

PD20REG 020A5005

440 Single-Phase Genset Circuit Diagram

Engine Maintenance

Utilize the following table to maintain the engine system. This will ensure many years of dependable service. This symbol “●” indicates when a maintenance item needs to be performed.

Items	Remarks	1st Use Check First 30 Hours	Every 50 Hours	Every 100 Hours	Every 200 Hours	Every 400 Hours	Every 1000 Hours
Oil	Check Oil Level	●	●	●			
	Replace	●			●		
Oil Filter	Replace	●			●		
Air Filter	Clean		●		●		
	Replace Filter Element					●	
Spark Plug	Check					●	
	Replace						●
Cooling System	Check Coolant Level and Leakage Occurs	●	●	●	●	●	●
	Clean radiator				●		
	Check the fan running condition				●		
	Check radiator hose connection		●		●		
	Change the coolant					●	
Gas Valve	Check/adjust	●			●		
Gas Line	Check the gas line for damage		●			●	
Exhaust System	Check to see if there is leakage, tighten or replace if needed		●				●
Screws and Nuts	Check all screws & nuts tighten if loose.		●		●		
Water Pump Belt	Adjust tension		●	●			
	Replace						●
Aging Wires	Check all wires for aging situation and if the connectors are loose or not		●		●		
Timing Belt	Depends on the wear pattern	Change Every 1200 Hours					

Additional system maintenance

- Keep the generator clean.
- Add lubrication oil and antirust at the frictional position
- Check all the screws loosen or not, and tighten them

Common Faults and Repair Methods of Generator

Number	Fault Symptoms	Reason & Troubleshooting
1	Generator without power indication	<ol style="list-style-type: none"> 1. Check whether battery is damaged 2. Fuse broken (Check, replace)
2	Generator has power indication but no power output	<ol style="list-style-type: none"> 1. Breaker not open 2. AC output is poorly connected (Check) 3. Check AVR and its fuse 4. Check carbon brush
3	Generator overheating	<ol style="list-style-type: none"> 1. Lack of coolant or pipe blocked (Add coolant or clean up radiator hoses) 2. Thermostat closed or damaged 3. Water pump worn out or damaged (Clean or replace pump) 4. Too much engine oil (Remove the unnecessary engine oil) 5. Damage of rotor bearing (Replace bearing) 6. Radiator blocked or damaged (Clean or replace radiator) 7. Short circuit of stator winding (Check wiring) 8. Rubbing of stator and rotor (Check, adjust gap)
4	Insufficient power output	<ol style="list-style-type: none"> 1. Abnormal gas pressure (adjust pressure) 2. Engine throttle worn out 3. Air filter blocked 4. Some spark or cylinder wire is damaged 5. Too much oil 6. Piston ring worn out

Common Faults and Repair Methods of Engine

Symptoms	Possible Solutions
Controller has no response with power.	Check starting batteries; Check controller connection wirings; Check DC fuse.
Generator shuts down	Check the water/cylinder temperature is too high or not; Check the genset AC voltage; check DC fuse.
Low oil pressure alarm after crank disconnect	Check oil level, then oil pressure sensor and its connections.
High coolant temp alarm after crank disconnect	Check coolant level, then temperature sensor and its connections.
Shutdown Alarm	Check related switch and its connections according to the information on LCD; check auxiliary input ports.
Fail to start	Check fuel oil circuit and its connections; check starting batteries; Check speed sensor and its connections; refer to engine manual.
Starter no response	Check starter connections; check starting batteries.
Stepping Motor Reverse	Cross connect the S11 and S12; Cross connect the S21 and S22; Change configuration (motor reduce direction) via PC.
GOV is out of control.	Check the speed sensor voltage is no less than 2V when cranking. Check the connections of S11, S12, S21, S22.

Common Faults and Repair Methods of Engine

Number	Fault	Check
1	Hard to start	<p>Electrical system fault</p> <ol style="list-style-type: none"> 1. Low battery with not enough power 2. Check battery for loose terminals 3. Starting fault 4. Ignition system fault 5. Spark plug carbon deposit and tarnish 6. Improper gap of spark plugs 7. Spark plug insulation burn out or electrode short circuit 8. Burned out Ignition coil 9. Solenoid valve damage. <p>Handling method</p> <ol style="list-style-type: none"> 1. Check all ignition wires to sparkplugs, make sure all are on secure. 2. Test for spark. Remove ignition wire, using insulated glove hold wire next to plug to see if sparks is present 3. Check the voltage of battery, if under 12.4 volts DC; Recharge 4. Replace or clean spark plug 5. Replace ignition coil, high pressure wire, solenoid valve <hr/> <p>Gas supply system fault</p> <ol style="list-style-type: none"> 1. Check main gas on/off valve (open valve) 2. Pressure reducer or solenoid valve damaged (replace) 3. Supply voltage is too low, cannot open the pipe solenoid and solenoid of the pressure reducer <p>Dealing method for Item 3: replace or charge battery</p> <ol style="list-style-type: none"> 4. Solenoid valve will not connect (settle) 5. Check fuel switch on generator; switch to correct gas(LPG/NG) 6. High pressure in fuel line Handling method: Use the spanner to open the joint softly. If it leaks, the existing parts are undamaged. Use this method to check each one. 7. Low pressure pipe buckling (settle) 8. Oil filter is too dirty (clean) 9. Check LPG/NG pressure

Common Faults and Repair Methods of Engine

Number	Fault	Check
2	Idling unstable	<ol style="list-style-type: none"> 1. Pressure reducer seals did not seat well (reseal) 2. Check the tightening screw of the mixer to see whether it is loose or not, check all of the connections between the gas inlet pipe and mixer for leaks. 3. Check fixed bolt on speed motor to see whether it is loose or not 4. Check the LPG/NG pressure to see whether it is normal or not 5. Check the screw of pressure regulating valve to see whether it is loose or not 6. Check the LPG tank surface to see whether it has frozen over
3	Engine will not operate standby	<ol style="list-style-type: none"> 1. The top dead center signal of cylinder one is not correct 2. Speed signal is not correct Elimination method: check or replace the sensor 3. Temperature of pressure reducing valve is too low 4. Pressure reducer does not work normally; repair or replace 5. Cylinder blow-by: Elimination method: check the cylinder cap of the screw. When necessary, replace the cylinder cap seal.
4	Engine not providing enough power, or consumption of fuel increases	<ol style="list-style-type: none"> 1. 1. Low pressure pipe buckled or too long (settle) 2. Ignition system with not enough ignition power 3. Ignition wires and FBT is not connected correctly 4. Ignition wires and sparkplugs are not connected properly 5. Some of the cylinders miss the ignition <p>Handling method of 3, 4, 5</p> <ol style="list-style-type: none"> 1. Pull out the spark plug, observe pole top to see whether it has burned trace, if there is, then replace the spark plug 2. Use multimeter (XKΩ GEAR) test the resistance of the ignition wires, if damaged, change ignition wires <ol style="list-style-type: none"> 6. Under pressure of the cylinder (check and adjust valve or replace the piston ring) 7. High pressure fuel line blocked or out of shape (clear or replace line) 8. Clean or replace air filter 9. Mixer is not sealed well (replace) 10. The joint part of mixer and throttle leaking (settle) 11. Check gas pressure flow 12. Check whether gas is up to standard, use only high grade LPG 13. Air filter , exhaust system jam,(clean air filter and exhaust pipe) 14. Voltage output instability; (adjust or change)

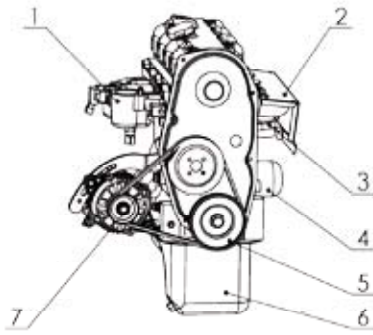
Common Faults and Repair Methods of Engine

Number	Fault	Check
5	Sudden Stop	<ol style="list-style-type: none"> 1. Safety fuse burned out (replace) 2. Loss of GND connection (settle) 3. Pressure reducer water cycle emerges ice block (Handling method: Clear the water cycle) 4. Pressure reducer low-pressure chamber leaks or diaphragm broken, repair or replace (settle or replace) 5. Air filter is too dirty - check or clean. 6. Solenoid valve fault closed 7. Fault of emergency stop switch
6	Abnormal sound when the engine is operating	<ol style="list-style-type: none"> 1. Ignition timing is early and causes detonation; check distributor timing! 2. Ignition timing is late which causes backfiring of exhaust Dealing methods for Item 1 and 2: adjust the ignition timing on the distributor 3. Tolerance between piston and cylinder is incorrect; it knocks when starting engine, noise dissipates after warmup of engine 4. The gap between piston pin and pin hole is too big, sound is light but clearer during idling 5. The gap between main bearing and connecting rod bearing is worn, can hear especially at lower speed, it sounds heavy and strong 6. Lose crankshaft bearing, can hear noise when idling 7. Broken Valve spring, excessive valve clearance, that can be heard knocking around the cylinder cap Dealing methods for Item 3, 4, 5, 6 and 7: replace the parts, insure proper tolerances and gaps. 8. When the piston hits the cylinder head, you can hear the knocking of metal around the cylinder head Repair method: check the piston and valve to see if damage has occurred
7	Temperature of the engine oil is too high	<ol style="list-style-type: none"> 1. Check around engine compartment for leaks 2. Too much engine load; Reduce load. 3. Too much or not enough engine oil. 4. Down exhaust is too much Dealing methods for Item 4: replace the piston ring or the cylinder sleeve. 5. Blockage in the oil cooler, oil temperature controller valve opened, the temperature is too high, Radiator intake vent is blocked by dirt and debris. 6. Oil mark is not correct (oil viscosity is too high)

Common Faults and Repair Methods of Engine

Number	Fault	Check
8	Pressure of engine oil is low	<ol style="list-style-type: none"> 1. Not enough oil in the oil pan Dealing method: add oil to the selected level 2. Damage of oil pump gear Dealing method: replace the oil pump 3. Blockage in the oil strainer or the oil filter 4. Damage or blocking in the relief valve or the pressure stabilizer spring 5. Blockage or leakage in the oil line Dealing methods for Item 3, 4 and 5: replace parts.
9	Temperature of engine coolant is too high	<ol style="list-style-type: none"> 1. Water thermostat is stuck, method; check and replace thermostat 2. Coolant; test and replace if necessary 3. Engine load if too much; Reduce load 4. Check for proper ventilation around radiator air intake vent
10	Starter fault	<ol style="list-style-type: none"> 1. Starter will not engage. 2. Weak starter engagement.; 3. Starter disengagement is slow or delayed; Prevention method; Check battery connections and voltage.
11	Muffler with black smoke	<ol style="list-style-type: none"> 1. Check air filter for blockage or obstructions. 2. Pressure regulating valve does not work normally Prevention method: Adjust the screw on the valve 3. Ignition timing too early, adjust ignition timing 4. The spark plug does not function normally 5. Ignition wires do not function normally 6. High pressure fuel line does not work normally Project 4, 5, and 6 handling method: replace the related accessories
12	Muffler with blue smoke	<ol style="list-style-type: none"> 1. Check engine oil level, if too much, drain excess oil 2. Replace piston ring 3. Overhaul or replace piston and ring.
13	Muffler with white smoke	<ol style="list-style-type: none"> 1. Engine preheating 2. Water in the cylinder, check head gasket, overhaul the engine cylinder if needed
14	Muffler with flare up and backfire	<ol style="list-style-type: none"> 1. Carburetor floater oil level is too high, adjust the floater 2. Exhaust valve is not totally sealing, polish the valve 3. Ignition timing too late, adjust the ignition timing
15	Load speed, drops too much	<ol style="list-style-type: none"> 1. Clogged fuel line (check and clean fuel line) 2. Dirty air filter (clean the air filter) 3. Improper valve clearance (repair and adjust)

Engine, Primary Parts and Structure

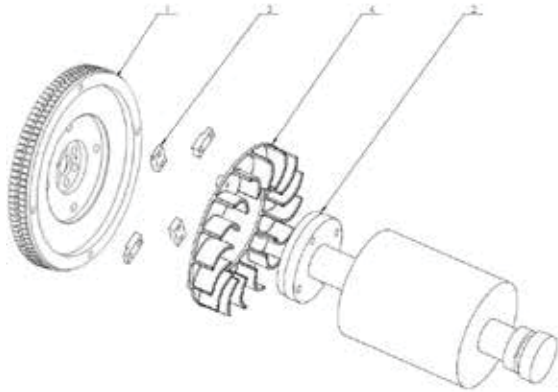


1. Gas inlet manifold
2. Exhaust manifold shield
3. Exhaust pipe manifold
4. Oil filter
5. Crankshaft pulley
6. Oil pan
7. Water pump pulley

Engine Specifications

MODEL#	TR15REG-EB	TR20REG-DB	TR20REG-DB-3
WARRANTY YEARS	2	2	2
ENGINE PART #	465QR	465QR	465QRZ
VOLUME (cc)	998	998	998
COMPRESSION RATIO	9.5:1	9.5:1	9.5:1
IGNITION SYSTEM	ECM	ECM	ECM
ELECTRIC START	YES	YES	YES
ENGINE ALTEERNATOR	QDY112 12V 0.8KW	QDY112 12V 0.8KW	QDY112 12V 0.8KW
FUEL TYPE	NG/LPG	NG/LPG	NG/LPG
CYLINDER BORE & STROKE (mm×mm)	L4-65.5×74	L4-65.5×74	L4-65.5×74
ASPIRATION TYPE	NATURAL ASPIRATION	NATURAL ASPIRATION	SUPER CHARGED
OIL CAPACITY	4.0 L	4.0L	4.0L
SPIN ON OIL FILTER	YES	YES	YES
CYLINDER BLOCK	CAST IRON	CAST IRON	CAST IRON
SLEEVE	CAST IRON	CAST IRON	CAST IRON
CHARGING	14V/70A Charging motor	14V/70A Charging motor	14V/70A Charging motor
Starting current (CCA)	525	550	550
Cooling system	LIQUID COOLED	LIQUID COOLED	LIQUID COOLED
Over heat stop	YES	YES	YES
Low oil pressure stop	YES	YES	YES

Generator Alternator



1. Fly wheel
2. Fan connection block
3. Alternator fan
4. Alternator rotor

This generator is directly coupled and attached to the engine.

Generator Alternator Specifications

MODEL#	TR15REG-EB	TR20REG-DB	TR25REG-DB-3
ALTERNATOR TYPE	synchronous, rotating magnetic field	synchronous, rotating magnetic field	synchronous, rotating magnetic field
VOLT. REG. SYSTEM	AVR	AVR	AVR
EXCITATION TYPE	BRUSH	BRUSH	BRUSH
POLES	2	2	2
THD @ FULL LOAD	≤5%	≤5%	≤5%
INSULATION CLASS	F	F	F
STATOR WINDING MATERIAL	COPPER	COPPER	COPPER
ROTOR WINDING MATERIAL	COPPER	COPPER	COPPER
ROTOR OD (mm)	164	164	164
STATOR OUTSIDE DIAMETER (mm)	270	270	270
STACK LENGTH (mm)	Single 160 / three 140	200	200
LAMINATION MATERIAL	cold rolling	cold rolling	cold rolling
CONNECTION METHOD	DIRECT COUPLED	DIRECT COUPLED	DIRECT COUPLED
Motor bearings	6306RS		

Item	Unit	TR15REG-EB	TR20REG-DB	TR20REG-DB-3
RATED POWER (KW)	LPG	15	20	20
	NG	14	18	18
FREQUENCY (HZ)		50	60	60
SPEED (RPM)		3600	3600	3600
RATED VOLT (V)		230 (230/400)	120/240	120/208
RATED CURRENT (A)	LPG	65.2/27.2	83.3	95.8
	NG	60.9/25.4	75	87.5
PHASE		Single-phase	Single-phase	Three-phase
POWER FACTOR		1.0 (0.8)	1.0	1.0
PROTECTION LEVEL		IP23	IP23	IP23
INSULATION		F	F	F
POLE		2	2	2

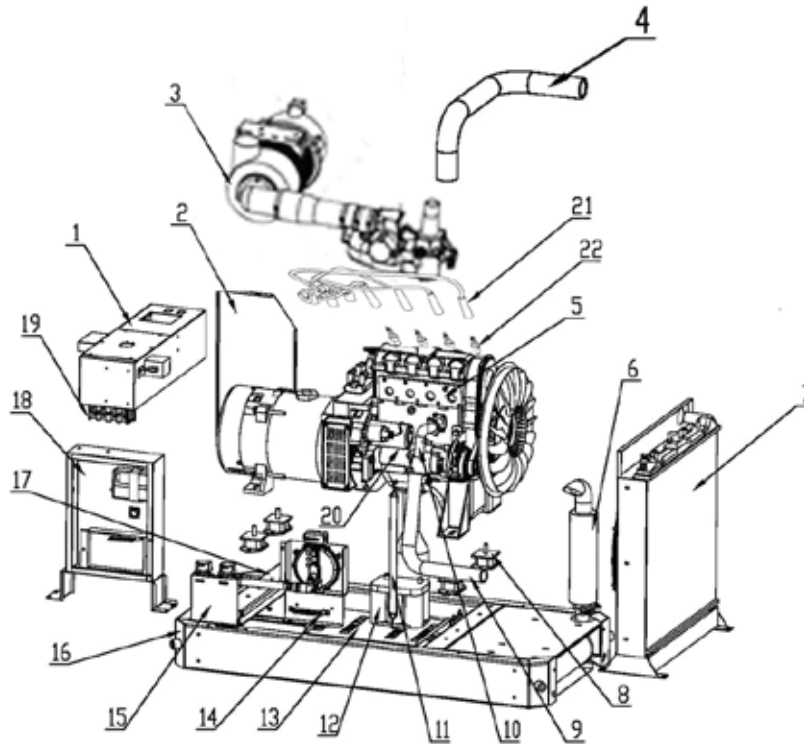
The generator unit is assembled from a large number of integrated components, including the primary silent cooling system, electronic speed control system, automatic power generating system, multi-energy power generation technologies, intelligent control systems, and ultra-low temperature starting technology.

Generator Components and Enclosure

The main frame and chassis are the primary structures to which all other component pieces are attached. The structure makes up the main noise protection and reduction features of the generator set. Other component parts include the chassis, Radiator compartments, electronic control box compartment, and electronic screen board compartments.

Inner Components:

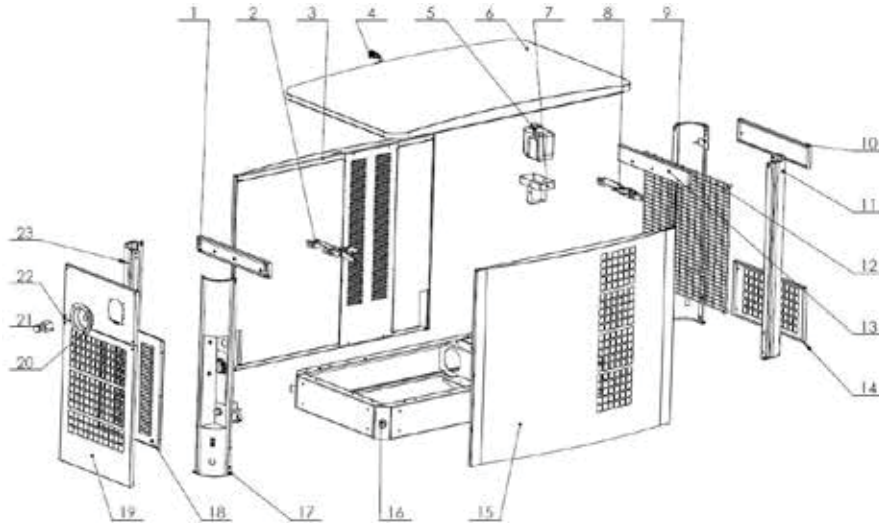
TR15REG-EB/TR20REG-DB two models:



TR15REG-DB / TR20REG-DB / TR20REG-DB-3

ITEMS	Parts Number	DESCRIPTION	QTY	REMARK
1		Electric control system	1	
2		Electric control box support	1	
3		Gas inlet system	1	
4		Radiator part	1	
5		Exhaust part	1	
6		Shock absorption	4	
7		Winding battery	1	
8		Battery base	1	
9		GND	1	
10		Unit base	1	
11		Gas part	1	
12		Motor beams	1	
13		Distribution box	1	
14		Engine alternator	1	

Enclosure Parts for TR15REG-DB / TR20REG-DB / TR20REG-DB-3 models:



TR15REG-DB / TR20REG-DB / TR20REG-DB-3

ITEMS	Parts Number	DESCRIPTION	QTY	REMARK
1		canopy right side support	1	
2		Right hinge	1	
3		Front board	1	
4		MS816-1A-1lock	1	
5		Water port	1	
6		Top cover	4	
7		Water port support	1	
8		Left hinge	1	
9		Stand column 1	1	
10		Side board 1	1	
11		R Stand column2	1	
12		Stainless steel board	1	
13		Board left support	1	
14		Side board 2	1	
15		Back board	1	
16		Base subassembly	1	
17		Output terminal	1	
18		Alternator waterproof board	1	
19		Side board 3	1	
20		Emergency stop switch shield	1	
21		Emergency stop switch	1	
22		Side board 4	1	
23		R Stand column 3	1	

Common Formulas

Items	Unit	Name	Conversion
Power	kW	kilowatt	1 kilowatt =1.36horsepower (1kW=1.36Ps)
Torsion	N·m	Newton · meter	1 kilogram · meter=9.81 Newton · meter (1kgf·m=9.81N·m)
Speed	r/min	rotate/minute	
Oil, fuel consumption	g/kW·h	gram/ killowatt·hour	1gram/horsepower·hour=1.36gram/kilowatt·hour (1g/Ps·h)=1.36g/kW·h)
Capacity(L)	l	liter	1 litre =1000milliliter(1L=1000ml)
Acreage	cm ²	square centimeter	1square meter=10000 square centimeter (1m ² =10000cm ²)
Pressure	KPa MPa	kilopascal mega-pascal	1kilogram force/square centimeter =98.1 kilopascal =0.0981 mega-pascal (1kgf/ cm ² =98.1kPa=0.0981Mpa)
Power	N	Newton	1 kilogram force =9.8Newton(1kgf=9.8N)
Length	m	meter	1 meter =1000millimeter(1m=1000mm)
Time	min(s)	minute (second)	1minute=60second(1min=60s)
Temperature	K(°C)	Kelvin degree (centigrade)	273K=0°C
Voltage	V	volt	
Current	A	ampere	
Crankshaft Angle	°CA	angle, crankshaft angle	
Quality	g	gram	1 kilogram =1000g(1kgf.m=9.81N.m)

Common Maintenance Parts for Generator

Item	Name	SPEC.	Unit	Quality	Note
1	Charge motor	12V 70A DC	PC	1	
2	Start motor	QDY112	PC	1	
3	Booster pump		PC	1	
4	Carbon brush	L65	PC	1	
5	Water pump belt	4PK-760	PC	1	
			PC	1	TR20REG-DB
			PC	1	
			PC	1	
	Booster pump belt	4PK-720	PC	1	
			PC	1	
6	Manifold inlet pad	465Q	PC	1	
7	Exhaust manifold pad	465Q-1	PC	1	
8	Ignition coil	465QR	PC	1	
9	Crankshaft position sensor	465Q5	PC	1	
10	Water temperature switch	100°C	PC	1	
11	Solenoid valve	QRY-4	PC	1	
12	Gas valve	HODHLKN	SET	1	
13	Fan		PC	1	Outer annulus size (Φ375)
14	Radiator	LD465	PC	1	
15	Mixer assembly	015A0372	PC	1	
16	ETC		SET	1	
17	Air filter	K1330	PC	1	
18	Air filter pipe	Φ50-Φ65	PC	1	
19	Oil filter sapnner	HM-501	PC	1	
20	Spark plug socket	L114	SET	1	
21	Spark plug	K6RTC	PC	4	
22	Universal wheel	Φ125-32	PC	2	
23	Directional wheel	Φ125-32	PC	2	
24	Foot support		PC	4	
25	Temperature control	45°C, 90°C	PC	1	
26	Heating pipe	500W AC220V	PC	1	
27	Waste pipe	015A0370	PC	1	
28	Wire harness		SET	1	
29	ECU	20KW/120V/240V	PC	1	
30	Control panel	HSC940	PC	1	