



## **HP EFI 4 BBL MPFI SYSTEMS**



### **SINGLE PLANE 4BBL SMALL BLOCK CHEVY MULTI-PORT EFI SYSTEMS**

**550-810** (Early/Late Models)

**550-815** (Vortec Heads)

### **SINGLE PLANE 4BBL BIG BLOCK CHEVY MULTI-PORT EFI SYSTEMS**

**550-830** (Std Deck, 1000 CFM Rect. Port)

**550-835** (Std Deck, 1000 CFM Oval Port)

**550-833** (Tall Deck, 1000 CFM Rect. Port)

**550-838** (Std Deck, 2000 CFM Rect. Port)

**550-839** (Tall Deck, 2000 CFM Rect. Port)

### **HARDWARE AND FUEL SYSTEM INSTALLATION MANUAL – 199R10508**

**NOTE:** Fuel pump and injectors are not included with HP Systems. They can be purchased separately through a Holley dealer.

**NOTE:** These instructions must be read and fully understood before beginning installation. If this manual is not fully understood, installation should not be attempted. Failure to follow these instructions, including the pictures may result in subsequent system failure.

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## 1.0 INTRODUCTION

Holley has written this manual for the installation of the **HP EFI** manifold and fuel system. Wiring harness and ECU installation, sensor connections, startup, and tuning are contained on the disc supplied with HP systems. Please read all the **WARNINGS**, **NOTES**, and **TIPS**, as they contain valuable information that can save you time and money. Should you need information or parts assistance, please contact our technical service department at 1-270-781-9741, Monday through Friday, 8 a.m. to 5 p.m. CST. Please have the part number of the product you purchased when you call.

**WARNING!** The **HP EFI** systems consist of a number of sophisticated components. Failure of any one component does not constitute, nor does it justify, warranty of the complete system. Individual service items are available for replacement of components. If assistance is required or if you need further warranty clarification, you can call Holley Technical Service at the number shown above.

**WARNING!** To preserve warranty, these instructions must be read and followed thoroughly and completely before and during installation. It is important that you become familiar with the parts and the installation of the **HP EFI** system before you begin. Failure to read and understand these instructions could result in damage to **HP EFI** components that are not covered by the warranty and could result in serious personal injury and property damage.

**WARNING!** Use of leaded fuels will degrade the oxygen sensor and will result in incorrect exhaust gas oxygen readings and improper fuel delivery. Failure to follow these directions does not constitute the right to a warranty claim.

**WARNING!** Failure to follow all of the above will result in an improper installation, which may lead to personal injury, including death, and/or property damage. Improper installation and/or misuse of this or any Holley product will void all warranties.

**WARNING!** Use of some RTV silicone sealers will destroy the oxygen sensor used with this product. Ensure the RTV silicone sealant you use is compatible with oxygen sensor vehicles. This information should be found on the RTV package.

## 2.0 BEFORE YOU BEGIN

Fuel injection systems have proven to increase engine performance by allowing the engine to operate to the best output it is capable of producing. Make sure your engine is in good basic running order before installing the **HP EFI** fuel injection system. Anything that increases the power of your engine demands more from all the components and systems. If your engine is in poor condition before you begin this installation, you won't get the results you want.

Fuel injection is more efficient, but also less forgiving than a carburetor. A properly tuned EFI system can disclose hidden problems your carburetor may have concealed. Corroded terminals or a weak battery, alternator or ignition system will not adversely affect your carburetor, but they will interfere with the precision functions of an EFI system.

The engine cooling system must have a working 140°F to 210°F thermostat. The intake manifold needs to be hot enough to completely vaporize the injected fuel.

## 3.0 WARNINGS, NOTES, AND NOTICES

**WARNING!** For the safety and protection of you and others, the installation, adjustment, and repair must be performed only by a trained mechanic having adequate fuel system experience. It is particularly important to remember one of the very basic principles of safety: fuel vapors are heavier than air and tend to collect in low places where an explosive fuel/air mixture may be ignited by any spark or flame resulting in property damage, personal injury and/or death. Extreme caution must be exercised to prevent spillage and thus eliminate the formation of such fuel vapors.

**WARNING!** These instructions are provided as a general guideline for installation. Each user must use his own judgment to determine whether his own, or the engine's safety will be endangered by any procedure selected. The user should consult factory engine manuals to ensure compliance with fastener torque and other important specifications unique to each engine.

**WARNING!** This type of work **MUST** be performed in a well-ventilated area. Do not smoke or have an open flame present near gasoline vapors or an explosion may result.

## 4.0 SKILL LEVEL REQUIRED

Installation of the **HP EFI** intake system and the ECU requires approximately the same level of skill and experience to replace or service an induction system consisting of a carburetor and conventional intake manifold (as well as basic wiring skills for the installations of the ECU).

Adequate skills for modifying the vehicle fuel supply are critical, and will vary widely, depending upon the selected components and methods of fuel line plumbing. The most basic level will require the user to plumb a high-pressure supply fuel line and a tank return fuel line to the fuel rails. The most complex level may require the user to modify the fuel tank, re-route or add fuel lines, or mount various combinations of electrical and/or mechanical fuel pumps. Some fabrications may be required, depending on applications, for throttle cable assemblies, throttle cable bracket and thermostat housings.

**NOTICE:** If you are not absolutely certain that you have the skills and experience required to perform these procedures, we strongly recommend you have this system installed and tested by a technician with specialized training in EFI and fuel systems service.

## 5.0 ADDITIONAL ITEMS REQUIRED FOR INSTALLATION

The following is a list of materials that are needed, depending on the application.

- Fuel Injectors (see Appendix 1 for proper selection)
- Fuel Pump
- 3/8" steel fuel line (must meet SAE J526)
- Various Electrical Connectors
- Teflon pipe sealing compound
- Mechanical fuel pump block off plate
- 0-50 psi fuel gauge (recommended)
- 3/8" fuel hose (must meet SAE J30)
- Parts to mount the throttle cable
- RTV sealant (O<sub>2</sub> sensor compatible)
- Selection of 1/2" and 3/8" pipe plugs
- Heat Shrink

## 6.0 TOOLS REQUIRED FOR INSTALLATION

The following is a list of materials that are needed, depending on the application.

- Standard wrench set
- #2 Phillips screwdriver
- Hole saw (2")
- Gasket Scraper
- Small & Medium blade screwdriver
- Digital Volt meter
- Allen Wrench Set
- Windows (XP, Vista, 7) laptop computer
- Timing/Advance Light
- Drill and assorted bit sizes
- 10" adjustable wrench
- Factory service manual

## 7.0 HP EFI SYSTEM OPTIONS

**HP EFI** systems offer several optional brackets and spacers designed to simplify installation in certain applications. These parts can be ordered separately by contacting our technical service department at 1-270-781-9741.

## 8.0 PLANNING THE INSTALLATION

Before starting the installation of the **HP EFI** system several things must be decided:

- Mounting location of the fuel pump
- Mounting location of the fuel filters
- Routing of the fuel supply line from the tank, to the filter, to the pump
- Routing of the high pressure fuel supply line from the pump to 10micron fuel filter to the fuel rails on top of the manifold
- Routing of the fuel return line from the pressure regulator to the fuel tank
- Mounting locations of the ECU
- Proper throttle cable installation
- Proper thermostat housing clearance

## 9.0 REMOVAL OF EXISTING FUEL SYSTEM

1. Disconnect the ground side of the battery.
2. Drain the cooling system. Remove the cooling system hoses and thermostat housing.
3. Drain the fuel tank, then disconnect the fuel supply line or disconnect the fuel supply line and plug the hose.
4. Disconnect all throttle linkages.
5. Identify or number the ignition wires. Numbering the ignition wires will help in reconnecting them during MPI system assembly. Remove the ignition wires from the coil and spark plugs.
6. Remove the ignition cables and distributor cap as one unit.
7. Note the position of the rotor and the distributor housing. Mark rotor position on the distributor and mark distributor housing position on the engine block to ensure accurate re-assembly. After marking the position of the rotor and the distributor remove the distributor. It is easiest if the rotor points directly towards the firewall.
8. Loosen all manifold bolts before removal. Remove the manifold bolts.

**DANGER! FROM THIS POINT FORWARD, USE EXTRA CAUTION TO ENSURE NO GASKET MATERIAL OR OTHER FOREIGN MATTER ENTERS OIL PASSAGES, HEAD PORTS, OR ANY OTHER LOCATION WHERE AN OBSTRUCTION MIGHT CAUSE DAMAGE.**

9. Remove the existing manifold. If required, remove valve covers.
10. Remove the mechanical fuel pump and push rod and install a mechanical fuel pump block-off plate.

### 9.1 Preparing the Manifold for Installation

1. Protect the lifter galley with clean shop rags. Close off the ports by stuffing them with clean shop rags.

**WARNING! Failure to cover the intake opening with a clean towel could result in dirt or debris entering the engine. Dirt or debris in the induction system can cause engine damage, which may require a complete engine overhaul.**

2. Using a gasket scraper, remove gasket material from heads and block. When all loose material is removed, carefully remove the shop rags from the ports, ensuring that no material falls into passages. Using a shop vac, remove all debris from the lifter gallery.
3. Inspect carefully. Use a flashlight to inspect the interior of all air, oil, and water passages.
4. Soak a clean shop rag with solvent, and clean all sealing surfaces. Surfaces must be completely clean to ensure a reliable seal between the components and gaskets.

### 9.2 Installation of HP EFI Manifold

**WARNING! Use new gaskets. Be sure you are using the proper gasket for your engine, for aluminum manifolds, as recommended by the manufacturer.**

1. The manifold comes with the rails, fittings, and crossovers loosely installed in the proper locations. The crossover lines will have to be removed in order to install the intake manifold bolts. The injectors, fittings, rails, and crossovers should be assembled and tightened after the manifold is installed on the engine.
2. Install the manifold gaskets, carefully following the instructions provided by the gasket manufacturer.
3. Use O<sub>2</sub> sensor compatible RTV (again following manufacturer's instructions) around all water passages and for end seals if end seal gaskets are not used.
4. Carefully position the manifold on the heads, so the bolt holes in the manifold are centered over bolt hoses in the heads.
5. Hand start all the bolts.

6. Tighten down the manifold bolts in the proper sequence and torque as recommended in the engine manual.

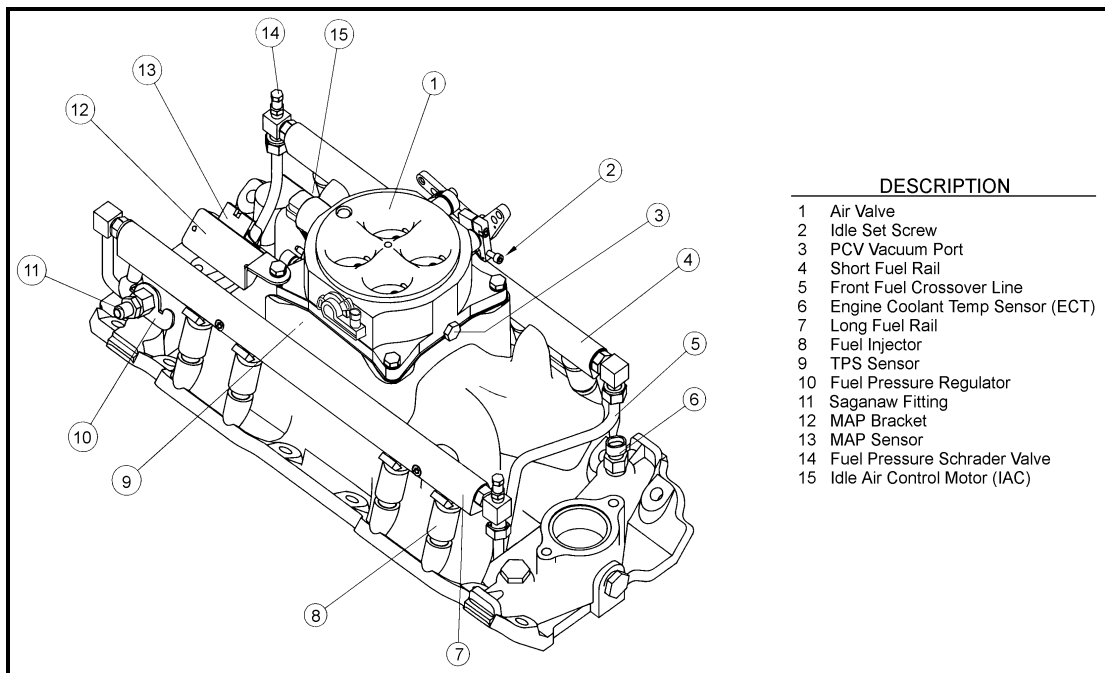
**NOTE:** Consult your engine manual for proper fastener torque, bolt tightening pattern and other manifold installation specifications.

**NOTE:** HP Systems DO NOT include injectors. For injector recommendations, please see Appendix 1.

7. Remove the fuel rails. Install the fuel injectors. Lubricate the fuel injector top and bottom O-rings. Do not use synthetic, animal or vegetable oils. Use of an O-ring specific lubricant is recommended. Use motor oil if you do not have a good O-ring lubricant. Be careful not to damage the O-rings.

**WARNING!** Damage of the O-ring can cause fuel leakage. A fuel leak may result in a fire or an explosion hazard, which could cause serious injury or death.

8. Carefully install the injectors into the rails and then install the injectors and both rails into the manifold. Reinstall the four 1/4-20 x 1" Allen head screws that held the rails in place and tighten securely.
9. Make sure that the four end fittings in the fuel rails (they should already be installed but not tightened) are threaded in to an adequate depth.
10. Reattach the front and rear crossover tubes. Tighten completely hand tight.
11. After the crossover tubes are installed, tighten the nut on the four fittings that go into the fuel rails. Tighten securely.
12. Securely tighten the front and rear crossover tubes with a wrench.
13. Install the schrader valve to the front of the fuel rail if not already installed. Use Teflon tape or liquid Teflon sealer. **See Figure 1.**
14. The regulator should already be installed. Make sure that the two Allen head screws securing it to the fuel rail are tight. Also check that the regulator fitting is tight and is pointed in the desired direction. Do not overtighten the fitting in the regulator or it will leak.



**Figure 1**

15. Next install the throttle body. The throttle body is in a separate box in the kit, which contains the gaskets needed. First install the gasket that matches the manifold base. Next install the steel plate included with the throttle body. Next install the gasket that matches the plate. Install the throttle body with the 4 5/16-18 bolts and washers included. The MAP sensor bracket is attached by the rear, passenger side bolt. Install the MAP sensor first with the two 10-32 x 1" screws and #10 washers. **See Figure 1.** The throttle cable bracket is attached with the rear driver's side bolt. The bracket in the kit works with most throttle cables and transmission cables.

16. Tighten throttle body bolts securely.
17. Check the front fuel rail cross over tubing. This line may shift during the foregoing operations, so ensure that the line cannot interfere against the manifold runner or the water cross-over. Adjust if necessary.
18. Install new thermostat housing gasket, replace thermostat housing, replace the coolant hoses and refill the cooling system.
19. Attach the throttle cable.

### 9.3 Installing the distributor

Follow the manufacturer's recommended procedures for the following steps:

1. Drop in the distributor making sure that the rotor aligns with marks made during disassembly. If you are installing a new distributor, you will have to make sure it is properly timed.
2. Align distributor housing with marks made on block during disassembly.
3. Ensure the distributor seats properly against manifold.
4. Ensure the distributor shaft is fully engaged in the oil pump.
5. Bolt the distributor hold down clamp to the manifold.
6. Replace the distributor cap.
7. Replace the spark plug wires and check that they are in the correct firing order.

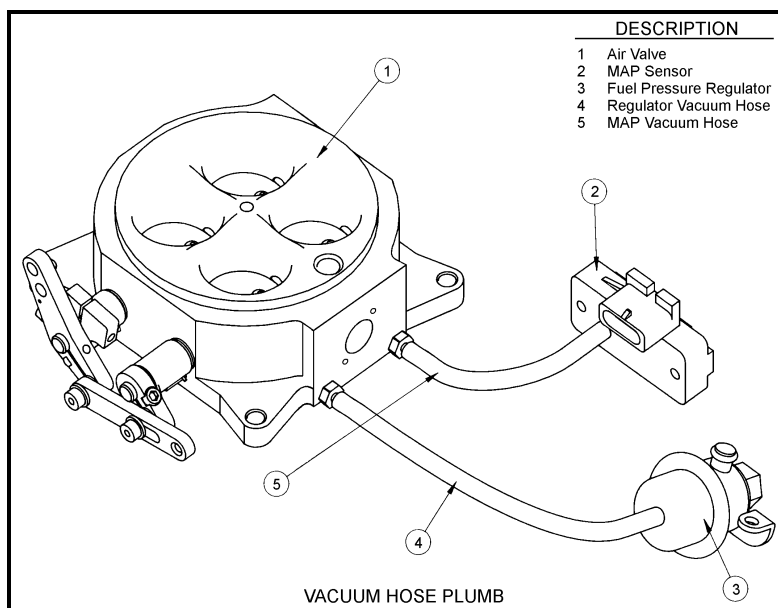


Figure 2

### 9.4 Vacuum Line Connections

1. Install vacuum hoses to the appropriate port on the throttle body (**See Fig 2**). Use the diagrams made during removal of the existing fuel system to locate the correct port. The vacuum ports of the throttle body are labeled in the figure to the right.

## 10.0 SUPPLY AND RETURN FUEL SYSTEM INSTALLATION

The MPI fuel system is a fuel metering system based on a time/pressure principle. The longer the injector is open the larger the amount of fuel per fueling event is delivered to the engine. Fuel pressure also plays a direct role in how much fuel is delivered to the engine. The higher the fuel pressure the more fuel is delivered during the fueling event. It is crucial for the proper operation of a high performance MPI system that the fuel system be installed and sized correctly. Unlike a carburetor where low-pressure fuel is delivered at an "as need" rate, the MPI supply system must continuously deliver fuel at the correct high pressure in a volume greater than the engine requires at maximum load. The excess fuel the injectors do not use is returned to the fuel tank. At idle, most of the fuel is returned to the tank, but a wide-open throttle (WOT) under full load nearly all of the fuel is used by the engine and only a small amount is returned to the fuel tank. An improperly installed or sized MPI supply fuel system may deliver enough fuel at low engine speeds but will starve the engine at WOT.

### 10.1 Fuel Supply/Return System Description

**NOTE:** HP Throttle Body systems DO NOT include a fuel pump. The installer can select their own in-tank or in-line pump of choice. Holley offers in-line and in-tank EFI fuel pumps. P/N 12-920 is an in-line pump rated for up to 600-650 HP naturally aspirated engines. It is the recommended in-line pump for Holley Multiport EFI systems for engines under 650 HP. Make sure the fuel pump flow is sufficient to support for the injector size selected.

The high pressure fuel supply system consists of the following sub-systems: the fuel pick-up, a coarse fuel pump pre-filter, the high pressure electric fuel pump, the 10 micron high pressure fuel filter and a 3/8" ID fuel line (See Fig.3). The fuel pick-up delivers fuel from the tank to the inlet of the fuel pump filter. From the filter the fuel line supplies filtered fuel to the high pressure pump inlet. The high pressure electric fuel pump delivers pressurized fuel to the 10micron fuel filter, which in turn delivers filtered pressurized fuel to the fuel rails, fuel injectors, and the fuel pressure regulator. The function of the regulator is to maintain a constant fuel pressure of 300kPa (43.5psi). The outlet of the regulator returns the excess fuel back to the fuel tank.

The following section covers the installation of an in-line pump such as Holley PN 12-920. Holley includes both a pre and post filter with the HP MPFI system. Both of these filters are designed to connect to an EFI pressure rated rubber hose. They are not designed for "AN" style plumbing. If AN lines and fittings are used, obtain AN style filters. AN fittings are available for the 12-920 pump. PN 26-160 contains two -6 pump fittings and PN 26-180 contains two -8 pump fittings.

All of the fittings on the intake manifold are -6 AN fittings (except the internal threads of the fuel pressure regulator which have a "Saginaw" thread. There are barbed adapters included that can be installed on the inlet and return fittings that can be used to connect to high pressure rated rubber fuel hose.

## **10.2 Fuel Pressure Regulator**

The function of the fuel pressure regulator is to provide constant fuel pressure for the fuel injectors. Constant fuel pressure is essential to ensure an accurate fuel metering process. The fuel pressure regulator of the system is set to 300kPa (43.5 psi) to match the flow characteristics of the fuel injectors. The pressure regulator is reference to the manifold pressure to ensure the required differential pressure for the metering event. Thus at high manifold vacuum (i.e. idle) the fuel pressure gage will read a fuel pressure that is slightly lower than 300kPa (43.5 psi) because the gage is referenced to atmospheric conditions and not to the intake conditions. The pressure reading at idle will vary with the application as manifold vacuum changes from engine to engine and from application to application.

The regulator included is adjustable. To adjust the fuel pressure: remove the vacuum reference line and turn the screw clockwise to increase the pressure (or counter-clockwise to decrease the fuel). Fuel pressure can be lowered slightly or raised to reduce or increase the amount of fuel the injectors add. This is usually only done when the injectors used need to have their flow decreased at idle or increased at wide-open throttle. Make sure you input the actual pressure into the software in the "Engine Parameters" section.

**NOTE:** Increasing the fuel pressure by 10 PSI (43.5 to 53.5) results in a fuel metering increase of about 10%. The same is true when reducing the fuel pressure.

**NOTE:** If the fuel pressure is changed, make sure to change the "Actual System Pressure" in the Engine Parameters setup in the software.

**DANGER!** INCREASING THE FUEL PRESSURE BEYOND THE OPERATING POINT OF THE FUEL PUMP MAY RESULT IN POOR ENGINE PERFORMANCE AND COULD CAUSE FUEL LEAKAGE ON COMPONENTS THAT ARE NOT RATED FOR EXCESSIVE HIGH FUEL PRESSURES. LEAKAGE OR BURSTING OF FUEL SYSTEM COMPONENTS MAY RESULT IN A FIRE OR EXPLOSION HAZARD, WHICH COULD CAUSE SERIOUS INJURY OR DEATH.



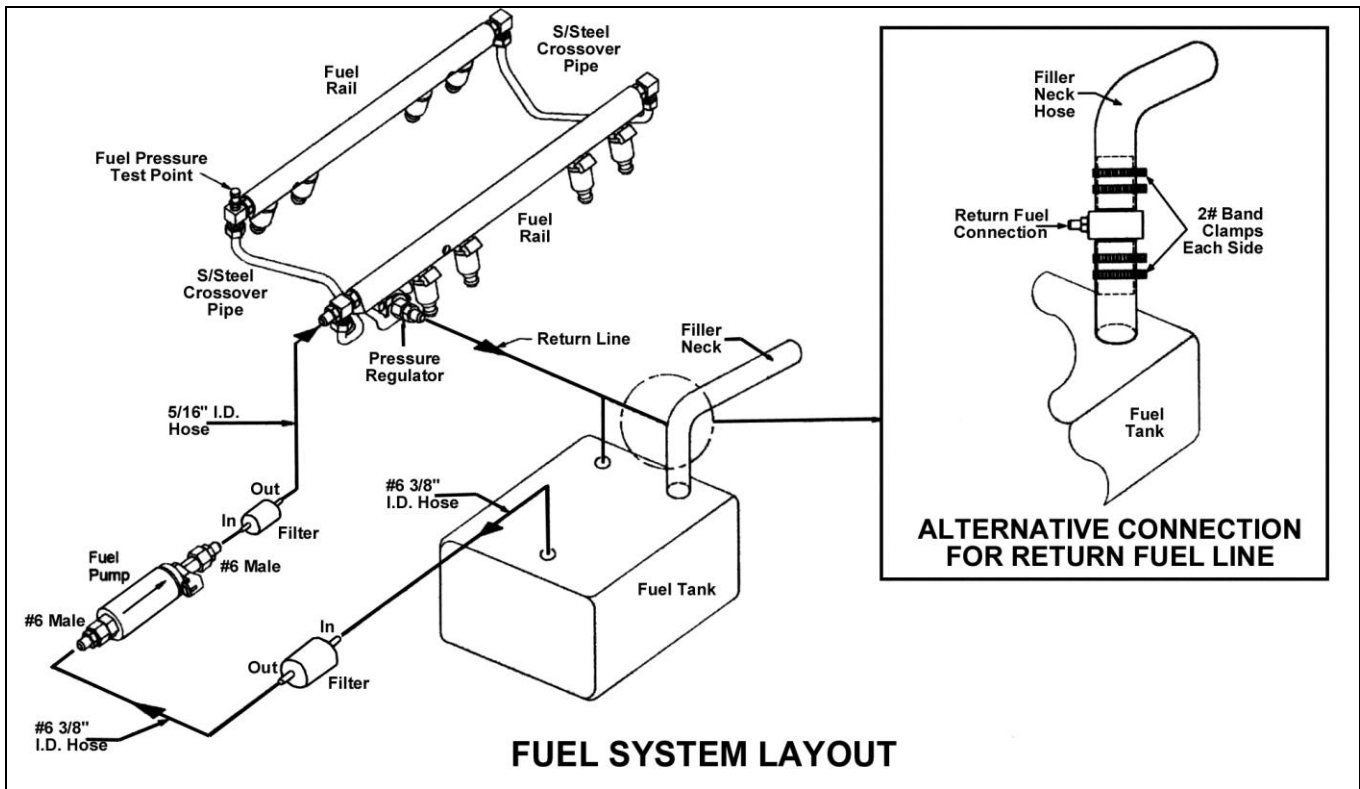


Figure 3

### 10.3 Fuel Pump Installation

**DANGER!** NEVER GET UNDER A VEHICLE SUPPORTED ONLY BY A JACK. SERIOUS INJURY OR DEATH CAN RESULT FROM VEHICLES FALLING OFF OF JACKS. BEFORE WORKING UNDERNEATH A VEHICLE, SUPPORT SOLIDLY WITH JACK STANDS.

Most in-line high-pressure fuel pumps have limited suction characteristics, so they need to be mounted as low as possible and should be mounted no higher than the bottom of the fuel tank. The pump can be mounted either horizontally or vertically. When mounting the fuel pump, check to make sure that you have the fuel flow in the correct direction. This may sound like a foolish reminder, but it is a common installation error. To prevent damage to the fuel pump before the fuel system is filled with fuel, drip/spray some light lubricant (such as 10w motor oil) into the inlet side of the pump.

1. Make sure fuel tank is properly vented.
2. Mount the electric fuel pump as close to the fuel tank outlet as possible. Mounting the fuel pump in this manner will insure that the pump will prime easily and purge fuel vapors in the fuel lines to insure faster starts.

**DANGER!** TAKE PRECAUTIONS TO ENSURE THAT ALL FUEL LINE ROUTINGS ARE AWAY FROM HEAT SOURCES, SUCH AS THE ENGINE, CATALITIC CONVERTER OR EXHAUST PIPES. A FIRE OR EXPLOSION HAZARD COULD CAUSE SERIOUS INJURY OR DEATH.

**DANGER!** ENSURE THAT THE FUEL PUMP MOUNTING LOCATION WILL NOT INTERFERE WITH ANY UNDER THE VEHICLE COMPONENTS, ESPECIALLY AT THE EXTREME LIMITS OF THE SUSPENSION TRAVEL. A FIRE OR EXPLOSION HAZARD COULD CAUSE SERIOUS INJURY OR DEATH.

3. Connect the pump to the tank using 3/8" I.D. fuel hose. Connect the outlet of the pump to the steel line which runs to the front of the vehicle with 3/8" I.D. fuel hose, depending on the diameter of the steel fuel line. All fuel hose used must meet SAE J30 performance standards.

### 10.4 Fuel Line Mounting

**DANGER!** FAILURE TO USE A FUEL HOSE THAT MEETS SAE J30 STANDARDS COULD RESULT IN FUEL LEAKS. A FUEL LEAK MAY RESULT IN A FIRE OR EXPLOSION HAZARD, WHICH COULD CAUSE SERIOUS INJURY OR DEATH.

1. If using existing fuel lines, inspect and replace any hose, clamps, or fuel line showing any sign of aging or does not meet SAE J30 fuel hose specifications. If you are not using existing fuel lines, you will need a fuel line routed to and from the engine compartment and fuel rails. Use a 3/8" steel fuel line available at any auto parts store. All steel fuel line must meet SAE J526 standards. Any time a rubber hose is connected to a steel fuel line, the steel fuel line must have a "barb" or "nipple" on it to properly retain the hose (along with hose clamps). Either use the proper tool to put a "nipple" on the end of the tube (similar to the ends of the fuel filters), or use a compression fitting and a barded fitting adapter that is the proper size for the lines used. Clamping a rubber hose to a steel line that has the end squarely cut off does not ensure a safe connection.

**DANGER!** FAILURE TO USE STEEL FUEL LINE THAT MEETS SAE J526 STANDARDS COULD RESULT IN FUEL LEAKS. A FUEL LEAK MAY RESULT IN A FIRE OR EXPLOSION HAZARD, WHICH COULD CAUSE SERIOUS INJURY OR DEATH.

**DANGER!** TAKE PRECAUTIONS TO ENSURE THAT ALL FUEL LINE ROUTINGS ARE AWAY FROM HEAT SOURCES, SUCH AS THE ENGINE, CATALYTIC CONVERTER, OR EXHAUST PIPES. A FIRE OR EXPLOSION HAZARD COULD CAUSE SERIOUS INJURY OR DEATH.

**DANGER!** RIGID FUEL LINE TUBING SHOULD BE USED FOR UNDER VEHICLE RUNS, SUCH AS ALONG VEHICLE FRAME RAILS OR UNDER FLOOR PANS. FAILURE TO DO SO IS A POTENTIAL FIRE OR EXPLOSION HAZARD, WHICH COULD CAUSE SERIOUS INJURY OR DEATH.

2. Anchor all fuel lines securely to solid chassis members at 1 ½ foot intervals using rubber coated steel clamps. Use of only approved steel fuel line tubing will afford maximum fuel line protection against road hazards, gravel bombardment and premature wearing due to flexing, temperature extremes, road salt, weather, etc.

## 10.5 Fuel Filters

**WARNING!** It is very important the fuel filters have the proper flow capacity, burst pressure rating and filter size. The flow capacity of the filters must at least 60 gallons per hour (gph), and the filter size must be no bigger than 10 microns for the high fuel pressure filter and not bigger than 75 microns for the fuel pump inlet filter. The high-pressure fuel filter should be rated for at least for 150 psi burst pressure.

**DANGER!** FAILURE TO USE HIGH PRESSURE FUEL FILTER LINE RATED FOR A MINIMUM OF 100 PSI BURST PRESSURE COULD RESULT IN FUEL LEAKS OR BURSTING OF THE FUEL FILTER. A FUEL LEAK MAY RESULT IN A FIRE OR EXPLOSION HAZARD, WHICH COULD CAUSE SERIOUS INJURY OR DEATH.

The fuel filter supplied by Holley meets or exceeds the above specifications. Most filters for carburetor systems do not.

The fuel pump inlet filter (marked WIX 33033) must be plumbed between the fuel tank and the fuel pump. It should be mounted as close to the fuel tank as possible and should be mounted no higher than the top of the fuel tank. The high-pressure fuel filter should be plumbed between the fuel pump and the fuel rail. It should be mounted as close to the fuel rail as possible but should not be mounted above the fuel rail level.

Be careful to ensure the suction part of the fuel system contains no air leaks. Air leaks are caused by holes and/or crevices so small that they will not leak fuel. Just because fuel is not leaking out does not mean air is not leaking in. Common causes of air leaks are not using thread sealing compound on fittings and cracks or holes in fuel lines. Air leaks could potentially cause fuel pump failure and or inadequate fuel supply to the fuel rails.

## 10.6 Return Line Installation

**DANGER!** DO NOT USE THE VAPOR CANISTER LINES AS A FUEL RETURN LINE. POSSIBLE FUEL LEAKS MAY CREATE A FIRE OR EXPLOSION HAZARD, CAUSING SERIOUS INJURY OR DEATH.

**WARNING!** Use only approved steel fuel line. The return fuel line should enter the fuel tank at the "fuel level sending unit flange" or at the "filler neck". The connection should be made below the flapper valve of the filler neck. The filler neck or sending unit must be removed from the tank to perform this operation.

**DANGER!** PROPER INSTALLATION OF THE FUEL RETURN LINE MAY REQUIRE THE COMPLETE REMOVAL OF THE FUEL TANK. THIS WORK SHOULD BE DONE BY A FUEL TANK SPECIALIST, WHO REGULARLY DOES THIS WORK AND IS FAMILIAR WITH SAFETY REGULATIONS AND PRECAUTIONS NECESSARY TO DO THIS WORK. IF A PERSON ATTEMPTS THIS WORK WHO IS NOT FAMILIAR WITH THE SAFETY REGULATIONS AND PRECAUTIONS, AN EXPLOSION HAZARD MAY RESULT CAUSING SERIOUS INJURY OR DEATH.

The fuel return line from the fuel pressure regulator must go back to the fuel tank and enter the fuel tank with a fitting that has an internal diameter of at least 3/8".

The internal thread on the fuel pressure regulator is a "Saginaw" style thread and is internally sealed with an O-ring. This fitting should not be over-tightened in the regulator or it will leak.

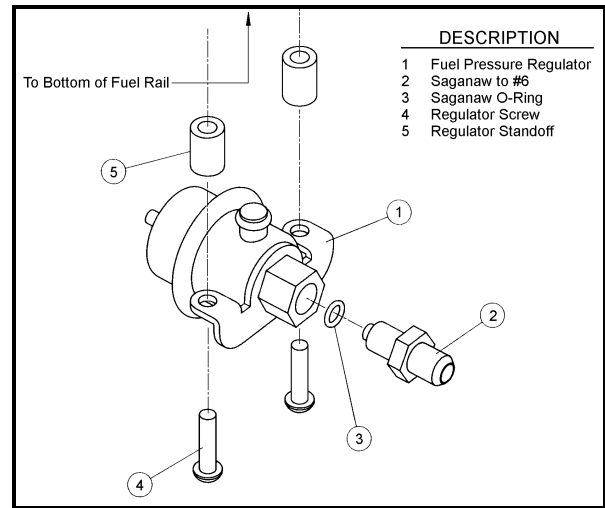
Returning fuel should be routed back to the tank away from the fuel tank pick-up tube. This will allow air bubbles from the returned fuel to dissipate before they are drawn into the pick-up tube.

There are several options including the following that meet the above criteria for returning the fuel to the fuel tank.

- Use a fitting already in the fuel tank
- Use the vent fitting. Be very careful not to block the fuel vapor from escaping the tank.
- Route the return line into the filler neck. This can be done by cutting the filler neck, inserting a welded "T" fitting, and securing the neck with multiple clamps.
- Drill and weld a new fitting into the tank

**NOTICE:** For best performance of your fuel supply system an in tank pump is recommended. Such an installation can be achieved by either buying a late model fuel tank or have your tank modified by professional companies that install an in-tank pump with the required swirl pods and baffles.

**DANGER!** MODIFICATIONS TO FUEL TANKS SHOULD BE DONE BY FUEL TANK SPECIALISTS, WHO REGULARLY DO THIS WORK AND ARE FAMILIAR WITH THE SAFETY REGULATIONS AND PRECAUTIONS NECESSARY. IF A PERSON ATTEMPTS THIS WORK WHO IS NOT FAMILIAR WITH THE SAFETY REGULATIONS AND PRECAUTIONS, AN EXPLOSION MAY RESULT CAUSING SERIOUS INJURY OR DEATH.



**Figure 4**

## 10.7 Oxygen Sensor Installation

### 10.7.1 Oxygen Sensor Mounting Procedure

**NOTE:** Someone should install the oxygen sensor boss that has experience welding exhaust systems. Any competent exhaust shop is able to perform this task at a minimal cost.

**WARNING!** Use of leaded fuels will degrade the oxygen sensor over time and will result in incorrect exhaust gas oxygen-content readings.

**WARNING!** Use of some RTV silicone sealers will destroy the oxygen sensor used with this product. Ensure the RTV silicone sealant you use is compatible with oxygen sensor vehicles. This information should be found on the RTV package.

1. Locate a position for the oxygen sensor as close to the engine as possible. If your vehicle has catalytic converters, the oxygen sensor MUST be located between the engine and the catalytic converters. Good locations are in the drop pipe, or in the "Y" pipe on single exhaust systems. Pick a location that allows easy installation of the oxygen sensor, but will protect the sensor from road hazards.

**NOTE:** Vehicles with open exhaust systems will require at least 18-20" of pipe after the sensor to eliminate false readings resulting from atmospheric reversion. Even then, a false lean reading may occur at idle.

2. Drill a 7/8" hole in the location picked for the sensor. Weld the threaded boss into the 7/8" hole. An old spark plug with matching threads will avoid thread damage during the welding process. Weld all the way around the boss to insure a leak proof connection. Install the oxygen sensor into the threaded boss and tighten securely. It is a good idea to add anti-seize to the threads to aid in removal.
3. On vehicles equipped with an AIR pump, the oxygen sensor must be mounted before the AIR injection into the exhaust, or the AIR pump must be disconnected. Holley recommends that if the AIR is injected into both exhaust manifolds, mount the oxygen sensor into the pipe immediately after the exhaust manifold. Disconnect the AIR pump tube from the exhaust manifold and plug both ends. Check with local ordinances for the legality of this procedure in your area.

**WARNING!** Failure to disconnect the AIR pump or locating the oxygen sensor downstream from AIR injection will result in an extremely rich mixture which could cause drivability problems and severe engine damage.

## 11.0 MECHANICAL CHECKOUT BEFORE STARTING ENGINE

Before starting engine, review and check off the following items:

- Are electrical connections correct?
- Are all fuel lines hooked up and correct?
- Is throttle linkage hooked up?
- Have fuel lines been leak checked?
- Are all vacuum hoses connected?
- Are all sensors installed and hooked up properly?

1. Reconnect the battery.
2. Make sure all relays and fuses are connected.
3. Make sure that there is no leakage from any fuel lines when the fuel system has been pressurized.
4. Ensure that all vacuum and port connections have been plugged or made. Now install the air cleaner.

**DANGER!** MOVE THE THROTTLE INTO LINKAGE INTO WIDE OPEN CONDITION AND CHECK THAT IT DOES NOT INTERFERE WITH AIR CLEANER OR OTHER COMPONENTS OF THE ENGINE AND MAKE SURE THAT IT RETURNS FREELY TO IDLE CONDITION WHEN RELEASED. THROTTLE RETURN ACTION CAN BE ENHANCED BY ADDING ADDITIONAL SPRINGS THAT PULL THE THROTTLE INTO CLOSED CONDITIONS. FAILURE OF TESTING THROTTLE ACTUATION PERFORMANCE MAY CAUSE UNSAFE DRIVING CONDITIONS, WHICH COULD CAUSE SERIOUS INJURY OR DEATH.

# APPENDIX 1 THE ENGINE APPLICATION AND THE SELECTION OF YOUR FUEL MANAGEMENT SYSTEM COMPONENTS.

## *Injector Fuel Flow*

Engine output is in direct relation to fuel supplied to the engine, however installing injectors, which are too big, will not make more power. Installing injectors that are too small can lead to engine damage. It is therefore very important to match the fuel injector flow characteristics to specific engine applications.

The following equation sizes fuel injectors for specific engine applications.

$$\text{Injector Static Flow Rate [lb./hr.]} = (\text{Engine HP} * \text{BSFC}) / (\text{Number of injectors} * \text{DC of Inj.})$$

**Engine HP** = Realistic HP output estimate of the engine

**BSFC** = Brake Specific Fuel Consumption [lb./HP\*hr.]. Good approximation 0.50

**Duty Cycle of Injector** = Maximum opening time of injector/cycle time.

**Maximum Duty Cycle** = 0.90

*Example:*

Engine HP = 400HP

Number of Injectors = 8

Injector Static Flow Rate [lb./hr.] =  $(400 * 0.50) / (8 * 0.90) = >27.78 \text{ lb./hr.}$

**NOTE:** If the application requires a static flow rate that falls in between two available injectors always use the next larger injector.

For the example above if only 25 lb./hr. and 30 lb./hr. injectors are available, choose 30 lb./hr. injectors.

The following are the injectors available from Holley.

PN	INJECTORS
522-191	Single Injector 19 PPH
522-198	8 pack Injectors 19 PPH
522-241	Single Injector 24 PPH
522-248	8 pack Injectors 24 PPH
522-301	Single Injector 30 PPH
522-308	8 pack Injectors 30 PPH
522-361	Single Injector 36 PPH
522-368	8 pack Injectors 36 PPH
522-421	Single Injector 42 PPH
522-428	8 pack Injectors 42 PPH
522-481	Single Injector 48 PPH
522-488	8 pack Injectors 48 PPH
522-661	Single Injector 66 PPH
522-668	8 pack Injectors 66 PPH
522-831	Single Injector 83 PPH
522-838	8 pack Injectors 83 PPH
522-121	Single Injector 120 PPH
522-128	8 pack Injectors 120 PPH

## 12.0 WIRING

The following reviews how to properly install the wiring harnesses for this system.

### 12.1 Important Wiring “Do’s and Don’ts”

An EFI system depends heavily on being supplied a clean and constant voltage source. The grounds of an electrical system are just as important as the power side.

HP ECU’s both contain multiple processing devices that require clean power and ground sources. The wiring harnesses for them must be installed in such a manner that they are separated from “dirty” power and ground sources.

#### DO’S

- Install the main power and ground directly to the battery.
- Keep sensor wiring away from high voltage or “noisy/dirty” components and wiring, especially secondary ignition wiring, ignition boxes and associated wiring.
- Use shielded/grounded cable that is supplied for wiring crankshaft and camshaft signals.
- Properly solder and heat shrink any wire connections.
- It is critical that the engine has a proper ground connection to the battery and chassis.

#### DON'TS

- NEVER run high voltage or “noisy/dirty” wires in parallel (bundle/loom together) with any EFI sensor wiring. If wires need to cross, try to do so at an angle.
- Do not install Crank and Cam signal wiring near spark plug and coil wires.
- Do not run non-shielded/grounded wire for crankshaft and camshaft signals, especially magnetic pickups.
- Do not run the USB Communications cable near or with any noisy wires.
- Do not exceed current limits provided for the various outputs. If current levels exceed these, use the appropriate relay or solenoid drivers.
- Do not use improper crimping tools.
- Don’t use things like “t-taps”, etc. Use solder and heat shrink.
- It is never recommended to splice/share signal wires (such as TPS, etc) between different electronic control units.
- Don’t wire items that require “clean” ground or power to the same points.

## 13.0 ECU CONNECTORS AND PINOUT

**Battery Power Connection** – The HP ECU has a main battery power and ground connector on the right side of the ECU. The bottom position, Terminal “A” is the ground. The upper position, Terminal “B” is the positive terminal. Always use the fused power cable with the proper connectors supplied by Holley only.

**USB Communications Connector** – HP ECU’s use a standard USB cable for Laptop communications. Looking at the front, the connector is at the far left side. This connection is a common “mini USB” connector, typically used for digital cameras and other devices. Holley offers a USB cable with a sealed connector, PN 558-409 for applications where the USB cable will be plugged in, and the ECU is mounted in a dirty environment.

**HP ECU** – The HP ECU has **two** main connectors:

- **P1A** - The first connector next to the USB connector is the “P1A” connector (34 pin). This connector is primarily an “Input” connector. It contains all the sensor inputs and wide band oxygen sensor control.
- **P1B** - The second connector is the “P1B” connector (26 pin). This connector is the “output” connector. It has 8 injector outputs, 8 DIS ignition outputs, 4 IAC outputs, and 4 user programmable outputs.



Figure 5

### 13.1 Pinout

The following is a pinout of the HP ECU connectors.

The P1A and P1B connectors and pinout are identical for the HP and Dominator ECU's.

<b>P1A Connector</b>		<b>P1B Connector</b>	
<b>Pin</b>	<b>Function</b>	<b>Pin</b>	<b>Function</b>
A1	Coil - Input	B1	IAC A Lo
A2	Fuel Pump Out (+12v) (10A Max)	B2	IAC A Hi
A3	Input #2 (F52THG)	B3	Output #4 (G P-)
A4	Input #4 (F5G)	B4	Injector F Output
A5	TPS Input	B5	Injector G Output
A6	Points Trigger Output	B6	Injector H Output
A7	WB1 COMPR2	B7	Injector E Output
A8	WB1 Shield	B8	IAC B Lo
A9	WB HTR -	B9	IAC B Hi
A10	Switched +12v Input	B10	Output #3 (G P-)
A11	Manifold Air Temp Input	B11	Output #2 (H P+)
A12	Input #1 (F52THG)	B12	Output #1 (H P+)
A13	Input #3 (F5G)	B13	Injector D Output
A14	Cam/Crank Ground	B14	EST Ground Output
A15	Gauge Digital Output	B15	EST 2 Output (Cylinder #2)
A16	WB1 COMPR1	B16	EST 4 Output (Cylinder #4)
A17	WB1 VS-/IP+	B17	EST 6 Output (Cylinder #6)
A18	Sensor Ground	B18	EST 8 Output (Cylinder #8)
A19	Engine Coolant Temp Input	B19	Injector A Output
A20	Oil Pressure Input	B20	EST 12V Output
A21	Knock #2 Input	B21	EST 1 Output (Cylinder #1)
A22	Cam Sync Input / Ignition Bypass Output	B22	EST 3 Output (Cylinder #3)
A23	Map Sensor Input	B23	EST 5 Output (Cylinder #5)
A24	CAN Lo	B24	EST 7 Output (Cylinder #7)
A25	WB1 VS+	B25	Injector C Output
A26	Sensor +5v	B26	Injector B Output
A27	NOT USED		
A28	EST/Spout Output		
A29	Knock #1 Input		
A30	Crank Speed Input		
A31	Fuel Pressure Input		
A32	CAN Hi		
A33	WB1 IP+		
A34	WB HTR +		

### 14.0 PRIMARY SENSORS CONNECTION

The following reviews all the connections that must be performed on the "Main Harness". The Main Harness is the primary harness that supports all the primary engine sensors, fuel and ignition for 8 cylinder engines, the #1 wideband oxygen sensor, and the four programmable input and output channels. There are two connectors for this harness designated as "P1A" (pin designations below that start with an A) and "P1B" (pin designations below that start with a B).

The following descriptions indicate the name of the item and the name as labeled on the harness (each connector has a label) is shown in parenthesis.

## **14.1 Throttle Position Sensor (TPS)**

Connect to the TPS which is located on the throttle body.

## **14.2 Manifold Air Pressure Sensor (MAP)**

A 1 Bar MAP sensor is provided with all Holley EFI systems. Connect to the MAP sensor.

## **14.3 Coolant Temperature Sensor (CTS)**

Connect to the Coolant Temperature sensor which should have been installed in an engine coolant passage.

## **14.4 Manifold Air Temperature Sensor (MAT)**

Connect to the Air Temperature Sensor. Multiport systems will have this installed in the intake manifold and TBI systems will have it installed in the throttle body air inlet.

## **14.5 Knock Sensor (Knock)**

Holley EFI systems work with either a one wire or two wire knock sensor. Application specific harnesses will have the correct knock sensor connections installed on the harness. A Universal harness comes with a 3 pin metripak connector. If a knock sensor is added, it should be connected into this connector

## **14.6 Wide Band Oxygen Sensor (WB02)**

Holley EFI systems can work with either a Bosch (PN 554-101) or NTK (PN 554-100) wide band oxygen sensor. These sensors must be purchased from Holley as they are calibrated specifically for use with Holley EFI systems. HP EFI systems are sold with the Bosch sensor. Make sure you have the proper sensor selected in the Engine Parameters area or sensor damage may occur. Connect the "WB02" connector to the WB02 sensor which should be installed in the exhaust system.

## **14.7 Fuel Pressure (Fuel)**

A fuel pressure transducer connector is pre-installed in the main harness. The system is plug-and-play configured for a Holley 100 PSI pressure transducer (can be purchased under PN 554-102). A different 0-5V transducer can be used, but the calibration must be set up as a custom sensor in the software. If these are not connected to a pressure transducer, the Fuel and Oil Pressure will read "LOW Err" in the data monitor. This will not cause any issues.

**NOTE:** Connect to the transducer (if installed).

## **14.8 Oil Pressure (Oil)**

An oil pressure transducer connector is pre-installed in the main harness. The system is plug-and-play configured for a Holley 100 PSI pressure transducer (can be purchased under PN 554-102). A different 0-5V transducer can be used, but the calibration must be set up as a custom sensor in the software. If these are not connected to a pressure transducer, the Fuel and Oil Pressure will read "LOW Err" in the data monitor. This will not cause any issues.

**NOTE:** Connect to the transducer (if installed).

## **14.9 CANbus (CAN)**

All harnesses have a CANbus communications connector. This is used to communicate with CANbus devices such as the Avenger Handheld tuning module or the 5.7" Touch Screen LCD. If these devices or any other CANbus device is not being used, there is no need to do anything with this connector.

A24 CAN Lo (Pin B)

A32 CAN Hi (Pin A)

## **15.0 PRIMARY OUTPUTS**

### **15.1 Idle Air Control (IAC)**

Connect to the idle air control motor which is installed in the throttle body.



## 15.2 Fuel Injector Outputs (Injectors)

All terminated harnesses have a fuel injector connector. Various fuel injector harnesses plug into this connector. It is essential these harnesses are used so that injector firing sequence is maintained.

Note that for engines with different firing orders, you do NOT change these pins. The engine's firing order is input in the software itself. V8 harnesses offered by Holley are labeled for GM, Ford, and Chrysler engines.

Each injector harness has the engine cylinder number labeled on each injector connector. Connect each injector on the appropriate cylinder.

## 15.3 Ignition Adapter (Ignition)

The Ignition Adapter connector contains all the wires needed to connect to adapter harnesses offered by Holley for various ignition systems and crank and cam sensor. The only ignition related wiring that is NOT contained on this connector is individual coil driver outputs for DIS applications as well as the "coil –" and "points trigger" wires which are loose wires.

The adapter is pinned as follows:

- A30** – Crank signal Input - Both digital and inductive (proper type must be selected in the software) (Pin A)
- A22** – Cam signal Input / Ignition Bypass Output – Both digital and inductive (proper type must be selected in the software)  
**NOTE:** If using a computer-controlled GM HEI Distributor, this pin will serve as the ignition bypass output. (Pin B)
- A14** – IPU Ground (Pin C)
- Chassis Ground** – (Pin D)
- A10** – Switched +12v (Pin E)
- A27** – NOT USED (Pin F)
- A14** – IPU Ground (Pin G)
- A28** – EST/Spout Output (Pin H)
- A14** – Shield Ground (Pin J)
- A14** – Shield Ground (Pin K)

**NOTE:** The crank and cam input wiring in both the main harness and adapter harnesses use a shielded/grounded cable. The shield is grounded at the ECU end. You do not ground both end of shielded/grounded cable. It is always recommended to use shield/grounded cable to protect the integrity of the crank or cam sensor input signals. This is especially important when using a magnetic pickup. A hall effect sensor is much less susceptible to noise interference and is always the recommended sensor type to use.

Holley offers the following ignition adapter harnesses.

- **558-303 – Magnetic Pickup Harness** – Intended for magnetic pickups. Either crank trigger or distributor mounted - Does not contain cam sync wiring.
- **558-304 – HEI** – Connects to a small cap GM HEI computer controlled distributor
- **558-306 – Universal Unterminated Ignition Harness** – Contains ignition adapter connector and all wiring to connect to any crank and cam sensors (pins A-K). Also, contains shielded/grounded cable for crank and cam sensor inputs. The user must supply terminals and connectors to plug into their chosen sensors.

**NOTE:** See section 18.0 for applications and diagrams on wiring most ignition systems.

## 16.0 LOOSE WIRES

The following loose wires in the main wiring harness should be connected as follows on all systems:

**12V Switched – Color = Red/White** – Should be connected to a clean +12 volt power source. Power source should only be active when the ignition is on. Make sure source has power when engine is cranking as well. Not all sources apply power when the ignition switch is in "cranking" position.

**12V Battery – Color = Red** – Should be connected directly to the battery. There is a fuse holder attached that should contain a 20A rated fuse. This powers the fuel pump and fuel injectors.

**12V Fuel Pump – Color = Green** - Used to directly power a fuel pump (+12 volt). Fully terminated harnesses utilize a relay to supply this power. 14 gauge wire is used. Due to this, it is not recommended for pumps that draw over 10-12 Amps to use this wire. For high current pumps, use this wire to trigger a separate relay and use larger gauge wire to feed the pump - 10 gauge is recommended.

**Points Output – Color = White** – Used to trigger a CD ignition box. See the ignition wiring section for detailed wiring.

**Ignition/DIS Chassis Ground – Color = Black** – Connect to a ground point that has excellent connectivity with both the engine and the battery.

**“Coil – ” – Color = Yellow** – Used for an RPM input signal when not controlling timing and NOT running a Capacitive Discharge (MSD) ignition system. See the ignition wiring section 8.0 for detailed wiring.

**WARNING!** Connecting this wire to the coil of a CD ignition will damage the ECU.

## 17.0 MAIN POWER HARNESS

Holley HP and Dominator ECU's use the same main power cable. These wires should be run **directly** to the battery. 10 gauge wire is used. The harness comes with a 40 Amp fuse pre-installed. Do not substitute smaller gauge wires.

## 18.0 IGNITION SYSTEM WIRING

Both the HP and Dominator Systems support a wide variety of ignition systems. The following schematics show how to wire the most typical systems.

### 18.1 Small Cap Computer Controlled GM HEI

To connect to a small cap computer controlled GM HEI, ignition adapter harness PN 558-304 is required. The following diagrams overview how to wire with and without a CD ignition box.

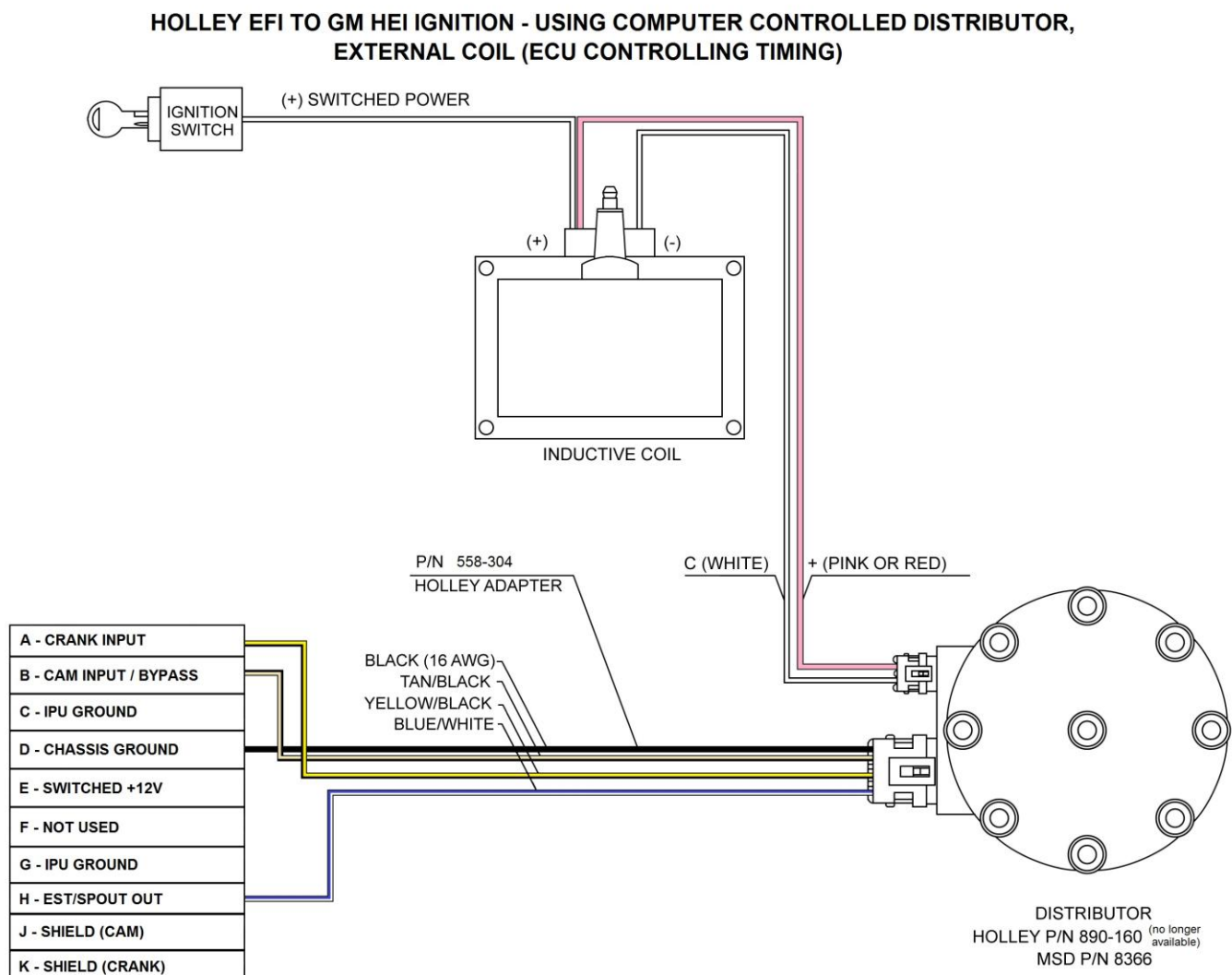


Figure 6

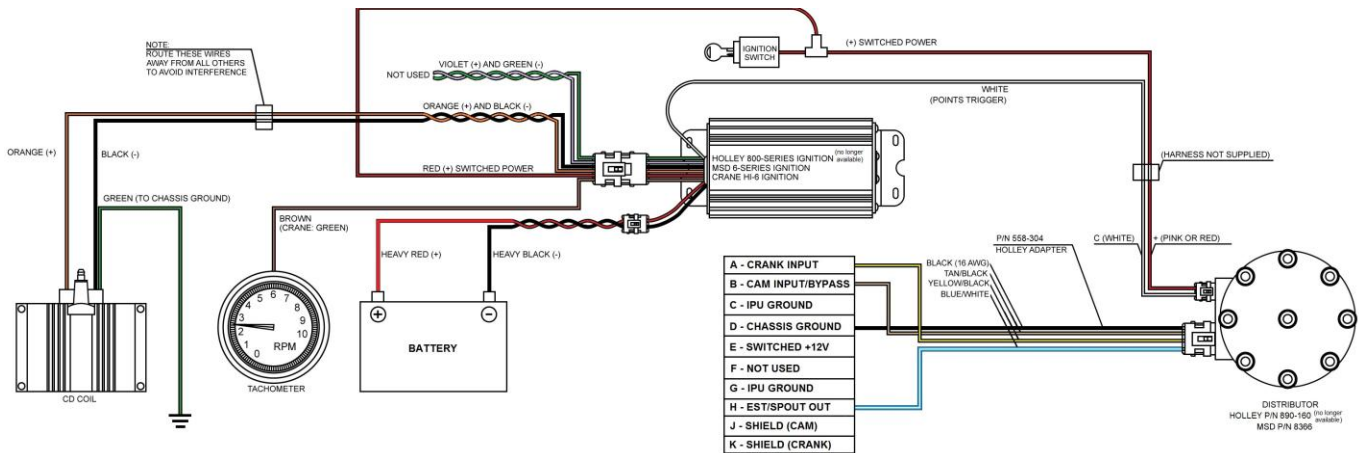


Figure 7

## 18.2 NON- ECU Controlled Timing Applications (ex. GM Non-ECU Controlled Large Cap HEI)

To connect to a distributor that has mechanical advance and is not controlled by the ECU (ex. GM large cap HEI non-computer controlled distributor), refer to the following diagrams.

- If **NOT** using a CD ignition box, connect the loose YELLOW (NOT yellow/black wire) in the harness to the negative side of the ignition coil.
- If using a CD ignition box, connect the purple crank input wire located in the ignition adapter harness to the “tach out” in the ignition box. This wire is located in Pin A of the 10 pin ignition adapter in the EFI harness (Do **NOT** use the purple wire in pin B – this is for the camshaft sensor input). The following shows three options in order of preference:
  - 1) Some kits come with a 10 pin ignition adapter harness with a single YELLOW/BLACK wire that directly connects to the ignition adapter on the main harness. If you have this adapter, use it to connect the YELLOW/BLACK wire into the tach output of the CD ignition box.
  - 2) If your kit contains an HEI distributor ignition adapter harness (4 wires), you can cut and splice into the YELLOW/BLACK wire in it. This saves you from having to modify the main harness.
  - 3) If you have no ignition adapter harness, you can splice into the purple wire in the main harness.

If splicing is done, make 100% certain that this is a very solid connection. Solder and heat shrink is highly recommended. This supplies the engine speed signal to the ECU and if the connection is not solid, the engine will not run properly.

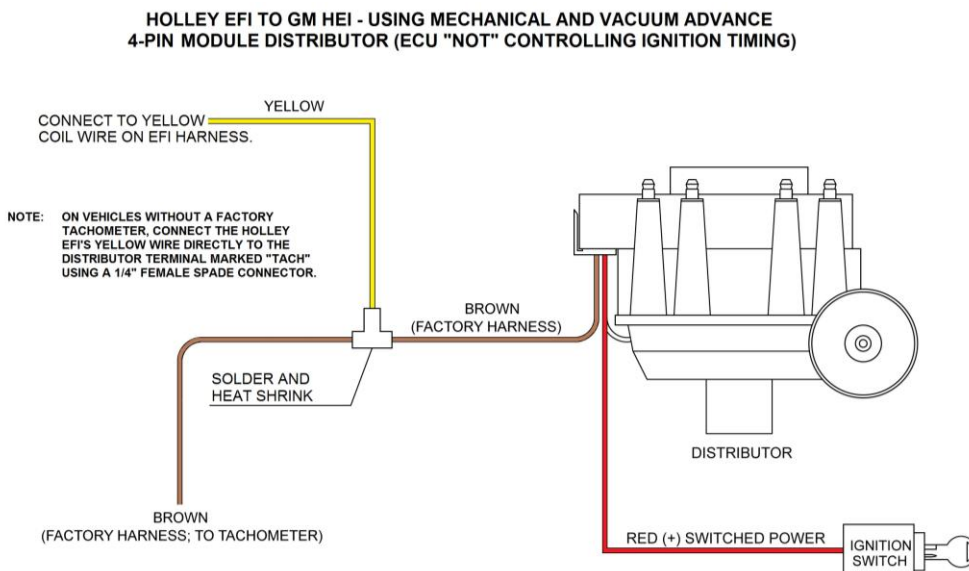
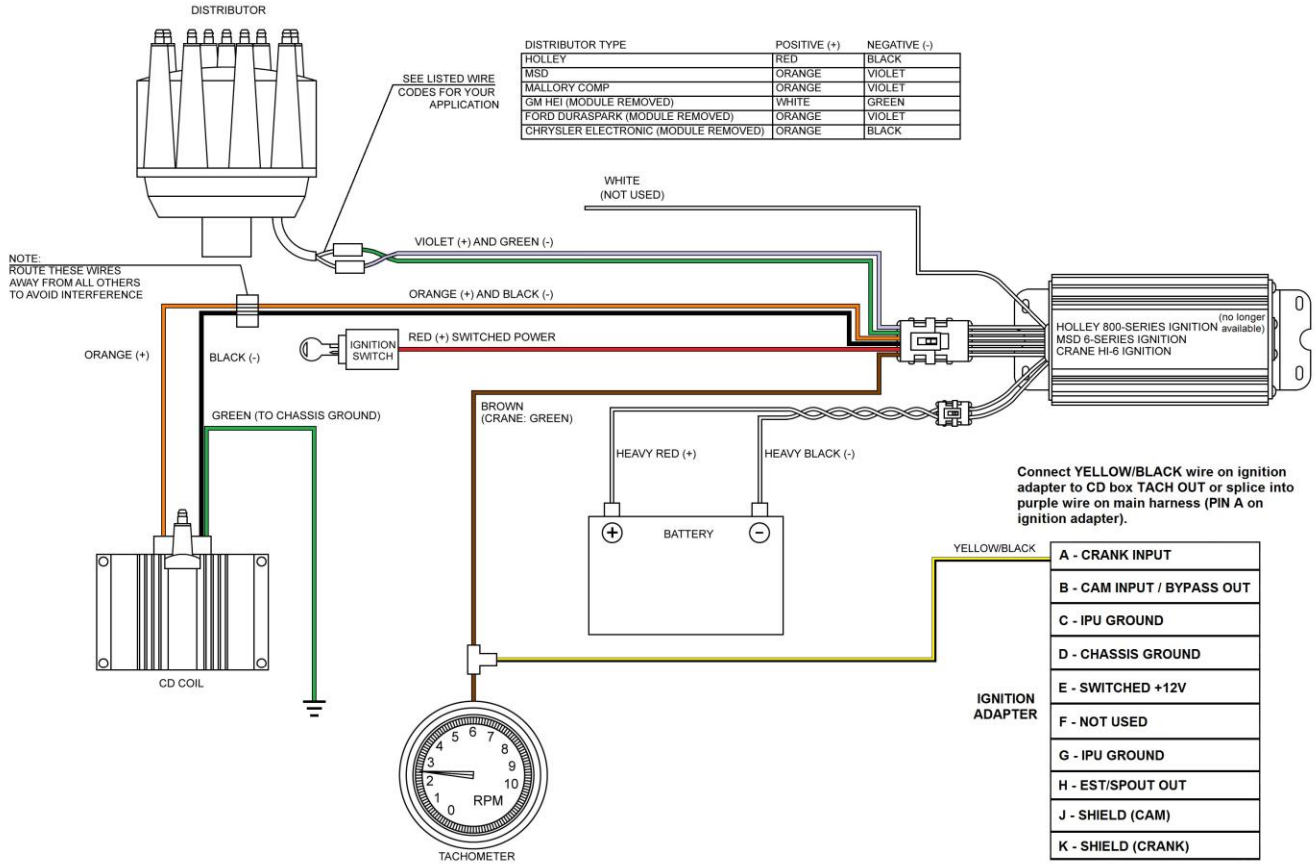


Figure 8

## HOLLEY EFI TO AFTERMARKET IGNITION - USING MAGNETIC PICK-UP DISTRIBUTOR (ECU "NOT" CONTROLLING IGNITION TIMING)



**Figure 9**

### 18.3 Magnetic Crank Pickup

The follow diagrams are for running a magnetic pickup, either a crank trigger or a distributor. To run just a magnetic pickup crank input and no camshaft input, PN 558-303 should be purchased. If a cam sync input will be used as well, it is recommended to use PN 558-306 which will contain wiring for both the crank and cam sensor inputs. It is critical that properly installed shielded and grounded cable is used when using a magnetic pickup, or it is likely that EMI will disturb the crankshaft signal. Both PN 558-303 and 558-306 come with the proper cabling. It must be installed properly as well. Make sure that the shield is properly grounded which requires it being grounded at the ECU with that ground maintained through the ignition adapter connection.

Note: The user must supply the proper terminals/connectors for the crank and cam sensors they are using.

#### HOLLEY EFI TO AFTERMARKET IGNITION - USING MAGNETIC PICK-UP CRANK TRIGGER (ECU CONTROLLING IGNITION TIMING)

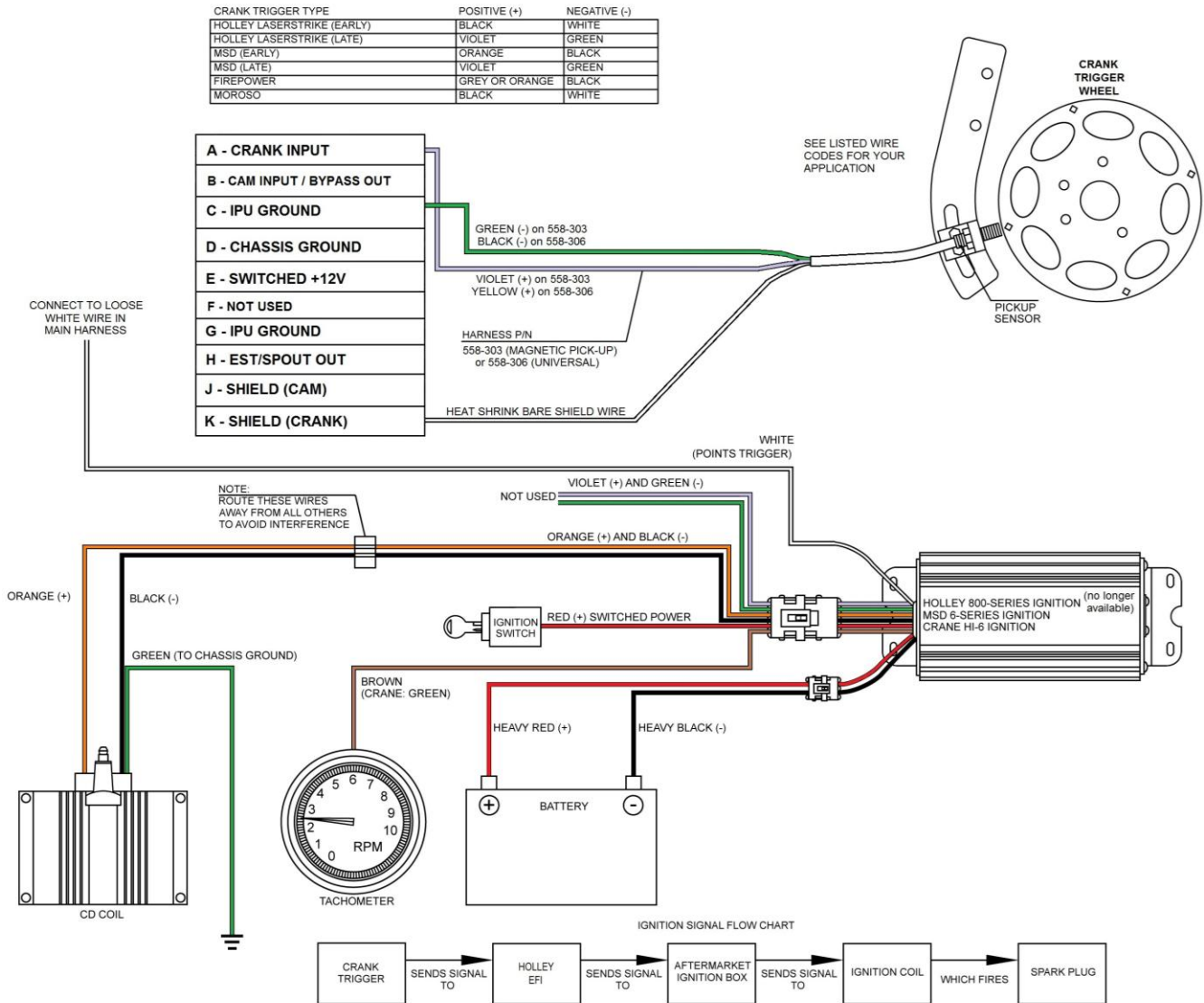


Figure 10

## 18.4 Magnetic Cam Pickup

The following diagram is to wire a magnetic cam sync signal. It utilizes the shielded/grounded cabling found in PN 558-306. It is critical that properly installed shielded and grounded cable is used when using a magnetic pickup, or it is likely that EMI will disturb the camshaft signal.

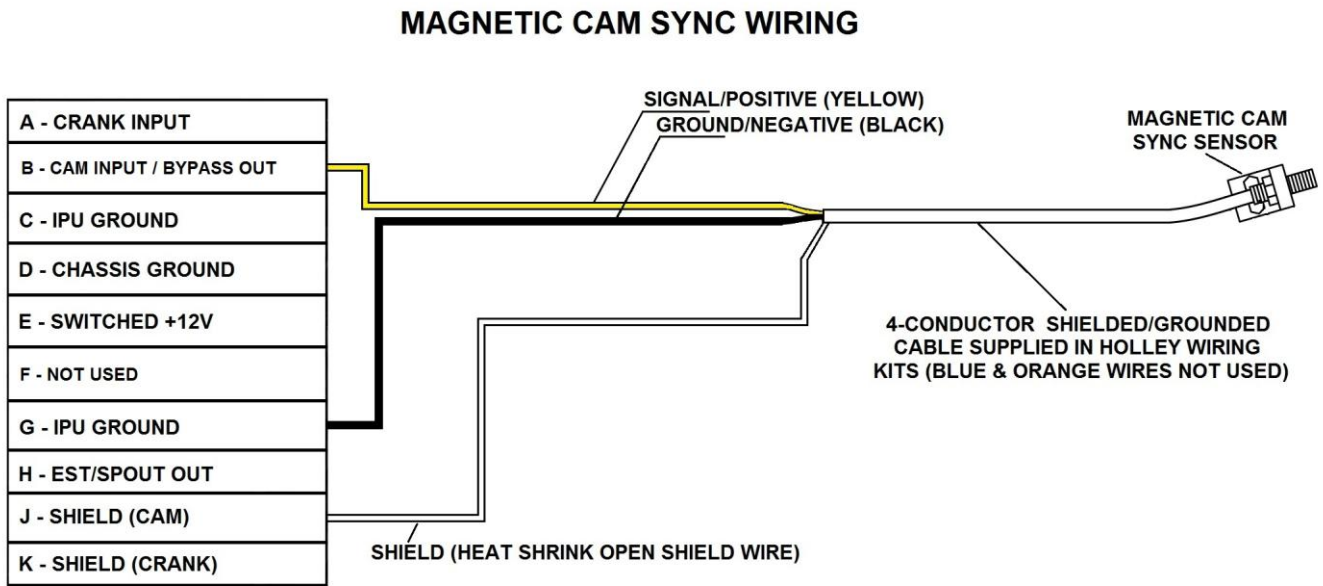


Figure 11

## 18.5 Hall Effect Crank Pickup

The follow diagrams are for running a hall effect pickup, either a crank trigger or a distributor. It is recommended to use PN 558-306 which will contain wiring for both the crank and cam sensor inputs. It is important that properly installed shielded and grounded cable is used when using a hall effect input. PN 558-306 comes with the proper cabling. It must be installed properly as well. Make sure that the shield is properly grounded which requires it being grounded at the ECU with that ground maintained through the ignition adapter connection.

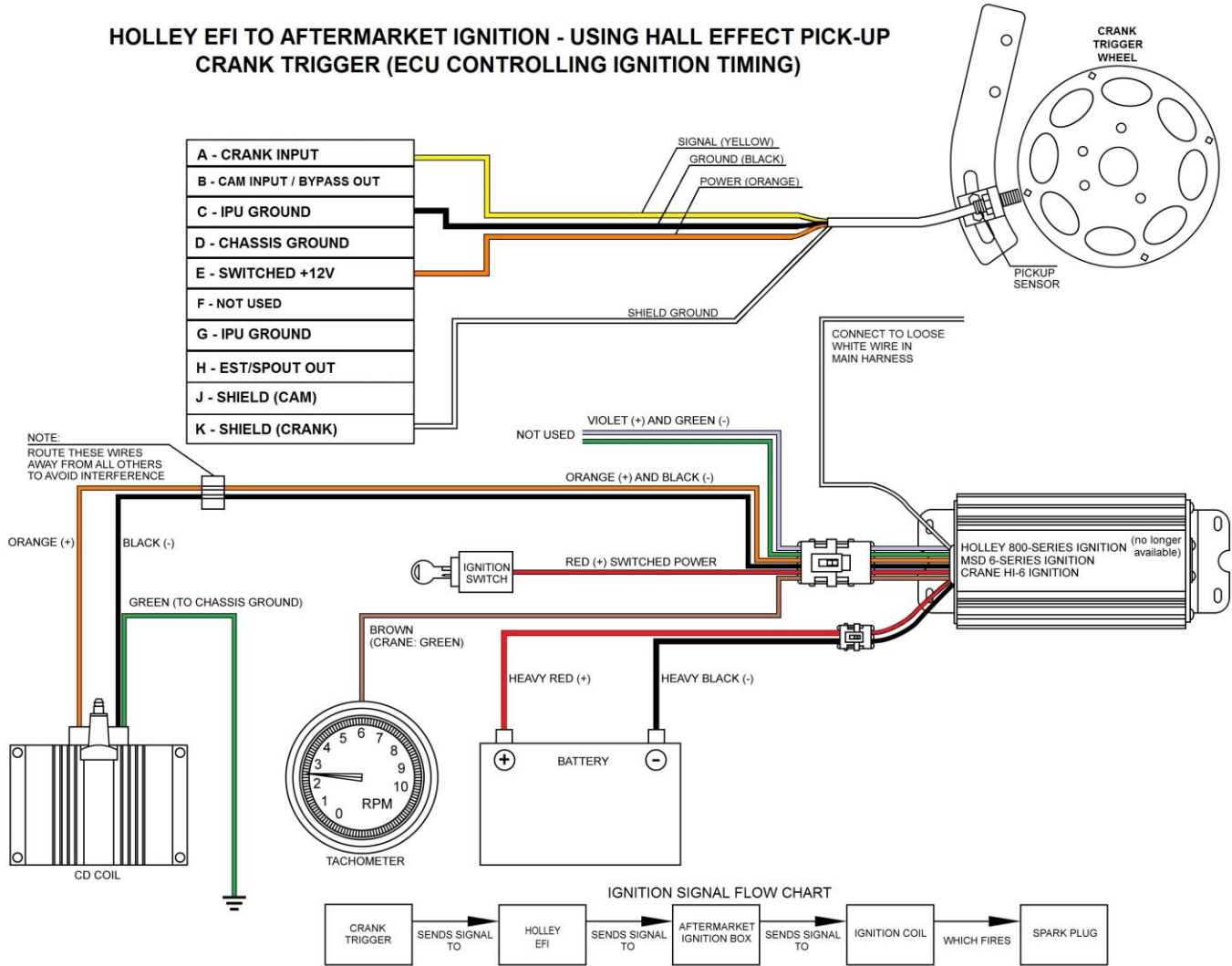
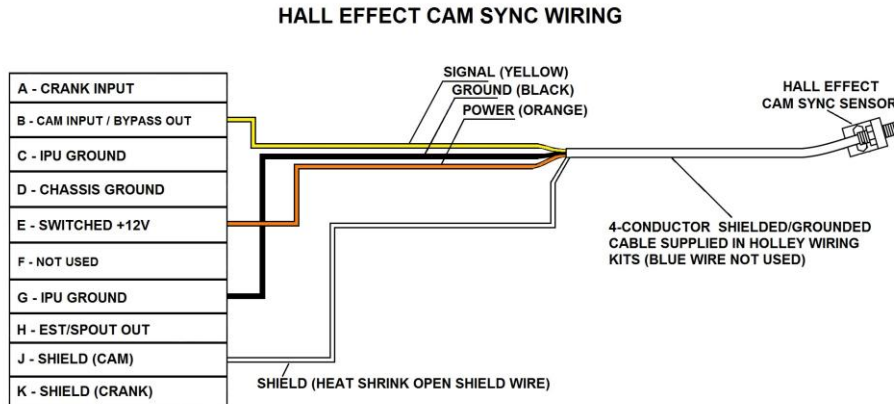


Figure 12

## 18.6 Hall Effect Cam Pickup

The following diagram is to wire a hall effect cam sync signal. It utilizes the shielded/grounded cabling found in PN 558-306. It is desirable to use a properly installed shielded and grounded cable so that EMI will not disturb the camshaft signal.



## 19.0 PROGRAMMABLE INPUTS AND OUTPUTS

Programmable input and outputs are intended to be any input or output that is created by the user when a Global Folder is configured. Once configured, they must be assigned to a specific pin location on the Pin Map, and then physically wired per the assigned location.

The HP ECU has an “Input/Output” connect on the main harness. This is an 8 pin metripak connector. Programmable inputs and outputs can be connected into this connector. PN 558-400 is a harness that plugs into this connector. If you do not want to purchase this harness, use alternative methods to connect to these 8 wires. This connector is as follows. The functions are described below.

<u>Input/Output Connector Pin</u>	<u>ECU Pin</u>	<u>Wire Color</u>	<u>Function</u>
A	P1-A12	White/Blue	F 5 2 T H G
B	P1-A3	White/Red	F 5 2 T H G
C	P1-A13	White/Black	F 5 G
D	P1-A4	White/Green	F 5 G
E	P1-B12	Grey/Yellow	P+ H
F	P1-B11	Grey/Red	P+ H
G	P1-B10	Grey/Black	P- G
H	P1-B3	Grey/Green	P- G

### 19.1 Inputs

There are **six** types of inputs that can be configured. The following lists them and reviews wiring recommendations. The designation on the Pin Map (Inputs) is given first, then a description.

1. **“H”** – Switched 12v or “High Side” input – This input will be triggered when system voltage is applied. Minimum triggering voltage is 4.5v. Do not exceed 24v.

Wiring: Connect up to any voltage source that is desired to trigger this input.

2. **“G”** – Switched Ground or “Low Side” input – This input will be triggered when a ground is applied.

Wiring: Connect up to any ground source that is desired to trigger this input.

3. **“5”** – 0-5 volt sensor input – Any 0-5 volt sensor input such as a TPS, MAP sensor, pressure transducer, and many others.

Wiring: Wire the signal wire from the 0-5v sensor used into the appropriate pin. Any 0-5v sensor requires a +5v reference voltage and a sensor ground. On an HP, the user must tie into the existing +5v reference and Sensor Ground lines (which go to any of the 5v sensor such as MAP, TPS, etc). These wires are as follows:



Connector  
P1A

Sensor +5v Reference Voltage Pin  
A26 (Orange)

Sensor Ground Pin  
A18 (Black White)

It is acceptable to have multiple sensors share the same +5v and ground reference lines. Be sure to solder, heat shrink, etc wires properly as poor connections will cause for inaccurate or faulty sensor readings.

Do not use +5v reference or ground sources from other controllers or power supplies to support the sensor, or sensor accuracy may be compromised.

4. **“2”** – 0-20 volt sensor input – Any 0-20 volt sensor input

Wiring: Connect to desired voltage input.

5. **“T”** – Thermistor temperature input – Most coolant and air temperature sensors are a 2 wire “thermistor” design.

Wiring: Connect to one side of the thermistor device. Connect the other side of the thermistor device to a “Sensor Ground” input pin to the ECU (same pins for a 0-5v sensor). These pins are as follows:

Connector  
P1A

Sensor Ground Pin  
A18

6. **“F”** – Frequency or a Digital Speed Input – Designed for a digital voltage input from a speed/rotation sensor. A hall effect sensor is the common sensor used. Voltage range can be 4.5 to 24 volts.

Wiring: A hall effect sensor has 3 wires: Power, Ground, and Signal. Most sensors can be supplied with battery voltage (12v), a few require a 5 volt reference. Check with the specifications of your specific sensor. Although not usually needed with a hall effect sensor, it is always advised to use a shielded/grounded cable to wire them (all three wires can be shielded). The following is advised when wiring a hall effect sensor.

**Signal** – Run the sensor signal wire into the Pin Mapped channel

**Power** – Either supply with clean switched power, or if it is not used for another purpose, you can power from Pin P1B-B20 which is a clean 12v power source. If the sensor requires 5 volts, use a +5v reference line.

**Ground** – It is best to connect to an IPU (Inductive/Magnetic Pickup) or Sensor Ground. The following pins are IPU grounds:

Connector  
P1A

Sensor Ground Pin  
A14

**Shield Wire** – If using shielded/grounded cable, connect the shield ground wire to the ECU only - best to connect it to an IPU ground.

## 19.2 Outputs

All PWM (Pulse Width Modulated) and switched outputs are rated at a maximum of 2A. If a device will draw more than 2A, some type of relay must be used. If the output is PWM, do not use a “switching” relay, but rather a solid state type relay designed to be pulse width modulated.

There are four types of outputs that can be configured. The following lists them and reviews wiring recommendations. The designation on the Pin Map (Outputs) is given first, then a description.

1. **“H”** – Switched 12v or “High Side” output – will output system voltage level.

Wiring: Connect the pin to the device to be triggered.

2. **“G”** – Ground or “Low Side” output – will output a ground trigger.

Wiring: Connect the pin to the device to be triggered.

3. **“P+”** - 12v Pulse Width Modulated output – Outputs a high side pulse width modulated output to control items such as a progressive nitrous solenoid or a PWM IAC – will output system voltage level.

Wiring: Connect the pin to the device to be triggered. A PWM device has 2 wires, connect the other side to ground.

4. **“P-”** – Ground Pulse Width Modulated output – Outputs a low side pulse width modulated output to control items such as a progressive nitrous solenoid or a PWM IAC.

Wiring: Connect the pin to the device to be triggered. A PWM device has 2 wires, connect the other side of the device to a voltage source.



**Holley Performance Products  
1801 Russellville Road  
Bowling Green, KY 42101**

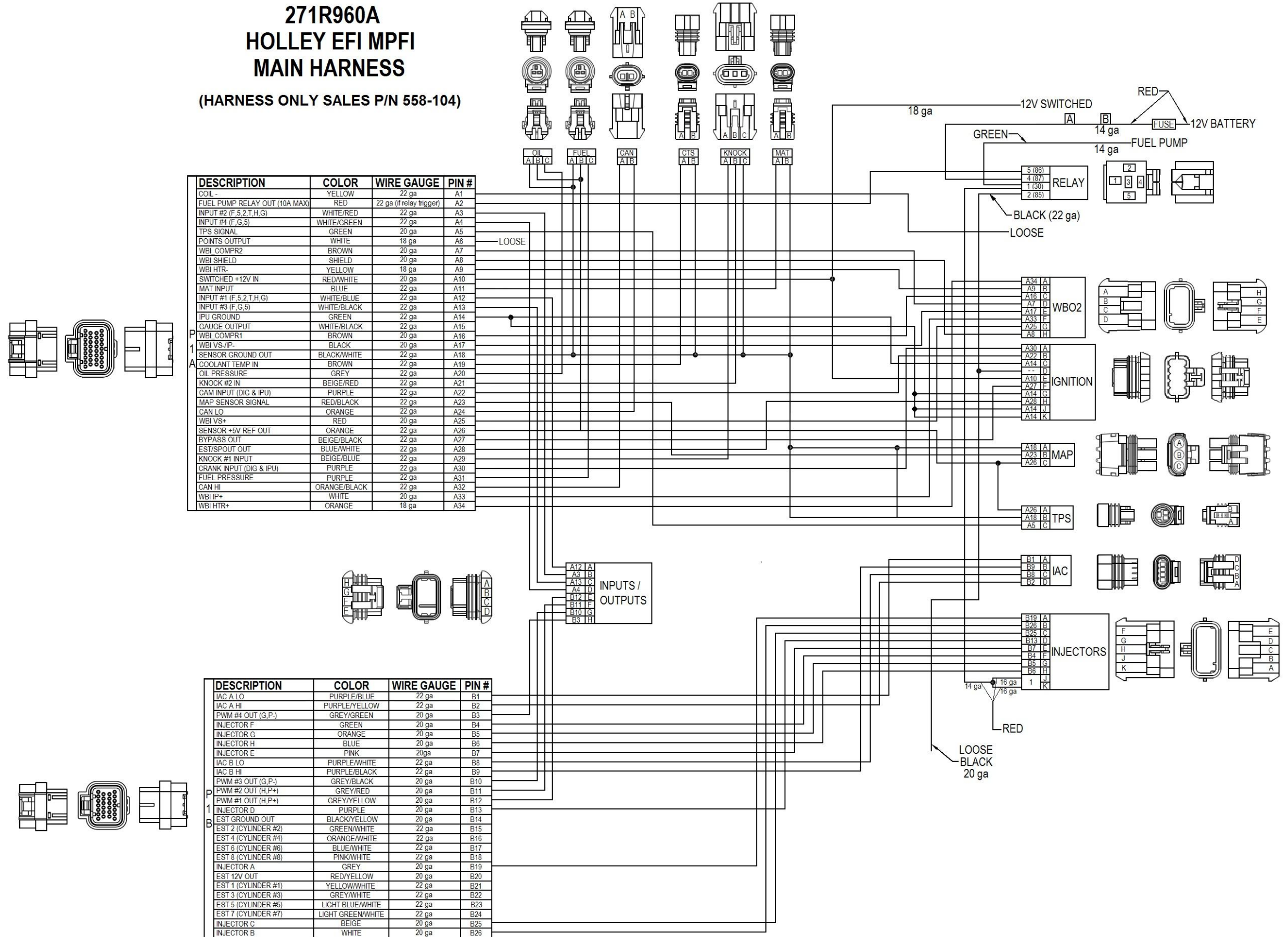
**Technical Service: 1-270-781-9741  
Fax: 1-270-781-9772**

**For online help, please refer to the Technical Information section of our website:  
[www.holley.com](http://www.holley.com)**

**199R10508 wf  
Date: 5-10-11**

# 271R960A HOLLEY EFI MPFI MAIN HARNESS

(HARNESS ONLY SALES P/N 558-104)



DESCRIPTION	COLOR	WIRE GAUGE	PIN #
COIL -	YELLOW	22 ga	A1
FUEL PUMP RELAY OUT (10A MAX)	RED	22 ga (if relay trigger)	A2
INPUT #2 (F, S, 2, T, H, G)	WHITE/RED	22 ga	A3
INPUT #4 (F, G, S)	WHITE/GREEN	22 ga	A4
TPS SIGNAL	GREEN	20 ga	A5
POINTS OUTPUT	WHITE	18 ga	A6
WBI_COMPR2	BROWN	20 ga	A7
WBI_SHIELD	SHIELD	20 ga	A8
WBI_HTR-	YELLOW	18 ga	A9
SWITCHED +12V IN	RED/WHITE	20 ga	A10
MAT INPUT	BLUE	22 ga	A11
INPUT #1 (F, S, 2, T, H, G)	WHITE/BLUE	22 ga	A12
INPUT #3 (F, G, S)	WHITE/BLACK	22 ga	A13
IPU GROUND	GREEN	22 ga	A14
GAUGE OUTPUT	WHITE/BLACK	22 ga	A15
WBI_COMPR1	BROWN	20 ga	A16
WBI_VS-/IP-	BLACK	20 ga	A17
SENSOR GROUND OUT	BLACK/WHITE	22 ga	A18
COOLANT TEMP IN	BROWN	22 ga	A19
OIL PRESSURE	GREY	22 ga	A20
KNOCK #2 IN	BEIGE/RED	22 ga	A21
CAM INPUT (DIG & IPU)	PURPLE	22 ga	A22
MAP SENSOR SIGNAL	RED/BLACK	22 ga	A23
CAN LO	ORANGE	22 ga	A24
WBI_VS+	RED	20 ga	A25
SENSOR +5V REF OUT	ORANGE	22 ga	A26
BYPASS OUT	BEIGE/BLACK	22 ga	A27
EST/SPOUT OUT	BLUE/WHITE	22 ga	A28
KNOCK #1 INPUT	BEIGE/BLUE	22 ga	A29
CRANK INPUT (DIG & IPU)	PURPLE	22 ga	A30
FUEL PRESSURE	PURPLE	22 ga	A31
CAN HI	ORANGE/BLACK	22 ga	A32
WBI_IP+	WHITE	20 ga	A33
WBI_HTR+	ORANGE	18 ga	A34

DESCRIPTION	COLOR	WIRE GAUGE	PIN #
IAC A LO	PURPLE/BLUE	22 ga	B1
IAC A HI	PURPLE/YELLOW	22 ga	B2
PWM #4 OUT (G,P-)	GREY/GREEN	20 ga	B3
INJECTOR F	GREEN	20 ga	B4
INJECTOR G	ORANGE	20 ga	B5
INJECTOR H	BLUE	20 ga	B6
INJECTOR E	PINK	20 ga	B7
IAC B LO	PURPLE/WHITE	22 ga	B8
IAC B HI	PURPLE/BLACK	22 ga	B9
PWM #3 OUT (G,P-)	GREY/BLACK	20 ga	B10
PWM #2 OUT (H,P+)	GREY/RED	20 ga	B11
PWM #1 OUT (H,P+)	GREY/YELLOW	20 ga	B12
INJECTOR D	PURPLE	20 ga	B13
EST GROUND OUT	BLACK/YELLOW	20 ga	B14
EST 2 (CYLINDER #2)	GREEN/WHITE	22 ga	B15
EST 4 (CYLINDER #4)	ORANGE/WHITE	22 ga	B16
EST 6 (CYLINDER #6)	BLUE/WHITE	22 ga	B17
EST 8 (CYLINDER #8)	PINK/WHITE	22 ga	B18
INJECTOR A	GREY	20 ga	B19
EST 12V OUT	RED/YELLOW	20 ga	B20
EST 1 (CYLINDER #1)	YELLOW/WHITE	22 ga	B21
EST 3 (CYLINDER #3)	GREY/WHITE	22 ga	B22
EST 5 (CYLINDER #5)	LIGHT BLUE/WHITE	22 ga	B23
EST 7 (CYLINDER #7)	LIGHT GREEN/WHITE	22 ga	B24
INJECTOR C	BEIGE	20 ga	B25
INJECTOR B	WHITE	20 ga	B26

DESCRIPTION	COLOR	WIRE GAUGE	PIN #
A12	A	22 ga	A12
A3	B	22 ga	A3
A13	C	22 ga	A13
A4	D	22 ga	A4
B12	E	20 ga	B12
B11	F	20 ga	B11
B10	G	20 ga	B10
B3	H	20 ga	B3

DESCRIPTION	COLOR	WIRE GAUGE	PIN #
B19	A	20 ga	B19
B26	B	20 ga	B26
B25	C	20 ga	B25
B13	D	20 ga	B13
B7	E	20 ga	B7
B4	F	20 ga	B4
B5	G	20 ga	B5
B6	H	20 ga	B6
B1	J	20 ga	B1
B2	K	20 ga	B2

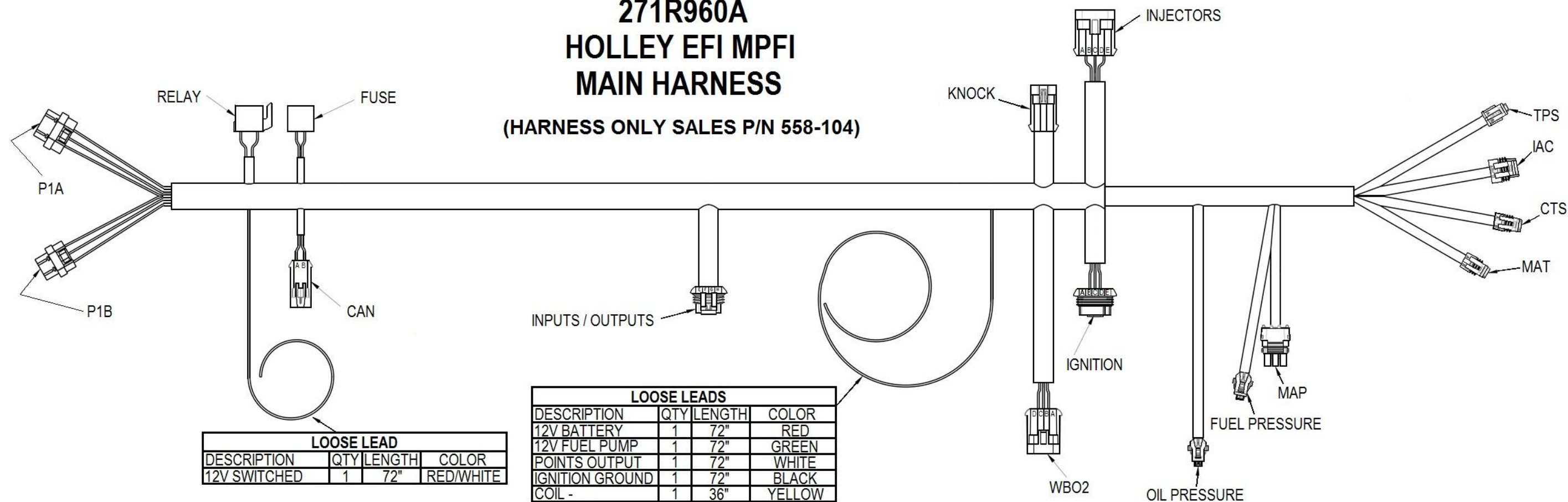
DESCRIPTION	COLOR	WIRE GAUGE	PIN #
A18	A	22 ga	A18
A23	B	22 ga	A23
A26	C	22 ga	A26

DESCRIPTION	COLOR	WIRE GAUGE	PIN #
A30	A	22 ga	A30
A22	B	22 ga	A22
A14	C	22 ga	A14
A10	D	22 ga	A10
A27	E	22 ga	A27
A14	F	22 ga	A14
A28	G	22 ga	A28
A14	H	22 ga	A14
A14	J	22 ga	A14
A14	K	22 ga	A14

DESCRIPTION	COLOR	WIRE GAUGE	PIN #
5	(89)	22 ga	5
4	(87)	22 ga	4
1	(30)	22 ga	1
2	(85)	22 ga	2

# 271R960A HOLLEY EFI MPFI MAIN HARNESS

(HARNESS ONLY SALES P/N 558-104)



LOOSE LEAD			
DESCRIPTION	QTY	LENGTH	COLOR
12V BATTERY	1	72"	RED
12V FUEL PUMP	1	72"	GREEN
POINTS OUTPUT	1	72"	WHITE
12V SWITCHED	1	72"	RED/WHITE

LOOSE LEADS			
DESCRIPTION	QTY	LENGTH	COLOR
12V BATTERY	1	72"	RED
12V FUEL PUMP	1	72"	GREEN
POINTS OUTPUT	1	72"	WHITE
IGNITION GROUND	1	72"	BLACK
COIL -	1	36"	YELLOW