the hole in the spool **(e)** so that when the winch reels in the cable the cable winds around the top of the spool.

8.11.11 Secure the cable to the spool using the cable clamp **(d)** and screw. Be sure to secure the cable in both sides of the clamp.

8.11.12 Use the appropriate switch **(b)** or auxiliary handle **(c)** to wind up the cable.

8.11.13 Reinstall the cover using four screws **(a)**.



wc_gr003159

8.12 Replacing Fuel Tank

See Graphic: wc_gr002445

Removal:

8.12.1 Shut down the engine and disconnect the battery.

8.12.2 Position the main mast in the vertical position.
Note: *It is not necessary to raise the tower.*

8.12.3 Remove the screws **(a)** securing the mast cradle **(b)** and remove the mast cradle.

8.12.4 Remove the cable clamp **(c)** securing the tower power supply cable **(d)**.

8.12.5 Using a suitable rope or wire **(e)**, secure the two doors in the open position.

8.12.6 Remove the four screws **(f)** securing the enclosure top and using an appropriate hoist or crane, lift the enclosure top from the machine.

8.12.7 Snip the wire ties **(g)**.

8.12.8 Remove the bolts **(h)** securing the hold-down straps **(i)**.

8.12.9 Disconnect the fuel intake **(j)** and return lines **(k)**.

8.12.10 With the aid of a partner or appropriate hoist, lift the fuel tank from the machine.

Reassembly:

8.12.11 Position the fuel tank into the machine.

8.12.12 Slide new wire ties **(g)** underneath the hold-down straps **(i)** and secure the fuel tank to the machine with the hold-down straps using bolts **(h)**.

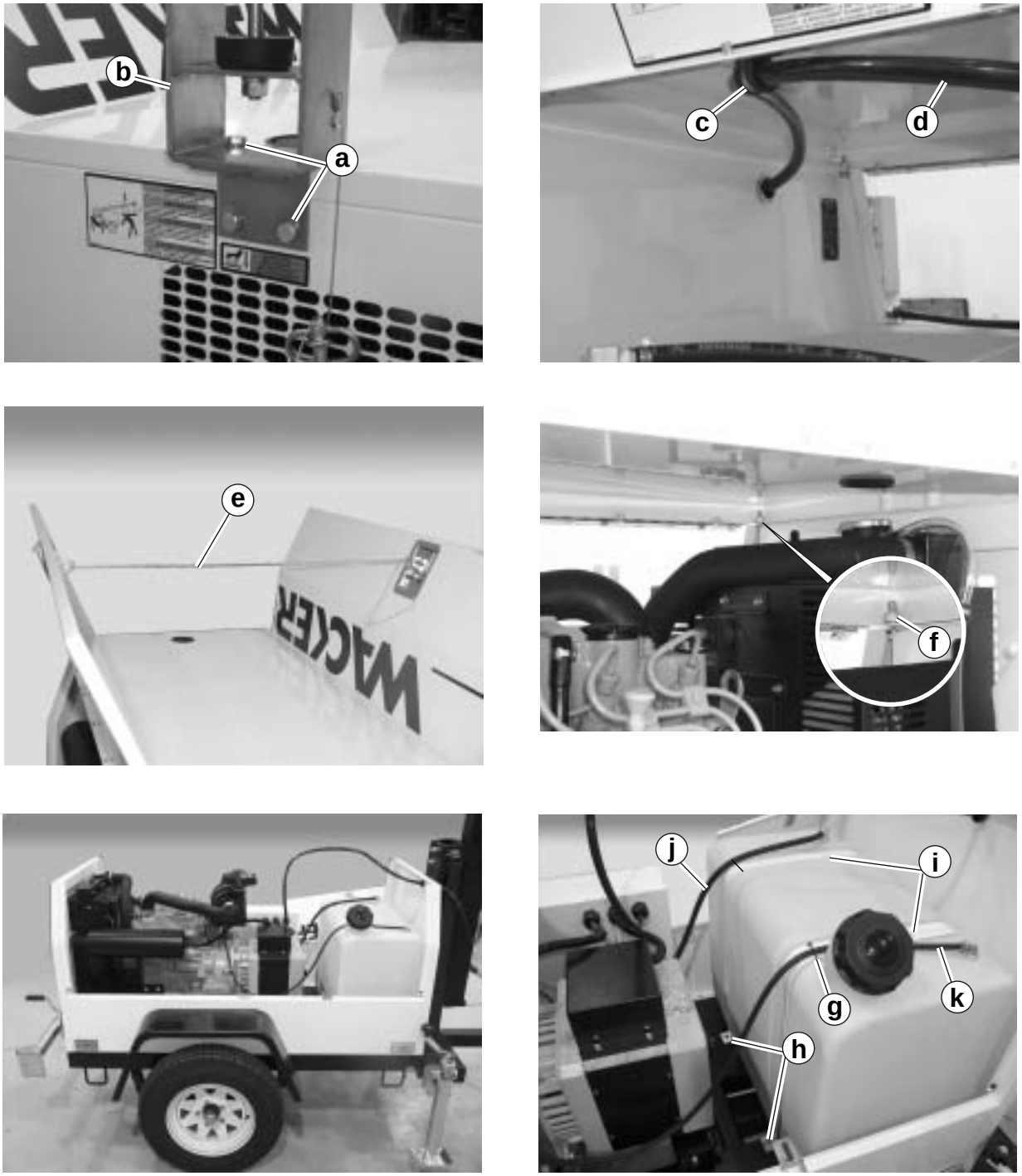
8.12.13 Reconnect the fuel intake **(j)** and return lines **(k)**.

8.12.14 Using an appropriate hoist or crane, position the enclosure top onto the machine. Secure the enclosure top to the machine with four screws **(f)**.

8.12.15 Position the tower power supply cable **(d)** and secure it to the machine using the cable clamp **(c)**.

8.12.16 Remove the rope or wire securing the two doors in the open position.

8.12.17 Secure the mast cradle **(b)** to the top enclosure using screws **(a)**.



wc_gr002445

8.13 Replacing Hour Meter

See Graphic: wc_gr002444

Disassembly:

8.13.1 Shut down the engine and disconnect the battery.

8.13.2 Remove the six screws securing the control panel cover to the control panel.

8.13.3 Make note of the wire connections on the hour meter and remove the wires **(a)** from the hour meter.

8.13.4 Pull out the tabs **(b)** on the locking bracket **(c)** and remove the hour meter from the panel.

Reassembly:

8.13.5 Insert the replacement hour meter into the control panel and secure it with the locking bracket **(c)**.

8.13.6 Attach the wires **(a)** to the appropriate terminals of the hour meter.

8.13.7 Secure the control panel cover to the control panel with the six screws.



wc_gr002444

Threadlockers and Sealants

Threadlocking adhesives and sealants are specified throughout this manual by a notation of “S” plus a number (S#) and should be used where indicated. Threadlocking compounds normally break down at temperatures above 175°C (350°F). If a screw or bolt is hard to remove, heat it using a small propane torch to break down the sealant. When applying sealants, follow instructions on container. The sealants listed are recommended for use on Wacker equipment.

TYPE ( ) = Europe	COLOR	USAGE	PART NO. – SIZE
Loctite 222 Hernon 420 Omnifit 1150 (50M)	Purple	Low strength, for locking threads smaller than 6 mm (1/4”). Hand tool removable. Temp. range: -54 to 149°C (-65 to 300°F)	73287 - 10 ml
Loctite 243 Hernon 423 Omnifit 1350 (100M)	Blue	Medium strength, for locking threads larger than 6 mm (1/4”). Hand tool removable. Temp. range: -54 to 149°C (-65 to 300°F)	29311 - .5 ml 17380 - 50 ml
Loctite 271/277 Hernon 427 Omnifit 1550 (220M)	Red	High strength, for all threads up to 25 mm (1”). Heat parts before disassembly. Temp. range: -54 to 149°C (-65 to 300°F)	29312 - .5 ml 26685 - 10 ml 73285 - 50 ml
Loctite 290 Hernon 431 Omnifit 1710 (230LL)	Green	Medium to high strength, for locking preassembled threads and for sealing weld porosity (wicking). Gaps up to 0.13 mm (0.005”) Temp. range: -54 to 149°C (-65 to 300°F)	28824 - .5 ml 25316 - 10 ml
Loctite 609 Hernon 822 Omnifit 1730 (230L)	Green	Medium strength retaining compound for slip or press fit of shafts, bearings, gears, pulleys, etc. Gaps up to 0.13 mm (0.005”) Temp. range: -54 to 149°C (-65 to 300°F)	29314 - .5 ml
Loctite 545 Hernon 947 Omnifit 1150 (50M)	Brown	Hydraulic sealant Temp. range: -54 to 149°C (-65 to 300°F)	79356 - 50 ml
Loctite 592 Hernon 920 Omnifit 790	White	Pipe sealant with Teflon for moderate pressures. Temp. range: -54 to 149°C (-65 to 300°F)	26695 - 6 ml 73289 - 50 ml
Loctite 515 Hernon 910 Omnifit 10	Purple	Form-in-place gasket for flexible joints. Fills gaps up to 1.3 mm (0.05”) Temp. range: -54 to 149°C (-65 to 300°F)	70735 - 50 ml

Threadlockers and Sealants

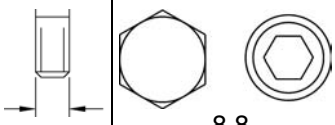
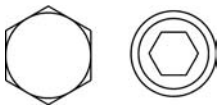
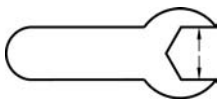
Threadlockers and Sealants (continued)

Threadlocking adhesives and sealants are specified throughout this manual by a notation of “S” plus a number (S#) and should be used where indicated. Threadlocking compounds normally break down at temperatures above 175°C (350°F). If a screw or bolt is hard to remove, heat it using a small propane torch to break down the sealant. When applying sealants, follow instructions on container. The sealants listed are recommended for use on Wacker equipment.

TYPE ( ) = Europe	COLOR	USAGE	PART NO. – SIZE
Loctite 496 Hernon 110 Omnifit Sicomet 7000	Clear	Instant adhesive for bonding rubber, metal and plastics; general purpose. For gaps up to 0.15 mm (0.006”) Read caution instructions before using. Temp. range: -54 to 82°C (-65 to 180°F)	52676 - 1oz.
Loctite Primer T Hernon Primer 10 Omnifit VC Activator	Aerosol Spray	Fast curing primer for threadlocking, retaining and sealing compounds. Must be used with stainless steel hardware. Recommended for use with gasket sealants.	2006124-6 oz.

Torque Values

Metric Fasteners (DIN)

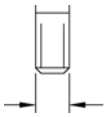
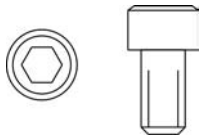
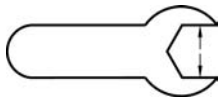
	TORQUE VALUES (Based on Bolt Size and Hardness)						**WRENCH SIZE**			
	 8.8		 10.9		 12.9					
Size	**Nm**	**ft.lb.**	**Nm**	**ft.lb.**	**Nm**	**ft.lb.**	**Metric**	**Inch**	**Metric**	**Inch**
M3	1.2	*11	1.6	*14	2.1	*19	5.5	7/32	2.5	–
M4	2.9	*26	4.1	*36	4.9	*43	7	9/32	3	–
M5	6.0	*53	8.5	6	10	7	8	5/16	4	–
M6	10	7	14	10	17	13	10	–	5	–
M8	25	18	35	26	41	30	13	1/2	6	–
M10	49	36	69	51	83	61	17	11/16	8	–
M12	86	63	120	88	145	107	19	3/4	10	–
M14	135	99	190	140	230	169	22	7/8	12	–
M16	210	155	295	217	355	262	24	15/16	14	–
M18	290	214	405	298	485	357	27	1-1/16	14	–
M20	410	302	580	427	690	508	30	1-1/4	17	–

1 ft.lb. = 1.357 Nm * = in.lb. 1 inch = 25.4 mm

Torque Values

Torque Values (continued)

Inch Fasteners (SAE)

										
Size	**Nm**	**ft.lb.**	**Nm**	**ft.lb.**	**Nm**	**ft.lb.**	**Metric**	**Inch**	**Metric**	**Inch**
No.4	0.7	*6	1.0	*14	1.4	*12	5.5	1/4	–	3/32
No.6	1.4	*12	1.9	*17	2.4	*21	8	5/16	–	7/64
No.8	2.5	*22	3.5	*31	4.7	*42	9	11/32	–	9/64
No.10	3.6	*32	5.1	*45	6.8	*60	–	3/8	–	5/32
1/4	8.1	6	12	9	16	12	–	7/16	–	3/32
5/16	18	13	26	19	33	24	13	1/2	–	1/4
3/8	31	23	45	33	58	43	–	9/16	–	5/16
7/16	50	37	71	52	94	69	16	5/8	–	3/8
1/2	77	57	109	80	142	105	19	3/4	–	3/8
9/16	111	82	156	115	214	158	–	13/16	–	–
5/8	152	112	216	159	265	195	24	15/16	–	1/2
3/4	271	200	383	282	479	353	–	1-1/8	–	5/8

1 ft.lb. = 1.357 Nm * = in.lb. 1 inch = 25.4 mm

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