Standard Repair Times

SRT Family: BI

Our energy working for you.™

Cummins Power Generation

Generator Set

X3.3 Engine

C33 D5
C38 D5
C30 D6
C35 D6

English – Original Instructions 03-2012 0900-0910 (Issue 4)

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Foreword

The Standard Repair Times (SRTs) in this manual represent the time required to perform service repairs on Onan Engine and Generator Sets. These times are representative of an average mechanic in a typical dealer or distributorship using the prescribed hand tools, equipment, and all available service tools and equipment required to perform quality repairs and do all necessary testing.

The use of this manual will:

- Encourage uniform terminology throughout the Cummins/Onan organization
- Standardize Repair Order job description write-ups
- Provide shop managers with a guide for establishing flat rate quotations
- Serve as a basis for Onan Corporation, Inc. to establish its warranty labor obligations

Reporting of errors, omissions, and recommendations for improving this publication is encouraged. Send your suggestions or comments to:

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General Information

Standard Repair Times (SRTs) are lists of work tasks (procedures) and the time required to perform those tasks. The procedures list the work tasks required to be sure an engine or generator set is ready to return to service at the lowest possible cost to the customer. A Standard Repair Time is equitable when the repair described in the procedure can be performed in a period of time less than or equal to the standard by a journeyman mechanic after he/she has performed that repair on the same model, in the same application at least once. Those SRTs that a particular mechanic performs more frequently will often require less time than the standard. Conversely, those SRTs that a particular mechanic does not frequently perform may require more time than the standard. Several of the procedures may be required to accurately depict all the work actually performed to return a particular engine or generator set to service because the repair of a particular engine or generator set is often unique in light of the complaint, failure model, progressive damage, condition of the parts and customer desires. To allow for differences in the time required to perform a repair because of interference by the application, a Service Accessibility Code Scheme has been created.

Types of Standard Repair Times

There are three types of SRTs. Most often at least one of each type is necessary to accurately depict the repair. The three types are:

- Administrative
- Troubleshooting
- Repair

Administrative SRTs

Administrative SRTs are intended to provide time to move the vehicle engine or generator set to and from the work area, fill out the repair order, record SRTs used, etc. It is intended that an administrative SRT be used only once for each repair order. There are two administrative SRTs found in this manual in Group 00 – Complete Engine or Generator Set. One of the administrative SRTs is to be used when the repair takes place in a shop operated by the repairing location. The other administrative SRT is to be used when the repair takes place away from the shop operated by the repairing location (road repairs). The time for the road repair administrative SRT is greater to allow for loading and unloading tools, equipment, parts, etc. from the service truck.

Troubleshooting SRTs

Troubleshooting SRTs are intended to be used when diagnosing and analyzing engine, generator set or component failures. Troubleshooting SRTs are broken down in to logical numbered steps. The time for each step is cumulative with successive steps, including the time for the appropriate preceding step(s). Some troubleshooting SRTs contain time to remove and install components to perform the check(s) listed. If a troubleshooting SRT does **NOT** include required component removal and installation, it is intended that the SRT for the removal and installation of that component be in addition to the troubleshooting SRT. Refer to the following example:

Procedure Number		Procedure Description	SRT Hours
00–055		Troubleshoot – Lubricating Oil Consumption Excessive Includes:	
	–01	– Check: – Oil consumption report – For external oil leaks – For overfilled oil pan – Oil specifications – For fuel contamination – Oil change interval – For engine oil in torque converter	0.4
	–02	– Perform checks in Step 01 – Check: – Oil temperature – Air compressor oil consumption – Turbocharger seal – Crankcase blowby	1.0

In the above example, the time required to perform the checks in Step 01 is 0.4 hour. If the problem is not located while performing the checks in Step 01, an additional 0.6 hour is allowed to perform the checks in Step 02 for a total of 1.0 hour. The total troubleshooting time appropriate is the time indicated in the column directly in line with the final step required to locate the problem. The step required to locate the problem may or may not be the last step shown in the troubleshooting SRT. Each step contains information as to which steps are included.

Repair SRTs

Repair SRTs make up the majority of this manual. These are the SRTs that cover the actual repair work. The time shown on the same line as the SRT code and title is the total time for that SRT.

Standard Repair Combined Times

Standard Repair Combined Times (SRCTs) provide for the combining of the three types of SRTs under one code so that, if appropriate, the user can identify the work performed with fewer SRT codes.

Manual Organization

SRT Coding System

Each SRT has a unique code so that SRT data can be computerized. The numbering system used is common to all the SRT manuals for all Onan engines and generator sets. The portion of the system shown in the manual contains three segments:

"Group Number"	"Procedure Number"	"Step Number"
XX	XXX	XX

Group Numbers

Group numbers (the first two digits in the SRT code) are used to identify major engine components. The following list explains the group numbers used in SRT manuals:

Procedure Numbers

The procedure number consists of three digits. The first digit provides guidance as to the category of the repair. The second and third digits, shown as XX in the following list, are sequential numbers or alpha within the category.

Group Number	Contents of Group	Specific Repair Number	Description of Category
00	Complete Engine or Generator Set		
01	Cylinder Block	0XX	Troubleshooting
02	Cylinder Head		ONLY in Group 00
03	Rocker Levers	1XX	Remove and Install
04	Cam Followers/Tappets	2XX	Rebuild
05	Fuel System	3XX	Replace
06	Injectors and Fuel Lines	4XX	Clean and Visually Check or Inspect for Reuse
07	Lubricating Oil System		
08	Cooling System	5XX	Machine/Ream/Dowel/
10	Intake Air System		Modify/Cut/Lap
11	Exhaust System	6XX	Adjust/Calibrate
13	Electrical Equipment	7XX	Test
14	Engine or Generator Set Testing		
15	Instruments and Controls		
16	Mounting Adaptations		
17	Miscellaneous	9XX	(SRCT in Group 99) General/Miscellaneous
21	Generator Equipment		
25	Generator Components		
26	Generator Control Components		

Step Numbers

While all SRT codes will contain a Group and Procedure number, only those procedures that are broken down into steps have step numbers. The step numbers are sequential within an SRT.

General

There is an alphabetic index in the back of the manual. Within a particular group the procedures are arranged in alphabetical order by title, thus are not in code numeric order.

There is also a numerical index in which the procedures are arranged in numeric order and not in alphabetical order.

Within a procedure, the user will note that some lines are indented. This indentation is intended to indicate that the sub–tasks are part of the task under which they are indented.

How Standard Repair Times are Developed

Cummins/Onan SRT Objectives and Philosophy

The objective of Cummins/Onan SRT program is to provide credible and equitable labor time standards and procedures to the worldwide Cummins/Onan service network.

An SRT is credible when the procedure accurately depicts the work that **must** be performed to accomplish a quality engine or generator set repair.

An SRT is equitable when it can be performed in a period of time less than or equal to the standard by a journeyman mechanic after he/she has performed that repair at least once.

To establish credible and equitable SRTs with sufficient flexibility to account for differences in complaints, failures, progressive damage, customer desires, etc., SRTs have been structured using the following considerations:

- What must ALWAYS be done to the engine or generator set to perform the work.
- What MAY have to be done to the engine or generator set parts dependent on their condition.
- What MAY have to be removed to access the engine or generator set.
- How difficult it is for the mechanic to reach the engine or generator set even after interfering application hardware has been removed.

While the most frequent use of SRT information is the Onan Warranty System, it is Onan's intent that the SRTs be applicable to repairs conducted for any customer.

As SRTs are developed, it is assumed:

- That all the required tools, equipment, and supplies are available in sufficient quantity and in operating condition.
- That required Onan Service Manuals are available to the mechanic are being used.
- That the correct parts are available when the mechanic needs them.

How Times are Developed

SRTs are developed from time studies conducted in the field and Onan Technical Service Personnel. Technical Service Representatives create a comprehensive list of all the work elements or tasks required to perform specific repairs. Field studies are analyzed to find these same work elements or tasks and determine the time required for each. The time for work elements or tasks that are not included in the field time studies is determined by conducting free engine or generator set studies or by estimation using similar elements from existing time studies. A time is determined for each element of the procedure. The time for all elements is then totaled to establish the total productive repair time.

Productive Repair Time

Productive Repair Time is described as the actual time involved doing productive work, such as: removing, disassembling, cleaning, inspecting, machining, installing and adjusting parts or components. In addition, the following operations are considered to be productive work for inclusion in an SRT:

- Clock on and off the job or repair order, including shift changes.
- Move vehicle, engine or generator set to and from the work area.
- Move tool box to the work area.
- Obtain tools from tool box, wipe and put away after use.
- Refer to service manuals.
- Obtain, unpack and clean replacement parts as necessary.
- Package and mark parts removed as necessary for warranty or local consumer laws.
- Operate engine or generator set to check for proper operation.
- Clean work area at completion of shift or repair.
- Properly dispose of used engine fluids such as oil and coolant.
- Write summary of work performed at completion of repair or work shift.
- Help from another mechanic (time for one man to complete the task times two).

Time Allowances

After the total productive time is established, an additional allowance of 15 percent is added to cover the following:

- Personal time of 5 percent for:
  - Scheduled rest breaks
  - Personal phone calls
  - Restroom breaks
  - Shift changes
- Supplementary time of 10 percent to cover normal work interruptions:
  - Seized or hard turning fasteners
  - Extra time for extremely dirty equipment
  - Excessive waiting time for replacement parts
  - Brief assistance to other mechanics (less than 5 minutes)
  - Routine maintenance (not repair) of shop equipment
  - Obtain consumable supplies
  - Technical consultation with shop supervision

The following is an example of how the allowances are calculated to establish the SRT for a procedure where the productive time is 208.7 minute (3.48 hr):

Allowance Type	Allowance Percent (%)	Time (Minutes)
Productive Repair Time	100	208.7
Personal	5	10.4
Supplementary	10	20.9
TOTAL	115	240.0

Published Standard Repair Time = 4.0 hours

Work Not Included in An SRT

For almost every complete repair there will be one SRT that contains most of the work performed. This is sometimes called a base repair. For example, repairing an engine for high oil consumption often requires use of the SRT title Piston and Rings – Remove and Install. This SRT contains most of the time appropriate for the repair, so it is the base repair. There can be work required that is **not** part of this base SRT. This does not mean that the other work is non–productive, rather that other work is **NOT** required EVERY TIME the pistons and rings are removed and installed. More often than not, this other work is covered by another SRT. If the other work is **not** included in the base repair or in another SRT, the work is probably still productive work required for that particular repair.

Non-Productive Work

Analysis of past SRT time studies reveals the following general types of work that were not considered to be productive:

- Waiting on camshaft gears to heat and cool
- Waiting on another mechanic to finish using special tools or shop equipment
- Hunting for misplaced parts
- Repairing shop equipment
- Sorting through capscrews, to find the correct length, that were all thrown together into one basket during disassembly
- Repairing customer supplied components
- Salvaging parts or tools that have been damaged from improper handling or lack of correct tools
- Clearing off tables, parts carts, parts racks etc. left dirty or loaded with parts from previous repairs on other equipment
- Rework caused by installation of incorrect parts or incorrect installation of correct parts
- Fabrication or modification of special tools or equipment because the correct tools or equipment are not available
- Visiting during non–break time
- Conducting business with tool vendors
- Waiting on other mechanics to provide required help

– Waiting on parts clerk to fill orders for other mechanics
– Unnecessary inspection of new parts
– “Hot Setting” valves and injectors when not required
– Repairs to application hardware
– Rework resulting from failure to follow recommended service practices
– Performing work that is **not** part of the repair order or helping another mechanic

Service Accessibility Codes

Service repairs are affected by engine or generator set accessibility. The more difficult the accessibility, the longer it will take to complete the tasks given in the SRT procedure. Accessibility for a particular application is determined by reviewing the application and rating the degree of difficulty for performing the 20 most common repairs. Four codes (A, B, C and D) are used to classify the degree of difficulty for the service accessibility of a specific model or type of equipment. An “A” accessibility code indicates the engine or generator set is easily accessible. A “D” code indicates the application does not make the engine or generator set as easily accessible, thus the highest degree of difficulty relative to SRT standards. An “S” code is included for special or specific repairs not covered in the other four classifications. The “R” code indicates the repair is completed with the component, engine or generator set removed from the application.

“A” Accessibility Rating

1. Engine or generator sets mounted in equipment where 90 percent of the work can be performed while standing on the ground, shop floor, or flat work deck.

2. Engine or generator set can be accessed without removing any doors or panels.

3. Interfering application hardware can all be removed.

4. Clearance is sufficient for hands, wrenches, and drain and fill operations, making visual checks and room to stand and work.

“B” Accessibility Rating

1. Engine or generator set mounted in equipment where 70 percent of the work can be performed while standing on the ground, shop floor or flat work deck.

2. Access to the engine can be gained by removing access panels or doors.

3. On 80 percent of the operations, interfering application hardware can be removed.

4. On 80 percent of the operations, clearance is sufficient for hands, wrenches, service tools, drain and fill operations, making visual checks and room to stand and work.

“C” Accessibility Rating

1. Engine or generator set mounted in equipment where 50 percent of the work can be performed while standing on the ground, shop floor or flat work deck.

2. Access to the engine or generator set can be gained by removing the hood, structural members (bolted in) or sheet metal panels.

3. On 60 percent of the operations, interfering application hardware can be removed.

4. On 60 percent of the operations, clearance is sufficient for hands, wrenches, service tools, drain and fill operations, making visual checks and room to stand and work.

“D” Accessibility Rating

1. Engine or generator set mounted in equipment where 25 percent of the work can be performed while standing on the ground, shop floor or flat work deck.

2. Access to the engine or generator set is limited due to interference from permanently mounted structural members, sheet metal or crossmembers.

3. On 40 percent of the operations, clearance is sufficient for hands, wrenches, service tools, drain and fill operations, making visual checks and limited room to stand and work.

Standard Repair Combined Times (SRCTs)

SRCTs are the combination of some of the SRTs in the manual within a distinctive code. These SRCTs are based on field input of SRTs that are most frequently used in combination to describe the most common field repairs on this engine.

Use of SRCTs can reduce the amount of time required to determine the labor standard for a specific complete engine or generator set repair. The use of SRCTs will also reduce the number of codes required when completing a warranty claim or customer invoice.

SRCTs are intended to supplement, NOT replace, SRTs. One SRCT code can be used instead of several SRT codes.

It is intended that other appropriate SRTs can be used to supplement an SRCT as long as the work does not overlap. If there is overlapping work, do **not** use an SRCT.

How To Use This Manual

1. **Determine the actual work performed:**

   – Obtain this information from the work description on the repair order.

2. **Determine the Accessibility Code:**

   – Determine the application from the repair order.

   – Look in the “Accessibility Code Listing” on page to determine the accessibility code for the application involved in the repair. If the application is not shown, assume the accessibility code is “B”.

   – Write down the code.

3. **Determine applicable SRCT:**

   – Find the Contents Page for Group 99 – Standard Repair Combined Times.

   – Compare the titles to the work performed to determine if a SRCT will apply.

   – If there is an SRCT that seems to apply, find that SRCT and compare the SRT within the SRCT to the work performed. If you are not sure of the work included in the SRT, read that SRT and compare the procedure listing with the work performed.

   – If a SRCT applies to all or part of the work performed, find the column that contains the same accessibility code determined in Step 2 above.

   – Move down the column to the line containing the SRCT code and title and pick out the appropriate time.

   – If all the work in the SRCT is performed and additional steps were taken, use the SRCT and continue to Step 4 to cover the additional work.

   – If there is NOT an appropriate SRCT, move to Step 4.

4. **Determine the appropriate repair SRT:**

   – Use the information from the repair order to identify the parts involved.

   – Use the contents page at the front of the manual or the alphabetical index in the back of the manual to determine the appropriate SRT group for the parts and/or work involved.

   – Find the contents page for that group.

   – Read the contents page for procedure titles that seem to correspond to the work performed.

   – Find the SRT within the group.

   – Read the SRT procedure listing to determine the work included.

– If the work performed and the work included in the SRT are the same, all or in part, determine and record the time.

– Repeat the steps in this paragraph until you have determined an SRT for all the work performed.

5. **Determine the appropriate troubleshooting SRT:**

   – Read the repair order to determine what troubleshooting work was performed.

   – Find the contents page for Group 00.

   – Read the contents page for procedure to determine the work included in each step.

   – If the work performed and the work included in the troubleshooting SRT are the same, all or in part, determine and record the time of the SRT step. Remember that troubleshooting SRTs are cumulative.

6. **Determine the appropriate miscellaneous SRT:**

   – Read the repair order to determine if any application hardware was removed and installed in order to access the engine or generator set.

   – Find the contents page for Group 17.

   – Read the contents page for procedure titles that seem to correspond to the work performed.

   – Find the SRT within the group.

   – Read the SRT procedure to determine the work included in the SRT.

   – If the work performed and the work included in the SRT are the same, all or in part, determine and record the time.

   – If the work required to application hardware is not given in the SRT manual, determine the time for ONLY this work from the repair order. Record the time for possible use as “99–999” or “Non-SRT Time”.

7. **Determine the appropriate administrative SRT:**

   – Both of the administrative SRTs are shown at the beginning of Group 00.

   – Determine the appropriate SRT.

   – Record the time.

8. **Determine the total appropriate SRT time:**

   – Check to be sure that there is no duplication of tasks within the SRT procedures selected. If there is work duplicated by some of those selected, use other information contained in the manual to reduce the time of one of the SRTs accordingly. If the information is not available, make an estimate.

   – Total all the times obtained during performance of Steps 2 through 7.

Standard Repair Times Review Procedure

Onan Corporation makes every effort to be sure the SRTs published in this manual are credible and equitable. It will be necessary to review the published times when one or more of the following changes occur:

– Design changes to special service tools or equipment required to perform the repair

– Changes to the repair procedure

A formal SRT review procedure is available for any Cummins/Onan Authorized Repair Location that believes the SRTs shown in this manual are incorrect.

To be sure prompt attention and an accurate appraisal is given to your request, the following guidelines must be met:

1. Be sure the technician has followed all the procedures and used all the service tools referred to in the appropriate service manuals.

2. Be sure a journeyman technician performed the repair, one who has completed the repair a sufficient number of times to become familiar with the procedure.

3. Be sure all the SRTs, including supplemental SRTs, are appropriate for the repair are being used.

4. Include as much detail as possible about the specific repair.

NOTE: It is **NOT** the intent of this procedure to provide a forum for appealing or disputing the amount of time or the SRT judged appropriate on a particular warranty claim. Communication of this sort **must** follow the processes shown in the Onan Warranty Administration Manual.

5. Provide photographs of the installation.

6. Provide copies of all repair orders applicable to the SRT involved, the technicians time cards, and any other information related to the repair that will aid in the review process.

7. Be sure to provide the correct name of the repairing location, a phone number, and point of contact.

Company Action

Upon receipt of the request for an SRT review, the following action will be taken:

1. The person signing the request will be contacted to acknowledge the receipt of the request.

2. All the information provided will be analyzed and compared with the history files of the specific operation.

3. All information will be analyzed to determine if an error has been made in the procedure, the operations description, or the published repair time.

4. If it is determined the published repair time is incorrect, additional studies/analysis will be performed to establish the correct time. The requester will be notified of the results, and the results will be published in the next SRT update.

5. If it is determined that the time and procedure is correct, recommendations and assistance will be offered as needed.

Group 00 – Complete Engine

Contents

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
00–010 TROUBLESHOOT – COOLANT LOSS (EXTERNAL)						
Step 1 *Includes:* – Evaluate fault codes – Coolant level in Recovery Bottle – Cap Sealing of Recovery Bottle/ Radiator – Coolant Level in Radiator – Leak if any from Radiator Top/Bottom tank and core – Cracked or leaking hoses – Loose hose clamps – Coolant Heater – Coolant in oil	–	–	0.3	–	–	–
Step 2 *Includes:* Perform checks in Step 01 – Pressure test radiator cap – Pressure test cooling system (cold)	–	–	0.6	–	–	–
00–019 TROUBLESHOOT – ENGINE GASES(BLOWBY) EXCESSIVE						
Step 1 *Includes:* Check: – Oil level – Oil Filler Cap – Evidence of coolant in oil – Crankcase breather – Choked breather pipe – Oil carry–over crankcase breather	–	–	0.3	–	–	–
Step 2 *Includes:* Perform checks in Step 01 – Measure blow bye – Measure Compression	–	–	1.5	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
00–021 TROUBLESHOOT – ENGINE CRANKS BUT WILL NOT START FAULT CODE 359 (Fail to Start – Shutdown)						
Step 1 *Includes:* Check – Fuel level is below pickup tube in tank – Fuel suction lines – Air in the fuel system – Start Relay – Fuel ON Relay – Fuel Solenoid / Fuel pump linkage – Fuel solenoid not energized – Loose Wiring connections, Base Board – Coolant Heater operation (cold weather)	–	–	0.5	–	–	–
Step 2 *Includes:* Perform checks in Step 01 Check – (Electronic Governed Engine) – Harness / Governor actuator / Base Board – Electronic Governor Power Module	–	–	0.7	–	–	–
Step 3 *Includes:* Perform checks in Step 01 and Step 02 Check – Restricted fuel supply – Fuel Feed Pump – Fuel Pump Delivery at Nozzle Inlet – Fuel Injector Functioning	–	–	1.0	–	–	–
Step 4 *Includes:* Perform checks in Step 01, Step 02 and Step 03 Check – Measure compression	–	–	1.5	–	–	–
Step 5 *Includes:* Perform checks in Step 01, Step 02, Step 03 and Step 04 Check – Fuel Injection Pump –service	–	–	2.5	–	–	–

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
(Continued from previous page)						
Step 6 *Includes:* Perform checks in Step 01, Step 02, Step 03, Step 04, and Step 05 Check – Engine is worn – service	–	–	3.0	–	–	–
00–024 TROUBLESHOOT – ENGINE DIFFICULT TO START						
Step 1 *Includes:* Check – Fault Codes – Fuel return from FIP overflow valve to tank – Cranking speed (fully charged battery) – Fuel suction lines – Fuel lines – Start/Stop solenoid – Loose Wiring connections – Coolant Heater – Faulty Starter Motor	–	–	0.7	–	–	–
Step 2 *Includes:* Perform checks in Step 01 Check – Fuel Feed Pump – Fuel Filter choked – Restricted Air Inlet – Fuel Pump Delivery at Nozzle Inlet – Fuel Injector Functioning	–	–	1.2	–	–	–
Step 3 *Includes:* Perform checks in Step 01 and Step 02 Check – Valve Setting – Injection timing(In case of wrong fitment)	–	–	1.5	–	–	–
Step 4 *Includes:* Perform checks in Step 01, Step 02 and Step 03 Check – Measure Compression	–	–	1.8	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
00–027 TROUBLESHOOT – ENGINE NOISE EXCESSIVE						
Step 1 *Includes:* Check – Exhaust system – Engine mounting	–	–	0.3	–	–	–
Step 2 *Includes:* Perform checks in Step 01 Check – Check valve lash – Enclosure – Loose fasteners	–	–	0.5	–	–	–
00–031 TROUBLESHOOT – ENGINE POWER OUTPUT LOW						
Step 1 *Includes:* Check – Fuel supply – Fuel lines – Intake restriction – Linkage Throttle	–	–	0.5	–	–	–
Step 2 *Includes:* Perform checks in Step 01 Check – Fuel Pump and Injector Calibration	–	–	1.5	–	–	–
Step 3 *Includes:* Perform checks in Step 01 and Step 02 Check – Measure compression (while the Injectors are removed for CALIBRATION)	–	–	1.6	–	–	–
00–037 TROUBLESHOOT – ENG STARTS BUT WILL NOT KEEP RUNNING						
Step 1 *Includes:* Check – Fault Codes – Fuel Level	–	–	0.7	–	–	–

(continued on next page)

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
(Continued from previous page) – Battery – Fuel suction lines (tube in tank & line from tank to Engine) – Air in fuel – Start/Stop solenoid – Defective Safer switches – Loose Wiring connections						
Step 2 *Includes:* Perform checks in Step 01 Check – Fuel Feed Pump – Restricted Air Inlet – Fuel Pump Delivery at Nozzle Inlet – Fuel Injector Functioning	–	–	1.2	–	–	–
00–041 TROUBLESHOOT – ENGINE UNSTABLE(HUNTS)(GENSET)						
Step 0 *Includes:* Check for: – Evaluate fault codes – Fuel supply – Loose wire connections – Governor actuator operation	–	–	0.6	–	–	–
00–042 TROUBLESHOOT – VIBRATION EXCESSIVE						
Step 0 *Includes:* Check for: – Pulleys – Belts – Drive discs – Isolator Vibrations	–	–	0.5	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
00–044 TROUBLESHOOT – ENG WILL NOT CRANK FAULT CODE 1438 (Fail to Crank – Shutdown)						
Step 1 *Includes:* Check for: – Battery voltage – Battery connections	–	–	0.3	–	–	–
Step 2 *Includes:* Perform checks in Step 01 Check – Manual Engine rotation – Wiring connections to and from control, relay, switch, and starter – Emergency Stop switch – Start relay Operation – Start/ Stop switch – MPU / circuit / Baseboard – Check wiring continuity/ test RL1 relay – Reset Control & restart – Test for B+ at the starter	–	–	0.6	–	–	–
Step 3 *Includes:* Perform checks in Step 01 and Step 02 Check – Starter Motor – Flywheel Ring gear	–	–	1.0	–	–	–
00–045 TROUBLESHOOT – FAULT CODE 2677 (Fail to Stop – Shutdown)						
Step 0 *Includes:* Check for: – Binding in the Governor – actuator adjustment – Start stop switch – E–stop switch – Control – Solenoid Linkage	–	–	0.5	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
00–047 TROUBLESHOOT – EXCESS WHITE SMOKE AT STARTUP(WARM)						
Step 0 *Includes:* Check: – Fuel supply	–	–	0.3	–	–	–
00–048 TROUBLESHOOT – EXCESS WHITE SMOKE AT START–UP (COLD)						
Step 0 *Includes:* Check: – Fuel supply – Coolant heater	–	–	0.4	–	–	–
00–0AD TROUBLESHOOT – HIGH/LOW AC OUTPUT(GENSET)						
Step 1 *Includes:* Check: – Proper output lead configuration – Genset output voltage – Voltage at line side of breaker – Voltage at load side of breaker – Voltage sense leads secure/in good condition – Wire harness condition (AVR harness) – Wire harness connections, control, PMG	–	–	0.5	–	–	–
Step 2 *Includes:* Perform checks in Step 01 Check: – Field voltage – Exciter stator resistance – Exciter rotor resistance – Excite with battery	–	–	0.7	–	–	–
Step 3 *Includes:* Perform checks in Step 01 and Step 02 Check: – Main stator resistance/winding – Main rotor resistance/winding	–	–	0.9	–	–	–

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
(Continued from previous page)						
Step 4 *Includes:* Check: Perform checks in Step 01, Step 02 and Step 03 – Rotating diodes + MOV (Surge suppressor) – Regulator Module	–	–	1.5	–	–	–
00–0AG TROUBLESHOOT – NO OUTPUT VOLTAGE(AVR)(GENSET						
Step 1 *Includes:* Check: – Proper output lead configuration – Genset output voltage – Voltage at line side of breaker – Voltage at load side of breaker – Voltage sense leads secure/in good condition – Wire harness condition (AVR harness) – Wire harness connections, control, PMG	–	–	0.5	–	–	–
Step 2 *Includes:* Perform checks in Step 01 Check: – Field voltage – Exciter stator resistance – Exciter rotor resistance – Excite with battery	–	–	0.7	–	–	–
Step 3 *Includes:* Perform checks in Step 01 and Step 02 Check: – Main stator resistance/winding – Main rotor resistance/winding	–	–	0.9	–	–	–
Step 4 *Includes:* Perform checks in Step 01, Step 02 and Step 03 Check: – Rotating diodes + MOV(Surge Suppressor)	–	–	1.5	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
00–0AH TROUBLESHOOT – UNSTABLE VOLTAGE ENG STABLE(GENSET)						
Step 0 *Includes:* Check: – Proper output lead connection – Genset output voltage – Voltage at load side of breaker – Voltage at line side of breaker – Voltage sense leads secure/in good condition – Plugs/harness connections – Verify engine governing/stability – Parasitic loads effecting stability	–	–	0.5	–	–	–
00–0AS TROUBLESHOOT – BATTERY NOT CHARGING						
Step 0 *Includes:* Check: – Output of charger – Battery condition – Battery connections – Connections at charger – Belt tension	–	–	0.6	–	–	–
00–0BD TROUBLESHOOT – FAULT CODE 1446 (High AC Voltage – Shutdown)						
Step 0 *Includes:* Check: (refer PCC1302 troubleshooting guidelines) – Fault simulation with InPower – Single step large block load removal – Clear fault and restart genset – Reset threshold – Generator / base board – Voltage sense connections/set up could be incorrect. – Reset Control & restart	–	–	1.0	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
00–0BE TROUBLESHOOT – FAULT CODE 1447 (Low AC Voltage – Shutdown)						
Step 0 *Includes:* Check: (refer PCC1302 troubleshooting guidelines) – Fault simulation with InPower – Reset threshold – Overload – Generator output connections – Excitation inputs – Rotating Rectifier assly – Loose connector or base board is bad – Reset Control & restart	–	–	1.5	–	–	–
00–0BF TROUBLESHOOT – FAULT CODE 1449 (Over Frequency – Shutdown)						
Step 0 *Includes:* Check: – AC output frequency high – Reset / adjust threshold – Governor fault – Fuel system (return line blocked) – Loose connector or Base board is bad – Reset Control & restart	–	–	1.0	–	–	–
00–0BG TROUBLESHOOT – FAULT CODE 1448 (Under Frequency – Shutdown)						
Step 0 *Includes:* Check: (refer PCC1302 troubleshooting guidelines) – Fault simulation with InPower – Reset / adjust threshold – Governor fault – Fuel shut–off coil – Fuel system (suction line blocked) – Loose connector or Base board is bad – Reset Control & restart	–	–	1.5	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
00–0BS TROUBLESHOOT – FAULT CODE 234 (Overspeed – Shutdown)						
Step 0 *Includes:* Check: (refer PCC1302 troubleshooting guidelines) – Cold engine – Single step large block load removal – Fault simulation with InPower – Reset / adjust threshold – Governor fault – Fuel shut–off coil – Speed adjustment device– adjust – Fuel Injection Pump – Engine rpm / Hz – monitor with InPower – Reset Control & restart	–	–	1.0	–	–	–
00–0BU TROUBLESHOOT – FAULT CODE 2335 (Excitation Fault – Shutdown)						
Step 0 *Includes:* Check: (refer PCC1302 troubleshooting guidelines) – Voltage sense lead – Excitation circuit – Field wiring (X1 and X2) – Ensure Genset setup to reach required speed manually	–	–	0.5	–	–	–
00–0BY TROUBLESHOOT – FAULT CODE 121 (Speed Signal Lost – Shutdown)						
Step 0 *Includes:* Check: (refer PCC1302 troubleshooting guidelines) – Confirm settings and configurations for genset – Damaged magnetic pickup (MPU) – Reset Control & restart – Harness / base board – Reset Control & restart	–	–	0.5	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
00–0BZ TROUBLESHOOT – FAULT CODE 1472 (High AC Current – Shutdown)						
Step 0 *Includes:* Check: (refer PCC1302 troubleshooting guidelines) – Fault simulation with InPower – Reset / adjust threshold – Overload – CTs and CT connections – Harness / base board – Incorrect rating setup – Reset Control & restart	–	–	0.8	–	–	–
00–0CF TROUBLESHOOT – FAULT CODE 415 (Low Oil Pressure – Shutdown)						
Step 0 *Includes:* Check: (refer PCC1302 troubleshooting guidelines) – Fault simulation with InPower for oil pressure sensor – Oil level, top–up as needed – Oil pipe & filters – should not be clogged – Oil pressure sensor by simulator – Harness / base board – Reset Control & restart	–	–	0.7	–	–	–
00–0CV TROUBLESHOOT – FAULT CODE 151 (High Coolant Temp – Shutdown)						
Step 0 *Includes:* Check: (refer PCC1302 troubleshooting guidelines) – Fault simulation with InPower for coolant sensor – Engine or sensor circuitry – Coolant Temp Sensor Reading with thermocouple – Harness / base board – coolant temperature sensor resistance – Coolant Level – Coolant Leak – Obstructions in Cooling Air–flow	–	–	0.9	–	–	–

(continued on next page)

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
(Continued from previous page) – Fan Belt – Reset Control & restart						
00–0XX TROUBLESHOOT – FAULT CODE 146 (Pre–High Coolant Temp – Warning)						
Step 0 *Includes:* Check: (refer PCC1302 troubleshooting guidelines) – review to fault code 151 – correction list for other possible causes – Increase in load – High ambient temp	–	–	0.9	–	–	–
00–0DA TROUBLESHOOT – CIRCUIT BREAKER (AC MAIN) TRIPS						
Step 0 *Includes:* Check: – Evaluate fault codes – Loads – Loose wire connections – Measure – voltage – Amperage – Frequency	–	–	0.3	–	–	–
00–0DC TROUBLESHOOT – NO PROBLEM FOUND						
Step 0 *Includes:* Verify customer complaint	–	–	0.5	–	–	–
00–0DD TROUBLESHOOT – EXCESSIVE EXHAUST SMOKE (BLACK)						
Step 1 *Includes:* Check: – Evaluate fault codes – Fuel supply – Intake restriction – Loads *(continued on next page)*	–	–	0.3	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
(Continued from previous page)						
Step 2 *Includes:* Perform checks in Step 01 Check: – Valve Lash	–	–	0.6	–	–	–
Step 3 *Includes:* Perform checks in Step 01 and Step 02 Check: – Measure Fuel flow – Injector – Check Governor operation	–	–	1.9	–	–	–
00–0DE TROUBLESHOOT – EXCESSIVE EXHAUST SMOKE (BLUE)						
Step 1 *Includes:* Check: – Oil level – Crankcase breather hose for restrictions	–	–	0.4	–	–	–
Step 2 *Includes:* Perform checks in Step 01 Check: – Measure compression	–	–	1.0	–	–	–
00–0DF TROUBLESHOOT – EXCESSIVE OIL CONSUMPTION						
Step 1 *Includes:* Check: – Oil level	–	–	0.4	–	–	–
Step 2 *Includes:* Perform checks in Step 01 Check: – Measure compression	–	–	1.0	–	–	–
00–0DG TROUBLESHOOT – ENGINE OIL LEAK						
Step 0 *Includes:* Check: – Oil level – Gaskets	–	–	0.3	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
00–0DH TROUBLESHOOT – LOW OIL PRESSURE						
Step 1 *Includes:* Check: – Oil level – Sensors	–	–	0.3	–	–	–
Step 2 *Includes:* Perform checks in Step 01 Check: – Lube oil Restriction – Metal particles in filters	–	–	0.6	–	–	–
00–0DI TROUBLESHOOT – SOFTWARE						
Step 0 *Includes:* Check: – Connect service tool – Create capture file – Perform diagnostic checks	–	–	0.4	–	–	–
00–0DJ TROUBLESHOOT – BELOW NOMINAL FREQUENCY						
Step 1 *Includes:* Check: – Check Speed Adjusting device – Check Fuel supply & Fuel line to free from any restriction – Check vacuum indicator for Intake Air restriction – Check Air Filter for partial chocking – Binding Governor / Fuel linkage – Check MPU signal	–	–	0.4	–	–	–
Step 2 *Includes:* Perform checks in Step 01 Check: – Fuel pump flow test – Check base load (% of block loading) – Check PWM command (if high check fuel restriction/ Gov Linkage)	–	–	1.4	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
00–0DK TROUBLESHOOT – UNBALANCED AC OUTPUT						
Step 1 *Includes:* Check: – Load distribution – Proper output lead configuration – Voltage sense leads secure/in good condition – Check exciter stator resistance – Wire harness condition – Wire harness connections, control, PMG	–	–	0.5	–	–	–
Step 2 *Includes:* Perform checks in Step 01 Check: – Field voltage – Exciter stator resistance	–	–	0.7	–	–	–
Step 3 *Includes:* Perform checks in Step 01 and Step 02 Check: – Main stator resistance	–	–	1.0	–	–	–
00–0FA TROUBLESHOOT – FAULT CODE 145 (Coolant Sensor OOR – Warning)						
Step 0 *Includes:* Check: (refer PCC1302 troubleshooting guidelines) – Coolant Sensor Connections – Coolant Sensor – Harness / base board – Reset Control & restart	–	–	0.5	–	–	–
00–0GI TROUBLESHOOT – FAULT CODE 441 (Low Battery – Warning)						
Step 0 *Includes:* Check: (refer PCC1302 troubleshooting guidelines) – Battery – weak / discharged – Recharge or replace battery – Battery connections loose or dirty – rectify / clean – Wrong battery voltage	–	–	0.5	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
– Verify that battery voltage matches calibration – Insufficient battery charging voltage – Adjust battery charge rate as required – Engine DC alternator could be bad – Replace engine DC alternator as necessary – Harness or base board – Reset / adjust threshold						
00–0GK TROUBLESHOOT – FAULT CODE 1442 (Weak Battery – Warning)						
Step 0 *Includes:* Check: (refer PCC1302 troubleshooting guidelines) – Battery – weak / discharged – Recharge or replace battery – Battery connections loose or dirty – rectify / clean – Wrong battery voltage – Verify that battery voltage matches calibration – Insufficient battery charging voltage – Adjust battery charge rate as required – Engine DC alternator could be bad – Replace engine DC alternator as necessary – Harness or base board – Reset / adjust threshold – Perform checks in steps 01 through 04	–	–	0.5	–	–	–
00–0GL TROUBLESHOOT – FAULT CODE 1311 (CUST_FAULT # 1 – Warning)						
Step 0 *Includes:* Check: (refer PCC1302 troubleshooting guidelines) – Disconnect the signal lead from TB1 – Reset the control – If message drops down – external wiring has a short circuit – Grounding input activates fault	–	–	0.5	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
00–0GM TROUBLESHOOT – FAULT CODE 1312 (CUST_FAULT # 2 – Warning)						
Step 0 *Includes:* Check: (refer PCC1302 troubleshooting guidelines) – Disconnect the signal lead from TB1 – Reset the control – If message drops down – external wiring has a short circuit – Grounding input activates fault	–	–	0.5	–	–	–
00–0GN TROUBLESHOOT – FAULT CODE 1317 (CUST_FAULT # 3 – Warning)						
Step 0 *Includes:* Check: (refer PCC1302 troubleshooting guidelines) – Disconnect the signal lead from TB1 – Reset the control – If message drops down – external wiring has a short circuit – Grounding input activates fault	–	–	0.5	–	–	–
00–0KF TROUBLESHOOT – FAULT CODE 442 (High Battery – Warning)						
Step 0 *Includes:* Check: (refer PCC1302 troubleshooting guidelines) – Excessive battery charging voltage – Replace charger as required – Engine Batt Charging alternator could be bad – Check fault threshold	–	–	0.5	–	–	–
00–0XM TROUBLESHOOT – FAULT CODE 1471 (High AC Current – Warning)						
Step 0 *Includes:* Check: (refer PCC1302 troubleshooting guidelines) – Fault simulation with InPower – Reset / adjust threshold – Overload – CTs and CT connections – Harness / base board	–	–	0.8	–	–	–

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
(Continued from previous page) – Incorrect rating setup. – Reset Control & restart – Check rating setup in control.						
00–0XN TROUBLESHOOT – FAULT CODE 135/141 (Oil Pressure Sensor OOR – Warning)						
Step 0 *Includes:* – Oil Pressure Sensor Connections – Oil Pressure Sensor – Harness / base board – Reset Control & restart	–	–	0.5	–	–	–
00–0XR TROUBLESHOOT – FAULT CODE 1944 (ANNUNCIATOR ERROR – Warning)						
Step 0 *Includes:* – Network configuration bad – Bad device – Troubleshoot network for bad device	–	–	0.5	–	–	–
00–0ZR TROUBLESHOOT – FAULT CODE 143 (Pre–Low Oil Pressure – Warning)						
Step 0 *Includes:* – Fault simulation with InPower for oil pressure sensor – Oil level, top–up as needed – Oil pipe & filters – should not be clogged – Oil pressure sensor by simulator – Harness / base board – Reset Control & restart – Check for +5 VDC at the sensor	–	–	0.6	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
00–1AE GENSET, STANDBY – REMOVE AND INSTALL						
Step 0 *Includes:* Check: – Disconnect and Connect – Battery cables – Output leads – Fuel lines – Exhaust system – Remove and install – Genset – Test run unit	–	–	5	–	–	–
00–201 ENGINE – REBUILD						
Step 0 *Includes:* Check: – Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Fuel lines – Coolant hoses – Exhaust pipes – Drain and refill Engine fluids – Remove and install – Enclosure (as needed) – Generator Control – Generator end – Flywheel – Flywheel housing – Intake manifold – Exhaust manifold – Coolant pump Belt Drive – Coolant pumps – Coolant hoses – Governor actuator – Fuel injection supply and return lines – Fuel injection pump – Valve cover rocker assembly	–	–	16	–	–	–

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
(Continued from previous page) – Cylinder head and gasket – Lifters – Crankshaft pulley – Gear case cover and gasket – Oil pan and gasket – Pistons and connecting rods – Rod bearings – Oil pump Drive Gear – Rear main seal carrier – Idler Gear – Camshaft – Fuel Camshaft – Crankshaft – main bearing carrier and bearings – Oil seals – Clean and visually inspect – Crankshaft – Camshafts – Cylinder block – Torque Cylinder head – Adjust valve lash – Test run unit						
00–3AA ENGINE – REPLACE						
Step 0 *Includes:* Check: – Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Fuel lines – Exhaust hose – Coolant hose – Drain and refill Engine fluids – Remove and install – Enclosure (as needed) – Starter	–	–	6	–	–	–
(continued on next page)						

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
(Continued from previous page) – Generator Control assembly – Generator assembly – Transfer parts to new Engine – Flywheel – Flywheel housing – Intake manifold – Exhaust manifold – Starter – Switches and senders – Engine mounts – Fuel Filter assembly and lines – Fuel pump – Test run unit						
00–7AB TEST STATOR WINDINGS						
Step 0 *Includes:* Check: – Access winding leads – Measure – Winding resistance – Winding to winding shorts – Winding to ground shorts	–	–	0.5	–	–	–
00–7AC TEST ROTOR WINDINGS						
Step 0 *Includes:* Check: – Access winding leads – Measure – Winding resistance – Winding to winding shorts – Winding to ground shorts	–	–	5	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
00–901 ADMINISTRATIVE TIME – OPEN/CLOSE REPAIR ORDER (SHOP)						
Step 0 *Includes:* Clock on and off the job Move equipment to and from work area Record the following: – Generator set model number – Generator set serial number – Transfer switch model number – Transfer switch serial number – Generator set hours of operation – Customer name and address Load/unload tools, equipment, and repair parts Clean up work area Write repair order (end of each shift & job completion) Write repair procedures	0.4	–	–	–	–	–
00–902 ADMINISTRATIVE TIME – OPEN/CLOSE REPAIR ORDER (ROAD)						
Step 0 *Includes:* Clock on and off the job Move equipment to and from work area Record the following: – Generator set model number – Generator set serial number – Engine serial number – Hours of operation – Date in service Load/unload tools, equipment and repair parts Clean up work area Write repair order	0.7	–	–	–	–	–

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Group 01 – Cylinder Block

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
01–112 CRANKSHAFT – REMOVE AND INSTALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Fuel lines – Exhaust pipes – Coolant hose – Drain and refill Engine fluids – Remove and install – Enclosure (as needed) – Radiator – Generator assembly – Flywheel – Flywheel housing – Coolant pump / Drive Belt – Governor actuator – Fuel injection supply and return lines – Valve cover rocker assembly .s – Cylinder head and gasket – Crankshaft pulley – Gear case cover and gasket – Oil pan and gasket – Pistons and connecting rods – Oil pump Drive Gear – Oil pump and gasket – Rear main seal carrier – Crankshaft – main bearing carrier and bearings – Oil seals – Clean and visually inspect Crankshaft – Torque Cylinder head – Adjust valve lash – Test run unit	–	–	15	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
01–114 GEAR,CRANKSHAFT – REMOVE AND INSTALL						
Step 0 *Includes:*	–	–	6	–	–	–
Disconnect and Connect						
– Battery cables						
– Engine wiring harness (as needed)						
– Fuel lines						
– Exhaust pipes						
– Coolant hose						
– Drain and refill Engine fluids						
– Remove and install						
– Enclosure (as needed)						
– Radiator						
– Coolant pump Drive Belt						
– Coolant pumps						
– Coolant hoses						
– Governor actuator						
– Crankshaft pulley						
– Gear case cover and gasket						
– Idler Gear						
– Crankshaft Gear						
– Test run unit						
01–121 GEAR COVER – REMOVE AND INSTALL						
Step 0 *Includes:*	–	–	4	–	–	–
Disconnect and Connect						
– Battery cables						
– Engine wiring harness (as needed)						
– Fuel lines						
– Exhaust pipes						
– Coolant hose						
– Drain and refill Engine fluids						
– Remove and install						
– Enclosure (as needed)						
– Radiator						
– Coolant pump Drive Belt						
– Coolant pumps						

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
(Continued from previous page) – Coolant hoses – Governor actuator – Crankshaft pulley – Gear case cover and gasket – Test run unit						
01–135 MAIN BEARINGS – REMOVE AND INSTALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Fuel lines – Exhaust pipes – Coolant hose – Drain and refill Engine fluids – Remove and install – Enclosure (as needed) – Radiator – Generator assembly – Flywheel – Flywheel housing – Coolant pump Drive Belt – Coolant pumps – Coolant hoses – Governor actuator – Fuel injection supply and return lines – Valve cover rocker assembly .s – Cylinder head and gasket – Lifting Hooks – Crankshaft pulley – Gearcase cover and gasket – Oil pan and gasket – Pistons and connecting rods – Rod bearings – Oil pump Drive Gear – Oil pump and gasket	–	–	15	–	–	–

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
(Continued from previous page) – Rear main seal carrier – Crankshaft – Oil seals – Clean and visually inspect Crankshaft – Torque Cylinder head – Adjust valve lash – Test run unit						
01–140 PISTON – REMOVE AND INSTALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Fuel lines – Exhaust pipes – Coolant hose – Drain and refill Engine fluids – Remove and install – Enclosure (as needed) – Radiator – Generator assembly – Coolant pump Drive Belt – Coolant pumps – Coolant hoses – Governor actuator – Fuel injection supply and return lines – valve cover rocker assembly and pushrods – Cylinder head and gasket – Oil pan and gasket – Pistons and connecting rods – Rod bearings – Clean and visually inspect Crankshaft – Torque Cylinder head – Adjust valve lash – Test run unit	–	–	8	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
01–1AA CONNECTING ROD – REMOVE AND INSTALL						
Step 0 *Includes:*	–	–	8	–	–	–
Disconnect and Connect						
– Battery cables						
– Engine wiring harness (as needed)						
– Fuel lines (as needed)						
– Exhaust pipes						
– Coolant hose						
– Drain and refill Engine fluids						
– Remove and install						
– Enclosure (as needed)						
– Radiator						
– Generator assembly						
– Fuel injection supply and return lines						
– Valve cover and rocker assembly						
– Cylinder head and gasket						
– Oil pan and gasket						
– Piston and connection Rod						
– Piston rings						
– Rod bearings						
– Clean and visually inspect						
– Torque Cylinder head						
– Adjust valve lash						
– Test run unit						
01–304 CRANKSHAFT SEAL,FRONT – REPLACE						
Step 0 *Includes:*	–	–	4	–	–	–
Disconnect and Connect						
– Battery cables						
– Engine wiring harness (as needed)						
– Coolant hose						
– Drain and refill Engine fluids						
– Remove and install						
– Enclosure (as needed)						
– Radiator and Fan Assembly						
– Crankshaft pulley						
– Oil seal						
– Test run unit						

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
01–308 CRANKSHAFT SEAL,REAR – REPLACE						
Step 0 *Includes:*	–	–	8	–	–	–
Disconnect and Connect						
– Battery cables						
– Exhaust bellow						
– Engine wiring harness (as needed)						
– Drain and refill engine fluids(as needed)						
– Remove and install						
– Enclosure (as needed)						
– Coolant Hoses(as needed)						
– Generator assembly						
– Flywheel						
– Rear OIL Seal cover						
– Oil seal						
– visually inspect for Oil leaks						
– Test run unit						
01–3AC PISTON RINGS – REPLACE						
Step 0 *Includes:*	–	–	8	–	–	–
Disconnect and Connect						
– Battery cables						
– Engine wiring harness (as needed)						
– Fuel lines						
– Exhaust pipes						
– Drain and refill Engine fluids						
– Remove and install						
– Enclosure (as needed)						
– Radiator hoses						
– Coolant hoses						
– Governor actuator						
– Fuel injection supply and return lines						
– Valve cover rocker assembly and pushrods						
– Cylinder head and gasket						
– Lifting Hooks						
– Oil pan and gasket						
– Pistons and connecting rods						
– Piston rings						

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
(Continued from previous page) – Clean and visually inspect Crankshaft – Torque Cylinder head – Adjust valve lash – Test run unit						
01–3AE CAMSHAFT – REPLACE						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Exhaust pipes – Coolant hose – Drain and refill Engine fluids – Remove and install – Enclosure (as needed) – Radiator – Coolant pump Drive Belt – Coolant pumps – Coolant hose – Fuel injection supply and return lines – Valve cover rocker assembly and pushrods – Cylinder head and gasket – Lifting Hooks – Crankshaft pulley – Gearcase cover and gasket – Camshaft stopper – Camshaft and Gear – Torque Cylinder head – Adjust valve lash – Test run unit	–	–	12	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
01–3AF CONNECTING ROD BEARINGS – REPLACE						
Step 0 *Includes:*	–	–	8	–	–	–
Disconnect and Connect						
– Battery cables						
– Engine wiring harness (as needed)						
– Fuel lines						
– Exhaust pipes						
– Coolant hose						
– Drain and refill Engine fluids						
– Remove and install						
– Enclosure (as needed)						
– Radiator						
– Fuel injection supply and return lines						
– Valve cover and rocker assembly						
– Cylinder head and gasket						
– Oil pan and gasket						
– Piston and connection Rod						
– Rod bearings						
– Clean and visually inspect Crankshaft						
– Torque Cylinder head						
– Adjust valve lash						
– Test run unit						

Group 02 – Cylinder Head

Contents

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
02–302 VALVE GUIDES – REPLACE						
Step 0 *Includes:*	–	–	6	–	–	–
Disconnect and Connect						
– Battery cables						
– Engine wiring harness (as needed)						
– Fuel lines						
– Exhaust pipes						
– Coolant hose						
– Drain and refill Engine fluids						
– Remove and install						
– Enclosure (as needed)						
– Exhaust manifold						
– Intake manifold						
– Coolant pump Drive Belt						
– Coolant hoses						
– Fuel injection supply and return lines						
– Valve cover rocker assembly and pushrods						
– Cylinder head and gasket						
– Remove and install from head						
– Caps						
– Spring collet, retainer, and Spring						
– Stem seal						
– Valve						
– Valve guides						
– Cylinder head						
– Torque Cylinder head						
– Adjust valve lash						
– Test run unit						
02–3AA CYLINDER HEAD GASKET – REPLACE						
Step 0 *Includes:*	–	–	4	–	–	–
Disconnect and Connect						
– Battery cables						
– Engine wiring harness (as needed)						
– Fuel lines						
– Exhaust pipes						

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
(Continued from previous page) – Coolant hose – Drain and refill Engine fluids – Exhaust manifold – Intake manifold – Coolant hoses – Valve cover rocker assembly and pushrods – Cylinder head and gasket – Clean carbon off – Cylinder head – Torque Cylinder head – Adjust valve lash – Test run unit						
02–3AB VALVES – REPLACE ALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Fuel lines – Exhaust pipes – Coolant hose – Drain and refill Engine fluids – Remove and install – Exhaust manifold – Intake manifold – Coolant hoses – Fuel injection supply and return lines – Valve cover rocker assembly and pushrods – Cylinder head and gasket – Remove and install from head – Caps – Spring collet, retainer, and Spring – Stem seal – Valve – Clean Carbon off – Cyl head – Torque Cylinder head	–	–	8	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
– Adjust valve lash – Test run unit						

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Group 03 – Rocker Levers

Contents

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
03–108 ROCKER LEVER ASSEMBLY – REMOVE AND INSTALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Fuel lines – Exhaust pipes – Coolant hose(as needed) – Remove and install – Enclosure (as needed) – Valve cover – rocker arm assembly – Adjust valve lash – Test run unit	–	–	2	–	–	–
03–603 VALVES – ADJUST,ALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Valve cover – Adjust valve lash – Test run unit	–	–	0.3	–	–	–

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Group 04 – Cam Follower/Tappets

Contents

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
04–118 VALVE TAPPETS – REMOVE AND INSTALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Fuel lines – Exhaust pipes – Coolant hose – Drain and refill Engine fluids – Remove and install – Exhaust manifold – Intake manifold – Coolant hoses – Fuel injection supply and return lines – Valve cover rocker assembly and pushrods – Cylinder head and gasket – VALVE TAPPETS – Clean carbon off – Cylinder head – Torque Cylinder head – Adjust valve lash – Test run unit	–	–	5	–	–	–

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Group 05 – Fuel System

Contents

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
05–102 PUMP,INJECTION – REMOVE AND INSTALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Fuel lines – Governor actuator (as required) – Fuel lines (as needed) – Fuel injection supply and return lines – Fuel injection pump – Test run unit	–	–	2	–	–	–
05–111 FUEL PUMP,MECHANCIAL – REMOVE AND INSTALL (FEED PUMP)						
Step 0 *Includes:* Disconnect and Connect – Fuel line – Remove and install – Fuel Feed Pump – Check Fuel line for leaks – Test run unit	–	–	0.5	–	–	–
05–1AB GOVERNOR ACTUATOR – REMOVE AND INSTALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Fuel lines – Coolant hose – Drain and refill Engine fluids – Remove and install – Actuator – Adjust – actuator linkage – test run unit	–	–	1	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
05–1AL THROTTLE LINKAGE – REMOVE AND INSTALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Fuel lines – Coolant hose – Remove and install – Throttle Control linkage – Adjust – Throttle Control linkage – Test run unit	–	–	0.5	–	–	–
05–3AC FUEL LINE – REPLACE						
Step 0 *Includes:* Remove and install – Fuel line – Check Fuel line for leaks – Test run unit	–	–	0.3	–	–	–

Group 06 – Injectors and Fuel Lines

Contents

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
06–149 INJECTORS – REMOVE AND INSTALL						
Step 0 *Includes:*	–	–	1	–	–	–
Disconnect and Connect						
– Battery cables						
– Fuel lines						
– Fuel injection supply and return lines						
– Injectors & seals						
– Test run unit						
06–303 FUEL FILTER, SPIN–ON TYPE – REPLACE						
Step 0 *Includes:*	–	–	0.3	–	–	–
Remove and install						
– Fuel Filter						
– Prime Fuel system						
– Test run unit						
06–304 WATER SEPARATOR – REPLACE						
Step 0 *Includes:*	–	–	0.3	–	–	–
Remove and install						
– Fuel Filter						
– Prime Fuel system						
– Test run unit						

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Group 07 – Lubricating Oil System

Contents

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
07–109 OIL BASE – REMOVE AND INSTALL (HORIZONTAL)						
Step 0 *Includes:* Disconnect and Connect – Battery cables – engine Wiring harness – Fuel lines – Exhaust pipes – Coolant hose – Drain and refill Engine fluids – Engine Mounting – Remove and install – Main Generator – Enclosure (as needed) – Radiator – Engine mounts – Oil pan and gasket – Test run unit	–	–	6	–	–	–
07–113 OIL PUMP – REMOVE AND INSTALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine Wiring harness – Fuel lines – Exhaust pipes – Coolant hose – Drain and refill Engine fluids – Engine Mounting – Remove and install – Main Generator – Enclosure (as needed) – Radiator – Engine mounts – Oil pan and gasket	–	–	6	–	–	–

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
(Continued from previous page) – Lube Oil pump – Test run unit						
07–115 OIL PICKUP SCREEN – REMOVE AND INSTALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine Wiring harness – Fuel lines – Exhaust pipes – Coolant hose – Drain and refill Engine fluids – Engine Mounting – Remove and install – Main Generator – Enclosure (as needed) – Radiator – Engine mounts – Oil pan and gasket – Oil pick up screen – Test run unit	–	–	6	–	–	–
07–301 OIL FILTER,FULL FLOW – REPLACE						
Step 0 *Includes:* Connect and Disconnect – Battery cables – Remove and install – Lube Oil Filter – test run unit	–	–	0.3	–	–	–
07–3AE LUBRICATING OIL DIPSTICK – REPLACE						
Step 0 *Includes:* Remove and install – Dipstick – Test run unit	–	–	0.2	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
07–801 LUBRICATING OIL AND FILTER – REPLACE						
Step 0 *Includes:* – Drain and fill Oil base – Remove and install Filter – Check for Oil leaks – Test run unit	–	–	0.6	–	–	–

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Group 08 – Cooling System

Contents

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
08–104 COOLANT THERMOSTAT – REMOVE AND INSTALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Coolant hose – Drain and refill Engine fluids – Remove and install – Thermostat cover and gasket – Thermostat – Test run unit	–	–	1	–	–	–
08–130 WATER PUMP – REMOVE AND INSTALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Drain and refill engine fluids – Wiring harness (as required) – Remove and install – Fan/Belt guards – Fan – Coolant hoses – Coolant pump Belt – Water pump – Adjust belt tension – Test run unit	–	–	1.5	–	–	–
08–142 BELT GUARD – REMOVE AND INSTALL						
Step 0 *Includes:* Remove and install – Fan/Belt guard – Test run unit	–	–	0.3	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
08–301 FAN AND ALTERNATOR BELT – REPLACE						
Step 0 *Includes:* Disconnect and connect – Battery cables – Remove & install: – Belt/Fan guards – Belt – Loosen Charging Alternator Brackets – Adjust belt tension – Test run unit	–	–	0.6	–	–	–
08–310 LOWER RADIATOR HOSE – REPLACE						
Step 0 *Includes:* – Drain and refill engine fluids – Remove and install – Fan guards – Hose clamps – Hose – Check for water leaks – Test run unit	–	–	0.8	–	–	–
08–311 UPPER RADIATOR HOSE – REPLACE						
Step 0 *Includes:* – Drain and refill engine fluids – Remove and install – Hose clamps – Hose – Check for water leaks – Test run unit	–	–	0.5	–	–	–
08–313 COOLANT HEATER – REPLACE						
Step 0 *Includes:* – Drain and refill Engine fluids – Disconnect and Connect – Batteries – Wiring harness (as required) – Remove and Install	–	–	0.5	–	–	–

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
(Continued from previous page) – Hose clamps/fittings – Heater assembly – Purge Air and Check for leaks – Test run unit						
08–315 RADIATORS – REPLACE ENTIRE ASSEMBLY						
Step 0 *Includes:* – Drain and refill Engine fluids – Disconnect and connect: – Battery cables – Wiring harness (as required) – Remove and install – Fan – Belt/Fan guards – Coolant hoses – Radiator – Test run unit	–	–	1.5	–	–	–
08–318 FAN – REPLACE ALL						
Step 0 *Includes:* Disconnect and connect: – Wiring harnesses (as required) – Battery cables – Drain and refill engine fluids(as needed) – Remove and install – Belt/Fan guards – Fan – Test run unit	–	–	1	–	–	–
08–319 RADIATOR CAP – REPLACE						
Step 0 *Includes:* Remove and install – Radiator cap – Test run unit	–	–	0.2	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
08–320 COOLANT DRAIN VALVE – REPLACE						
Step 0 *Includes:* – Drain and refill cooling system – Remove and install – Enclosure (As needed) – Drain valve – Check for leaks – Test run unit for proper operation	–	–	1	–	–	–
08–704 RADIATOR – PRESSURE TEST						
Step 0 *Includes:* – Seal openings – Pressure test – Check for leaks	–	–	1	–	–	–
08–705 SYSTEM – PRESSURE TEST						
Step 0 *Includes:* Remove and install – Radiator cap – Pressure test –30 minutes – Check for leaks	–	–	0.6	–	–	–
08–801 COOLANT AND FILTER CHANGE						
Step 0 *Includes:* Remove and install – Drain and refill cooling system – Remove and install – Visually Check Radiator cap – Check for leaks – Test run unit for proper operation	–	–	1	–	–	–

Group 10 – Intake Air System

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
10–117 AIR CLEANER ASSEMBLY – REMOVE AND INSTALL						
Step 0 *Includes:* Remove and install – Filter Assembly – Clamps and hose – Test run unit	–	–	0.5	–	–	–
10–129 INTAKE MANIFOLD – REMOVE AND INSTALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Remove and install – Intake filter/ filter hose – Intake manifold and gasket – Test run unit	–	–	0.8	–	–	–
10–301 AIR CLEANER ELEMENT – REPLACE						
Step 0 *Includes:* Remove and install – Cover and gasket – Filter element – Test run unit	–	–	0.2	–	–	–

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Group 11 – Exhaust System

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
11–105 EXHAUST MANIFOLD – REMOVE AND INSTALL						
Step 0 *Includes:*	–	–	0.8	–	–	–
Disconnect and Connect						
– Battery cables						
– Exhaust Guarding						
– Exhaust pipes						
– Remove and install						
– Exhaust manifold and gasket						
– Test run unit						
11–3AB EXHAUST PIPE/TUBE – REPLACE (Bellow)						
Step 0 *Includes:*	–	–	0.8	–	–	–
Disconnect and Connect						
– Disconnect and Connect						
– Battery cables						
– Enclosure as needed						
– Remove and install						
– Exhaust pipe						
– Test run unit						
11–3AC EXHAUST RAIN CAP – REPLACE						
Step 0 *Includes:*	–	–	0.2	–	–	–
Remove and install						
– Rain cap						
– Test run unit						
11–3AD EXHAUST ADAPTER/FLANGE – REPLACE						
Step 0 *Includes:*	–	–	0.8	–	–	–
Remove and install						
– Exhaust pipes						
– Adapter/flange						
– Clean gasket						
– Test run unit for leaks						

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Group 13 – Electrical Equuipment

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
13–104 STARTER MOTOR – REMOVE AND INSTALL						
Step 0 *Includes:* Disconnect and connect: – Battery cables – Engine wiring harness (as needed) – Remove and install – Starter – Test run unit	–	–	0.4	–	–	–
13–3AN DC ALTERNATOR – REMOVE & REPLACE						
Step 0 *Includes:* Disconnect and connect: – Battery cables – Engine wiring harness (as needed) – Remove and install – Fan/Belt guards – Drive belt – DC charge alternator – Test run unit	–	–	1	–	–	–
13–3AP BATTERY CABLE – REPLACE						
Step 0 *Includes:* Disconnect and connect: – Battery cables – Engine wiring harness (as needed) – Test run unit	–	–	0.2	–	–	–

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Group 14 – Engine Testing

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
14–704 TEST RUN GENERATOR						
Step 0 *Includes:* Disconnect/reconnect – Load bank – Fuel supply – Battery – Measure and adjust – Voltage – Frequency – Current – Check for leaks and noises	–	–	1	–	–	–

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Group 15 – Instruments and Controls

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
15–308 METER – REPLACE						
Step 0 *Includes:* Disconnect and connect: – Battery cables – Engine wiring harness (as needed) – Remove and install – Enclosure (as needed) – Control box cover – Meter – Test run unit	–	–	0.5	–	–	–

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Group 16 – Mounting Adaptations

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
16–103 FLYWHEEL – REMOVE AND INSTALL						
Step 0 *Includes:*	–	–	6	–	–	–
Disconnect and Connect						
– Battery cables						
– Fuel lines						
– Exhaust pipes						
– Coolant hose						
– Drain and refill Engine fluids						
– Remove and install						
– Starter						
– Generator Control assembly						
– Generator assembly						
– Flywheel						
– Test run unit						
16–108 FLYWHEEL HOUSING – REPLACE						
Step 0 *Includes:*	–	–	8	–	–	–
Disconnect and Connect						
– Battery cables						
– Fuel lines						
– Exhaust pipes						
– Coolant hose						
– Drain and refill Engine fluids						
– Remove and install						
– Starter						
– Generator Control assembly						
– Generator assembly						
– Flywheel Housing						
– TIR						
– Test run unit						
16–1AH SKID – REMOVE AND INSTALL						
Step 0 *Includes:*	–	–	8	–	–	–
Disconnect and Connect						
– Battery cables						

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
(Continued from previous page) – Output leads – Exhaust system – Remove and install – Radiator – Mounts – Control Panel – Lift Engine Generator assembly – Skid – Test run unit for proper operation						
16–1AI SUB–BASE FUEL TANK – REMOVE AND INSTALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Output leads – Fuel lines – Drain–Refill Fuel – Exhaust system – Remove and install – Control Panel – Enclosure (as needed) – Lift Engine Generator assembly – Sub–base tank – Test run unit for proper operation	–	–	5	–	–	–

Group 17 – Miscellaneous

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
17–131 MUFFLER – REMOVE AND INSTALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Exhaust pipes – Coolant hose – Remove and install – Enclosure (as required) – Muffler – Test run unit	–	–	1	–	–	–
17–1AB VIBRATION ISOLATORS – REMOVE AND INSTALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Exhaust pipes – Coolant hose – Remove and install – Enclosure (as needed) – Vibration isolators – Test run unit	–	–	3	–	–	–
17–1AD HOUSING ASSEMBLY – REMOVE AND INSTALL						
Step 0 *Includes:* Remove and install – Access door(s) – Roof Panel(s) – Front Panel(s) – Rear Panel(s) – Divider Panel(s) – Side Panel(s)	–	–	5	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
17–3AB ENCLOSURE DOOR/PANEL – REPLACE						
Step 0 *Includes:* Remove and install – Access door	–	–	0.5	–	–	–
17–3AC ENCLOSURE GRILL/SCREEN – REPLACE						
Step 0 *Includes:* Remove and install – Grill/screen	–	–	0.5	–	–	–
17–3AD ENCLOSURE DOOR/PANEL HANDLE/LATCH – REPLACE						
Step 0 *Includes:* Remove and install – Door handle latch	–	–	0.6	–	–	–
17–3AE ENCLOSURE DOOR/PANEL HINGE – REPLACE						
Step 0 *Includes:* Remove and install – Access door – Door hinge	–	–	0.8	–	–	–
17–3AF ENCLOSURE INSULATION – REPLACE						
Step 0 *Includes:* Remove and install – Insulation	–	–	1	–	–	–
17–3AG BATTERY – REPLACE						
Step 0 *Includes:* Remove and install – Battery	–	–	0.2	–	–	–

Group 21 – Generator Equipment

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
21–102 MAIN CIRCUIT BREAKER (AC) – REPLACE						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Remove and install – Load Cable – Control Panel cover – Circuit breaker – Test run unit	–	–	1	–	–	–
21–105 OIL PRESSURE SENDER – REPLACE						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Remove and install – Sender – Test run unit	–	–	0.5	–	–	–
21–315 COOLANT TEMPERATURE SENDER – REPLACE						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Drain and refill Engine fluids – Remove and install – Sender – Test run unit	–	–	0.8	–	–	–
21–316 COOLANT TEMPERATURE SWITCH – REPLACE						
Step 0 *Includes:* Disconnect and Connect – Battery cables	–	–	0.8	–	–	–

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
(Continued from previous page) – Engine wiring harness (as needed) – Drain and refill Engine fluids – Remove and install – Switch – Test run unit						
21–319 OIL PRESSURE SWITCH – REPLACE						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Remove and install – Switch – Test run unit	–	–	0.5	–	–	–
21–322 COOLANT LEVEL SWITCH – REPLACE						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Drain and refill Engine fluids – Remove and install – Switch – Test run unit	–	–	0.8	–	–	–
21–323 TANK LEVEL SENDER – REPLACE						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Drain and refill Engine fluids – Remove and install – Sender – Test run unit	–	–	0.8	–	–	–

Group 25 – Generator

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
25–1AA MAIN ROTOR – REMOVE AND INSTALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables, Engine wiring harness (as needed) – Remove and install – Enclosure (as needed) – Generator mounts – End bell / bearing carrier – main rotor assembly – test run unit	–	–	6	–	–	–
25–1AB MAIN STATOR – REMOVE AND INSTALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables, Engine wiring harness (as needed) – Remove and install – Enclosure (as needed) – Generator mounts – End bell / bearing carrier – Main stator – Test run unit	–	–	6	–	–	–
25–1AE EXCITER ROTOR – REMOVE AND INSTALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables, Engine wiring harness (as needed) – Remove and install – Enclosure (as needed) – Removal of NDE (NON DRIVE END BEARING CARRIER) bracket – Exciter Rotor – Test run unit	–	–	3	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
25–1AF EXCITER STATOR – REMOVE AND INSTALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables, Engine wiring harness (as needed) – Remove and install – Enclosure (as needed) – Removal of NDE bracket – Exciter Stator – Test run unit	–	–	3	–	–	–
25–3AC BEARING – REPLACE						
Step 0 *Includes:* Disconnect and Connect – Battery cables, Engine wiring harness (as needed) – Remove and install – Enclosure (as needed) – NDE (NON DRIVE END BEARING) bracket – Bearing – Test run unit	–	–	2	–	–	–
25–3AD ROTATING DIODE – REPLACE						
Step 0 *Includes:* Disconnect and Connect – Battery cables, Engine wiring harness (as needed) – Remove and install – Enclosure (as needed) – Surge Suppressor (MOV) – De–soldering the exciter rotor leads – Rotating Diode – Test run unit	–	–	1	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
25–3AE OUTPUT LEAD TERMINAL BLOCK – REPLACE						
Step 0 *Includes:* Disconnect and Connect – Battery cables, Engine wiring harness (as needed) – Output Lead Terminal block – Test run unit	–	–	0.5	–	–	–
25–3AF NDE (NON DRIVE END BEARING CARRIER) BRACKET – REPLACE						
Step 0 *Includes:* Disconnect and Connect – Battery cables, Engine wiring harness (as needed) – Remove and install – Enclosure (as needed) – Removal Output Lead Terminal block – Exciter stator – NDE (NON Drive end bearing carrier) Bracket – Test run unit	–	–	2.5	–	–	–
25–3AG REPLACEMENT ALTERNATOR ON GENERATOR SET						
Step 0 *Includes:* Disconnect and Connect – Battery cables, Engine wiring harness (as needed) – Remove and install – Enclosure (as needed) – Generator mounts – Disconnect coupling disc and Drive end adaptor bolts – Remove & install Generator – Test run unit	–	–	2.5	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
25–3AH REPLACEMENT OF COUPLING DISC						
Step 0 *Includes:* Disconnect and Connect – Battery cables, Engine wiring harness (as needed) – Remove and install – Enclosure (as needed) – Output Lead Terminal block – Generator – Coupling disc – Test run unit	–	–	0.5	–	–	–
25–3AJ GENERATOR COOLING FAN						
Step 0 *Includes:* Disconnect and Connect – Battery cables, Engine wiring harness (as needed) – Remove and install – Enclosure (as needed) – Generator – Coupling disc – Cooling Fan – Test run unit	–	–	0.5	–	–	–
25–5AR GENERATOR WINDING SPACE HEATER						
Step 0 *Includes:* Disconnect and Connect – Battery cables, Engine wiring harness (as needed) – Removal of NDE (NON Drive end bearing carrier) screen – Space heater – Test run unit	–	–	0.5	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
25–601 AC OUTPUT LEAD RECONFIGURE/RECONNECT						
Step 0 *Includes:* Disconnect and Connect – Battery cables, Engine wiring harness (as needed) – Reconfigure / Reconnect AC Output leads – Test run unit	–	–	0.5	–	–	–

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Group 26 – Generator Control Components

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
26–1AB DC WIRE HARNESS – REMOVE AND INSTALL						
Step 0 *Includes:*	–	–	1	–	–	–
Disconnect and Connect						
– Battery cables						
– Engine wiring harness (as needed)						
– Remove and install						
– Electrical wiring						
– Test run unit						
26–1AC AC CONTROL BOX – REMOVE AND INSTALL						
Step 0 *Includes:*	–	–	2	–	–	–
Disconnect and Connect						
– Battery cables						
– Engine wiring harness (as needed)						
– Remove and install						
– Control box cover						
– Control box						
– Ground strap						
– Transfer Control parts to new box						
– Test run unit						
26–1AD AC WIRE HARNESS – REMOVE AND INSTALL						
Step 0 *Includes:*	–	–	1.5	–	–	–
Remove and install						
– Enclosure (as required)						
– Disconnect and Connect						
– wiring harness (as required)						
– Battery leads						
– AC leads to Circuit breaker						
– AC leads to PCB Control						
– Test run Genset						
26–3AB PCB CONTROL BOARD – REPLACE						
Step 0 *Includes:*	–	–	1.5	–	–	–
Disconnect and Connect						
– Battery cables						
– Engine wiring harness (as needed)						

(continued on next page)

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
(Continued from previous page) – Remove and install – Enclosure (as needed) – PCB Control – Program Control – Test run unit						
26–3AD BRIDGE RECTIFIER – REPLACE (Battery Charger)						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Control box cover – Battery Charger – Test run unit	–	–	0.3	–	–	–
26–3AF STOP SOLENOID – REPLACE						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Remove and install – Enclosure (as needed) – Start/stop solenoid – Adjust solenoid linkage – Test unit for proper operation	–	–	0.5	–	–	–
26–3AI FUSE HOLDER – REPLACE						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Remove and install – Control box cover – Fuse holder – test run unit	–	–	0.3	–	–	–

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
26–3AL RELAY – REPLACE						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Remove and install – Control box cover – Relay – Test run unit	–	–	0.3	–	–	–
26–3AN FUSE – REPLACE						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Remove and install – Control box cover – Fuse – Test run unit	–	–	0.2	–	–	–
26–3AT CURRENT TRANSFORMER – REPLACE						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Output leads – Engine wiring harness (as needed) – Remove and install – Current transformer – Calibration of Control – Test run unit for proper operation	–	–	1	–	–	–
26–3AV TERMINAL BLOCK – REPLACE						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Remove and install – Terminal block	–	–	0.5	–	–	–

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Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
(Continued from previous page) – Calibration of Control – Test run unit for proper operation						
26–4AH MAG PICKUP SENSOR – REMOVE AND INSTALL						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Remove and install – MPU – Adjust MPU – Test unit for proper operation	–	–	0.5	–	–	–
26–666 DISPLAY PANEL – REMOVE AND REPLACE						
Step 0 *Includes:* Disconnect and Connect – Battery cables – Engine wiring harness (as needed) – Remove and install – Control panel – Display – Test run unit for proper operation	–	–	0.6	–	–	–
26–669 SOFTWARE – CALIBRATE						
Step 0 *Includes:* – Connect service tool – Create capture file – Download software	–	–	0.5	–	–	–

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V

W

Request for SRT Review

Distributor/Dealer Data		
Distributor/Dealer		Phone No.
Address		
City	State	Zip Code
Country		

My experience has indicated the following repair procedures require more time:

Procedure Data

SRT Number	Procedure Discription	Published time Hrs.	Suggested time Hrs.
		Total Hours	

Generator Set Model
Transfer Switch Model
Repair Date
Technician Name

Describe how repair was performed:

Signature _____ **Title** _____

Mail to: **Cummins Power Generation**
Service Department
1400 73rd Avenue NE
Minneapolis, MN 55432

Cummins Power Generation
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Minneapolis, MN 55432 USA

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