HILBORN GM LS3 EFI-R
Injector Manifold/Electronic Fuel Injection Kits

199R12262

(Before installation, please read these instructions completely.)

Hilborn P/N	Engine Application & Induction Configuration
300-816	HILBORN GM LS3 EFI-R Injector Manifold Kit, 2-3/16" Throttle Diameters; Fuel Rails, Vacuum Kit, & TPS w/ Connector included
300-818	HILBORN GM LS3 EFI-R Injector Manifold Kit, 2-1/2" Throttle Diameters; Fuel Rails, Vacuum Kit, & TPS w/ Connector included
300-819	HILBORN GM LS Gen IV Valley Cover Kit, (seals DOD oil passages), w/ Vacuum J-Block Mount
300-830	HILBORN Ram Tube Set, 2-3/16" I.D. x 12" Long, Std. Full Flare, Steel (plated), set of 8
300-831	HILBORN Ram Tube Set, 2-3/16" I.D. x 8" Long, Std. Full Flare, Steel (plated), set of 8
300-820	HILBORN Ram Tube Set, 2-1/2" I.D. X 12" Long, Std. Full Flare, Aluminum, set of 8
300-835	HILBORN Ram Tube Set, 2-1/2" I.D. X 8" Long, Std. Full Flare, Aluminum, set of 8
550-725	HILBORN GM LS3 EFI-R Injector Manifold & Hilborn EFI ECU Kit, 2-3/16" Throttle Diameters; Fuel Rails, Vacuum Kit, and TPS w/ Connector included
550-727	HILBORN GM LS3 EFI-R Injector Manifold & Hilborn EFI ECU Kit, 2-1/2" Throttle Diameters; Fuel Rails, Vacuum Kit, and TPS w/ Connector included

INSTALLATION INSTRUCTIONS

MANIFOLD COMPONENTS:

For the GM LS3 engine, the Hilborn injector manifold assemblies are mounted to the cylinder heads directly. Complementing the injector manifold assemblies, the GM Gen IV lifter valley cover, available separately, provides mounting for the manifold vacuum junction block, an OE oil pressure sensor, and seals off the DOD oil passages. A ram tube kit will need to be purchased separately. The various P/N's are shown in the table on the first page and complete kit contents for these P/N's are listed at the end of these instructions.

EMISSIONS EQUIPMENT:

Hilborn induction systems do not accept any emission-control devices. This part is not legal for sale or use for motor vehicles with pollution-controlled equipment.

ENGINE & CYLINDER HEAD APPLICATIONS:

Hilborn GM LS3 EFI-R injector manifold kits are designed for GM LS engines fitted with LS3/L92 type cylinders heads using a standard intake manifold flange placement, angle, and port openings in a standard location.

ENGINE BLOCK APPLICATIONS FOR 300-819 VALLEY COVER:

The 300-819 Hilborn GM LS GEN IV valley cover kit is designed for GM LS engines using a GM GEN IV engine block. The 300-819 is designed for the GM GEN IV valley cover bolt pattern and seals off the DOD oil passages. The OE oil pressure sensor, M16 x 1.50 thread w/ seal washer, is located on the Hilborn valley cover in the OE location.

DIMENSIONS:

NOTE: All heights measure to the engine block lifter valley flange unless otherwise noted.

- A-B Height, (top of the injector manifold) – 7.82"
- Total Height with: 6" Ram Tube – 12.95"
  8" Ram Tube – 14.95"
  12" Ram Tube – 18.95"
- As-Cast Port-Flange Opening Size – 2.49" Height x 1.21" Wide
- Injection Manifold Runner Length with: 6" Ram Tube – 11.63"
  8" Ram Tube – 13.63"
  12" Ram Tube – 17.63"

OTHER PARTS & SUPPLIES REQUIRED:

- ❑ RTV silicone sealer – Mr. Gasket P/N 78080G
- ❑ PTFE Pipe Thread Sealant – Earls P/N D024ERL
- ❑ Thread Assembly Lubricant – ARP P/N 100-9909
- ❑ Cyanoacrylate Adhesive (super glue) - for Gluing Lifter Valley Mounting Flange O-Ring
- ❑ Silicone O-Ring Lubricant – for Lubricating O-Rings for Installation
- ❑ AN-6 Plumbing to Connect Vacuum Junction Block to MAP Sensor and other Closed Vacuum Requirements
- ❑ Fuel Plumbing to and from the Fuel Rails and a Pressure Regulator on the Return Side of the Fuel System – Consult the EFI install instructions for detailed requirements.
- ❑ Various Sensors for the EFI system – Consult EFI install instructions for more information.

INSTALLATION INSTRUCTIONS:

Throttle Linkage/Return Spring Placement:

The HILBORN LS3 injector manifolds are supplied with the throttle arm, and throttle stop located at the front of the left injector manifold (as mounted on the engine). If you elect to change the throttle arm location, it is important to design your throttle linkage so both the throttle and the return spring assemblies pull from the same point on the throttle shaft and they should be located right next to a throttle stop lever. Failure to do so WILL result in bending or twisting of the throttle shafts resulting in poor idle and throttle tip-in performance.

Cooling:

Conveniently, for the Hilborn LS3 injector manifold installation, the main engine coolant passages into and out of the engine are routed through the front face of the engine block and the water pump. There is steam vent plumbing that is routed from the cylinder heads. The OE steam vent plumbing may not be compatible with the Hilborn lifter valley cover and the engine vacuum plumbing. Custom steam vent plumbing solutions are available from Earls. See https://www.holley.com/brands/earls/.

Vacuum Kit:

The supplied vacuum kit is comprised of the rubber lines attached to the junction block, which mounts on the lifter valley cover. A -6AN fitting is provided to supply vacuum to closed vacuum accessories such as the MAP sensor. Do not attach open vacuum accessories such as a PCV valve or IAC, this will adversely affect the vacuum signal resolution for the MAP sensor.

Idle Speed:

Idle speed is adjusted using the idle stop next to the throttle arm. If supplied, a secondary idle stop is correctly adjusted when light closing pressure is applied by hand to the throttle stop and the throttle blades move slightly.

Throttle Linkage:

Throttle arms are provided as a means to attach your vehicles linkage or cable to the injector. Brackets may need to be constructed.

When constructing your linkage please remember:

1. Cable linkage, such as those available from Lokar Products or Control Cables Inc., provide the greatest flexibility.
2. There should not be any bind in your throttle linkage system.
3. A mechanical wide open throttle stop on the throttle pedal should be used. Do not use the injector manifold's throttle stop as the pedal stop or damage to the shafts and couplers could result.
4. It is recommended that the throttle return spring be attached to the same point on the injector manifold as the throttle linkage.
5. Avoid using the hex cross link to pull the throttles open, as it is needed for adjustment.
6. Throttle shafts and couplers can be easily bent and care should be taken not to introduce twist into these assemblies. Design your linkage and throttle springs arrangements accordingly.

Manifold Adjustment Videos:

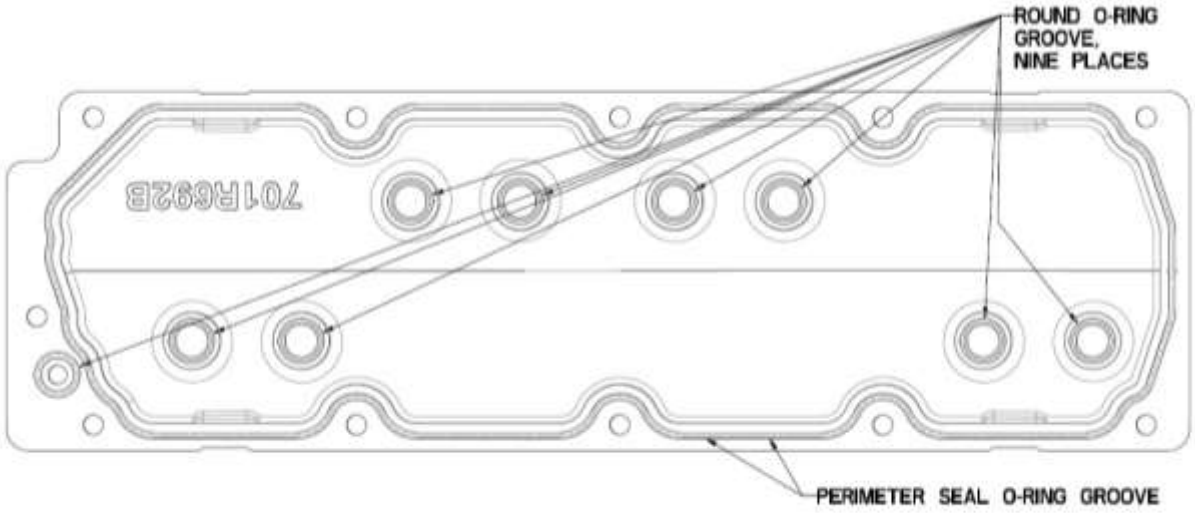
Correct synchronization of the butterflies is crucial for correct idle and part throttle operation of your HILBORN Injector Manifold. Videos detailing manifold adjustments are available on YouTube or our web site: www.hilborninjection.com. Click on Video Gallery and scroll down to view.

HILBORN GM GEN IV VALLEY COVER INSTALLATION

Valley Cover Installation, P/N 300-819:

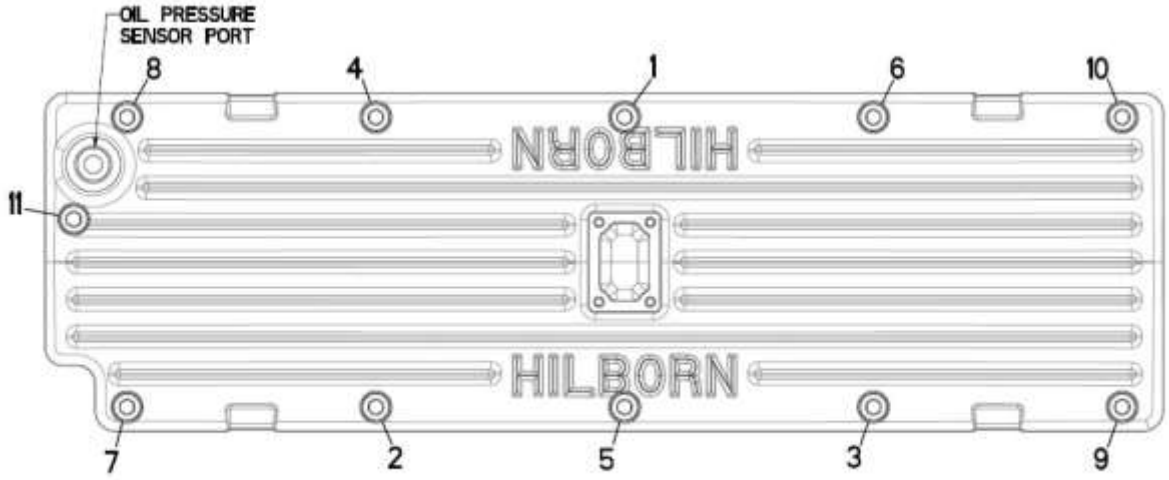
Before installing the sealing o-rings in the valley cover, do a trial install making sure the cover seats properly on the flange and all of the fasteners thread-in fully without any interference. Various OE type oil pressure sensors are available from Delco-Remy, M16 x 1.50 thread with a crush washer seal. To find the desired sensor with proper wiring connector and output signal, please consult Delco-Remy online catalogs. If an adapter is desired to connect a hose for plumbing to a gauge, Earl's has -3AN & -4AN adapters anodized in either blue or black. Also available are Earl's oil pressure gauge install kits for LS engines. See the parts list at the end of this document for part numbers or see https://www.holley.com/brands/earls/

1. Install the nine o-rings provided into the valley cover mounting flange round o-ring grooves (see the following figure). The o-ring grooves are a dove-tail design to insure that the o-rings do not fall out of the grooves during installation of the valley cover. Lightly apply a silicone lubricant to the o-rings to aid insertion of the o-rings into the grooves. Being careful not to cut or chaff the o-ring, gently push each o-ring into its groove working around the o-ring until the entire o-ring is in the groove.



VALLEY COVER MOUNTING FLANGE SHOWING THE SEALING O-RING GROOVES

2. For the perimeter seal, the supplied o-ring cord will need to be cut and glued to the proper length before it is installed into the groove. Accurately lay the o-ring cord on the perimeter seal o-ring groove on the valley cover mounting flange with the free ends overlapped to set the o-ring length. For reference the length of the perimeter o-ring groove is 47-27/32". Mark the position for cut to be made across both o-ring ends. Lay the o-ring on a flat surface with the ends overlapped and the marks aligned as they were when the marks were made. With a sharp razor blade, cut through both ends of the o-ring at the mark simultaneously. With a drop of super glue (Cyanoacrylate), bond the ends of the o-ring together, allowing the glue joint to fully cure. The glued joint should be smooth, not offset or kinked.



VALLEY COVER MOUNTING BOLT TIGHTENING SEQUENCE

3. Choose a location in the middle of a straight section of the groove to start the insertion of the glued o-ring. Apply a dab of RTV silicone in the o-ring groove at this location. Begin the insertion of the o-ring into the groove, starting with the o-ring glue joint into the dab of RTV in the groove. Carefully insert the rest of the o-ring into the groove, taking care not to cut or chaff the o-ring on the edge of the groove.

4. Before placing the valley cover on the engine block, apply a dab of silicone at the o-ring glue joint. Carefully lay the valley cover in place without smearing the RTV silicone. Thread lubricant should be applied to the mounting bolt threads and the under-head area of the bolt. Thread the bolts into place evenly just compressing the o-rings and then tighten them in two steps, first to 8 ft-lbs and then to 15 ft-lbs, in the sequence show in the diagram above.

5. Before cranking or starting the engine, something will need to be installed in the oil pressure sensor port to prevent oil from being pumped from the port. If the sensor or adapter to be installed does not have a pre-applied thread locking product, it would be recommended to apply a non-permanent thread locker product such as Loctite® 242 (blue) to clean threads on the sensor and in the valley cover.

HILBORN LS3 EFI-R MANIFOLD INSTALLATION

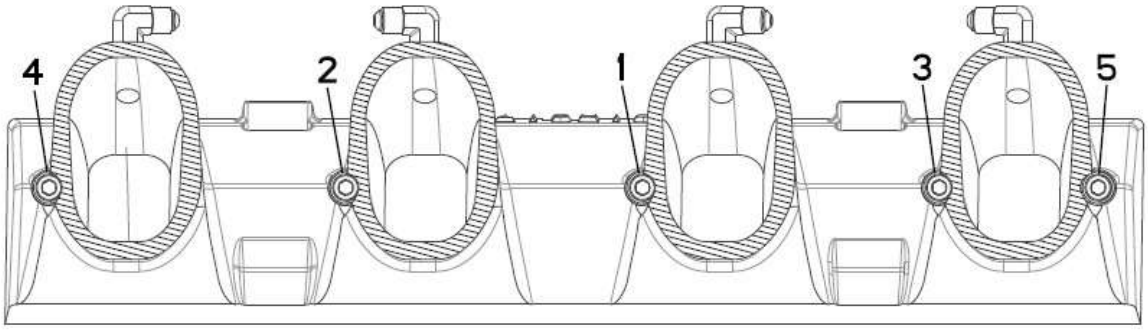
Injector Manifold Installation:

To avoid the need of repeated install and removal, a trial install of the injector manifolds is recommended. A mock up installation will allow the areas of possible interference to be identified, allow port alignment to be verified, configure throttle linkages, and to check & configure vacuum, fuel, and steam vent plumbing. The 90 degree vacuum fitting NPT threads should be lubricated with a PTFE thread sealant, and the injector manifold mounting fastener threads coated with a thread lube.

1. Install the eight o-rings provided in the injector manifold mounting flange o-ring grooves. The o-ring grooves are a dove-tail design to insure that the o-rings do not fall out of the grooves during installation of the injector manifolds. Lightly apply a silicone lubricant to the o-rings to aid insertion of the o-rings into the grooves. Being careful not to cut or chaff the o-ring, gently push the o-ring into the groove working around the o-ring until the entire o-ring is in the groove. Gently stretching lengthways the section of the o-ring being inserted will reduce the resistance of the o-ring to pass into the groove.

2. Threaded studs, properly sized washers, and 12-point flanged nuts have been included in the installation kit. It is best to be able to tighten the bolts using a torque wrench and to be able to re-torque the nuts after the injector manifolds are fully installed. Lubricate the stud & nut threads and nut flanges with thread lubricant and install each injector manifold assembly. The end of the stud with the shorter thread length should be threaded into the cylinder head. Following the sequence shown in the diagram below tighten the fasteners in two steps, first to 50 in-lbs (4 ft-lbs) and then 100 in-lbs (8.5 ft-lbs).

WARNING! The M6x1 threads in the aluminum cylinder head will not withstand abuse. Care must be taken to have proper thread engagement, use thread lubricant, and to tighten the fasteners to the proper specifications.



INJECTOR MANIFOLD MOUNTING BOLT TIGHTENING SEQUENCE

3. The proper installation of throttle shaft cross link is important for the off-idle and part throttle opening to be equal between left-bank and right-bank cylinders. The closed throttle plate angle is ten degrees. The throttles opening from closed to full open rotate 80 degrees. To have equal opening of the left-bank and right-bank throttle plates, the throttle shaft arms connected by the cross link should be parallel to each other from throttle closed to full open. To maintain these throttle arms as parallel, the length of the cross-link needs to be adjusted to the correct length.

4. To install the manifold vacuum plumbing, the junction block of the vacuum plumbing assembly should be placed on the flange on the 300-819 valley cover and attached with the supplied 8-32 Allen head bolts and 8-32 split lock washers. The -6AN hose fitting can be placed on whichever side and direction that is most desirable for the routing of the vacuum supply hose to the MAP sensor. The longer hoses attach to the adjacent fitting on the injector manifolds at cylinders 3, 4, 5, and 6. The shorter hoses attach to the adjacent fitting on the injector manifolds at cylinders 1, 2, 7, and 8. The 90 degree vacuum fittings on the injector manifold may require re-clocking to optimize the routing of each hose after it is attached to the fitting.

   If the 300-819 valley cover is not used with the injector manifold kit, mounting of the vacuum plumbing assembly will need to be fabricated for the installation.

Installation of the Fuel Injectors and Fuel Plumbing –

The injector manifolds come with the fuel rails mounted, but no fuel injectors are installed or included with the injector manifold kit. The choice of fuel injectors is dependent on the engine combination and the fuel being used. The full range of fuel injectors available from Holley EFI are shown at https://www.holley.com/brands/holley_efi/products/fuel_systems/fuel_injection/injectors/. To determine which injector to use, it is best to consult with your Holley EFI dealer. The fuel rail mounting is designed to use a standard length injector similar to a Bosch style EV-1 fuel injector. Follow the steps below for the injector installation and fuel plumbing recommendations.

1. Remove the fuel rails from the injector manifolds, this is best done by removing the fasteners mounting the fuel rail brackets to the injector manifolds.

2. Apply a silicone lubricant to the O-ring on the inlet end of fuel injectors and insert the fuel injectors into the ports in the fuel rail. To insert the injector without tearing the O-ring, gently rock the injector in the inlet of the port while applying pressure to insert the injector.

3. Position the injectors to properly orient the wiring plugs, apply silicone lubricant to the injector outlet O-rings, and insert all four injectors into injector bosses in the base intake manifold applying gentle downward pressure on the fuel rail.

4. Once the injectors are inserted into the injector manifold and the fuel rails are in position, re-install and tighten the mounting bracket fasteners. Also, tighten the fasteners attaching the fuel rails to the brackets.

5. Check and make sure the injectors are floating on the O-rings. Rotate the injector back and forth to confirm that there is no load on the injector body.

6. The fuel rail is designed to provide enough flow and volume to dampen fuel pressure oscillations and variations at the inlet of the fuel injectors. The fuel rails are machined to receive an adapter fitting for ¾-16 (AN-8) O-ring port, and adapter fittings with an AN-8 male flare are installed in the fuel rails.

GENERAL FUEL PLUMBING RECOMMEDATIONS:

- For power levels below 700-750HP, AN-6 (3/8") plumbing to and from the fuel rails should be sufficient.
- For power levels above 750HP, AN-8 (1/2") plumbing is recommended.
- It is always recommended to only use tubular hose ends when a non-straight hose end is required.
- The best configuration for plumbing the fuel rails is to split from the supply line with a "Y" type distribution block or fitting, then feed into the inlet end of each fuel rail. The hoses from the exit end of each fuel rail would then feed into each inlet port of a return type fuel pressure regulator with two inlet ports or into another "Y" type distribution block or fitting connecting to a hose leading to the fuel pressure regulator.

Go to https://www.holley.com/brands/earls/ for fuel system plumbing components.

Go to https://www.holley.com/brands/holley/products/fuel_systems/fuel_pumps_regulators_and_filters/regulators/efi_regulators/ for EFI fuel pressure regulators.

Installation of the Inlet Ram Tubes –

The ram tubes will be the last components to be installed, likely after the throttle linkage and idle airflow synchronization tuning is completed. Along with the desired ram tube length, one thing to consider is the installation of the EFI air temperature sensor (ATS) which may be in a ram tube.

1. Slip the ram tubes in the inlet bores in the injector manifolds and make sure the ram tubes are fully seated in the bore. There is an o-ring installed in the bore into which ram tube is inserted. Be careful not to cut the o-ring when inserting the ram tube. Some silicone lubricant on the o-ring may ease the installation of the ram tube.

2. Gently tighten the ram tube clamp screws tight enough to clamp the ram tubes in place, but not so tight as to crush the ram tube or bend/break the ears on ram tube clamp.

Installation of the EFI System –

These install instructions are an overview of the mechanical component installation for the LS3 EFI-R kits. For installation of the EFI system, ECU, wiring, sensors, tuning etc., please follow the manufacturer's instructions, and consult your EFI dealers and tech resources. This would also apply to the Hilborn EFI system included in P/N's 550-725, and 550-727.

KIT CONTENTS:

300-816 EFI-R INJECTION MANIFOLD KIT, GM LS3 2-3/16":

- ❑ 1 – Left Hand Injection Manifold Assembly w/ Fuel Rail, 2-3/16" Throttle Bores
- ❑ 1 – Right Hand Injection Manifold Assembly w/ Fuel Rail, 2-3/16" Throttle Bores
- ❑ 1 – Vacuum Plumbing Assembly
- ❑ 1 – Bagged Installation Kit with Instruction Sheet, Fasteners, Flange Gasket O-Rings, Throttle Plate Opening Gauges, & Warranty Card

550-725 INJECTION MANIFOLD and ECU KIT, GM LS3 2-3/16":

- ❑ 1 – 300-816 EFI-R Injection Manifold Kit, 2-3/16" Throttle Bores
- ❑ 1 – 554-152H Hilborn EFI ECU Kit

300-818 EFI-R INJECTION MANIFOLD KIT, SBC RAW 2-1/2":

- ❑ 1 – Left Hand Injection Manifold Assembly w/ Fuel Rail, 2-1/2" Throttle Bores
- ❑ 1 – Right Hand Injection Manifold Assembly w/ Fuel Rail, 2-1/2" Throttle Bores
- ❑ 1 – Vacuum Plumbing Assembly
- ❑ 1 – Bagged Installation Kit with Instruction Sheet, Fasteners, Flange Gasket O-Rings, Throttle Plate Opening Gauges, & Warranty Card

550-727 INJECTION MANIFOLD and ECU KIT, GM LS3 2-1/2":

- ❑ 1 – 300-818 EFI-R Injection Manifold Kit, 2-1/2" Throttle Bores
- ❑ 1 – 554-152H Hilborn EFI ECU Kit

300-819 LIFTER VALLEY COVER KIT, GM LS GEN IV:

- ❑ 1 – GM LS GEN IV Valley Cover
- ❑ 1 – Bagged Installation Kit with Instruction Sheet, Fasteners, Flange Gasket O-Rings, O-Ring Cord, & Warranty Card

300-830 RAM TUBE KIT, 2-3/16" X 12" STD-FLARE:

- ❑ 8 – Ram Tube, 2-3/16" I.D. X 12" Long Std.-Flare, Plated Steel

300-831 RAM TUBE KIT, 2-3/16" X 8" STD-FLARE:

- ❑ 8 – Ram Tube, 2-3/16" I.D. X 8" Long Std.-Flare, Plated Steel

300-820 RAM TUBE KIT, 2-1/2" X 12" STD-FLARE:

- ❑ 8 – Ram Tube, 2-1/2" I.D. X 12" Long Std.-Flare, Aluminum

300-835 RAM TUBE KIT, 2-1/2" X 12" STD-FLARE:

- ❑ 8 – Ram Tube, 2-1/2" I.D. X 8" Long Std.-Flare, Aluminum

APPLICABLE SERVICE & INSTALLATION PARTS AVAILABLE SEPARATELY:

176008ERL	O-RING, -8AN FITTING PORT, BUNA-N, PKG OF 10
2-11-HIL	O-RING, #2-011, BUNA N, 90 DURO, PKG OF 10
508-21	O-RING CORD, 3/32 FKM X 4.5 FT LONG, PLENUM OR VALLEY CVR. GASKET
508-22	INTAKE MANIFOLD GASKET SET, O-RINGS LS3/LS7
9919AFJERL	GM LS OIL PRESSURE GAUGE ADAPTER FITTING, -3AN, M16X1.50, BLUE
9919BFJERL	GM LS OIL PRESSURE GAUGE ADAPTER FITTING, -4AN, M16X1.50, BLUE
AT985008ERL	ADAPTER FITTING, EARLS AN-8 MALE TO 3/4-16 (AN8) O-RING PORT, BLACK
AT9919AFJERL	GM LS OIL PRESSURE GAUGE ADAPTER FITTING, -3AN, M16X1.50, BLACK
AT9919BFJERL	GM LS OIL PRESSURE GAUGE ADAPTER FITTING, -4AN, M16X1.50, BLACK
EL109-3-HIL	PIGTAIL HARNESS, HILBORN TPS
EL109A-HIL	THROTTLE POSITION SENSOR, HILBORN CW
F101-HIL	THROTTLE ARM, 5/16, BRASS, 1-3/16 LONG
F102-HIL	THROTTLE SHAFT STOP, 5/16, BRASS
F104-HIL	THROTTLE ARM, 5/16, REMOVEABLE, 1-3/16 LONG
F105-HIL	THROTTLE ARM, 5/16, REMOVABLE, MULTI LENGTH
F107-HIL	THROTTLE ARM, 5/16, STD, MULTI LENGTH
F113-HIL	THROTTLE SHAFT COUPLER, 5/16 SHAFT, STANDARD ROTATION
F113-R-HIL	THROTTLE SHAFT COUPLER, 5/16 SHAFT, REVERSE ROTATION
F538A-HIL	JUNCTION BLOCK, 8 -3AN FEMALE X 2 -6AN FEMALE
F60-0600-HIL	HEX LINK ASSY, HILBORN, 3/16 X 3/16 X 6.00”
F73A-HIL	ROD END BEARING, 10-32 RH X .190”
F74A-HIL	ROD END BEARING, 10-32 LH X .190”
H100-HIL	GAUGE SET, THROTTLE OPENING SETTING TOOL
H3AB-0525-HIL	#3 HOSE-ASSY, STRT-STRT, HILBORN, 5.25” LONG
H3AB-0575-HIL	#3 HOSE-ASSY, STRT-STRT, HILBORN, 5.75” LONG
H3AB-1000-HIL	#3 HOSE-ASSY, STRT-STRT, HILBORN, 8.75” LONG
H3AB-0900-HIL	#3 HOSE-ASSY, STRT-STRT, HILBORN, 9.00” LONG
LS0032ERL	OIL PRESSURE GAUGE INSTALL KIT – GM LS W/36” LONG -3AN HOSE
LS0033ERL	OIL PRESSURE GAUGE INSTALL KIT – GM LS W/48” LONG -3AN HOSE
LS0034ERL	OIL PRESSURE GAUGE INSTALL KIT – GM LS W/72” LONG -3AN HOSE
STEBK-HIL	SYNCHROMETER, AIR FLOW, 2-7/16” TO 2-5/8”
STEBKM-HIL	SYNCHROMETER, AIR FLOW, 2-3/16”

Holley Technical Support
1801 Russellville Road
Bowling Green, KY 42101
1-866-464-6553
270-781-9741
www.holley.com

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