SERVICE MANUAL

S70-120XL (D004)



FORM 897253 Rev. 12/03

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SERVICE MANUAL CONTENTS

Section	SRM Number	Rev Date
FRAME	0100 SRM 0396	06/92
GM V6-4.3L ENGINE (CARBURETED)	0600 SRM 0104	09/93
PERKINS DIESEL ENGINE-1000 SERIES	0600 SRM 0412	08/97
GM V6-4.3L ENGINE WITH FUEL INJECTION	0600 SRM 0590	11/03
PERKINS DIESEL ENGINE-1000 SERIES (AR, YG, YH)	0600 SRM 0705	11/01
COOLING SYSTEM	0700 SRM 0626	11/01
WEBER CARBURETOR WITH GOVERNOR	0900 SRM 0347	12/92
LPG FUEL SYSTEM	0900 SRM 0348	09/01
SINGLE-SPEED PS TRANSMISSION-REPAIR	1300 SRM 0397	02/04
SINGLE-SPEED PS TRANS-DESCR / OPER	1300 SRM 0399	09/03
DRIVE AXLE	1400 SRM 0400	02/97
STEERING CONTROL UNIT	1600 SRM 0054	10/03
STEERING CONTROL UNIT (ROSS HGF)	1600 SRM 0257	07/00
STEERING AXLE	1600 SRM 0326	10/03
BRAKE SYSTEM	1800 SRM 0338	07/00
HYDRAULIC GEAR PUMPS	1900 SRM 0097	10/03
HYDRAULIC SYSTEM	1900 SRM 0333	03/97
HYDRAULIC PUMP DRIVE ASSEMBLY	1900 SRM 0339	10/03
MAIN CONTROL VALVE	2000 SRM 0077	07/00
TILT CYLINDERS	2100 SRM 0103	10/03
ALTERNATOR	2200 SRM 0002	10/03
STARTER	2200 SRM 0106	02/01
HIGH ENERGY IGNITION SYSTEM	2200 SRM 0107	03/02
INSTRUMENT PANEL INDICATORS / SENDERS	2200 SRM 0143	12/03
MSTS-GM V6-4.3L (EARLY CONTROL MODULES)	2200 SRM 0463	04/93
GM V6 ENGINE CONTROL-REPAIR (EARLY MODULES)	2200 SRM 0468	05/96
GM V6 ENG CONTROL-DESC/OPER (EARLY MODULES)	2200 SRM 0473	03/94
MSTS-GM V6-4.3L (LATER CONTROL MODULES)	2200 SRM 0765	11/01
GM V6 ENG CONTROL-DESC/OPER (LATER MODULES)	2200 SRM 0781	01/00
GM V6 ENGINE CONTROL-REPAIR (LATER MODULES)	2200 SRM 0782	03/00
LIFT CYLINDERS	4000 SRM 0135	10/03
VISTA MASTS	4000 SRM 0340	09/02
METRIC AND INCH (SAE) FASTENERS	8000 SRM 0231	03/03
PERIODIC MAINTENANCE	8000 SRM 0393	12/03
DIAGRAMS	8000 SRM 0394	02/88
CAPACITIES and SPECIFICATIONS	8000 SRM 0395	03/88

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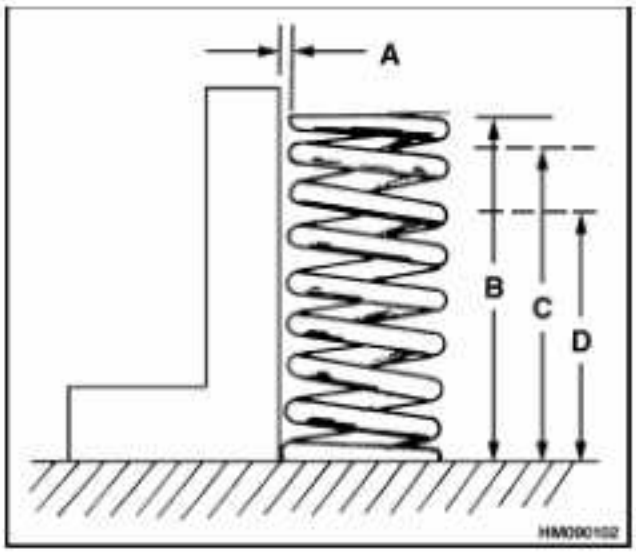
The specifications for the valve seats are shown in the Engine Specifications section and in Figure 4.

- If the contact line is too high, it can be made lower by using a 30° stone.
- If the contact line is too low, it can be raised using the 46° stone.
- If the seat is too narrow, it can be made wider using a 46° stone.
- If the seat is too wide, it can be made narrower using a 60° stone.

The correct dimensions for the valve seat widths and valve/valve seat overlap are shown in Figure 6. The valve seat widths are the dimensions of the 46° face only. The valve/valve seat overlap is the distance from the edge of the seat to the outside edge of the valve.

VALVE SPRINGS

Measure the length of the valve springs. The correct length is 51.6 mm (2.03 in.).



A. VARIATION FROM VERTICAL: LESS THAN 1.6 mm (0.063 in.)
B. FREE LENGTH: 51.6 mm (2.03 in.)
C. SPRING COMPRESSED TO 338 to 374 N (76 to 84 lbf) AT 43 mm (1.69 in.)
D. INSTALLED HEIGHT
EARLY MODELS : 42.92 to 43.43 mm (1.690 to 1.710 in.)
LATE MODELS:
INTAKE: 45.2 mm (1.78 in.)
EXHAUST: 45.2 to 43.43 mm (1.780 to 1.710 in.)

Figure 7. Valve Spring Specifications

WARNING

Be careful when testing the valve springs. These springs can come loose with enough force to cause an injury. Always use equipment that was designed to test springs. Always wear eye and face protection while testing valve springs.

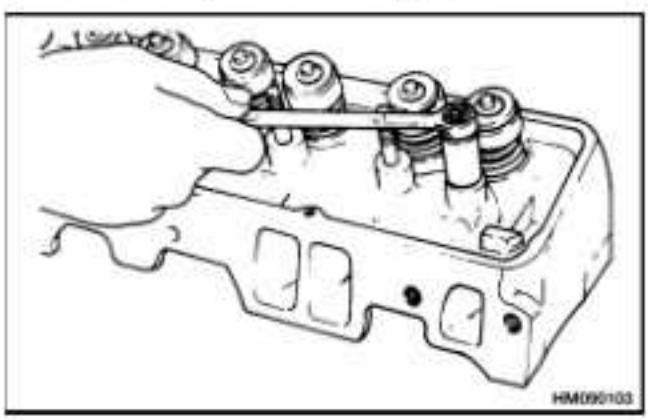
Use a special tool to check the tension of the valve springs. Compress the spring to the correct height and check the tension. For the correct specifications, see Figure 7. Replace valve springs that are not within specifications.

ROCKER ARM STUDS (EARLY MODELS)

These studs are pressed into the head.

Replace a stud that has damaged threads or is loose in the cylinder head. New studs are available in the following oversizes: 0.003 in. and 0.013 in.

1. To remove old stud, install spacer, flat washer, and nut to damaged stud. Use a wrench to remove damaged stud. See Figure 8.



NOTE: EARLY MODELS ONLY.

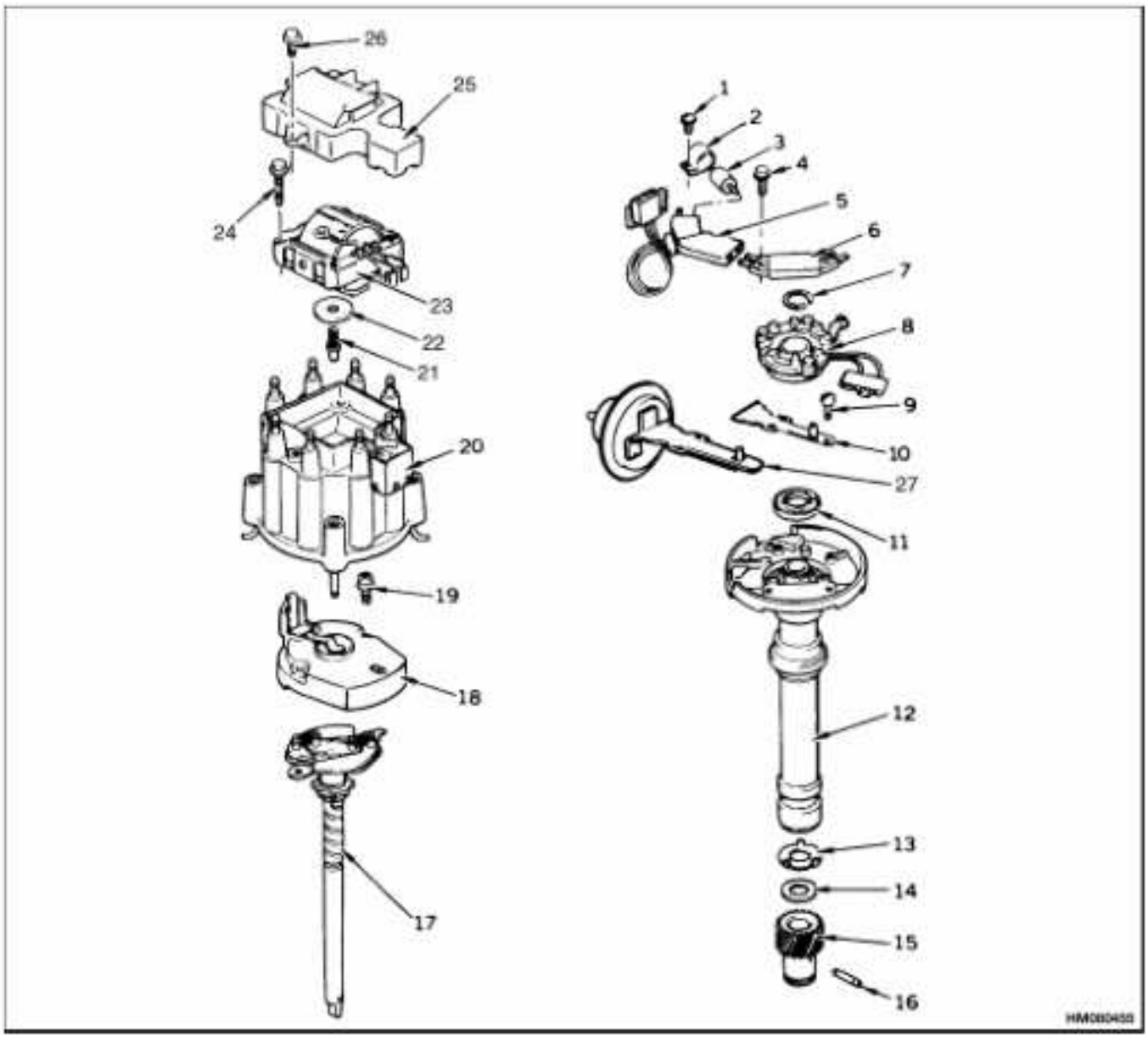
Figure 8. Rocker Arm Stud Removal

CAUTION

Do not attempt to install an oversized stud without reaming the stud hole to the new size. Installation of an oversized stud without reaming the stud hole can cause cracks in the cylinder head.

2. Use a reamer of the correct size for new oversized stud. Apply SAE 90 lubricant to new stud during installation. Install new stud as shown in Figure 9.

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1. SCREW
2. BRACKET
3. CAPACITOR
4. SCREW
5. WIRING HARNESS
6. ELECTRONIC MODULE
7. SNAP RING
8. POLE PIECE/SENSING COIL
9. SCREW
10. SPACER RETAINER*
11. GREASE SEAL
12. HOUSING
13. THRUST WASHER*
14. SHIM*
15. GEAR
16. PIN
17. SHAFT ASSEMBLY
18. ROTOR
19. SCREW
20. DISTRIBUTOR CAP (V8 SHOWN)
21. RESISTOR BRUSH AND SPRING
22. SEAL
23. IGNITION COIL
24. SCREW
25. COVER
26. SCREW
27. VACUUM ADVANCE UNIT

*V8 ONLY

Figure 7. HEI, Some Models with Coil as Part of Distributor

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- **All voltage measurements must be done with a digital voltmeter with a minimum rating of 10 megohm input impedance.**
- **When a test light is used in troubleshooting, the test light must have less than 0.3 amps (300 milliamps) of maximum current flow. A test for a correct test light is shown in Figure 10.**

The following troubleshooting diagrams are designed to give an efficient method of fault analysis on the MSTS. The MSTS connector pin assignments and functions are shown in Table 1.

Table 1. MSTS Module Connections

This voltage chart is for use with a digital voltmeter when doing troubleshooting. There can be small variations in the voltage shown in the chart from those voltages measured during troubleshooting. These small variations are because of the battery charge and other resistances in the connections. A variation of more than 0.5 volts can be an indication of a malfunction.
When this chart is used for troubleshooting, the engine must be at its operating temperature and the engine must be at idle speed (for ENGINE RUNNING column).

MSTS 6-Pin Connector		**Sensor Connector**		**Normal Voltage**	
Pin	Function	Pin	Function	Key **ON**	Engine Running
A	Distributor Reference	C	Ignition Control Module	5.0	5.0
B	Ignition Control	D	Ignition Control Module	-	-
C	Bypass	B	Ignition Control Module	0	5.0
D	ECT Sensor	B	MSTS to ECT Sensor	0	1.5 - 2.0[2]
E	MAP Sensor Signal	B	Manifold Absolute Pressure	4.75[1]	1.0[1]
F	+5 Volt Reference	C	Manifold Absolute Pressure	5.0	5.0
MSTS 5-Pin Connector		**Connector**		**Normal Voltage**	
Pin	Function	Pin	Function	Key **ON**	Engine Running
A	Ignition Feed		Alternator EXC Terminal and Coil	12	12
B	Battery Feed	A	B+ (Fuse Connector)	B+	B+
C	Alternate Fuel		Not Used	0	0
D	Knock Signal		Not Used	0	0
E	MSTS Ground		Engine Ground	0	0
MSTS 3-Pin Connector		**Diagnostic Connector**		**Normal Voltage**[3]	
Pin	Function	Pin	Function	Key **ON**	Engine Running
A	Data	G		-	-
B	Malfunction Indicator Lamp (MIL)	E	Malfunction Indicator Lamp	-	-
C	Diagnostic Test Terminal	B		-	-

[1] Voltage changes with atmospheric pressure.
[2] Voltage changes with temperature.
[3] Not applicable.

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