

Group 12 Exhaust System

GENERAL: This group contains information on the automotive engine exhaust system from the engine exhaust manifold to the tailpipe.

SPECIFICS: As applicable

...Exhaust Muffler

...Exhaust Pipes

...Exhaust Shields

...Tailpipe



FMC Corporation
Recreational Vehicle Division
333 Brokaw Road Box 664 Santa Clara, California 95052

GROUP 12

EXHAUST SYSTEM

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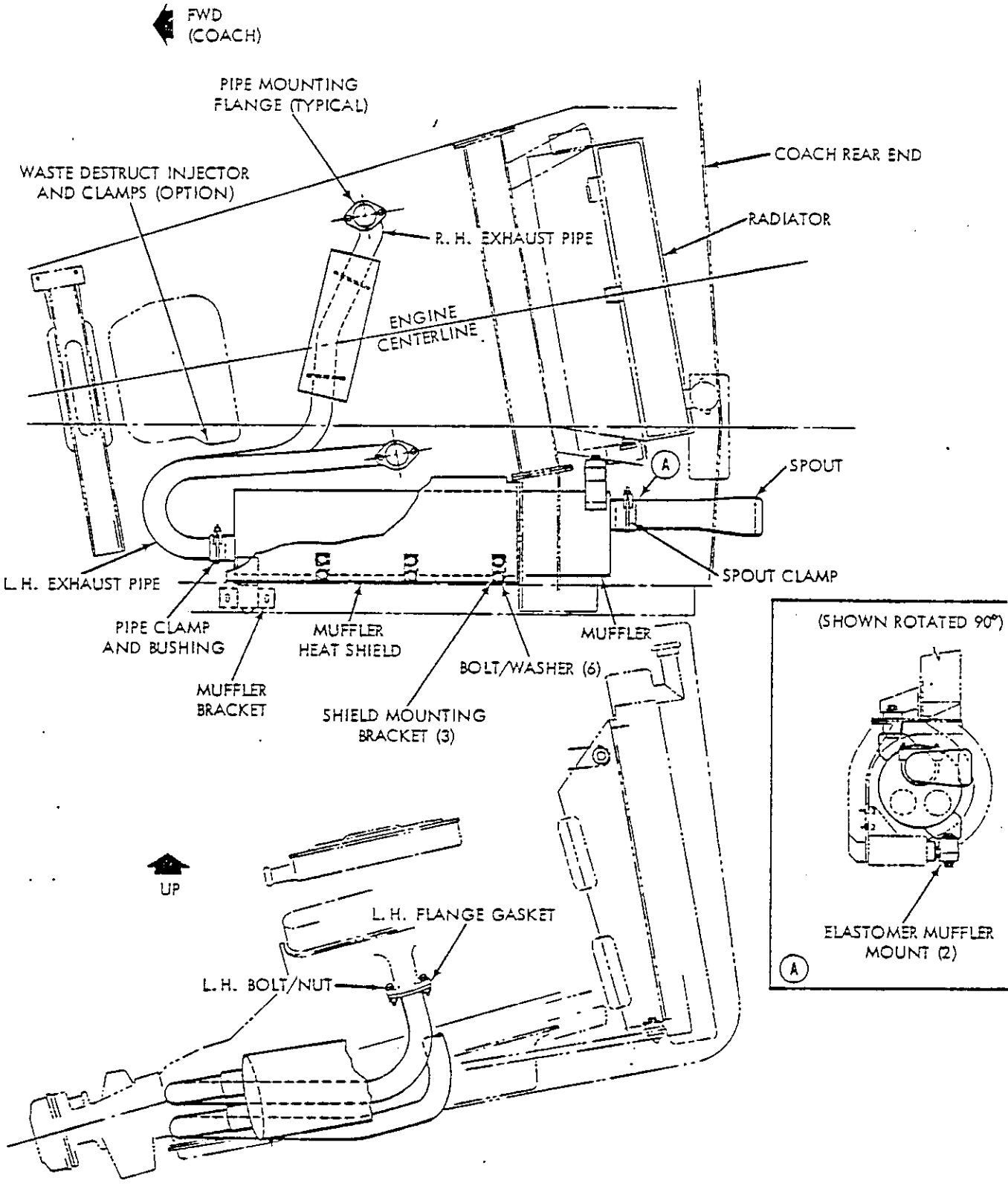


Figure 12-1. Exhaust system

SD-159

GROUP 12

EXHAUST SYSTEM

12-1. DESCRIPTION

a. General (fig. 12-1). The engine exhaust system consists of two exhaust pipes (left and right-hand) that conduct exhaust gasses from the left-hand and right hand engine exhaust manifolds to the muffler for emission through a rear-mounted spout (tail pipe). The system is suspended by brackets and elastomer mounts. A Waste-Destruct System injector is installed as an option on some coaches in the right hand exhaust pipe just forward of the muffler; refer to Group 35 for servicing the waste-destruct components.

Warning

Carbon monoxide produced in engine operation is poisonous. Leaks in the engine exhaust system should be repaired as soon as possible. Do not operate the coach in enclosed places without adequate ventilation.

This group provides service instructions for the exhaust system and its components. For service information on related systems such as the engine assembly; refer to Group 15, or to the applicable group referenced. For information on part numbers and procurement of replacement parts, refer to Group 12 in the 2900R Parts Catalog.

b. Exhaust Pipes and Muffler Spout. The exhaust pipes are curved 180 degrees to provide longitudinal clearance for muffler mounting under the left rear side of the coach. A flange on each ex-

haust pipe engine end has two bolt holes for mounting the pipe and gasket to engine exhaust manifold. The flange-less end of each exhaust pipe, and the muffler spout (tail pipe), are inserted into the muffler inlet and outlet tubes and secured by clamps.

c. Muffler. The muffler is a baffle restrictor type mounted on the coach frame with a shock-absorbing elastomer mount at a bracket on each end. The muffler has two forward inlet tube fittings to receive the exhaust pipes and one rear outlet tube fitting to receive the muffler spout (tail pipe).

d. Heat Shields. The muffler heat shield is a curved aluminum, double-skin, heat guard for protection of components in the engine compartment. The shield has a 90-degree arc extending to cover the muffler top and inboard side. Three welded brackets on the coach chassis attach the shield in position. A sheet-steel heat shield is an integral part (welded) of the right-hand exhaust pipe, protecting the bottom of the engine.

12-2. TROUBLESHOOTING

Troubles in the exhaust system can be caused by leakage, constriction, Waste-Destruct System problems, and failure of the heat shields to protect engine parts. Before troubleshooting the exhaust system, inspect according to paragraph 12-4b.

Troubleshoot malfunctions of the exhaust system according to table 12-1.

Table 12-1. Troubleshooting Engine Exhaust System

Malfunction (symptoms)	Probable causes	Corrective action (remedies)
Exhaust system leaking fumes, noisy, whistles, or rattles	Loose exhaust system attaching parts	Tighten loose part(s); for loose manifold, refer to Group 15
	Constricted exhaust pipes, muffler spout, or muffler	Remove constriction or replace defective part; also see other remedies for last malfunction in this table
	Defective exhaust pipe gasket	Replace gasket; refer to paragraphs 12-3 <u>b</u> and <u>c</u>

Table 12-1. Troubleshooting Engine Exhaust System (Continued)

Malfunction (symptoms)	Probable causes	Corrective action (remedies)
Exhaust system leaking fumes, noisy, whistles, or rattles (continued)	Muffler, spout (tail pipe) or exhaust pipes have holes (rusted or burned)	Replace defective part; for exhaust pipe refer to paragraphs 12-3 b (left) or 12-3 c (right); or for tail pipe refer to paragraphs 12-3 h and i
	Loose, cracked, or broken exhaust manifold	Correct defect; refer to Group 15
	Loose or defective waste-destruct injector	Install servicable injector; refer to Group 35
Engine overheats	Badly damaged or missing heat shields or parts of exhaust system	Repair, reinstall or replace parts as necessary; refer to paragraphs 12-3 and 12-6
Engine runs rough, because of excessive back pressure in exhaust system (3 psi max. allowable)	Constricted or clogged muffler, exhaust pipe, or spout	Remove constriction or replace clogged muffler. Check Waste-Destruct System for malfunctions that may cause muffler clogging; refer to Group 35. Check engine for malfunctions that may clog muffler; refer to Group 15
Excessive liquid emitted from tail pipe	Waste destruct system malfunctioning	Refer to Group 35

12-3. REMOVAL/INSTALLATION

a. General (fig. 12-1). Step-by-step instructions for replacement of the exhaust system components are provided in this section. Replacement parts should be procured from those listed in the 2900R Parts Catalog. A torque wrench is required for correct tightening of all nuts. Apply penetrating oil to all corroded nuts, bolts, and clamps before loosening.

b. Left-Hand Exhaust Pipe Removal. To remove left-hand exhaust pipe, proceed as follows:

(1) Loosen muffler upper inlet clamp and slide it aft onto muffler inlet tube.

(2) Remove two bolts and nuts, then remove exhaust pipe and gasket from left-hand engine manifold.

(3) Pry exhaust pipe and the clamp bushing out of muffler inlet tube.

(4) Move exhaust pipe rearward and up past engine.

c. Left-Hand Exhaust Pipe Installation. To install left-hand exhaust pipe, proceed as follows:

(1) Use a small amount of gasket cement to hold gasket to engine left-hand manifold outlet during installation.

(2) Push end of exhaust pipe and the clamp bushing into upper muffler inlet tube.

(3) Position other end of exhaust pipe to engage left-hand manifold and gasket. Install two bolts and nuts. Torque nuts to 39 to 43 foot pounds.

(4) Secure exhaust pipe to muffler by tightening clamp over the clamp bushing.

d. Right-Hand Exhaust Pipe Removal. To remove right-hand exhaust pipe, proceed as follows:

(1) Loosen two clamps on waste-destruct injector; slide clamps off ends of injector plate.

(2) Remove injector with screen and four gaskets.

(3) Loosen muffler lower inlet clamp and slide it onto muffler inlet tube.

(4) Remove two bolts and nuts, then remove exhaust pipe and gasket from right-hand engine manifold.

(5) Pry exhaust pipe and clamp bushing out of muffler inlet tube.

(6) Slide injector mounting clamps off of exhaust pipe.

e. Right-Hand Exhaust Pipe Installation. To install right-hand exhaust pipe, proceed as follows:

(1) Use a small amount of gasket cement to hold gasket to engine right-hand manifold outlet during installation.

(2) Slide two injector clamps onto outlet end of replacement exhaust pipe.

(3) Push end of exhaust pipe and the clamp bushing into lower muffler inlet tube.

(4) Position other end to engage right-hand manifold and gasket. Install two bolts and nuts. Torque nuts to 39 to 43 foot pounds.

(5) Install waste-destruct injector with three gaskets, screen, another gasket, then curved plate.

(6) Secure plate with two clamps on exhaust pipe.

(7) Secure exhaust pipe to muffler by tightening clamp over the clamp bushing.

f. Muffler Removal. To remove the muffler, proceed as follows:

(1) Remove rear two bolts and washers from muffler mount.

(2) Remove two forward clamps from muffler inlet tubes. Move clamps onto exhaust pipes.

(3) Remove forward two bolts and washers from muffler mount.

(4) Disengage muffler from exhaust pipes, lower muffler and remove it from vehicle. Remove

and retain the two clamp bushings from two muffler inlet tubes.

(5) Remove rear clamp and muffler spout.

g. Muffler Installation. To install the muffler, proceed as follows:

(1) Install spout on replacement muffler with clamp.

(2) Move muffler under vehicle and engage it with clamp bushings and exhaust pipes.

(3) Secure clamp on joint of exhaust pipes and muffler.

(4) Install forward muffler mount with two bolts and washers. Torque bolts to 22 to 24 foot pounds.

(5) Install rear muffler mount with two bolts and washers. Torque bolts to 22 to 24 foot pounds.

h. Muffler Spout Removal. To remove muffler spout, remove clamp from muffler, then remove spout.

i. Muffler Spout Installation. To install muffler spout, secure new spout on muffler with clamp.

12-4. INSPECTION/CLEANING

a. General Procedures in this paragraph contain information required for inspecting and cleaning the engine exhaust system. The engine exhaust system should be visually inspected for damage and constrictions, especially after long storage or prolonged trips.

b. Inspection. Inspect the exhaust system according to table 12-2. Replace parts which have obvious damage.

c. Operational Checkout. If exhaust problems are suspected but not revealed during inspection procedures, operate engine and check exhaust system by sight, sound, and feel (avoid touching hot parts with your hands). Check for excessive vibration and listen for the sound of leaking gasses. Also check the exhaust manifolds for problems; refer to Group 15.

d. Cleaning. Rusted, dirty, and corroded areas may be cleaned by using a metal scraper, wire brush, abrasive cloth, and steam cleaning, as necessary. After cleaning parts, inspect them for servicability.

Table 12-2. Engine Exhaust System Inspection

Component (and Item or Area)	Inspection Method	Inspect For	Disposition
All gas conducting parts	Visual	Dark spots (evidence of leaking gasses)	Replace part
		Thin rusted areas	Replace part
		Holes	Replace part
		Deep dents	Remove dents
		Constrictions	Remove constricting matter
		Other damage	Replace parts with extensive damage
Fasteners, brackets, and heat shields	Visual and manual	Looseness and damage	Tighten loose parts, repair or replace parts which have extensive damage

12-3. GENERAL INFORMATION

a. General. This section contains general information related to procedures contained in previous sections.

b. Exhaust System Data. General data on the exhaust system is contained in table 12-3.

c. Torque Requirements. Torque requirements for fasteners used in the exhaust system are given in table 12-4.

Table 12-3. Exhaust System Data

Item	Type	Material	Value/Size	Length
Muffler	Cylinder with baffles and two mounting brackets	Aluminized steel	8.5 inches diameter	43.5 inches
Exhaust back pressure	-	-	3 psi max. allowable	-
Muffler heat shield	Double-wall	Aluminum 0.05 inch thickness	-	29 inches
Left-hand exhaust pipe	Seamless or welded tube	Carbon steel 0.062 inch wall	2-3/8 inches O. D.	30 inches
Right-hand exhaust pipe	Seamless or welded tube; with heat shield	Carbon steel 0.062 inch wall; Shield 0.063 inch steel	2-3/8 inches O. D.	31 inches
Muffler spout	Seamless or welded tube	Steel	3 inches O. D. at muffler	15 inches

Table 12-4. Torque Requirements

Item	Torque	Lubricant
Exhaust pipe flange nut (7/16 -20)	50 foot pounds	Threadlube
Exhaust pipe clamp bolt (3/8 -24)	20 foot pounds	Threadlube
Pipe support clamp bolt (3/8 -24)	20 foot pounds	Threadlube



URGENT

ROUTINE

MANDATORY

INFORMATIONAL

Service Bulletin

DATE 10 August 1973

NUMBER 291220001

ATTENTION: SERVICE MANAGERS AND OWNERS	GROUP 12
<u>DESCRIPTION</u>	SUBJECT
This bulletin provides instructions for replacement of the power steering hose heat shield presently installed on the RH engine exhaust manifold, with a smaller heat shield that improves air flow characteristics and allows better access to the right hand bank of spark plugs and wiring.	REPLACEMENT OF ENGINE RH EXHAUST HEAT SHIELD
<u>COMPLIANCE</u>	MODEL(S) AFFECTED
Dealers should comply with this bulletin prior to delivery of coach to owner. Present owners should return coach to dealer for this modification as soon as practicable.	2900R
<u>MANPOWER</u>	(Factory Use Only) Information added to:
Estimated accomplishment time for one mechanic is one-quarter hour.	OWNER MANUAL(S)
<u>MATERIAL</u>	SERVICE MANUAL(S)
One heat shield per coach; RVD part number 5101801.	PARTS MANUAL(S)
<u>ACCOMPLISHMENT INSTRUCTIONS</u>	WARRANTY MANUAL(S)
Before accomplishing these procedures, ensure that engine exhaust manifold and pipes are cool, then proceed as follows:	OTHER
<ol style="list-style-type: none"> 1. Remove 2 bolts attaching present heat shield to RH engine exhaust manifold and remove and discard shield and bolts. 2. Remove the forward outboard nut and bolt attaching the RH exhaust pipe to manifold; retain nut and bolt. 3. Position mount hole of new 5101801 heat shield over hole on exhaust manifold from which bolt was 	



URGENT

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ATTENTION: SERVICE MANAGERS AND OWNERS	GROUP 12
<p>previously removed, with long body of shield extending down adjacent to the exhaust pipe.</p> <p>4. Install bolt down through (head end up) heat shield, manifold and flange on exhaust pipe.</p> <p>5. Align outboard surface of shield to be approximately parallel with coach outboard frame longitudinal beam, then install nut; torque 39 to 43 foot pounds.</p>	<p>SUBJECT</p> <p>REPLACEMENT OF ENGINE RH EXHAUST HEAT SHIELD</p> <p>MODEL (S) AFFECTED</p> <p>2900R</p>
<p style="text-align: center;"><i>John L. Strever</i></p> <p style="text-align: center;">John L. Strever Service Manager</p>	<p>(Factory Use Only) Information added to:</p>
	OWNER MANUAL (S)
	SERVICE MANUAL (S)
	PARTS MANUAL (S)
	WARRANTY MANUAL (S)
	OTHER



FMC Corporation
Recreational Vehicle Division
333 Brockway Road, Box 864, Santa Clara, California 95052

URGENT ROUTINE
 MANDATORY INFORMATIONAL

Service Bulletin

DATE 11 March 1974

NUMBER 2912 20002

ATTENTION: SERVICE MANAGERS AND OWNERS

GROUP
12

1. DESCRIPTION

To provide increased reliability of bolts which fasten exhaust pipes to engine manifolds, replacement bolts and nuts are being supplied to dealers and owners for installation in the coaches listed below.

SUBJECT
REPLACEMENT OF
EXHAUST-PIPE-TO-
ENGINE-MANIFOLD
ATTACHMENT BOLTS/
NUTS

2. EFFECTIVITY

Coach serial numbers 00001 through 00399.

MODEL (S)
AFFECTED

3. MANPOWER

Estimated accomplishment time for one mechanic is twenty minutes.

2900R

4. MATERIAL

Parts required are as follows:

TITLE	RVD P/N	QTY PER COACH
BOLT, Hex hd, 7/16-14 x 1-3/4	5100800-20	4
NUT, Self locking, 7/16-14	M17138	4

(Factory Use Only)
Information
added to:

OWNER MANUAL (S)

SERVICE MANUAL (S)

PARTS MANUAL (S)

WARRANTY MANUAL (S)

OTHER

5. ACCOMPLISHMENT INSTRUCTIONS

a. Left Side Exhaust Manifold. The procedure for removal and installation of bolts/nuts on the left side exhaust manifold is as follows:

(1) Gain access to the exhaust manifold through engine-transmission-APU service door.

CAUTION

Accomplish steps 5.a.(2) and 5.a.(3) as two separate steps to leave one bolt/nut intact while replacing opposite bolt/nut to prevent gasket damage from sagging of the exhaust pipe.



URGENT

ROUTINE

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DATE 11 March 1974

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ATTENTION: SERVICE MANAGERS AND OWNERS	GROUP 12
<p>(2) Remove existing forward bolt/nut then insert new bolt (5100800-20) down through top of exhaust manifold flange. Install nut (M17138) and torque 33 to 37 foot pounds.</p> <p>(3) Repeat step 5.a.(2) on aft bolt/nut.</p> <p>b. <u>Right Side Exhaust Manifold.</u> The procedure for removal and installation of bolts/nuts on the right side exhaust manifold is as follows:</p>	SUBJECT REPLACEMENT OF EXHAUST-PIPE-TO-ENGINE-MANIFOLD ATTACHMENT BOLTS, NUTS
<p>(1) Gain access to the exhaust manifold through engine service door.</p> <p>(2) Observe caution preceding previous step 5.a.(2) then remove existing forward bolt/nut and heat shield (5101801-01). Retain heat shield for reinstallation.</p> <p>(3) Position mounting hole of heat shield over hole on exhaust manifold flange with long body of shield extending down adjacent to the exhaust pipe.</p>	MODEL (S) AFFECTED 2900R
<p>(4) Insert new bolt (5100800-20) down through top of heat shield into exhaust manifold flange.</p> <p>(5) Align outboard surface of shield to be approximately parallel with coach outboard frame longitudinal beam.</p> <p>(6) Install nut (M17138) and torque 33 to 37 foot pounds.</p> <p>(7) Repeat step 5.a.(2) for the aft bolt/nut.</p>	(Factory Use Only) Information added to: OWNER MANUAL (S) SERVICE MANUAL (S) PARTS MANUAL (S) WARRANTY MANUAL (S)
<p>6. <u>SERVICE MANAGERS</u></p> <p>Make certain the replacement bolts/nuts provided with this bulletin are installed on coaches now in your possession before delivery.</p> <p>7. <u>OWNERS</u></p> <p>Make an appointment with your dealer to have the replacement bolts/nuts provided with this bulletin installed.</p> <p style="text-align: right;"><i>John L. Strever</i> John L. Strever Service Manager</p>	OTHER