

ACCEL DFI

ENGINE MANAGEMENT SYSTEMS



ENGINE MANAGEMENT INSTALLATION CENTERS (EMIC'S)

ACCEL invested huge financial resources and dedicated manpower to develop integrated engine management systems. To provide qualified installation and calibration services for the more complex ACCEL systems a network of authorized EMIC's (Engine Management Installation Centers) have been established. Your satisfaction has been, and will continue to be a primary objective. EMIC installers are usually established performance machine shops or aftermarket installers; individuals accustomed to working on high dollar, one of a kind vehicles.

Many already have extensive fuel injection experience. All prospective EMIC's attend an intensive training session, where they become familiar with ACCEL engine management system theory, examine and discuss the products, and get hands-on experience with system calibration.

Factory Services

For warranty information and technical information regarding application, installation, calibration, etc., contact:

ACCEL, 8700 Brookpark Rd., Cleveland, OH 44129
PHONE: (216) 398-8300. FAX: (216) 485-1885

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Step Up To The Latest Technology and Feel the Power!

ACCEL/DFI's Electronic Spark/Fuel Management systems combined with ACCEL's throttle bodies, injectors, induction and fuel system components, give you unmatched performance and reliability. With intelligent fuel management, ACCEL/DFI adds horsepower and torque, increases throttle response and maximizes fuel economy.

CALMAP software allows you to custom calibrate both the fuel and spark curves specifically to your engine's requirements - whether it's monster cubic inches, high-revving multi-valve, normally aspirated, supercharged, turbocharged or a heavy nitrous breather!

So whether you're blasting down the quarter mile, pounding the off-shore surf, crossing an off-road trail, cruising the streets or towing a trailer, you need the best fuel injection system - ACCEL/DFI. Unparalleled race winning performance - track-proven by thousands of satisfied customers.

ACCEL-The FIRST word in ACCEleration

DFI-The ONLY name in proven Digital Fuel Injection

Ultimate Driveability and Reliability from ACCEL/DFI

If you're looking for the latest technology in electronic fuel management, look no further! ACCEL/DFI provides excellent driveability, reliable performance and has sold the most programmable engine management systems currently in use!

Just ask Mark Stielow, owner of the 1996 Hot Rod Car of the Year (pictured to the left):

"My ACCEL/DFI system enabled my 1967 Camaro to achieve over 18 MPG during a leg of the Hot Rod Powertour. Amazing when you consider it was powered by a 532 CID Big Block. ACCEL/DFI allows me to dial in fuel curves through my laptop computer to maximize economy and power. I used ACCEL/DFI on my car when it had a 600+ HP small block and achieved excellent results. For the ultimate in reliability, driveability and performance, DFI is the only way to go!"

John Lingenfelter, one of ACCEL/DFI's EMIC's believes in ACCEL/DFI:

"For street and race applications, ACCEL/DFI systems are hard to beat. They have several thousand ECU's in the market and an excellent installation channel through their EMIC (Engine Management Installation Center) program. As one of their EMIC's, I see the value of digital fuel injection and the tremendous benefits it produces over carburetors. ACCEL/DFI gives you improved driveability, better fuel economy, and a broader torque curve, which adds up to a winning product."

Note: All systems sold unpolished.

1996 HOT ROD CAR OF THE YEAR



DARE TO COMPARE

ACCEL DFI FUEL INJECTION

After extensive R&D testing, we've created several fuel injection systems for your Chevrolet powered vehicle that produce substantial increases in torque and horsepower over factory and aftermarket induction systems. For higher RPM applications, ACCEL has a single plane multi-port kit for square and oval port big block Chevy engines. This system has all the advantages of electronic fuel injection with the flow characteristics of a high rise manifold, tuned to enable motors to run up to 7500 RPM's. For custom applications, ACCEL has a variety of fuel injectors, pumps and ECU's which can be tuned to many of your specific applications. ACCEL also has the only camshafts specifically designed for use with fuel injected small block and big block engines. Whether your vehicle is racing, towing, off-road or street machining, ACCEL has the fuel injection systems and components for you!

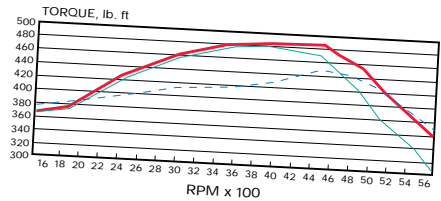
Note: All systems sold unpolished.



MULTIPOINT



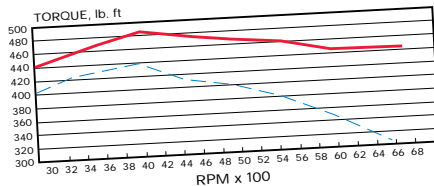
SMALL BLOCK SUPER RAM



— SuperRam EFI 383 cid Chevrolet '90 Corvette Cylinder Heads
 1 3/4" Primary Tubes
 209"/217", 0.513"/0.522" Hyd. Roller Camshaft
 93 Octane Pump Gas



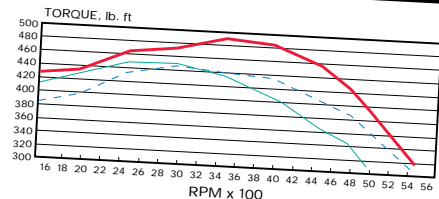
BIG BLOCK CHEVY SUPERRAM



— SuperRam EFI 454 cid Chevrolet
 8.8:1 Compression
 235"/244" Duration
 0.561"/0.571" Valve Lift
 87 Octane Pump Gas



BIG BLOCK "STEALTH" OVAL PORT



— "Stealth" Prototype 461 cid Chevrolet
 8.5:1 Compression

— Stock GM Manifold and Quadrajct Carburetor

— Edlebrock Performer and Quadrajct Carburetor

new

SMALL BLOCK PRO-RAM

Low cost, fully programmable EFI by DFI is here. Introducing the ProRam Single Plane Small Block Multi-Port Spark/Fuel Management. The new system is available with a cast 750 CFM throttle body, single plane intake manifold, and 30 #/hr injectors for engines producing up to 500HP. For engines producing over 500HP, the system is available with 36#/HR injectors and a billet 1200 CFM throttle body. The manifold, designed by John Lingenfelter, produces excellent power from 2000 RPM to 6500 RPM, has optimized runners for precise air delivery and correct fuel distribution.

The system includes intake manifold, throttle body, injectors, ECU, fuel pump, wiring harness, and all components necessary for installation.

Intake Manifold and Matching Fuel Rails . . . 74139

Intake Manifold Only 74140

Complete System With 750CFM Throttle Body,
30 #/hr Injectors (320-510 HP) 74141

Complete System With 750CFM Throttle Body,
30 #/hr Injectors With IPU
Modification (320-510 HP) 74142

Complete System With 1200CFM Billet Throttle Body,
36 #/hr injectors (480-620 HP) 74143

Complete System With 1200CFM Billet Throttle Body,
36 #/hr Injectors With IPU
Modification (480-620 HP) 74144

* The inductive pickup modification is required when controlling ignition timing with the ECU, and when using a crank trigger or locked advance magnetic pickup distributor without a module. This modification required the use of an aftermarket ignition enhancer box, such as an ACCEL 300+. (Call 216-398-8300 DFI Tech Service for exact application)

Note: All systems sold unpolished.

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ENGINE MANAGEMENT SYSTEMS

ENGINE MANAGEMENT SYSTEMS

ENGINE

74139



SUPER RAM SMALL BLOCK

SMALL BLOCK CHEVROLET SUPERRAM™

Converts Carbureted Small Blocks to Multiport Electronic Fuel Injection.

- Improved Performance, Driveability, and Economy.
- More Power than OEM-Style Tuned Port Injection Systems.
- EGR Availability for Emissions Control Capability.

ACCEL's electronics expertise and John Lingenfelter's small block Chevy product development background have teamed up to build the most powerful small block Chevy multiport fuel injection system available anywhere.

Using a tuned plenum/runner combination, SuperRam Small Block provides a balanced inlet air charge to all eight combustion chambers. In addition, the SuperRam's resonant pressure wave (producing the "ram effect") is designed to occur at higher RPM. When the OEM TPI manifold is beginning to run out of steam, ACCEL's SuperRam starts to shine. At 4500 RPM the stock unit's torque has already started to drop off. ACCEL's SuperRam produces 19 ft-lbs more than a ported OEM manifold at 4500 RPM at higher RPMs. The performance gap then increases further. At 5800 RPM, SuperRam generates 61 ft-lbs more than the ported OEM manifold. (See Torque Curve, right)

SuperRam Small Block is equipped with EGR capability for late model applications.*

If computer controlled ignition timing is to be utilized without the use of a GM style computer controlled HEI ignition system, see 74043I IPU modification on page 237. If computer controlled ignition timing is not desired, only RPM signal is required.

NOTE: CALMAP Software not included; See page 236 for CALMAP applications.

*Recommended for 350 c.i.d. or larger

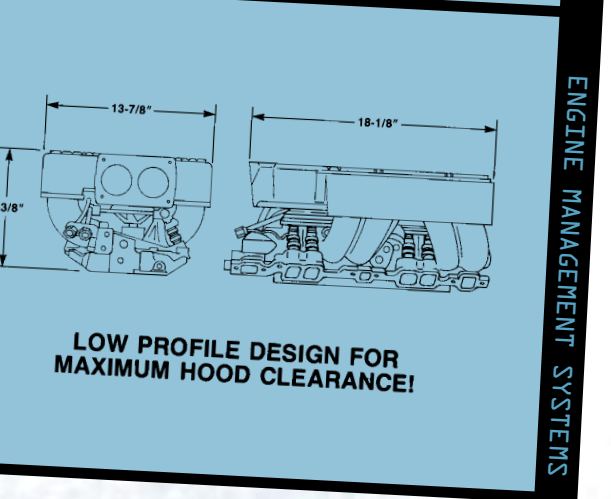
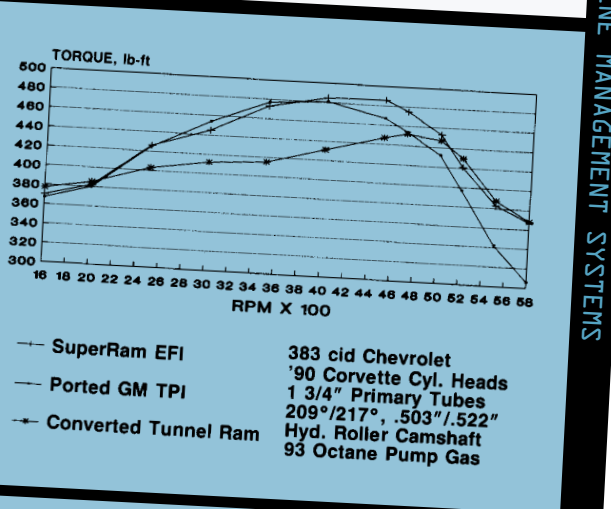
Small Block Chevy 74131
 Small Block Chevy 74131H

Note: All systems sold unpolished.

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TUNING



SYSTEMS

ENGINE MANAGEMENT SYSTEMS

ENGINE MANAGEMENT SYSTEMS



NODE CH2

STREETRAM SMALL BLOCK

STREETRAM

Upgrade to maximum TPI performance! If you're into performance fuel injection, we've got your system! ACCEL's complete line of StreetRam bolt-on TPI upgrade components can transform your machine into a 50-state-legal powerhouse. Developed with the assistance of tuning wizard John Lingenfelter, these components maximize torque and horsepower while maintaining environmental friendliness.

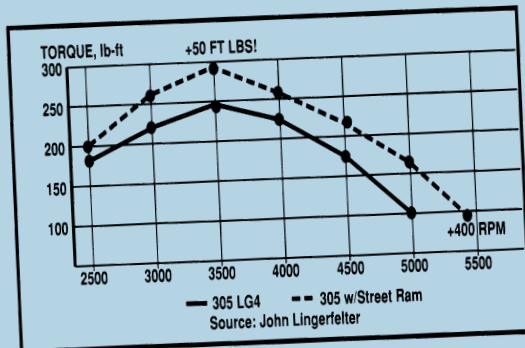
There's a 1,000-CFM billet throttle body, high-flow plenum, free-breathing runners, and the heart of the system, our max-flow manifold base. Each component may be installed separately, or as a complete StreetRam assembly for maximum TPI performance. Best of all, these goodies are completely compatible with your OEM computer. Switch to Tuned Port Injection! If you own a carbureted or throttle-body injected car or truck and want the tire-spinning torque and horse-power of TPI, the StreetRam system is available, complete with computer, wiring, fuel pump and all hardware for an easy, legal conversion.

StreetRam systems and components are recommended for small-block Chevy engines up to 377 cubic inches, get SuperRam for big-inch engines! Larger displacement Small Block applications require our Lingenfelter Signature SuperRam components, the ultimate big-inch, high-rpm Tuned Port Injection. At ACCEL, we promise the ultimate-and we deliver!

If computer controlled ignition timing is to be utilized without the use of a GM style computer controlled HEI ignition system, see 74043I IPU modification on page 237.

If computer controlled ignition timing is not desired, only a RPM signal is required.

Note: Calmap Software not included; see page 236 for Calmap applications.



COMPLETE SYSTEMS

Small Block Chevy. 74130

INDIVIDUAL COMPONENTS

High Flow Plenum 88-85 74189E
 92-89 ex LT-1 74189L

Runners 88-85 74195
 92-89 ex LT-1 74199

Throttle Body 88-85 74190
 92-89 ex LT-1 74191

Base Manifold 74197

Note: All systems sold unpolished.

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PRORAM BIG BLOCK

1000 AND 1200 CFM MULTI-POINT SPARK FUEL MANAGEMENT SYSTEM

ACCEL is now offering a system using the new cast high rise single plane multi-port intake for Big Block Chevy's with oval and rectangular port heads. This system offers all the advantages of electronic fuel injection plus the flow characteristics of a high rise manifold, tuned to enable motors to run up to 7500 RPM's. The complete programmability of the system along with the capability of closed loop operation offers tremendous versatility. For both fuel and spark control, an HEI computer controlled distributor is recommended (non-computer controlled HEI distributor can be used for fuel only control). This system is intended for off road use with emission exempt vehicles. A minimum of 12-1/2" is needed for height clearance. System includes: ECU, Main and Injector Harnesses, Manifold, 8-36 lb per hour Injectors, Fuel Rails and Lines, Pressure Regulator, Fuel Pump, Fuel Filter, 1000 CFM Throttle Body, Air Filter, Plenum Adapter, Sensors: (Coolant Temp., Air Temp., TPS, Oxygen, MAP), IAC Motor.

If computer controlled ignition timing is to be utilized without the use of a GM style computer controlled HEI ignition system, see 74043I IPU modification on page 237. If computer controlled ignition timing is not desired, only a RPM signal is required.

Multi-Point Spark Fuel Management System for Big Block Chevy

- BBC Single Plane Rect. Port System (1000 CFM) with Electronics74202H
- BBC Single Plane Oval Port System (1000 CFM) with Electronics74202I
- BBC Single Plane Oval Port with 1200 CFM Billet T.B. System74202J
- BBC Single Plane Rect. Port with 1200 CFM Billet T.B. System74202K
- Rect. Port Manifold only74202D
- Oval Port Manifold only74202E

Note: All systems sold unpolished.

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ENGINE MANAGEMENT SYSTEMS

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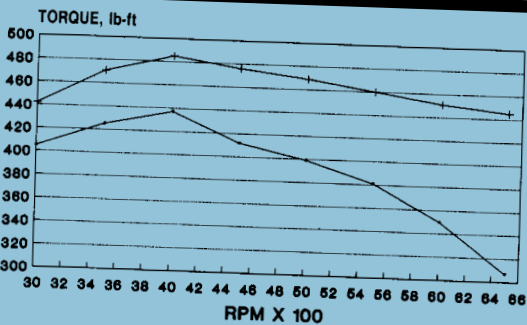
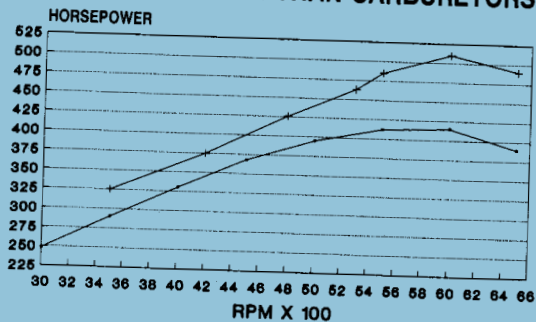
SUPERRAM BIG BLOCK

ENGINE MANAGEMENT SYSTEMS



NOTE

MORE HP & TORQUE THAN CARBURETORS!



+ SuperRam EFI 454 cid Chevrolet
 8.8:1 Compression
 235°/244° Duration
 .561"/1.571" Valve Lift
 87 Octane Pump Gas
 — GM Alum. Hi-Rise,
 750 Holley

BIG BLOCK CHEVROLET RECTANGULAR PORT & OVAL PORT CONVERTS TO MULTIPOINT ELECTRONIC FUEL

- Increased HP & Torque
- Crisper Throttle Response
- Improved Fuel Economy

Now, big block Chevy owners can enjoy the advantages of electronic fuel injection. Short runner, "SuperRam" intake manifold plenum and runners are designed to maximize horsepower in the 3500 to 6500 RPM band. Multipoint injection virtually guarantees equal fuel distribution to each cylinder for improved power and fuel economy.

Utilizing the accuracy of microprocessor-based digital electronics, fuel delivery is precisely metered, constantly monitoring engine conditions and optimizing air-fuel mixture at the injectors.

If computer controlled ignition timing is to be utilized without the use of a GM style computer controlled HEI ignition system, see 740431 IPU modification on page 237. If computer controlled ignition timing is not desired, only a RPM signal is required.

NOTE: CALMAP Software Not Included

SUPERRAM EFI SYSTEMS—BIG BLOCK CHEVROLET

	AUTOMOTIVE	MARINE
RECTANGULAR PORT	74102	74104
(HIGH OUTPUT)	74102H	•
OVAL PORT	74106	74109

Note: All systems sold unpolished.

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ENGINE MANAGEMENT SYSTEMS

ENGINE MANAGEMENT SYSTEMS

STEALTH BIG BLOCK

BIG BLOCK CHEVROLET "STEALTH" OVAL PORT

- Specifically designed for superior low-end and midrange torque.
- Especially suited for tow vehicle, RV, and marine applications.
- Improved fuel mileage for economical performance.
- EGR equipped for emissions control capability.

When the time arrived to develop our Stealth big block Chevy fuel injection system, ACCEL engineers solicited the intake manifold development expertise of John Lingenfelter, NHRA champion, premier engine builder, and designer of highly innovative performance parts for Chevrolet engines.

The result was "Stealth", a stump-puller of a manifold matched to ACCEL's electronic fuel injection controls. Especially effective off-idle to 4500 RPM, "Stealth" increased torque by up to 90 ft.lb at 3500 RPM (see graph to the right). Power, economy, and driveability are dramatically improved when "Stealth" is installed on tow vehicles, recreational vehicles (RV's) and boats.

The only compatible distributors that will fit this system is the GM Remote Mount Coil Computer Control HEI Distributor or ACCEL BilleTech part no. 60109 and 60110.

"Stealth" is equipped with EGR (Exhaust Gas Recirculation) ports for vehicles originally equipped with EGR. The kit also contains an EGR blockoff plate for non-EGR applications.

"Stealth" systems can be calibrated using ACCEL's CALMAP software and a PC or laptop computer.

If computer controlled ignition timing is to be utilized without the use of a GM style computer controlled HEI ignition system, see 74043I IPU modification on page 237. If computer controlled ignition timing is not desired, only a RPM signal is required.

NOTE: CALMAP Software not included

SUPERRAM "STEALTH"—BIG BLOCK CHEVROLET

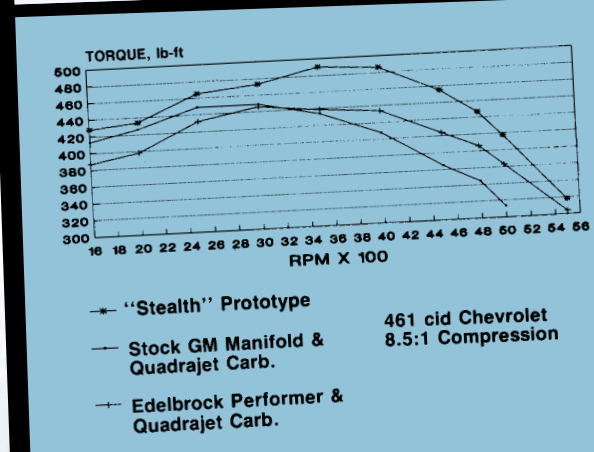
	AUTOMOTIVE	MARINE
OVAL PORT	74107	74110

Note: All systems sold unpolished.

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74107



ENGINE MANAGEMENT SYSTEMS

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4 BARREL THROTTLE BODY

GM 4 BARREL TBI SPARK FUEL MANAGEMENT SYSTEM

With the implementation of electronic fuel injectors in the automotive industry, many vehicles with carburetors or inadequate TBI systems lack the power, fuel economy or driveability to provide dependable service and performance.

To improve on these inadequacies, ACCEL now has a Throttle Body Injection (TBI) Spark Fuel Management System for systems that operate in closed loop for optimum mileage, while reaping the benefits of this impressive 4 bbl, 750 CFM throttle body.

Precalibrated for a 350 cid engine, up to 300 hp, it can be calibrated for other applications with the CALMAP calibration software. For ignition control, in addition to fuel control, an HEI Computer controlled distributor is recommended (non-computer controlled HEI distributor can also be used for fuel only applications). For convenience, this aluminum throttle body will bolt to a standard 4 bolt carburetor flange manifold. System includes: ECU, Main and Injector Harness, Throttle body assembly with gaskets, Air Cleaner, Fuel Pump, Fuel Filter, Coolant Temperature Sensor, Air Temperature Sensor, TPS, MAP Sensor, IAC Motor, Oxygen Sensor w/nut, Linkage Hardware.

If computer controlled ignition timing is to be utilized without the use of a GM style computer controlled HEI ignition system, see 74043I IPU modification on page 237. If computer controlled ignition timing is not desired, only RPM signal is required.

GM 4 bbl T.B.I System	74135
Throttle body and fuel rails wo/electronics	74135B

CALMAP PROGRAM ENGINE MANAGEMENT CONTROLS FOR SPECIAL APPLICATIONS

A user-friendly calibration tool that allows anyone with a basic understanding of engine tuning to recalibrate ACCEL SuperRam Fuel Injection Systems, ACCEL Electronic Spark Fuel Management Systems for specific engine combinations. With CALMAP, access and change any table within ACCEL ECU's. Calibration can be performed on engine dyno or "on the fly" (in the vehicle under actual driving conditions). Calibrations may be saved in computer file to be stored, or changed and reused as often as desired. No PROM's to burn in order to change fuel delivery and spark timing-calibration. The digital ACCEL ECU's allow CALMAP direct user interface of fuel injection and ignition system controls to accommodate virtually any engine components selected. CALMAP software package includes: 3 1/2" Software Floppy Disks, Serial Interface Cable, CALMAP Instruction Booklet.

CALMAP Software with 25 ft. Cable	74990L
CALMAP Software w/5 ft. Cable	74990S
CALMAP Software Only,V6.32	74990N

CALMAP calibrates fuel and ignition systems only in SuperRam and EFM ECU's.

Note: All systems sold unpolished.

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74135

CALMAP can be used with any PC or laptop computer with the following features:

- DOS (Version 2.11 minimum)
- RS-232 serial port
- 3 1/2" disc drive
- CPU speed - 25-166 MHz
- 200 x 640 pixel display capability

CALMAP software package includes:

- 3 1/2" Floppy Disks
- Serial Interface Cable
- CALMAP Instruction Booklet

ELECTRONIC SPARK/FUEL MANAGEMENT SYSTEM

INSTALL MULTI-POINT FUEL INJECTION ON CARBURETED ENGINES!

ACCEL's Electronic Spark/Fuel Management Systems include the electronic components required to install Multipoint Fuel Injection on carbureted engines. ACCEL converts the mass air flow systems to "Speed-Density," eliminating the restrictive mass air flow (MAF) sensor and adding several horsepower.

Closed Loop Systems include a heated oxygen sensor for placement in the exhaust header or manifold, providing exhaust gas information to the ECU which then continuously adjusts injector pulse width for optimum air-fuel mixture, peak part-throttle performance, and maximum fuel economy.

If computer controlled ignition timing is to be utilized without the use of a GM style computer controlled HEI or Ford style computer controlled Thick Film ignition, see 74043I IPU modification on page 237.

If computer controlled ignition timing is not desired, only a RPM signal is required.

CALMAP, ACCEL's calibration software may be used with a PC or laptop computer to recalibrate ACCEL ECU's for maximum performance with specific engines.

CLOSED LOOP SYSTEMS

The following include ECU, Main Harness, Injector Harness, 1 Bar MAP Sensor* and Heated Water Sensor:

350 cid Chevrolet - Auto/RV	74022A
350 cid Chevrolet -Marine	74022M
350 cid Chevrolet LT-1	74022L
383 cid Chevrolet	74023
400-406 cid Chevrolet	74024
Buick GN/Turbo V6	74025
289-302 Ford	74030
Universal 4,6,8 Cyl. - Auto/RV	74040A
Universal 4,6,8 Cyl. - Marine	74040M

*2 and 3 Bar MAP Sensors are also available at extra cost for turbocharged and supercharged applications.

3 STAGE NITROUS ECU MODIFICATION

The factory can now upgrade a single stage nitrous ECU to 3 stage capabilities. This has become such a popular feature that we had to offer it under its own part number.

3 Stage Nitrous ECU Modification 74043

INDUCTIVE PICKUP MODIFICATION

The 74043-I modification needs to be ordered with an ACCEL Control System if timing control is to be utilized when using an aftermarket crank trigger or aftermarket magnetic pickup distributor without a mechanical or vacuum advance. This modification requires the use of an aftermarket ignition enhancer box, like the ACCEL 300+ system.

Inductive Pickup Modification 74043I

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ENGINE MANAGEMENT SYSTEMS

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TUNER OPTIONS

ENGINE MANAGEMENT SYSTEMS

ENGINE MANAGEMENT SYSTEMS

ENGINE MANAGEMENT SYSTEMS



74042

INDUCTIVE PICKUP ECU

ACCEL now offers their work horse ECU to be compatible with crank trigger and inductive pickup distributors. The timing can now be mapped and is controlled by the points wire on ACCEL and/or MSD ignition systems.

Inductive Pickup ECU 74042

POWERTUNER™ ADJUST IDLE AND WIDE OPEN THROTTLE FUEL MIXTURE FROM THE DRIVER'S SEAT!

The PowerTuner module plugs directly into the main wiring harness of the SuperRam EFI and ACCEL Electronic Spark Fuel Management Systems to provide the driver with on-board fine adjustment of idle and wide open throttle air-fuel mixture. ACCEL's use of electronic controls has eliminated dirty hands from the power-tuning process. Consider turning the IDLE knob as turning a carburetor's idle mixture screws and turning the WOT (Wide Open Throttle) knob as changing carburetor main jets. MAP and TPS lights illuminate in the event of a sensor failure indicating that the ECU has gone to "limp home" mode.

NOTE: Cannot be used with original equipment or ECU.

PowerTuner 74500

74500



AIR/FUEL RATIO METER WITH OXYGEN SENSOR

This unit is an excellent tuning aid for immediate response to air/fuel mixture changes. The 9 LED's provide a wide range of operational information in order to tune any engine management system for any size engine using unleaded fuel. Mounts conveniently on the dash or in the passenger compartment. Includes air/fuel monitor, harness, oxygen sensor and mounting nut.

Air/Fuel Ratio Meter with Oxygen Sensor 74550

Air/Fuel Ratio Meter w/o Oxygen Sensor 74551
(For Unleaded Fuel Only)

74550



ACCEL INTRODUCES VARIABLE INJECTOR CONTROLLER (VIC)

new

ACCEL now offers an option for existing DFI systems that allows individual cylinder fuel control, and the ability to use high flow, low impedance injectors with the standard DFI batch fire ECU.

The Variable Injector Controller (VIC), will also work with the following ECU's:

- 1991 or earlier GM batch fire ECU
- 1993 or earlier Ford Batch Fire ECU
- Haltech Batch fire
- Motec batch fire

The Variable Injector Controller (VIC) is sold complete with a plug in harness for use with DFI batch fire ECU's, and allows individual cylinder fuel to be trimmed by up to 25% by adjusting one of the eight injector control knobs mounted on the module. No need for a laptop computer for tuning individual cylinder fuel trim.

Variable injector controller (VIC) 74070



ENGINE MANAGEMENT SYSTEMS

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ENGINE



74601

FUEL INJECTORS

INJECTORS

These are ACCEL's highest flowing, high impedance injectors. Still compatible with the OE computer injector drivers.

They also provide excellent atomization of the fuel, improved fuel economy and throttle response. The Performance Injectors are also the new anti-plugging type which will eliminate problems that were once associated with carbon build up.

Chevrolet 305 TPI, 8/set	74601
Ford 302 HO, 8/set	74603
Buick Grand National V6, 6/set	74604
Chevrolet 350 - 383 TPI, 8/set	74605
Universal to 500 HP, 8/set	74606
36 lb/hr. Injector Pack, 6/set	74614
36 lb/hr Injector Pack, 8/set	74615

Due to the low impedance of the injectors below, they need to be driven (controlled) by 1-4 AMP/1 AMP injector driver per injector such as in the ACCEL Sequential Engine Management System or the Accel Variable Injector Controller (VIC). When used with the correct ECU they will produce excellent idle stability and tremendous power.

55 lb/hr Universal Injector, up to 950 H.P.	74612
72 lb/hr Universal Injector, up to 1200 H.P.	74616
83 lb/hr Universal Injector, up to 1400 H.P.	74607

The following equation can be used as a guide to select the proper ACCEL Performance Injectors:

$$\text{lb/hr (fuel)} = (\text{Max. HP} \times \text{BSFC}) / (\text{number of injectors})$$

where: • Max. HP is a realistic horsepower estimate or known value from dyno testing;

- BSFC is Brake Specific Fuel Consumption. Typically, BSFC for a normally aspirated (unblown) engine will be 0.45. For a turbocharged or super charged application, use BSFC = 0.55. Dyno testing can provide exact BSFC data.

- Number of injectors should be one per cylinder, if possible. For high horsepower applications, two injectors per cylinder is also acceptable.

Example: 383 cid Chevrolet 8 cylinder
 350 HP
 TPI multiport Injection
 $\text{lb/hr} = 350 \times 0.45$
 $\quad \quad \quad 8$
 $\quad \quad \quad = 19.69 \text{ lb/hr fuel}$
 Use 22 lb/hr injectors (P/N 74605)

The following chart lists ACCEL Performance Injectors' fuel mass flow rate:

FUEL FLOW RATE

19 lb/hr (8 pack), High Impedance, GM	74601
19 lb/hr (8 pack), High Impedance, Ford	74603
22 lb/hr (8 pack), High Impedance	74605
22 lb/hr (individual), High Impedance	74610
30 lb/hr (8 pack), High Impedance	74606
30 lb/hr (individual), High Impedance	74609
30 lb/hr (6 pack), High Impedance	74604
36 lb/hr (individual), High Impedance	74613
36 lb/hr (6 pack), High Impedance	74614
36 lb/hr (8 pack), High Impedance	74615
55 lb/hr (individual), Low Impedance	74612
72 lb/hr (individual), Low Impedance	74616
83 lb/hr (individual), Low Impedance	74607

Note: The 55 lb/hr and 83 lb/hr injector should only be used with the SEFI system.

EFI BY DFI

MAXIMIZING YOUR
PROGRAMMABLE FUEL
INJECTION SYSTEM.

BY RAY T. BOHACZ
REPRINTED FROM HIGH-TECH PERFORMANCE

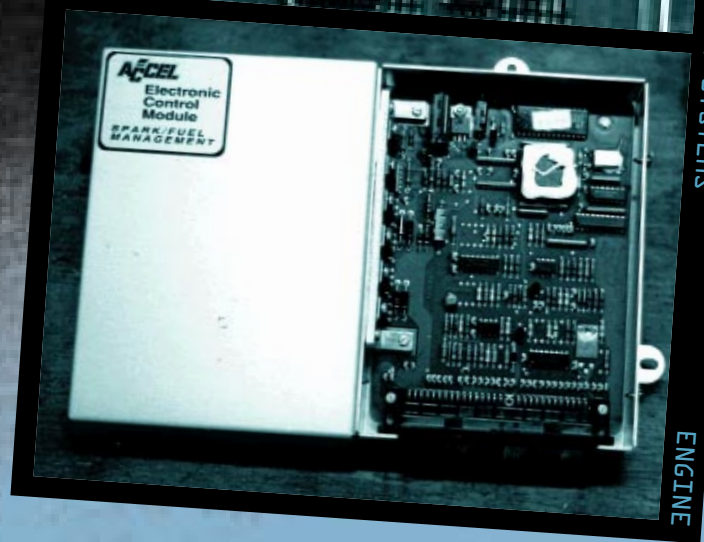
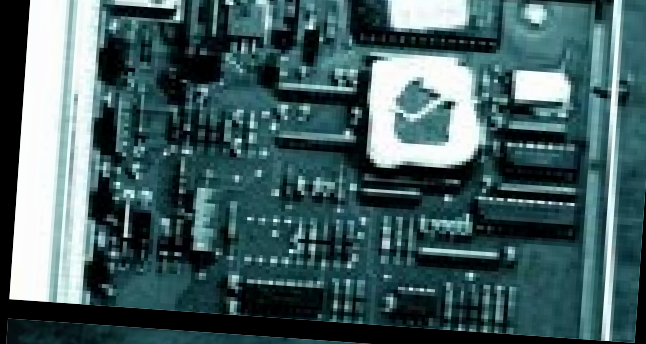
The arrival of fuel injection on performance cars in the mid 1980s not only spawned the renaissance of the musclecar, but created a whole new segment of the industry, the programmable ECU. Since this issue of HTP is focusing on aftermarket ECUs, and the ACCEL DFI ECU is one of the most prolific and popular aftermarket upgrades, we felt that it would be only appropriate to showcase it with an in-depth article dedicated to DFI tuning.

WHY DFI?

As enthusiasts recognized the performance potential in the then-new Buick GNs, 5.0 Mustangs and GM TPIs, and as a myriad of go-fast parts hit the marketplace, the inability of the factory ECU to accept these modifications became apparent. As good as the OE ECU is, its strength became its weak point: The complicated and proprietary programming that was necessary for the manufacturers to gain EPA compliance became their bane when aggressive cam profiles, high-flow cylinder heads and large injectors were introduced to the engine. The inability of the tuner to access the fuel and spark tables in the factory ECU left scores of potentially fast cars with pitiful performance, which forced some owners to revert to carburetors. In response to this dilemma, ACCEL developed and brought to market one of the first affordable, user-friendly and, most important, "on the fly" tuning-programmable ECUs. It developed a software that could only be used on its engine management systems called CalMap, which allowed the end user

to tune the complete fuel and spark tables without a degree from MIT in computer technology. It also presented opportunities for increased power production by eliminating the common MAF sensor, which proved to be a restriction in large-cubic-inch engines. The deficiency of most factory ECUs was also corrected by the employment of four peak-and-hold drivers in lieu of the customary two saturated drivers that most OE management systems incorporate. This allowed the DFI the ability to control low-resistance high-flow injectors, enabling the fuel system to support huge horsepower numbers.

Another industry breakthrough developed by ACCEL with its DFI unit was the integration of programmable dry-flow nitrous, something that had never before been accomplished. It was the ability to add nitrous independent of the fuel, along with the accuracy of adding the needed enrichment through the injectors and controlled by the DFI, along with the luxury of a programmable amount of timing retard and engagement delay. This system

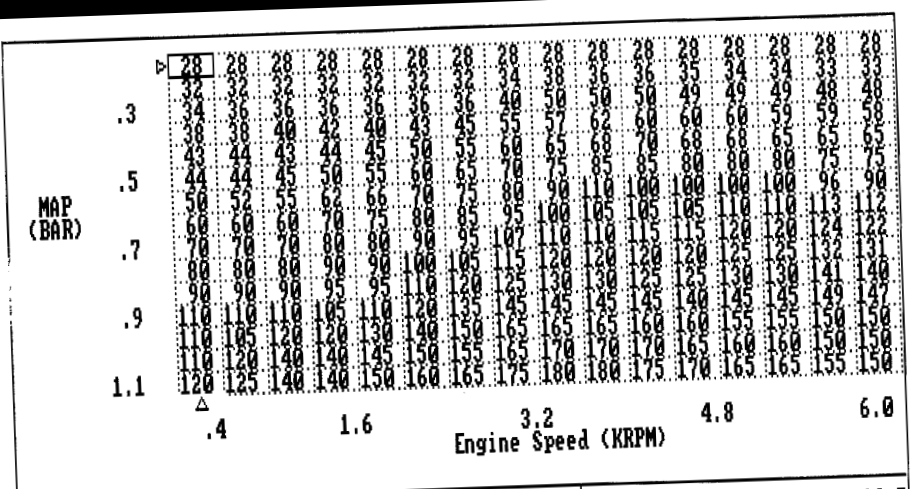


ENGINE MANAGEMENT SYSTEMS

ENGINE

Photography by Richard A. Lentinello

Note: The acronyms CalMap and DFI are both registered trademarks of the Mr. Gasket Performance Group Inc.



The base fuel map is scaled so that the horizontal axis represents rpm, and the vertical designates load. If configured for 1-, 2- or 3-bar, the resolution of the load side of the map is reduced proportionally.

1.79	Base Pulse Width (mS)	.006	O2 Sensor Volts	12.7	14.7	16.7
			Open Loop Air/Fuel			

completely did away with the fuel distribution problems caused when fuel is administered behind the throttle plates of a dry-flow long-runner intake manifold and removed a great deal of complexity from a nitrous installation.

WHERE TO START?

An ACCEL/DFI is a rarity in that it is not only a performance part but a tool. As with any tool, it is only as effective as the operator's skills allow. To tune the DFI encompasses a multi-step process you need to be familiar with the CalMap software, and you need to be able to recognize what the engine needs.

The first part is easier, thanks to the CalMap's menu-driven design and ease of execution. The second part is a little more complex. Anyone can buy a laptop computer and the calibration software and consider himself a tuner. Properly tuning a late-model fuel-injected engine requires substantial experience, time and patience. One mistake with the keyboard on the laptop and your engine can easily be turned into a pile of junk from detonation or a lean condition.

Our advice to anyone contemplating the incorporation of any one of the programmable ECUs on the market into your engine program is to learn as much about the internal workings of an engine as possible, and learn to respect the delicate balance that needs to be established between air/fuel ratios and timing demands in

regard to maximum engine output. From my years of experience working with the ACCEL/DFI system as well as almost every other programmable ECU on the market, there is a definite pattern to the obstacles and pitfalls that a novice tuner faces. Due to space constraints, I will touch on just some of the main areas of tuning.

SOFTWARE VERSIONS

Before our discussion of the prescribed tuning procedures, let's establish that due to a continual refinement process that ACCEL uses with all its products, there are different versions of CalMap in the field, depending on the date of purchase. All of this text is referenced from the 6.32 version, the most current as of late September 1997. If you have outdated software, you can purchase an updated disk from anyone of more than 100 ACCEL EMIC centers nationwide.

WORKING WITH CALMAP

Even though CalMap offers more than 30 different screens, the majority of your tuning will be done in the base fuel map and ignition timing screens once your configuration is established in the global function.

When in the global function Configure ECU, it is important to use this screen to its fullest extent. A common error in this section is choosing too large a base fuel map cell size. Ideally, when determining the size of the base fuel map's rpm resolution, you

EFI BY DFI

want the cell widths to be as small as possible, yielding the most tuning set points in the operating rpm range of the engine. To establish this, if we were to configure the map to only 4500 rpm, we would lose any resolution above that rpm figure, but we would gain tuneability where the engine spends its most time, below 4500 rpm. The common mistake is to look for large rpm values on the base fuel map, even though the engine will only see brief excursions to that rpm. A common misunderstanding is that the fuel table will stop issuing injector pulses above the rpm limit of the fuel map. That is incorrect; it will just carry out the last pulse width as the engine's speed eclipses the resolution of the fuel map. For instance, if the fuel map is calibrated to 4500 rpm and the calibrated pulse width at that speed is 10 ms, the ECU will keep issuing pulses of 10 ms at any speed above 4500 rpm. Since most street engines spend very little time in the higher rpm range, my rule of thumb is to configure the base fuel map so that you have an overshoot of 500 rpm to reach the maximum safe engine speed at which power is still being produced.

Another area of controversy is the closed-loop idle hysteresis. Ideally, you want the engine to idle in closed loop, especially if catalytic converter efficiency must be maintained. The situation will arise with headers and the varying placement of the oxygen sensor sample port with different header manufacturers and the sensor's ability to remain accurate. For this reason, ACCEL suggests using only a heated oxygen sensor to keep the output signal accurate (see "Tuning With Oxygen Sensors," ISSUE DATE). Once a camshaft is installed with increased overlap, the reversion of the exhaust back into the header during low engine speeds when poor scavenging is experienced may wreak havoc with the sensor's ability to identify accurately a stoichiometric mixture. In these instances it will be necessary to set the idle program to allow for open-loop status and ignore the sensor's output signal.

BASE FUEL MAP

Entering the base fuel map, it is beneficial to use as many of the 256 set points as possible during tuning. This is established by setting the rpm between cells as stated above. The values in the fuel map are arbitrary units that when multiplied by .0627 will determine the pulse width issued. While looking at the matrix, you will notice that the program as shipped from ACCEL has the

largest fuel commands at the torque peak, and as the engine speed escalates above peak torque the pulse width diminishes. It is common for the novice tuner not to understand that an engine's fuel demand is always highest at peak torque because volumetric efficiency is the greatest there, and in turn the fuel requirements ramp down as peak horsepower is approached in accordance with the diminished cylinder fill rates. When starting your tuning, the base fuel map is where you will spend most of your time. It usually works best to use a building block method of starting from idle, higher rpm no load, idle load (in gear), slight tip-in, part-throttle load and then full load. By engaging the View screen, most values from the ECU's inputs and outputs will be available, analogous to the serial data link on a production GM ECU. While in this mode, it is especially helpful to reference your changes to the fuel map from the amount of correction that the



EFI BY DFI

ECU is commanding to maintain an air/fuel ratio of 14.7:1.

For example, if the amount of O2 correction is stated as -12 percent, then the fuel cells that are at that load and rpm need to be leaned by 12 percent to arrive at stoich. To derive this mathematically, simply take the given matrix value (123 x .88=108.24) and multiply it by the amount of correction needed and input the new number. Keep in mind that CalMap is an interpolative software, and the cells surrounding the actual chosen cell in the fuel map will affect the issued pulse width. In reference to the required air/fuel ratios, you will find that most engines perform best with a mixture ratio of 12.7-12.9 at peak torque and 12.9-13.1 at peak power. During part-throttle light-load cruise, a stoichiometric ratio is desirable. When I write a fuel table I use a feed-forward approach instead of a feedback logic. I strive to get my fuel calculations as near to the stoichiometric set point as possible and use very little, if any, oxygen sensor trim. This is the approach that the OEs use, relying very little on correction. Keep in mind that the

air/fuel ratio monitor on the bottom of the fuel map screen is registering what the mixture would be if it was not driven back to stoich. A value of 13.2 on this scale would represent what the mixture would be if the closed-loop function was disabled with the given pulse widths in the fuel map.

IGNITION TIMING

Along with the complete controllability of the fuel tables, the same authority also lies with the spark tables. The rpm resolution of the ignition map is referenced from the fuel table and is scaled at a rate of 1.5 to the fuel table. The same theory applies to the spark table as the fuel table in regard to keeping the same timing command beyond its rpm resolution.

A common mistake inexperienced tuners make with the ignition profile is setting it much like a mechanical advance would be tuned. The graphic display of the contours of an optimized EST map vs. an analog mechanical advance graph says it all. Most engines want varying amounts of spark lead at different load and rpm levels. This was not easily accomplished with a centrifugal advance mechanism due to the basics of physics. Even though this has been recognized from the beginning of the development of the internal combustion engine, it was not accomplished until the advent of electronic spark control. The best-performing DFI-equipped vehicles have had a great deal of effort put forth in this screen.

If the vehicle has an ESC system installed, the amount of timing retard to end detonation is also displayed on the bottom of the timing map screen. Unlike the oxygen sensor feedback information, this data cannot be used to help determine the optimal spark curve other than that it is recognizing abnormal combustion. To further elaborate on this, see "Detonation" in the DATE issue. The phenomena of the hysteresis of knock establishes that when utilizing a closed-loop timing control system, the amount of retard to stop detonation once it is started in the combustion chamber is disproportionate to the amount of spark lead that would need to be removed from the total timing curve to never allow detonation to start. When working with the timing matrix, an understanding of the design aspects of your particular combination of components will reduce the tuning time immensely, but a trial and error method is still required for the best results. The amount of spark lead time is affected by numerous engine criteria such as: cylinder head combustion chamber design and mixture motion; squish-to-bore relationships; piston design; intake

INJECTOR STATIC CHART FOR SDF

RPM	PW	MATRIX VALUE
3500	17.14	273
3750	16.00	255
4000	15.00	239
4250	14.12	225
4500	13.33	212
4750	12.63	217
5000	12.00	191
5250	11.42	182
5500	10.90	173
5750	10.43	166
6000	10.00	159
6250	9.60	153
6500	9.23	147
6750	8.88	141
7000	8.57	136
7250	8.28	132
7500	8.00	127
7750	7.74	123
8000	7.50	119

Note: For SEFI ECUs use the same matrix values to identify static opening but due to the frequency difference in the firings of the injectors in SDF vs. SEFI the indicated gross pulse width in the VIEW screen will be double the matrix value.

This 3-D interpolation represents the layout of both the fuel and timing matrices in relationship to load and rpm.

manifold runner length and material composition; compression ratio; available fuel; effectiveness of thermal transfer from the cylinder head to the cooling system.

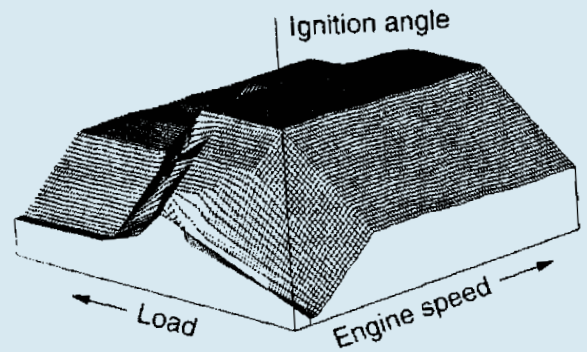
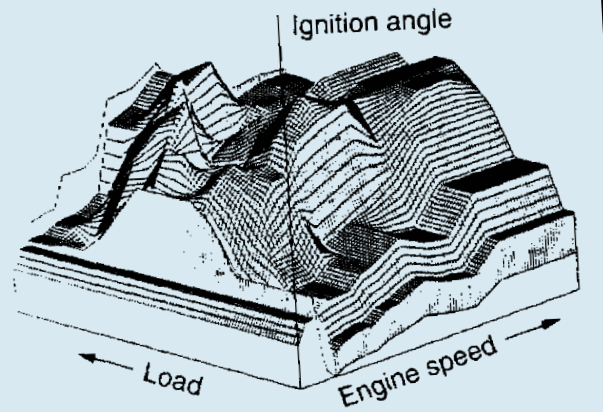
Incorporated in the DFI/ECU is a function that is referred to as Idle Spark. Accessed under the Global file, this allows for a programmable amount of timing to be used in accordance with a predetermined amount of engine idle speed variation to help smooth the idle. This is accomplished by changing the timing command to the ignition module in a rapid-duty-cycle manner. This function is coded on the board to not allow engagement above 1.5 percent throttle angle and under 100° F coolant temperature.

ESTABLISHING A SMOOTH IDLE

One area of difficulty for the novice DFI tuner is achieving a smooth stable idle, especially if increased degrees of overlap are ground into the cam and a large-capacity intake manifold is used. Working under the proviso that the engine is sound mechanically and there are no ignition or air leak problems present, the following steps will usually deliver the desired results.

While working in the base fuel map, keep in mind that injector pulse widths below 2.0 ms are entering the range of unrepeatability, and fuel pressures below 40 lbs. affect atomization and in turn idle quality. Work with all of the cells around the chosen idle cell due to the nature of the CalMap software using the surrounding cells for interpolation. Large variations in matrix values around the idle cell usually lead to surging or rolling idle conditions. It may be necessary to work back and forth between the fuel, spark and idle spark maps to achieve a nice idle quality. Longer runner intake manifolds will historically idle better with less initial spark lead, so if your attempts are hitting a brick wall in regard to idle quality, try pulling some timing out at idle and being less dependent on the Idle Spark function.

Low battery output voltages that usually come in conjunction with improperly sized underdrive pulley ratios will cause extreme idle instability and even stalling as the input voltage to the ECU ramps below 12.2 volts. No amount of tuning will compensate for the decrease in voltage that affects all of the circuits of the engine management system. Air temperature correction functions when exaggerated will also have a negative impact on idle quality.



CONCLUSION

The tuneability of a DFI system allows you to obtain the most performance from your fuel-injected engine regardless of make or modifications. But this adjustability is also a double-edged sword in that it allows you more room for error. If you use common sense and a chassis dyno session to quantify your changes and allow for repeatable back-to-back runs, you will wonder how you ever got by with the factory computer. Should your engine modifications require the use of a DFI but you don't feel comfortable doing the installation or tuning yourself, ACCEL has the answer with its EMIC program. The engine management installation program is a network of independently owned performance shops that have been selected and trained by ACCEL to sell, service and install its fuel and ignition components. With the popularity of the EMIC program, there is no excuse for not demanding the highest level of performance from your fuel-injected vehicle.

FUEL PRESSURE REGULATORS

ENGINE MANAGEMENT SYSTEMS

74560



FUEL PRESSURE REGULATORS

These premium quality pressure regulators provide stable fuel pressure under the most demanding conditions.

Part No. 74750 and 74753 allow fuel pressure adjustment for increased fuel volume and superior fuel atomization. Stock Ford 5.0L systems operate at 39 psi, while 305 and 350 TPI systems are factory set at 45 psi (except 1985 350 TPI; 39 psi).

Adj. Pressure Regulator - GM TPI 74750

Non-Adj. Pressure Regulator
- Fuel Rail Mounted (set at 45psi) 74751

Adj. Pressure Regulator - Ford Multiport 74753

Rail Mount Adjustable Regulator
(Fits all complete systems except
Small Block SuperRam or StreetRam) 74560

Adj. Pressure Regulator - Ford 1993-86 5.0L . . . 74561

Adj. Pressure Regulator
- Ford 1998-94 5.0L & 4.6L 74562

Adj. Pressure Regulator
- Chevrolet 1996-92 Corvette LT1/LT4 74565

Adj. Pressure Regulator
- Chevrolet 1997-94 F-Body LT1/LT4,
1996-94 Impala SS, Caprice LT1 74566

ENGINE MANAGEMENT SYSTEMS

74562



ENGINE MANAGEMENT SYSTEMS

74566



74725



FUEL PRESSURE GAUGE KIT

- Monitors fuel pressure to ensure that the pump and filter are performing properly.
- By adding and adjustable pressure regulator, the gauge may be used to increase or decrease pressure for maximum power.

1992-86 Ford 5.0L w/Fuel Injection 74725

1993-90 Corvette, Camaro, Firebird
w/TPI, w/Bracket 74726

1996-86 Corvette, Camaro, Firebird
w/TPI or LT-1 74745

*Products on this page are not legal for sale or use on California pollution-controlled motor vehicles.

FUEL PUMP AND FILTERS

HIGH PRESSURE ELECTRIC FUEL PUMPS

These powerful electric fuel pumps are available from ACCEL in two sizes. The 74702 pump flows 70 gal/hr. at 45 psi for engines producing 420 to 870 HP and operating at 45 psi.

High Pressure Electric Fuel Pump - 870 HP max. 74702
Fuel Pump Mounting Bracket. 74710

400 HP FUEL PUMP

ACCEL now offers a lower cost fuel pump for 500 Horsepower (45 psi) applications. The pump is designed to be installed and comes with its own mounting brackets.

400 HP Fuel Pump. 74701

HIGH PRESSURE FUEL FILTER

Stainless steel, two piece laser welded construction, ACCEL's high pressure fuel filters can withstand up to 100 psi. These filters trap particles as small as 5 microns and prevent contaminants from obstructing flow or causing fuel injector leakage between pulses.

High Pressure Fuel Filter. 74720

INLINE STAINLESS STEEL FUEL FILTER

ACCEL now offers a high pressure stainless steel fuel filter with integral hose barbs. With the hose barbs, the expensive Saginaw fittings are eliminated.

Inline Stainless Steel Fuel Filter. 74719



74702



ENGINE MANAGEMENT SYSTEMS

74710



ENGINE MANAGEMENT SYSTEMS

74720

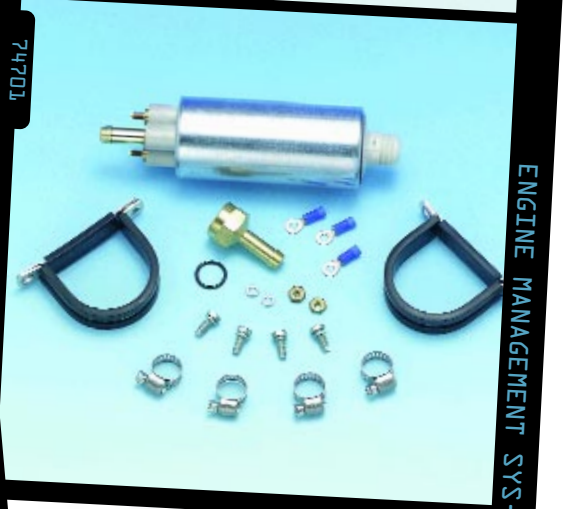


ENGINE MANAGEMENT SYSTEMS

74719



74701



ENGINE MANAGEMENT SYSTEMS

THROTTLE BODIES

ENGINE MANAGEMENT SYSTEMS



74190



ENGINE MANAGEMENT SYSTEMS



ENGINE

THROTTLE BODY 1000 CFM!

Bolt on more inlet air flow than any ported, honed, or modified OEM throttle body! This 58mm Lingenfelter designed unit is CNC machined from aluminum billet to precise, leakproof throttle operation. Stock GM throttle blades screw onto a flat surface machined onto the throttle shaft. High airflow entering the throttle body can exert such force as to produce bending and misalignment of the throttle blades. ACCEL solves this problem by using a slotted throttle shaft. As the throttle blades fit into the shaft's slots, clamping force is significantly increased and bending is eliminated. ACCEL also spins the end of the throttle shaft over the throttle linkage for increased durability. ACCEL High Flow Billet Throttle Bodies fit OEM General Motors Tuned Port Manifolds as well as all ACCEL SuperRam Manifolds. Using ACCEL's Manifold Conversion Kit, High Flow Billet Throttle Bodies can be used to convert any carbureted manifold (with Holley bolt pattern) to electronic fuel injection.

- Billet Throttle Body 1988-85 GM TPI74190
- Billet Throttle Body 1992-89 GM TPI
Except LT-1,74191
- 1000 CFM Air Filter Adapter Kit74192
- Accessory Kit, IAC Motor,
Coolant Cover, TPS, Clean Air Cover74193

Note: All systems sold unpolished

ACCEL/DFI INTRODUCES LINGENFELTER SIGNATURE SERIES THROTTLE BODY FOR LT1 POWERED VEHICLES

ACCEL/DFI introduce a billet aluminum Throttle Body (part #74191L) for 1996-1992 six-speed Corvettes, and 1997-1993 LT1 six-speed Camaros (except 1993 with traction control and cruise control). The 58mm high-flow billet Throttle Body is capable of air flow up to 1000 CFM, and is a direct replacement for the factory Throttle Body. The Throttle Body does not include IAC housing, clean air cover, IAC or TPS.

Billet Throttle Body 1997-92 LTI Six speed . . .74191L

1200 CFM 4 BARREL THROTTLE BODY

Billet aluminum 1200 CFM throttle body is CNC machined by Lingenfelter to ACCEL's close tolerances. The throttle blades are hand lapped to provide minimum air leakage while providing excellent idle control. Stainless throttle shafts provide excellent corrosion resistance for marine use. Staged progressive linkage guarantees unparalleled driveability. The throttle body comes with integral TPS and IAC motor.

With IAC and TPS74202L

Without IAC and TPS74202M

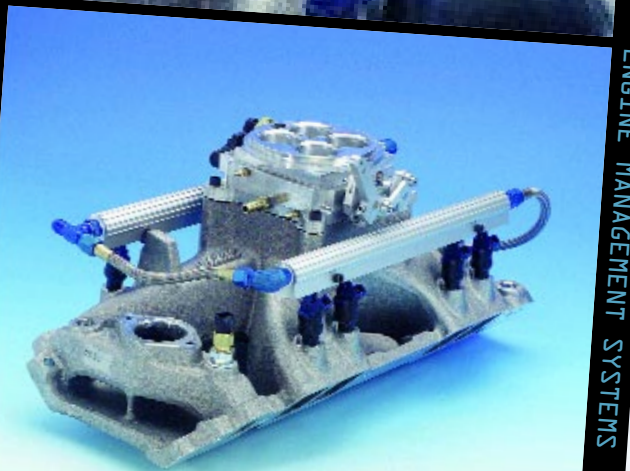
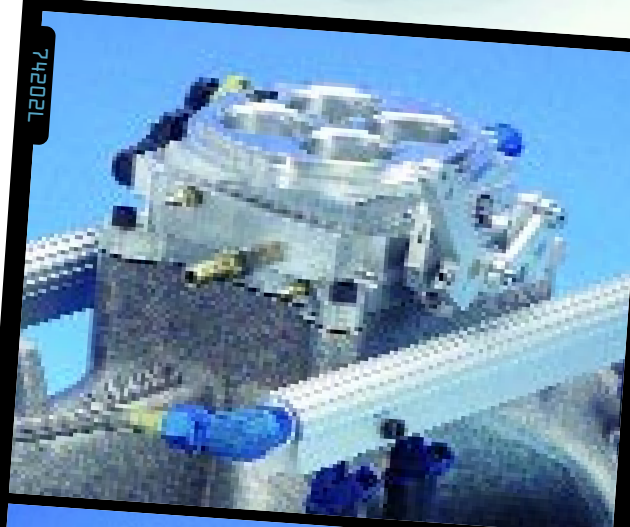
Note: All systems sold unpolished



74191L



74202L



ENGINE MANAGEMENT SYSTEMS

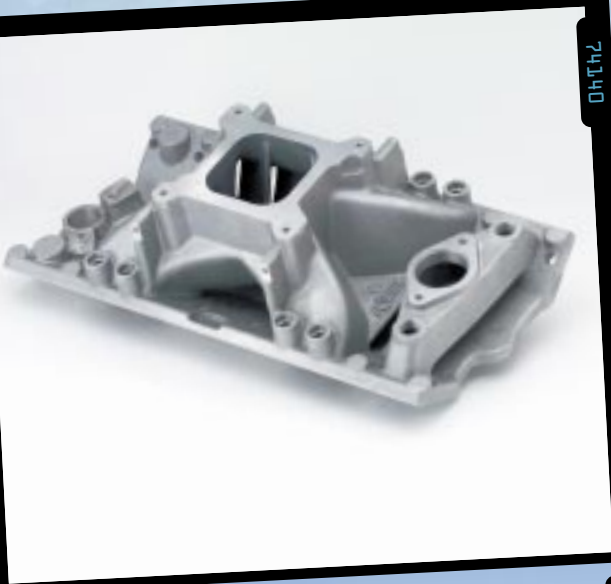
ENGINE MANAGEMENT SYSTEMS

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ENGINE MANAGEMENT SYSTEMS

74140



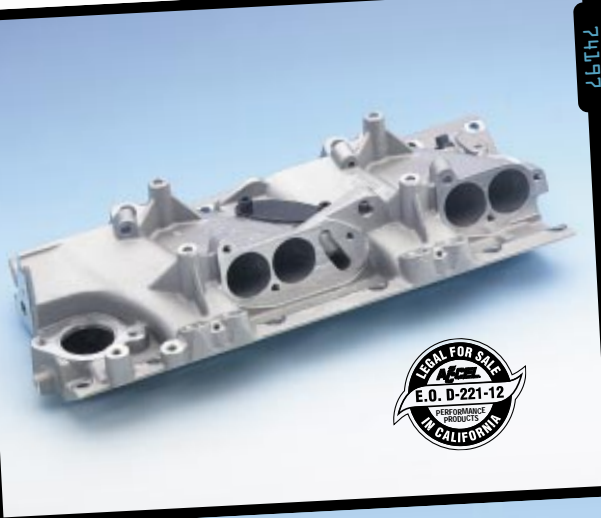
ACCEL INTRODUCES LINGENFELTER SIGNATURE SERIES INTAKE MANIFOLD FOR SMALL BLOCK CHEVROLET ENGINES

Accel introduce a small block Chevrolet intake manifold for use with either carburetion or port fuel injection. The manifold, designed by John Lingenfelter, produces excellent power from 2000RPM to 6500 RPM, has optimized runners for precise air delivery and correct air distribution, and will fit standard production 23 degree small block Chevy cylinder heads, as well as LT1 and Vortec L31 truck cylinder heads.

Manifold only – S.B. Chev 74140

Manifold with fuel rails 74139

74197



SMALL BLOCK CHEVROLET SUPERRAM MANIFOLD BASE. REPLACES STOCK OEM TPI BASE FOR HIGH FLOW PERFORMANCE!

Another John Lingenfelter design, this totally new small block SuperRam Manifold Base increases manifold port volume and recontours port shape for increased inlet air flow while maintaining high flow velocity, providing maximum charge density.

The SuperRam Manifold Base accepts OEM TPI runners or ACCEL High Flow TPI runners or ACCEL SuperRam Plenum/Runners Kit. ACCEL's SuperRam Manifold Base is equipped with EGR ports for use with vehicles originally equipped with EGR.

SuperRam Manifold Base – S.B. Chev. 74197

Note: All systems sold unpolished

**REPLACE YOUR STOCK OEM TPI
PLENUM & RUNNERS FOR
HIGH FLOW HORSEPOWER!**

ACCEL's SuperRam Plenum and Runners are available as a kit for TPI-equipped vehicles. Consisting of the Lingenfelter designed plenum and runners, this kit bolts onto the stock GM manifold base or ACCEL's SuperRam Manifold Base shown below.

This new manifold configuration significantly improves volumetric efficiency for more horsepower and torque.

The plenum lid is removable to enable plenum-to-runner port matching.

- S.B. Chev. Plenum-Runner Kit74196
- Optional Billet Plenum Lid74198
- SB Super Ram Gasket Kit74196G
- Camaro/Firebird LT-174196F
- Gasket Kit for 74196-F Super Ram74196H

**HIGH FLOW TPI RUNNERS
INCREASES INLET AIRFLOW FOR
MORE HP AND TORQUE!**

By now, it has become common knowledge that modifying TPI intake runners can significantly affect performance characteristics of the small block Chevy. John Lingenfelter and ACCEL engineers have spent hundreds of hours on the flowbench and at the dyno developing the optimum balance of port volume and velocity to ensure that the ACCEL TPI runner design outperforms any other existing runner design. These new ACCEL castings are precision cast and machined for unequalled port shape consistency and easy bolt-on installation.

ACCEL Runners #74195 are equipped with cold start valve plug kit for 1988-85 applications. The runners' cold start valve passages are also blocked off.

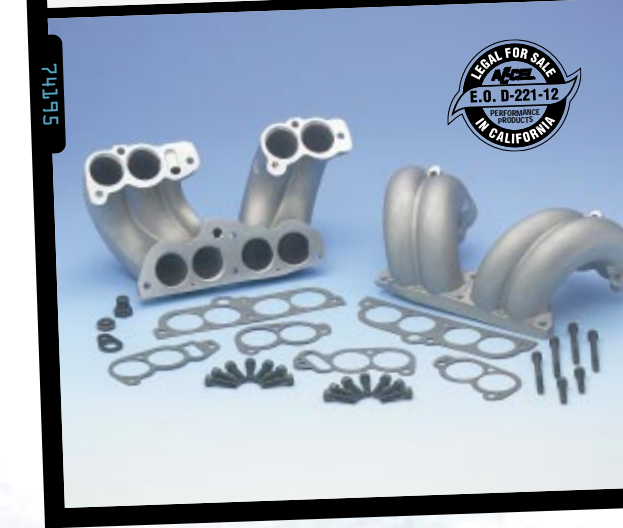
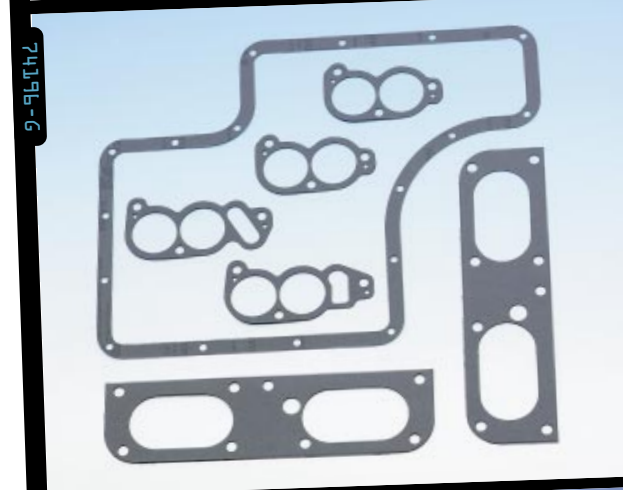
- High Flow TPI Runners 1988-8574195
- High Flow TPI Runners 1992-89
Except LT174199
- High Flow TPI Gasket Kit74195G
- OE Style High Flow Plenum, 1989-8574189E
- OE Style High Flow Plenum,
1992-89, Except LT-174189L

Note: All systems sold unpolished

74196

74196-G

74195



CAMSHAFTS

MAXIMIZE PERFORMANCE OF SUPERRAM™ FUEL INJECTION SYSTEMS!

You've heard it before: the internal combustion engine is nothing more than an air pump. The more air pumped in and pumped out, the more power can be generated. Well, it's a little more involved than this but it's a good analogy. It's relevant here because intake manifold design can be made most powerful when tailored around a specific camshaft profile and vice versa. By specifying valve timing events with known intake manifold parameters, John Lingenfelter maximized the "ram effect" of the resonant pressure wave band of the ACCEL plenum/runner combinations. This fills the cylinder with as much intake charge as possible for peak volumetric efficiency and maximum performance. Thorough, repetitive dynamometer testing has been performed to verify engineering calculations and fine tune the design of the SuperRam profiles.

ACCEL Roller camshafts are equipped with a unique feature: prior to final journal grinding, a cast iron distributor drive gear and rear cam journal are pressed onto the remainder of the hardened camshaft. This eliminates the need to use a bronze distributor gear which has to be inspected and replaced frequently due to normal wear of the soft bronze material.

SUPERRAM™ HYDRAULIC ROLLER CAMS (LIFTERS NOT INCLUDED)

DESCRIPTION	APPLICATION	DURATION @ .050"		VALVE LIFT		LOBE SEP. ANGLE	PART NO.
		INTAKE	EXHAUST	1.5 RATIO ROCKERS INTAKE	EXHAUST		
Fairly smooth idle, strong low speed and midrange torque. Works well with stock intake manifold and ported heads.	SBC 1987-present w/OEM roller cam	210	218	.499	.525	110/114	74211
Fairly smooth idle, strong low speed and midrange torque. Works well with stock intake manifold and stock heads.	SBC 1987-present w/OEM roller cam	213	219	.462	.471	112	74216
Rough idle. Needs headers and gears. Works well with SuperRam intake manifold and ported heads.	SBC 1987-present w/OEM roller cam	218	218	.525	.525	112	74219
Specially designed for use with Superchargers.	SBC 1987-present w/OEM roller cam	215	220	.500	.510	114	74220

F-BODY CONVERSION KIT

Now you can use the late model (1992-87), small diameter Camaro/Firebird V8 distributor with any ACCEL SuperRam™ or Spark/Fuel Management System.

This harness adapter kit comes with OEM-style wiring and connectors for high reliability and perfect compatibility. To install, simply plug one end into the ACCEL Engine Management Harness.

To release your ignition system's full potential, ACCEL recommends installing a Tan Hi-Performance Cap & Rotor Kit. 8132

Electronic Super Coil for GM remote mount HEI.(through '95) 140011

ACCEL SuperRam™ EFI and ACCEL Spark/Fuel Management using 1992-87 Small Diameter Chevrolet V8 Distributor 74170

ACCEL BilleTech distributor 60109, 60110

ENGINE MANAGEMENT SYSTEMS

74121

ENGINE MANAGEMENT SYSTEMS

74170

CONVERTS CARBURETED MANIFOLDS TO MULTIPOINT FUEL INJECTION!

This new ACCEL Kit provides the hardware required to convert single plane, dual plane or tunnel ram intake manifolds (with Holley carb. bolt pattern) to multipoint fuel injection.

The Lingenfelter designed 58mm bore plenum adapter replaces the old carburetor and accepts a GM throttle body, or ACCEL's 1000 cfm High Flow billet throttle body.

Simply machine the carbureted manifold to accept the eight injector adapter bushings which are then welded or epoxied in place. The portion of the bushing which extends into the manifold port is ground away to maintain unobstructed air flow.

Un-machined extruded aluminum fuel rails are included to provide fuel delivery to the injectors.

See the Injector Selection Guide on page 16 to determine the optimum ACCEL fuel injector for your specific engine.

Using ACCEL's Spark Fuel System and CALMAP Calibration Software, tuning for peak performance and economy is easily accomplished.

With some basic machining and knowledge of engine tuning, the quicker starting, crisper throttle response, added horsepower, and improved fuel economy of multipoint fuel injection are achievable with any engine.

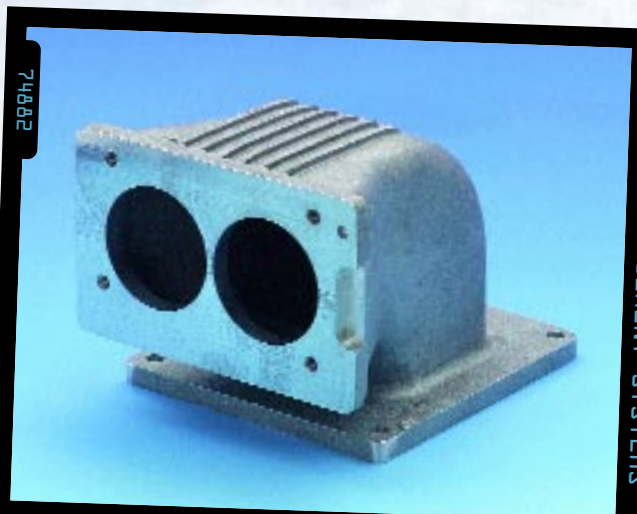
The following ACCEL components are not included in this kit but are recommended to complete this conversion:

Billet Throttle Body 1000 CFM	.....74190
PowerFilter™ Air Filter	.....72100
Coolant Temperature Sensor (CLT)	.....74764
Fuel Pressure Regulator	.....74751
High Pressure Fuel Pump	
870 HP (max.)	.....74702
Accessory Kit	.....74193
High Pressure Fuel Filter	.....74720
Jumper Line Kit	.....74731
Fuel Filter Fitting Kit	.....74721
Fuel Rail Fitting Kit	.....74730
Heated Oxygen Sensor	.....74761
ACCEL Performance Injector	.....74601 - 74606*
CALMAP Calibration Software - with 5ft. cable	74990S
- with 25ft. cable	74990L

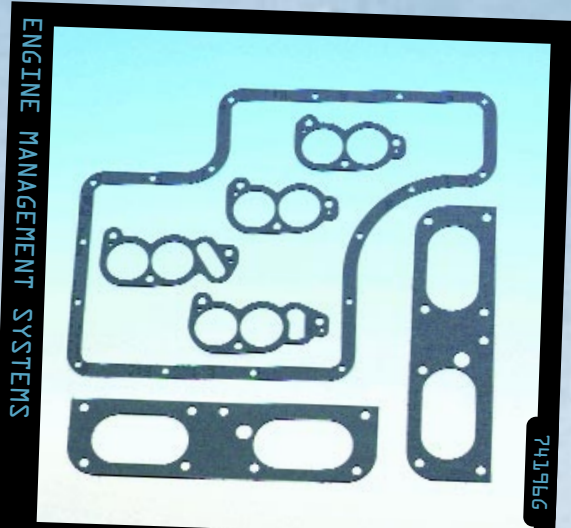
Fuel Rail Extrusion, (sold in 12" increments up to 6')
 12" Length74734

Manifold Conversion Kit74801
 Includes:
 Plenum Adapter74882
 Fuel Rails, (two 18" Pieces)see above
 8 Injector Bushings74740

*See Injector Selection Guide on page 240



ENGINE MANAGEMENT SYSTEMS



74196G

SMALL BLOCK CHEVY SUPER RAM GASKET KIT

ACCEL now offers a complete replacement gasket kit for the infamous Super Ram Manifold. The kit includes the following gaskets:

- Lid to Plenum.
- Runners to Plenum.
- Runners to Base.

Small Block Chevy Super Ram Gasket Kit 74196G

TPI GASKET KITS

ACCEL now offers a complete replacement gasket kit for the L98 style high flow runners. Kit fits either 74195 or 74199 runner kits. The set includes:

- Lid to Plenum.
- Runners to Plenum gaskets.
- Runners to Base gaskets.

TPI Gasket Kit, 88-85 74195G

THROTTLE BODY GASKET KIT

ACCEL now offers a complete replacement gasket kit for the 1000 cfm billet throttle body. The 74190G kit can be used with both the 74190 and 74191 throttle bodies.

The set includes:

- Air cleaner adapter to throttle body gasket.
- Throttle body to plenum gasket.

Throttle Body Gasket Kit 74190G

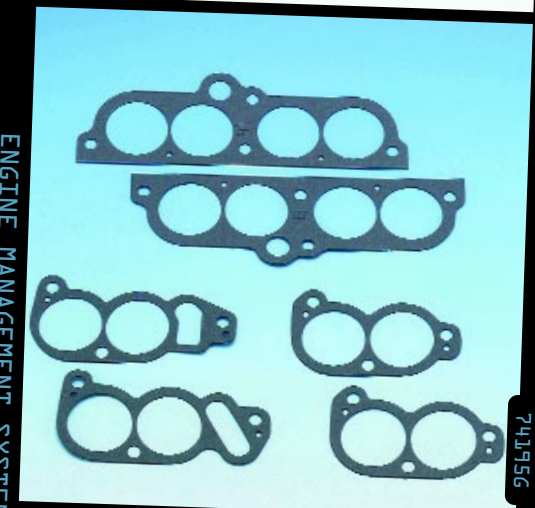
DESIGNED FOR EASY TPI INSTALLATION!

ACCEL's TPI Installation Kit includes all of the components required for a trouble free Tuned Port Injection system installation.

TPI Installation Kit 74800

Kit Includes:

- Small Block Chevrolet Manifold to Cylinder Head Gaskets *
- GM TPI Manifold Base-to-Runner Gaskets *
- GM TPI Manifold Runner-to-Plenum Gaskets *
- GM TPI Throttle Body to Plenum Gasket *
- GM TPI Distributor to Manifold Gasket
- High Pressure Electric Fuel Pump - 870 HP (max.) . 74702
- High Pressure Stainless Steel Fuel Filter 74720
- Fuel Pump Fittings *
- Fuel Filter Inlet & Outlet Fittings 74721
- Jumper Line Kit 74731
- Accelerator Cable for GM TPI 74201A
- Transmission Kickdown Cable (200R4, 700R4) 74201
- 5/16" Return Line (to install at Fuel Level Sensor Flange in the Fuel Tank) *
- Small Block Chevrolet Alternator Bracket
- Cold Start Valve Plug Kit 74820



74195G



74800



74820

ENGINE MANAGEMENT SYSTEMS

ENGINE MANAGEMENT SYSTEMS

ENGINE MANAGEMENT SYSTEMS

TPI FUEL RAIL ASSEMBLY

This high quality fuel rail assembly was especially designed for TPI-equipped small block Chevrolets. It is also used on ACCEL SuperRam™ EFI Systems for small blocks.

For easier installation, coat the injector O-rings lightly with light oil prior to fitting the rail assembly over the injectors.

Small Block Chevrolet with
TPI or ACCEL SuperRam™ EFI 74704

74704



FUEL LINE FITTINGS

High quality anodized aluminum fittings provide perfect fit to adapt GM fuel rails (Saginaw) or ACCEL's High Pressure Fuel Filter to AN-type fittings.

DESC.	QTY.	FITTINGS	
Fuel Filter			
Fitting Kit	2	3/8 Saginaw to 6AN	74721
	2	3/8 Saginaw to 8AN	74721H

74720



TPI Fuel Rail			
Fitting Kit	1	3/8 Saginaw to 6AN	
	1	5/16 Saginaw to 6AN	74730

74721H



HIGH FLOW FUEL FILTER & PUMP FITTINGS

Anodized in a rich gold, these fittings allow the highest flowrate possible of any Saginaw fitting available. Complete with O-rings, these fittings now accept both 6AN and 8AN fuel line.

High Flow 8AN Fuel Pump Fitting	74711H
High Flow 6AN Fuel Pump Fitting	74711
High Flow 8AN Fuel Filter Fitting	74743H
High Flow 6AN Fuel Filter Fitting	74743

74743H



SENSORS

ENGINE MANAGEMENT SYSTEMS

74761



HEATED OXYGEN SENSOR

This sensor measures the amount of oxygen in the exhaust gases in order to tell the ECU how much fuel to inject for optimum air-fuel mixture. ACCEL's gas-tight ceramic body uses zirconium dioxide stabilized with yttrium oxide for high durability and accurate measurement. Platinum electrodes ensure positive catalytic reaction.

- Heated Oxygen Sensor 74761
- Linear Oxygen Sensor Control Kit 74063

ENGINE MANAGEMENT SYSTEMS

74763



THROTTLE POSITION SENSOR (TPS)

The TPS Sensor attaches to the throttle body telling the ECU the amount of throttle opening. ACCEL's TPS sensor uses high resistance material with an extra light wiper arm for accurate throttle angle measurement and long service life.

- Throttle Position Sensor-SuperRam Systems . . 74763
- Throttle Position Sensor-TBI Systems 74781

ENGINE MANAGEMENT SYSTEMS

74777



MANIFOLD ABSOLUTE PRESSURE SENSOR (MAP)

This sensor monitors manifold vacuum, varying output voltage to the ECU as a function of load placed on the engine, providing necessary data to control fuel enrichment.

- MAP Sensor – 1 Bar 74764
- MAP Sensor – 2 Bar 74776
- MAP Sensor – 3 Bar 74777

COOLANT TEMPERATURE SENSOR (CLT)

ACCEL's Coolant Temperature Sensor employs a thermistor to obtain accurate measurement of engine temperature. As the engine warms, thermistor resistance decreases, letting the ECU know that it can reduce fuel enrichment.

Coolant Temperature Sensor 74765

74765



AIR TEMPERATURE SENSOR

ACCEL electronic fuel injection systems monitor inlet air temperature to provide the ECU with more accurate status of engine operating conditions.

This Air Temperature Sensor is a replacement for the unit supplied with ACCEL SuperRam™ EFI Systems. It helps determine the proper amount of fuel to inject.

Air Temperature Sensor 74773

74773



IDLE AIR CONTROL MOTOR (IAC)

The Idle Air Control permits the ECU to control idle speed by extending or retracting the IAC valve, thereby controlling airflow around the throttle plates. ACCEL's premium quality IAC motor is equipped with precision wound windings for quick response and die-cast valve for consistent airflow.

IAC Motor – SuperRam Systems 74766

74766

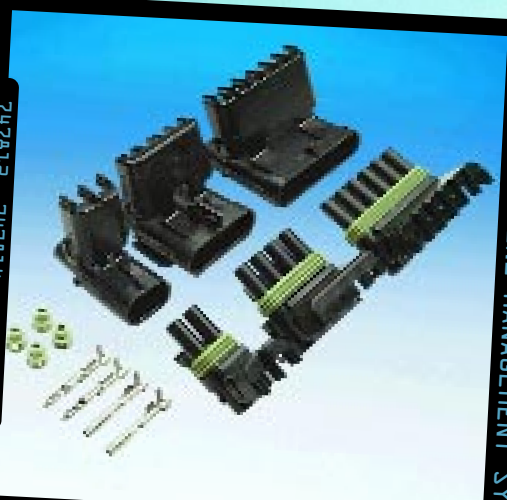


WEATHERPROOF ELECTRICAL CONNECTORS

ACCEL's Weatherproof Connectors provide OEM grade connections for do-it-yourself harness construction. Each package includes a male and female connector housing with the corresponding number of wire seals and terminals.

- Weatherproof Electrical Connector
- 1 Pin 74811
- 2 Pin 74812
- 3 Pin 74813
- 4 Pin 74814
- 5 Pin 74815
- 6 Pin 74816

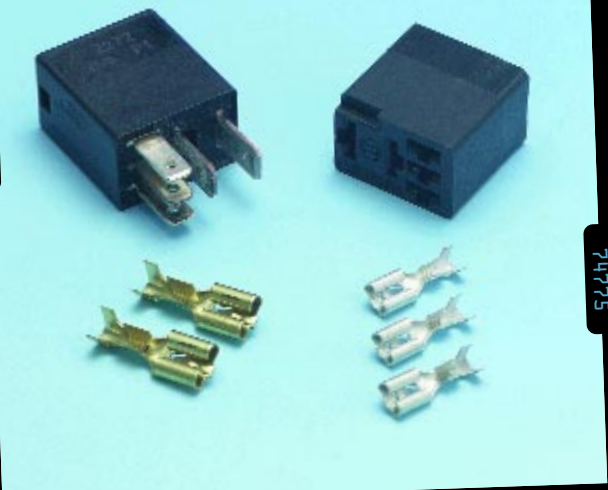
747812
747814
747816



OPTIONAL CONTROLS

74762

ENGINE MANAGEMENT SYSTEMS



74775

MICRO RELAY

This relay comes complete with terminals, molded socket and wiring diagram for easy installation. Rated at 20 Amps, it replaces the relay used in ACCEL's main wiring harness to switch ACCEL electric fuel pumps on and off.

Micro Relay	74762
Micro Relay for Marine Use	74775

ENGINE MANAGEMENT SYSTEMS



74172

TORQUE CONVERTER LOCKUP CONTROL KIT

With this kit installed, you control your torque converter's lockup characteristics. ACCEL's Torque Converter Lockup Control Kit connects GM's 700-R4 4 speed automatic transmissions to ACCEL SuperRam™ and Spark/Fuel Management System harnesses. Now you can preset the engine speed and throttle position at which torque converter lockup occurs.

Connecting your PC or laptop to the ACCEL ECU, and using CALMAP software, simply enter the ECU Configuration section and type the desired converter lockup throttle position and RPM.

ACCEL SuperRam™ EFI and ACCEL Spark/Fuel Management with GM 700-R4 automatic trans.	74172
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ENGINE MANAGEMENT SYSTEMS



74180

NITROUS OXIDE CONTROL KIT

This kit includes the hardware required to incorporate Nitrous Oxide injection control with ACCEL SuperRam™ Fuel Injection and ACCEL Spark/Fuel Management Systems.

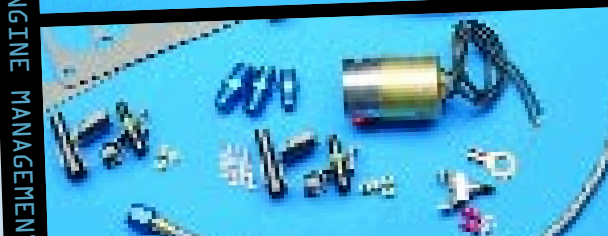
Kit Includes:

- Harness Adapter
- TPI Nitrous Oxide plate Nitrous
- Oxide Solenoid
- Nitrous Oxide Relay
- Toggle Switch (Armed-Unarmed)
- Braided Nitrous Oxide Hose (12 in.)
- Throttle Cable Relocation Bracket
- Longer Throttle Body/Bolts

ACCEL SuperRam™ EFI
and Spark/Fuel Management Systems

Single Stage	
Small Block Chevy	74180
Big Block Chevy	74182

Multi-Stage	
Small Block Chevy	74183
Big Block Chevy	74181



KNOCK CONTROL KITS

“Knocking” or “pinging” is the sound produced when a portion of the air-fuel mixture in the combustion chamber self-ignites independent of the flame front initiated by the spark plug discharge. Its consequences can range from high engine temperatures to broken valves and pistons, depending on the severity.

With the advances of modern electronics, vehicle manufacturers can now monitor knock and automatically retard ignition timing to eliminate it. ACCEL's Knock Control Kits adapt SuperRam™ and Spark/Fuel Management Systems to GM's knock sensing devices.

Use the 74173 kit to connect your stock GM knock sensor and module to ACCEL SuperRam™ EFI or Spark/Fuel Management Systems.

The 74174 and 74175 kits also include the knock sensor and module, specifically tuned for either small block or big block Chevrolet engines.

Harness Adapter Kit Only. 74173

Harness Adapter with Knock Sensor and Module-Small Block Chevrolet . . 74174

Harness Adapter with Knock Sensor and Module-Big Block Chevrolet . . . 74175

COOLANT FAN CONTROL KIT

This harness adapter kit lets you specify the exact coolant temperature at which the electric coolant fan is switched on.

This kit connects your vehicle's fan to your ACCEL harness and also uses OEM-style wiring and connectors for trouble-free installation and reliable operation.

Using your PC or laptop computer and ACCEL's CALMAP software, simply enter the ECU Configuration section and type in the desired “Fan On” temperature. The ECU will store the number and automatically switch the fan on whenever this temperature is reached.

ACCEL SuperRam™ EFI and ACCEL Spark/Fuel Management with electric coolant fan 74171

JUMPER LINES

The kit consists of three 12" long, 3/8" diameter steel tubes and one 12" long, 5/16" diameter steel tube with the Saginaw flare used in stock GM fuel injection systems. It allows direct connection to TPI fuel rails and ACCEL's High Pressure Fuel Filter.

Jumper Line Kit 74731

3/8" Jumper Line Only. 74731A

5/16" Jumper Line Only. 74731B

74173



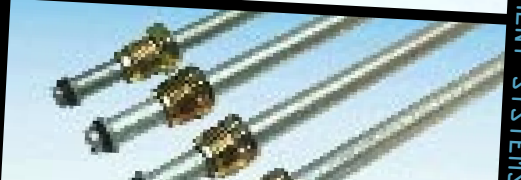
74174



74171



74731



REPLACEMENT PARTS

EFM Systems— Closed Loop Chevrolet

N/A EFM Control Module
74680 Harness, Main
74681 Harness, Injector
74764 MAP Sensor
74761 Heated Oxygen Sensor

Marine Power EFM System Chevrolet 350 cid

N/A Marine EFM Control Module
74682 Harness, Main
74681 Harness, Injector
74764 MAP Sensor

74030 EFM System— Closed Loop Ford

N/A EFM Control Module
74686 Harness, Main
74687 Harness, Injector
74764 MAP Sensor
74765 Coolant Temperature Sensor
74766 Idle Speed Control Motor
74769 Idle Speed Control Motor Housing with Gasket
74770 Idle Speed Control Motor Adapter Plate
74771 Throttle Position Sensor Conversion Kit

74102 SuperRam Fuel Injection System 396-454 Chevrolet Rectangular Port

N/A SuperRam Manifold Assy.
N/A SuperRam ECU Assembly
74765 Temperature Sensor (2)
74751 Pressure Regulator
74194 Bracket, Throttle
74834 Fitting, Vacuum
74835 Fitting, Vacuum
74836 Fitting, Vacuum (3)
74735 Fuel Rail, LH
74736 Fuel Rail, RH
74606 Injector (8)
74722 Fitting, Fuel Return
74741 O-ring
74832 Gasket, Front
74833 Gasket, Rear
74737 Valve, Fuel Rail
74738 Cap, Fuel Rail
74701 Fuel Pump
74711 Fitting, Fuel Pump
74720 Filter, Fuel Line
74721 Fitting, Fuel Filter (2)
74761 Oxygen Sensor
74769 Nut, Oxygen Sensor
74680 Harness, Main
74681 Harness, Injector
74764 MAP Sensor
72100 Filter, Air
74190 Throttle Body
74762 Relay, Fuel Pump
74755 Spacer Pressure Reg. (2)
74739 Spacer Fuel Rail (8)
74743 Fitting 3/8 NPT/6AN (2)
74744 Fitting 6AN-90 Deg
74745 Fitting 6AN/6AN Tee
74746 Fitting 3/8 - 1/4 Adpt.
74707 Braided Line, Rear
74708 Braided Line, Front

74104 SuperRam Marine Fuel Injection System 396-454 Chevrolet Rectangular Port

N/A SuperRam Manifold Assy.
N/A Sealed Marine ECU Assy.
74765 Temperature Sensor (2)
74751 Pressure Regulator
74194 Bracket, Throttle
74834 Fitting, Vacuum
74835 Fitting, Vacuum
74836 Fitting, Vacuum (3)
74735 Fuel Rail, LH
74736 Fuel Rail, RH
74606 Injector (8)
74722 Fitting, Fuel Return
74741 O-ring
74832 Gasket, Front
74833 Gasket, Rear
74737 Valve, Fuel Rail
74738 Cap, Fuel Rail
74701 Fuel Pump
74711 Fitting, Fuel Pump
74720 Filter, Fuel Line
74721 Fitting, Fuel Filter (2)
74682 Marine Harness Main
74681 Marine Harness Injector
74764 MAP Sensor
72100 Filter, Air
74190 Throttle Body
74762 Relay, Fuel Pump
74755 Spacer, Pressure Reg. (2)
74739 Spacer, Fuel Rail (8)
74743 Fitting, 3/8 NPT/6AN (2)
74744 Fitting, 6AN-90 Deg
74745 Fitting 6AN/6AN Tee
74746 Fitting 3/8 - 1/4 Adpt.
74707 Braided Line, Rear
74708 Braided Line, Front

74106 SuperRam Fuel Injection System 396-454 Chevrolet w/Oval Port Cyl. Heads

N/A SuperRam Manifold Assy.
N/A SuperRam ECU Assembly
74765 Temperature Sensor (2)
74751 Pressure Regulator
74194 Bracket, Throttle
74834 Fitting, Vacuum
74835 Fitting, Vacuum
74836 Fitting, Vacuum (3)
74735 Fuel Rail LH
74736 Fuel Rail RH
74606 Injector (8)
74722 Fitting, Fuel Return
74741 O-ring
74832 Gasket, Front
74833 Gasket, Rear 74764
74737 Valve, Fuel Rail
74738 Cap, Fuel Rail
74701 Fuel Pump
74711 Fitting, Fuel Pump
74720 Filter, Fuel Line
74721 Fitting, Fuel Filter (2)
74761 Oxygen Sensor
74769 Nut, Oxygen Sensor
74680 Harness Main
74681 Harness Injector
74764 MAP Sensor
72100 Filter Air
74190 Throttle Body
74762 Relay, Fuel Pump
74755 Spacer Pressure Reg. (2)
74739 Spacer Fuel Rail (8)
74743 Fitting 3/8 NPT/6AN (2)
74744 Fitting 6AN-90 Deg
74745 Fitting 6AN/6AN Tee
74746 Fitting 3/8 - 1/4 Adpt.
74707 Braided Line, Rear
74708 Braided Line Front

74107 SuperRam "Stealth" Fuel Injection System 396-454 Chevrolet w/Oval Port Cyl. Heads

N/A SuperRam Manifold Assy.
N/A SuperRam ECU Assembly
74765 Temperature Sensor (2)
74751 Pressure Regulator
74194 Bracket, Throttle
74834 Fitting, Vacuum
74835 Fitting, Vacuum
74836 Fitting, Vacuum (3)
74735 Fuel Rail LH
74736 Fuel Rail RH
74606 Injector (8)
74722 Fitting, Fuel Return
74741 O-ring
74832 Gasket, Front
74833 Gasket, Rear 74764
74737 Valve, Fuel Rail
74738 Cap, Fuel Rail
74701 Fuel Pump
74711 Fitting, Fuel Pump
74720 Filter, Fuel Line
74721 Fitting, Fuel Filter (2)
74761 Oxygen Sensor
74769 Nut, Oxygen Sensor
74680 Harness Main
74681 Harness Injector
74764 MAP Sensor
72100 Filter Air
74190 Throttle Body
74762 Relay, Fuel Pump
74755 Spacer Pressure Reg. (2)
74739 Spacer Fuel Rail (8)
74743 Fitting 3/8 NPT/6AN (2)
74744 Fitting 6AN-90 Deg
74745 Fitting 6AN/6AN Tee
74746 Fitting 3/8 - 1/4 Adpt.
74707 Braided Line, Rear
74708 Braided Line Front

74110 SuperRam "Stealth" Marine Fuel Injection System 396-454 Chevrolet w/Oval Port Cyl. Heads

N/A "Stealth" Intake Manifold Assy.
N/A Sealed Marine ECU Assembly
74765 Temperature Sensor (2)
74751 Pressure Regulator
74194 Bracket, Throttle
74834 Fitting, Vacuum
74835 Fitting, Vacuum
74836 Fitting, Vacuum (3)
74606 Injector (8)
74722 Fitting, Fuel Return
74741 O-ring
74832 Gasket, Front
74833 Gasket, Rear 74764
74737 Valve, Fuel Rail
74738 Cap, Fuel Rail
74701 Fuel Pump
74711 Fitting, Fuel Pump
74720 Filter, Fuel Line
74721 Fitting, Fuel Filter (2)
74682 Marine Harness, Main
74764 MAP Sensor
74190 Throttle Body
74762 Socket, Relay
74763 Relay, Fuel Pump
74743 Fitting 3/8 NPT/6AN (2)
74744 Fitting 6AN-90 Deg
74745 Fitting 6AN/6AN Tee
74746 Fitting 3/8 - 1/4 Adpt.
74707 Braided Line, Rear
74708 Braided Line, Front

74131 SuperRam Fuel Injection System Small Block Chevrolet

74196 SuperRam Plenum & Runners
74197 SuperRam Manifold Base
N/A SuperRam ECU Assembly
N/A Fuel Rail Assembly
74765 Temperature Sensor (2)
74750 Pressure Regulator
74194 Bracket, Throttle
74834 Fitting, Vacuum
74835 Fitting, Vacuum
74836 Fitting, Vacuum (3)
74606 Injector (8)
74741 O-ring
74832 Gasket, Front
74833 Gasket, Rear 74764
74737 Valve, Fuel Rail
74738 Cap, Fuel Rail
74701 Fuel Pump
74711 Fitting, Fuel Pump
74720 Filter, Fuel Line
74721 Fitting, Fuel Filter (2)
74761 Oxygen Sensor
74769 Nut, Oxygen Sensor
74680 Harness, Main
74681 Harness Injector
74764 MAP Sensor
72100 Throttle Body
74190 Throttle Body
74762 Relay, Fuel Pump

74132 SuperRam Marine Fuel Injection System with Matched Camshaft

74196 Sealed Marine ECU Assy.
74197 SuperRam Manifold Base
N/A SuperRam ECU Assembly
N/A Fuel Rail Assembly
74765 Temperature Sensor (2)
74750 Pressure Regulator
74194 Bracket, Throttle
74834 Fitting, Vacuum
74835 Fitting, Vacuum
74836 Fitting, Vacuum (3)
74606 Injector (8)
74741 O-ring
74832 Gasket, Front
74833 Gasket, Rear 74764
74737 Valve, Fuel Rail
74738 Cap, Fuel Rail
74701 Fuel Pump
74711 Fitting, Fuel Pump
74720 Filter, Fuel Line
74721 Fitting, Fuel Filter (2)
74682 Marine Harness, Main
74764 MAP Sensor
72100 Throttle Body
74190 Throttle Body
74762 Relay, Fuel Pump