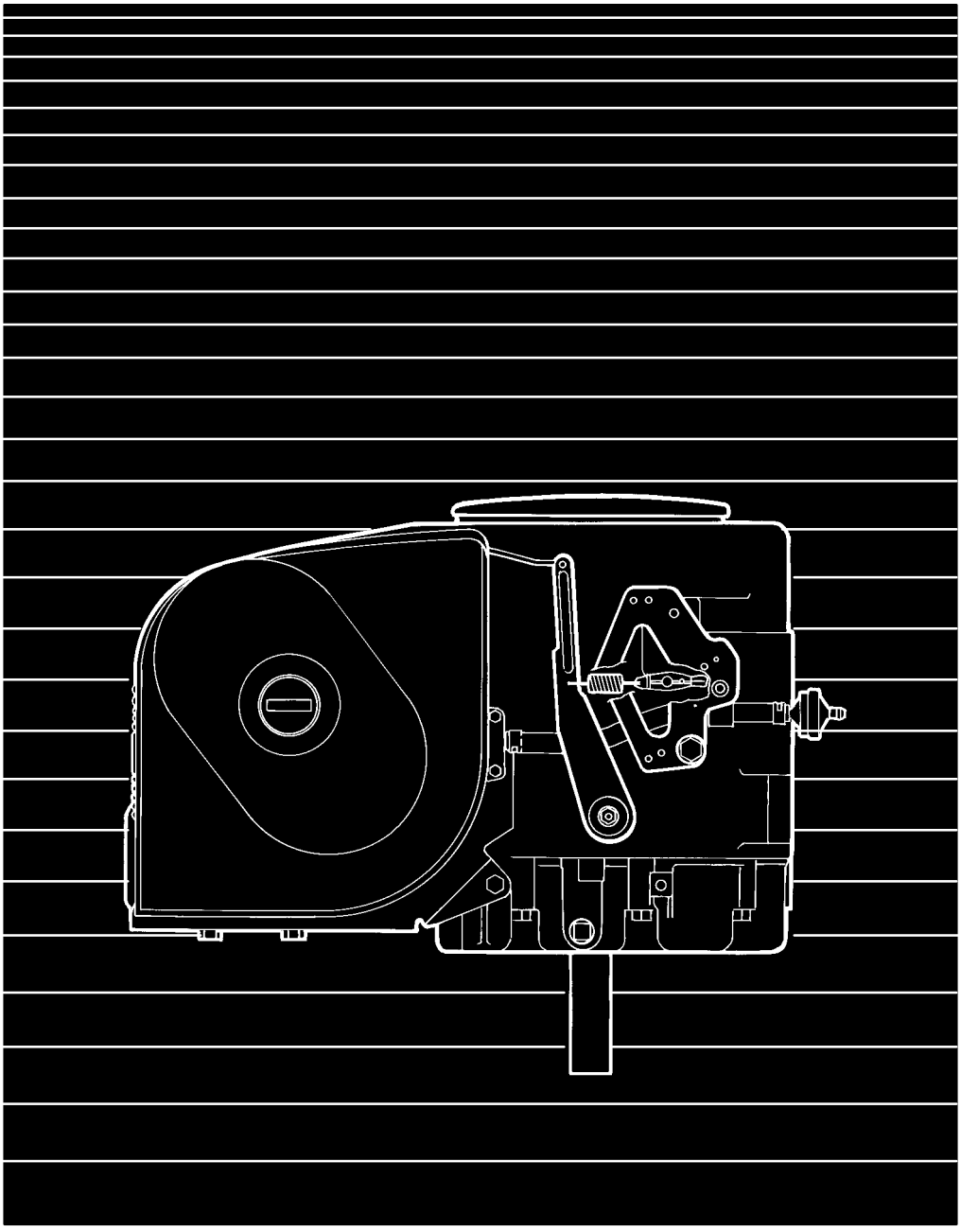
Onan

Engine

Standard Repair Times

E124V, E125, E140

Elite Series – Horizontal and Vertical



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Cummins Power Generation

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Foreword

The Standard Repair Times (SRT) 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 (SRT) 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 SRT that a particular mechanic performs more frequently will often require less time than the standard. Conversely, those SRT 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 SRT. Most often at least one of each type is necessary to accurately depict the repair. The three types are:

- Administrative
- Troubleshooting
- Repair

Administrative SRT

Administrative SRT 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 SRT used, etc. It is intended that an administrative SRT be used only once for each repair order. There are two administrative SRT found in this manual in Group 00 – Complete Engine. One of the administrative SRT 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 SRT

Troubleshooting SRT are found only in Group 00 – Complete Engine. These SRT are intended to be used when diagnosing and analyzing engine, generator set or component failures. Troubleshooting SRT 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 SRT contain time to remove and install components to perform the check(s) listed. Most do not. 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:	0.4
	– 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	
–02	– Perform checks in Step 01	1.0
	– Check:	
	– Oil temperature	
	– Air compressor oil consumption	
	– Turbocharger seal	
	– Crankcase blowby	

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 SRT

Repair SRT make up the majority of this manual. These are the SRT 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 (SRCT) provide for the combining of the three types of SRT under one code so that, if appropriate, the user can identify the work performed with fewer SRT codes.

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

Group Numbers

Group numbers (the first two digits in the SRT code) are used to identify major engine components. The sample list below explains the group numbers used in SRT charts.

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 letters within the category.

Group Number	Contents of Group	Specific Repair Number	Description of Category
00	Complete Engine or Genset		
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
09	Drive Units		Sleeve
10	Intake Air System		Modify/Cut/Lap
11	Exhaust System	6XX	Adjust/Calibrate
12	Air (Compressed) System		
13	Electrical Equipment	7XX	Test
14	Engine or Generator Set Testing		
15	Instruments and Controls		
16	Mounting Adaptations		

Group Number	Contents of Group	Specific Repair Number	Description of Category
17	Miscellaneous	9XX	(SRCT in Group 99) General/Miscellaneous
22	Hardware		
25	Generator Components		
26	Generator Control Components		
27	Transfer Switches		
99	SRCT		

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 a SRT.

Manual Organization

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.

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.

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

A 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 SRT with sufficient flexibility to account for differences in complaints, failures, progressive damage, customer desires, etc., SRT 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 the 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 SRT be applicable to repairs conducted for any customer.

As SRT's 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 Standard Repair Times are Developed

SRT's 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 a 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. A “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 (SRCT)

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

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

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

It is intended that other appropriate SRT can be used to supplement a SRCT as long as the work does not overlap. If there is overlapping work, do **not** use a 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 a 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 a 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 SRT 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 SRT 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 SRT 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 SRT 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 SRT 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 SRT, including supplemental SRT, 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 Page

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 (In Shop) *Includes:* – Clock on and off the job – Move equipment to and from work area – Clean work area and write repair order at the end of each shift and when job has been completed – Record the following: – Engine model number – Engine serial number – Customer name and address – Original date of purchase – Hours of operation	0.4	-	-	-	-	-
00–203 Engine – Rebuild (Gas Engine) *Includes:* – Drain crankcase oil – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring – Remove and Install – Housings – Muffler – Air cleaner assembly – Carburetor – Air deflector – Ignition module – Flywheel and stator – Oil filter – Starter – Intake manifold – Exhaust manifold *(continued on next page)*	-	-	7.5	-	-	-

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
00–203 Engine – Rebuild (Gas Engine) – Spark plug – Valve cover – Cylinder head – Oil base – Balance shaft assembly – Connecting rod and piston – Crankshaft – Camshaft – Tappets – Bearings – Oil seals – Oil pump – Hone or bore cylinder – Test run engine	-	-	7.5	-	-	-
00–101 Engine – Remove and Install *Includes:* – Disconnect and connect – Battery cables – Wiring harness – Fuel lines – Exhaust system – Remove and Install – Engine from mounting location – Test run for proper operation	-	-	2.0	-	-	-
00–037 Troubleshoot – Engine Starts but will not Stay Running						
–01 – Check – Fuel supply – Fuel pumps – Fuel lines – Voltage at ignition coil	-	-	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
00–037 Troubleshoot – Engine Starts but will not Stay Running						
– Carburetor choke						
– Carburetor						
00–044 Troubleshoot – Engine Will Not Crank Or Cranks Slowly						
–01 – Check	-	-	0.7	-	-	-
– Battery						
– Voltage at the starter						
– Engine seizure						
– Loads						
– Starter						
00–021 Troubleshoot – Engine Cranks But Will Not Start						
Includes:						
–01 – Check	-	-	0.3	-	-	-
– Fuel supply						
– Spark plugs						
–02 – Perform ckecks in Step 01	-	-	0.5	-	-	-
– Check						
– Battery						
– Ignition coil						
– Ignition module						
–03 – Perform checks in Step 01 and 02	-	-	0.9	-	-	-
– Check						
– Fuel filter						
– Fuel pump						
– Carburetor						
– Perform engine leak down test						
00–024 Troubleshoot – Engine Difficult To Start						
Includes:						
–01 – Check	-	-	0.3	-	-	-

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
00–024 Troubleshoot – Engine Difficult To Start *(continued on next page)* – Fuel supply – Carburetor choke – Spark plugs						
–02 – Perform checks in Step 01	-	-	0.9	-	-	-
– Check – Air cleaner element – Fuel filter – Intake manifold gaskets – Fuel pump – Carburetor – Ignition coil – Ignition module						
– Perform engine leak down test						
00–026 Troubleshoot – Engine Idles Rough *Includes:*						
–01 – Check	-	-	0.3	-	-	-
– Fuel supply – Spark plugs						
–02 – Perform checks in Step 01	-	-	0.5	-	-	-
– Check – Carburetor choke – Spark plug wires – Ignition coil						
00–027 Troubleshoot – Engine Noise Excessive *Includes:*						
–01 – Check	-	-	0.3	-	-	-
– Exhaust system – Engine mounting						
–02 – Perform checks in Step 01	-	-	0.7	-	-	-

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 *(continued on next page)* – Check – Valve lash – Starter to ring gear clearance						
00–028 Troubleshoot – Engine Overspeeds *Includes:*						
–01 – Check – Governor adjustment – Throttle cable	-	-	0.3	-	-	-
00–031 Troubleshoot – Engine Power Output Low *Includes:*						
–01 – Check – Governor – Throttle cable – Carburetor choke – Fuel filter – Air cleaner element – Fuel pump – Carburetor	-	-	0.5	-	-	-
–02 – Perform checks in Step 01 – Check – Intake manifold gaskets – Perform engine leak down test	-	-	0.9	-	-	-
00–033 Troubleshoot – Engine Runs Rough or Misfires *Includes:*						
–01 – Check – Spark plugs – Fuel supply	-	-	0.3	-	-	-
–02 – Perform checks in Step 01 – Check	-	-	0.6	-	-	-

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
00–033 Troubleshoot – Engine Runs Rough or Misfires *(continued on next page)* – Fuel filter – Fuel pump – Carburetor choke – Carburetor – Spark plug wires – Ignition coil – Engine electrical ground						
00–040 Troubleshoot – Engine Surges *Includes:*						
–01 – Check – Fuel supply – Fuel filter – Fuel pump – Plugged idle jet – Governor adjustment	-	-	0.7	-	-	-
–02 – Perform checks in Step 01 – Check – Intake manifold gaskets	-	-	0.9	-	-	-
00–045 Troubleshoot – Engine Will Not Shut Off *Includes:*						
–01 – Check – Ignition switch – Voltage at the ignition coil	-	-	0.3	-	-	-
00–042 Troubleshoot – Vibration Excessive *Includes:*						
–01 – Check – Pulleys – Belts – Couplings	-	-	0.7	-	-	-

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
00–042 Troubleshoot – Vibration Excessive – Drive shafts *(continued on next page)* – Engine mounting – Flywheel						

Group 01 – Cylinder Block

Contents Page

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
01–3AD Balancing Shafts – Replace *Includes:* – Disconnect and connect – Choke cable – Governor linkage – Electrical wiring – Remove and install – Housings – Flywheel and stator – Starter – Intake manifold – Exhaust manifold – Cylinder head – Oil base – Balance shaft assembly – Test run engine	-	-	2.0	-	-	-
01–311 Block, Short – Replace *Includes:* – Disconnect and connect – Choke cable – Governor linkage – Electrical wiring – Drain oil and remove filter – Remove and Install – External accessories – Housings – Connecting lines – Exhaust system – Intake manifold – Starter – Flywheel and stator – Cylinder head *(continued on next page)*	-	-	3.5	-	-	-

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
01–311 Block, Short – Replace – Gearcase cover – Oil base – Oil pump – Oil filter and adapter – Install – Short block assy – New gaskets – Torque to proper spec – Fill oil pan with oil – Test run unit	-	-	3.5	-	-	-
01–3AE Camshaft – Replace *Includes:* – Disconnect and connect – Choke cable – Governor linkage – Electrical wiring – Remove and install – Housings – Flywheel and stator – Cylinder head – Oil base – Gearcase cover – Gearcase cover gasket – Camshaft – Valve assembly – Torque cylinder head – Test run unit	-	-	2.5	-	-	-
01–1AA Connecting Rod – Remove and Install *Includes:* – Disconnect and Connect – Choke cable *(continued on next page)*	-	-	2.0	-	-	-

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 – Governor linkage – Electrical wiring – Remove and Install – Housings – Flywheel and stator – Intake manifold – Exhaust system – Cylinder head – Oil base – Gearcase cover – Connecting rod and piston – Clean and visually inspect – Crankshaft – Test run unit – Crankshaft gear – Bearings – Oil seals – Test run engine	-	-	2.0	-	-	-
01–304 Crankshaft Seal, Front – Replace *Includes:* – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring – Remove and Install – Housings – Flywheel and stator – Gearcase cover – Oil seal – Test run engine	-	-	1.4	-	-	-

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
01–541 Cylinder Block – Hone or Bore *Includes:* – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring – Remove and Install – Housings – Flywheel and stator – Intake manifold – Exhaust manifold – Cylinder head – Oil filter and adapter – Oil base – Gearcase cover – Piston and piston rings – Connecting rod – Crankshaft – Camshaft – Valve assembly – Tappets – Bearings – Oil seals – Oil pump – Hone or bore cylinder – Install – New piston and rings – New connecting rod – New bearings – Adjust valve lash – Test run unit	-	-	7.5	-	-	-

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
01–107 Gear, Camshaft – Remove and Install *Includes:* – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring – Remove and Install – Housings – Flywheel and stator – Cylinder head – Oil base – Gearcase cover – Gearcase cover gasket – Camshaft – Valve assembly – Replace head gasket – Torque cylinder head – Test run unit	-	-	2.0	-	-	-
01–308 Crankshaft Seal, Rear – Replace (Horizontal) *Includes:* – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring – Remove and Install – Bearing plate – Oil seal – Test run engine	-	-	1.0	-	-	-
01–3AA Crankshaft Seal, Rear – Replace (Vert) *Includes:* – Disconnect and Connect – Choke cable *(continued on next page)*	-	-	2.4	-	-	-

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
01–3AA Crankshaft Seal, Rear – Replace (Vert) – Governor linkage – Electrical wiring – Remove and Install – Oil base and o–rings – Oil base assembly – Oil seal – Test run unit	-	-	2.4	-	-	-
01–112 Crankshaft – Remove and Install *Includes:* – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring – Remove and Install – Housings – Flywheel and stator – Starter – Intake manifold – Exhaust manifold – Cylinder head – Oil base – Gearcase cover – Piston – Connecting rod – Crankshaft – Crankshaft gear – Bearings – Oil seals – Test run engine	-	-	3.5	-	-	-

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 *Includes:* – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring – Remove and Install – Housings – Flywheel and stator – Gearcase cover – Crankshaft gear – Test run engine	-	-	2.4	-	-	-
01–3AB Gear Cover Gasket – Replace *Includes:* – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring – Remove and Install – Housings – Flywheel and stator – Gearcase cover – Test run unit	-	-	0.9	-	-	-
01–121 Gear Cover – Remove and Install *Includes:* – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring – Remove and Install – Housings – Flywheel and stator *(continued on next page)*	-	-	0.9	-	-	-

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
01–121 Gear Cover – Remove and Install – Gearcase cover – Test run engine	-	-	0.9	-	-	-
01–1AB Governor, Mechanical – Remove and Install *Includes:* – Disconnect and Connect – Mechanical linkage – Remove and Iinstall – Governor – Test run engine	-	-	0.7	-	-	-
01–3AC Piston Rings – Replace *Includes:* – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring – Remove and Install – Housings – Flywheel and stator – Intake manifold – Exhaust manifold – Cylinder head – Oil base – Gearcase cover – Valve assembly – Camshaft – Connecting rod and piston – Crankshaft – Hone or bore cylinder – Adjust valve lash – Test run unit	-	-	3.5	-	-	-

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
01–140 Piston – Remove and Install *Includes:* – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring – Remove and Install – Housings – Flywheel and stator – Intake manifold – Exhaust manifold – Cylinder head – Oil base – Gearcase cover – Piston – Connecting rod – Crankshaft – Crankshaft gear – Bearings – Oil seals – Hone or bore cylinder – Adjust valve lash – Test run unit	-	-	3.5	-	-	-

Group 02 – Cylinder Head

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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
02–3AA Cylinder Head Gasket – Replace *Includes:* – Remove and Install – Housings – Cylinder head – Scrap carbon from – Cylinder head – Top of piston – Around valves and ports – Torque to proper spec – Test run unit	-	-	1.0	-	-	-
02–104 Cylinder Head – Remove And Install *Includes:* – Remove and Install – Housings – Cylinder head – Scraping carbon from – Cylinder head – Top of piston – Around valves and ports – Replace head gasket – Torque cylinder head – Test run unit	-	-	1.0	-	-	-
02–302 Valve Guides – Replace *Includes:* – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring – Remove and Install – Housings – Flywheel and stator *(continued on next page)*	-	-	1.5	-	-	-

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 – Intake manifold – Cylinder head – Gearcase cover – Valve assembly – Adjust valve lash – Test run unit	-	-	1.5	-	-	-
02–513 Valves – Grind *Includes:* – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring – Remove and Install – Housings – Flywheel and stator – Intake manifold – Cylinder head – Gearcase cover – Valve assembly – Refinish valve seats – Grind valves – Clean and visually inspect springs – Adjust valve lash – Test run unit	-	-	2.0	-	-	-

Group 03 – Rocker Levers

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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
03–801 Breather Valve – Service *Includes:* – Remove and Install – Rocker cover – Clean and visually inspect – Breather valve	-	-	0.3	-	-	-
03–603 Valves – Adjust, All *Includes:* – Remove and Install – Rocker cover – Adjust valve lash – Test run unit	-	-	0.5	-	-	-

Group 04 – Cam Follower

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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 *Includes:* – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring – Remove and Install – Housings – Intake manifold – Rocker cover – Oil base – Gearcase cover – Valve assembly – Adjust valve lash – Test run unit	-	-	1.5	-	-	-

Group 05 – Fuel 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
05–6AA Carburetor – Adjust *Includes:* – Adjust – Throttle stop – Main jet – Idle jet – (1995 C.A.R.B. engines have tamper proof carburetor) – Test run unit	-	-	0.3	-	-	-
05–214 Carburetor – Rebuild *Includes:* – Remove and Install – Air cleaner assembly – Intake manifold – Carburetor – Clean and visually inspect – Carburetor – Install replacement parts as needed – Adjust – Throttle stop – Main jet – Idle jet – (1995 C.A.R.B. engines have tamper proof carburetor) – Test run unit	-	-	1.0	-	-	-
05–118 Carburetor – Remove and Install *Includes:* – Remove and Install – Air cleaner assembly – Intake manifold – Carburetor – Adjust – Throttle stop	-	-	0.5	-	-	-

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
05–118 Carburetor – Remove and Install *(continued on next page)* – Main jet – Idle jet – (1995 C.A.R.B. engines have tamper proof carburetor) – Test run unit	-	-	0.5	-	-	-
05–3AA Choke, Carburetor – Replace *Includes:* – Remove and Install – Choke assembly – Adjust choke – Test run unit	-	-	0.5	-	-	-
05–1AD Electronic Control Unit (ECU) – Remove and Install *Includes:* – Disconnect and Connect – Vacuum line – Wiring Harness – Remove and Install – Air cleaner cover – Test run unit	-	-	0.5	-	-	-
05–6AE Duty Solenoid – Remove and Install *Includes:* – Disconnect and Connect – Wiring harness – Remove and Install – Carburetor – Test run engine	-	-	0.8	-	-	-

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
05–6AF Oxygen Sensor – Remove and Install *Includes:* – Disconnect and Connect – Wiring harness – Test run engine	-	-	0.1	-	-	-
05–1AG Pressure Regulator–Remove and Install *Includes:* – Disconnect and Connect – Fuel lines and clamps – Remove and Install – Speed Control Assembly – Re-adjust governor speed – Test run engine	-	-	0.3	-	-	-
05–1AH Fuel Cutoff Solenoid–Remove and Install *Includes:* – Disconnect and Connect – Wiring harness – Test run engine	-	-	0.2	-	-	-
05–6AB Governor, Mechanical-Adjust *Includes:* – Adjust – Governor lever – Idle speed – Choke – Speed control cable – Test run engine	-	-	0.2	-	-	-

Group 07 – Lubricating Oil 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
07–801 Lubricating Oil And Filter – Change *Includes:* – Drain and fill oil base – Remove and install filter – Fill filter and engine with oil – Check for oil leaks – Test run unit	-	-	0.4	-	-	-
07–3AA Oil Base Gasket – Replace (Horizontal) *Includes:* – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring – Remove and Install – Housings – Oil base – Check for oil leaks – Test run unit	-	-	0.5	-	-	-
07–3AB Oil Base Gasket – Replace (Vert) *Includes:* – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring – Remove and Install – Oil base cover and o–rings – Oil pick–up cup (Spec A) – Oil base assembly – Oil base gasket – Test run unit	-	-	1.0	-	-	-

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) *Includes:* – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring – Remove and Install – Housings – Oil base gasket – Test run unit	-	-	0.5	-	-	-
07–1AA Oil Base – Remove and Install (Vert) *Includes:* – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring – Remove and Install – Oil base and o–rings – Oil pick–up and cup (Spec A) – Oil base assembly – By–pass retaining ring – By–pass spring – By–pass ball bearing – Oil seal – Crankshaft bearing – Oil base gasket – Test run unit	-	-	1.0	-	-	-
07–410 Oil By–Pass – Inspect and Reuse (Horizontal) *Includes:* – Disconnect and Connect – Electrical wiring – Remove and Install	-	-	0.4	-	-	-

(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
07–410 Oil By–Pass – Inspect and Reuse (Horizontal) – Oil by–pass bolt – Washer – By–pass spring – By–pass ball bearing – Clean and visually inspect – Bore – Ball – Spring – Test run unit	-	-	0.4	-	-	-
07–4AA Oil By–Pass – Inspect and Reuse (Vert) *Includes:* – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring – Remove and Install – Oil base cover and o–ring – Retaining spring – By–pass spring – By–pass ball bearing – Clean and visually inspect – Test run unit	-	-	1.0	-	-	-
07–301 Oil Filter, Full Flow – Replace *Includes:* – Remove and Install – Oil fiilter – Rubber filter gasket – Fill oil pan – Check for oil leaks – 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
07–114 Oil Pickup Cup and Tube – Remove and Install (Hor) Spec A *Includes:* – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring – Remove and Install – Housings – Flywheel and stator – Oil base – Gearcase cover – Oil pump and pickup – Test run unit	-	-	1.0	-	-	-
07–1AB Oil Pickup Cup And Tube – Remove and Install (Vert) Spec A *Includes:* – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring – Remove and Install – Housings – Oil base cover and o–rings – Oil pick–up cup (Spec A) – Oil base – Oil pick–up tube, spring and o–ring – Oil base gasket – Test run unit	-	-	1.0	-	-	-
07–113 Oil Pump – Remove and Install *Includes:* – Disconnect and Connect – Choke cable	-	-	0.7	-	-	-

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
						Special
Procedure Number and Description	R	A	B	C	D	S
07–113 Oil Pump – Remove and Install *(continued on next page)* – Governor linkage – Electrical wiring – Remove and Install – Housings – Flywheel and stator – Oil base – Gearcase cover – Oil pump – Test run unit	-	-	0.7	-	-	-

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
10–301 Air Cleaner Element – Replace *Includes:* – Remove and Install – Outer air cleaner cover – Inner air cleaner cover – Air element – Air element wrapper – Install new element – Clean and visually inspect – Wrapper – Apply fresh oil to wrapper – Test run unit	-	-	0.2	-	-	-
10–801 Air Cleaner Element – Service *Includes:* – Remove and Install – Outer air cleaner cover – Inner air cleaner cover – Air filter wrapper – Clean and visually inspect – Wrapper – Paper element – Apply fresh oil to wrapper – Test run unit	-	-	0.2	-	-	-
10–3AA Intake Manifold Gasket – Replace *Includes:* – Disconnect and Connect – Electrical wiring – Remove and Install – Air cleaner assembly – Intake manifold – 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
10–129 Intake Manifold – Remove and Install *Includes:* – Disconnect and Connect – Electrical wiring – Remove and Install – Intake manifold – Carburetor – Gaskets – Test run unit	-	-	0.5	-	-	-

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 *Includes:* – Remove and Install – Exhaust manifold – Muffler and pipes – Gaskets – Check for exhaust leaks – Test run unit	-	-	0.2	-	-	-
11–304 Exhaust Manifold Gaskets – Replace *Includes:* – Remove and Install – Exhaust manifold – Muffler and pipes – Gaskets – Check for exhaust leaks – Test run unit	-	-	0.2	-	-	-

Group 13 – Electrical Equipment

Contents

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
13–116 Ignition Coil – Remove and Install *Includes:* – Disconnect and Connect – Electrical wiring – Remove and Install – Ignition coil – Test run unit	-	-	0.7	-	-	-
13–119 Spark Plug Wires – Remove and Install *Includes:* – Remove and Install – Spark pulg wire – Test run unit	-	-	0.2	-	-	-
13–109 Spark Plug – Remove and Install *Includes:* – Disconnect and Connect – Spark plug wire – Test run unit	-	-	0.2	-	-	-
13–104 Starter Motor – Remove and Install *Includes:* – Disconnect and Connect – Electrical wiring – Remove and Install – Housings – Starter motor – Test run unit	-	-	0.5	-	-	-
13–1AA Stator, Battery Charging – Remove and Install *Includes:* – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring	-	-	0.8	-	-	-

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
13–1AA Stator, Battery Charging – Remove and Install *(continued on next page)* – Remove and Install – Housings – Flywheel and stator – Test run unit	-	-	0.8	-	-	-
13–3AA Voltage Regulator DC – Replace *Includes:* – Disconnect and Connect – Electrical wiring – Remove and Install – Voltage regulator – Test run unit	-	-	0.2	-	-	-

Group 15 – Instruments and Controls

Contents

Standard Repair Times	Removed From Chassis	In-Chassis Service Accessibility Codes				
Procedure Number and Description	R	A	B	C	D	Special S
15–1AA Control, Engine – Remove and Install *Includes:* – Disconnect and Connect – Choke cable – Governor linkage – Electrical wiring – Remove and Install – Complete control – Test run unit	-	-	0.6	-	-	-
15–303 Switch, Stop – Replace *Includes:* – Disconnect and Connect – Electrical wiring – Ignition switch – Test run unit	-	-	0.2	-	-	-

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 *Includes:* – Remove and Install – Housings – Flywheel – Ring gear – Test run unit	-	-	0.5	-	-	-
16–301 Flywheel Ring Gear – Replace *Includes:* – Remove and Install – Housings – Flywheel – Ring gear – Test run unit	-	-	0.8	-	-	-

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 *Includes:* – Remove and Install – Exhaust manifold – Muffler and pipes – Gaskets – Check for exhaust leaks – Test run unit	-	-	0.2	-	-	-
17–1AJ Muffler (Floorcare Engine) – Remove and Install *Includes:* – Remove and Install – Exhaust manifold – Brackets – Oxygen sensor – Muffler and pipes – Gaskets – Check for exhaust leaks – Test run unit	-	-	0.5	-	-	-

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: Onan Corporation
Service Department
1400 73rd Avenue NE
Minneapolis, MN 55432

Onan

Cummins Power Generation
1400 73rd Avenue N.E.
Minneapolis, MN 55432
763-574-5000
Fax: 763-574-8087

Power Generation