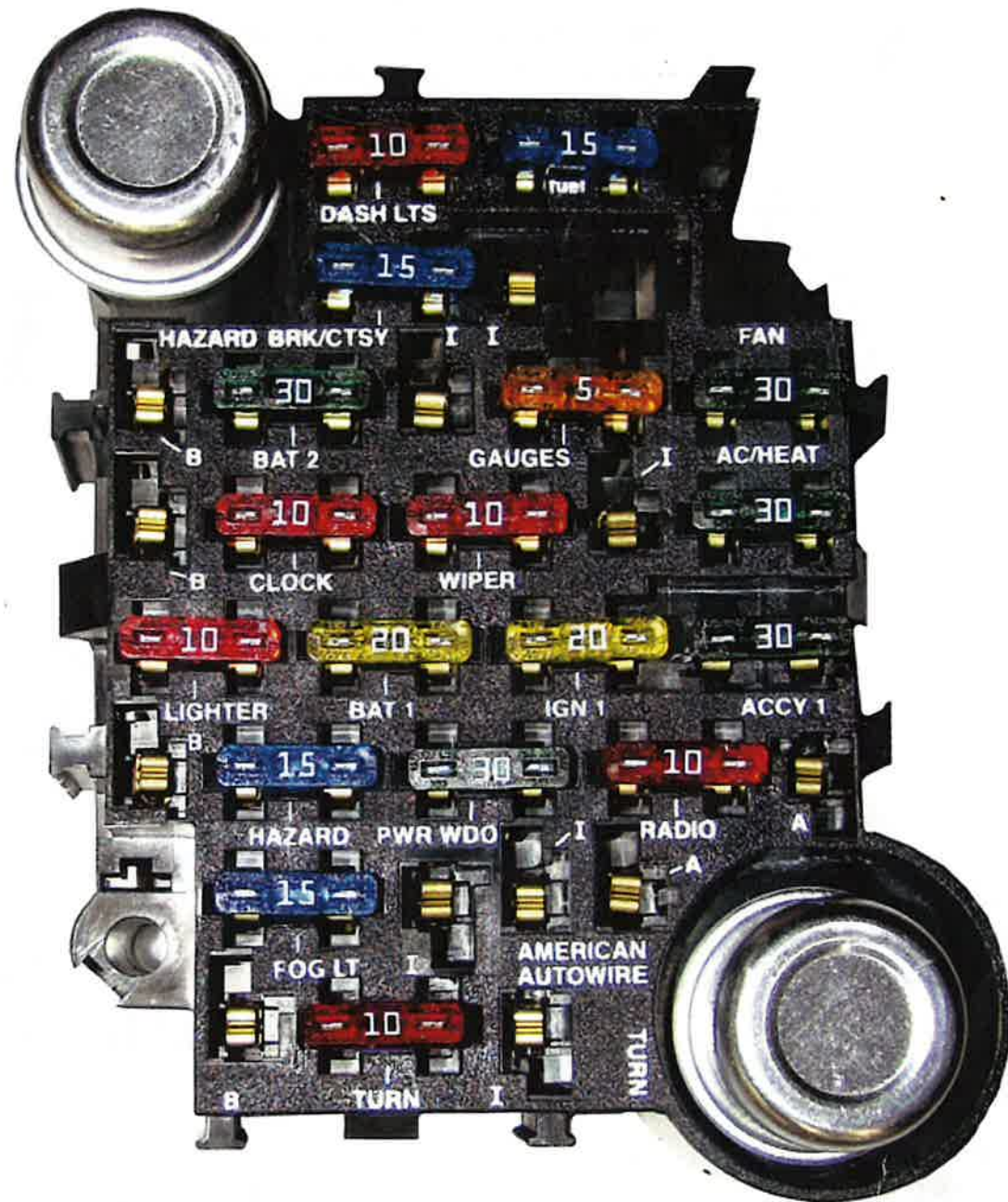


Fuse Placement and Circuit Values



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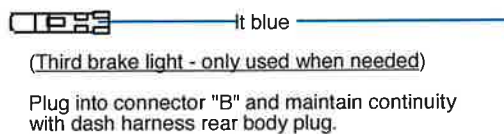
PART # **510055**

DESCRIPTION:

**1967-68 Mustang
Classic Update Series Kit**

92968935 Rev 15.0 7/19/2017

sheet 1



American Autowire

92968924

Rev 2.0

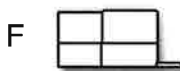
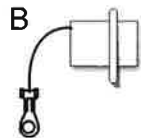
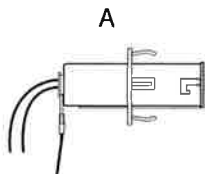
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M

USE THIS SHEET FOR ALL 1967-70 MUSTANG CARS

Note: You have been provided with terminals C and connectors E to complete the pigtail extensions for your stop/tail and back up lamps as shown on sheet 1.



Brown

Rear running lamps

(1964-68 without side markers lamps) Route this wire to the LH tail lamp, cut to length, take that wire and the cut off portion, double them together with terminal N, and install into connector F as shown on sheet 1. Take the other end of the cut off portion and route to your tag light, cut to length, take that wire and double it with the cut off portion in terminal P and install into sleeve Q (your stock tag lamp assembly will plug directly into this connection). Take the other end of the cutoff portion and route to your RH tail lamp, cut to length, install terminal J and plug into connector F as shown on sheet 1.

(1968-70 with side markers lamps) Route this wire to the LH side marker lamp, cut to length, take that wire and the cut off portion, double them together with terminal D, and plug into lamp socket pigtail B as shown on sheet 1. Take the other end of the cut off portion and route it to your LH tail lamp, cut to length, take that wire and the cut off portion, double them together with terminal N, and install into connector F as shown on sheet 1. Take the other end of the cut off portion and route it to your tag light, cut to length, take that wire and double it with the cut off portion in terminal P and install into sleeve Q (your stock tag lamp assembly will plug directly into this connection). Take the other end of the cutoff portion and route it to your RH tail lamp, cut to length, take that wire and the cut off portion, double them together with terminal N, and install into connector F as shown on sheet 1. Take the remaining wire, route it to the RH side marker lamp, cut to length, install terminal G and plug into lamp socket pigtail B as shown on sheet 1.

Black

Grounds

There are six (6) ground wires in this kit. There are 2 wires installed onto the tail lamp sockets, 2 wires installed into the back up lamp connections, and 2 wires installed into the side marker lamp sockets. After installing the tail lamp and backup lamp extensions, bring your black ground wires to a common area, trim all 4 to length, install terminal U, and ground to the body of the car inside the trunk. The last 2 wires installed into your side marker lamp sockets get grounded to the body inside the trunk of the car.

LH Stop / Turn

Route this wire to the LH tail lamp, cut to length, install terminal J, and plug into connector F as shown on sheet 1.

RH Stop / Turn

Route this wire to the RH tail lamp, cut to length, install terminal J, and plug into connector F as shown on sheet 1.

Back Up Lamp Feed

Route this wire to the LH backup lamp, cut to length, take that wire and the cut off portion, double them together with terminal N, and install into connector F with the black ground wire as shown on sheet 1. Take the other end of the cutoff portion and route to your RH backup lamp, cut to length, install terminal J and plug into the other connector F with the black ground wire.

Third Brake Light

If you are using this option, insert the light blue "third brake light" wire into connector B maintaining color continuity with the dash harness rear body plug. Route the other end to your third brake light as needed.

12V Battery Fused

This wire can be used as a trunk light feed or 12 volt battery power if you are running LED tail lamps. If you are using this option, insert the orange "12v battery fused" wire into connector B maintaining color continuity with the dash harness rear body plug. Route the other end to your trunk area as needed.

Fuel Tank Feed

Take this wire, route it down through the trunk floor and over to the fuel tank sender, cut to length, slide on sleeve "L", and install terminal H. Install this assembled ring onto the fuel tank sender to complete this circuit.

Yellow

Dark Green

Light Green

Light Blue

Orange

Tan

Table 'A' -
AAW Turn Signal Switch wires to
stock 1967-68 Mustang turn signal switch.

AAW Wire #	AAW Wire color	AAW Wire Printing	Ford Wire Color
14A	Light Blue	Left Front Turn	Green with white stripe
15B	Dark Blue	Right Front Turn	White with blue stripe.
16	Purple	Turn Switch Feed	Blue
17A	White	Brake Switch	Green
18	Yellow	Left Rear Turn	Green with orange stripe.
19	Dark Green	Right Rear Turn	Orange with blue stripe.
27	Brown	Turn Sw - Hazard	White with red stripe.
28	Black	Horn Relay Ground	Yellow
28A	Black	Horn Relay Ground	Blue with yellow stripe.

Note: Ford originally switched power to the horns through the steering column horn button. In this kit, ground is being switched through the original steering column switch to ground a horn relay which switches power to the horns.

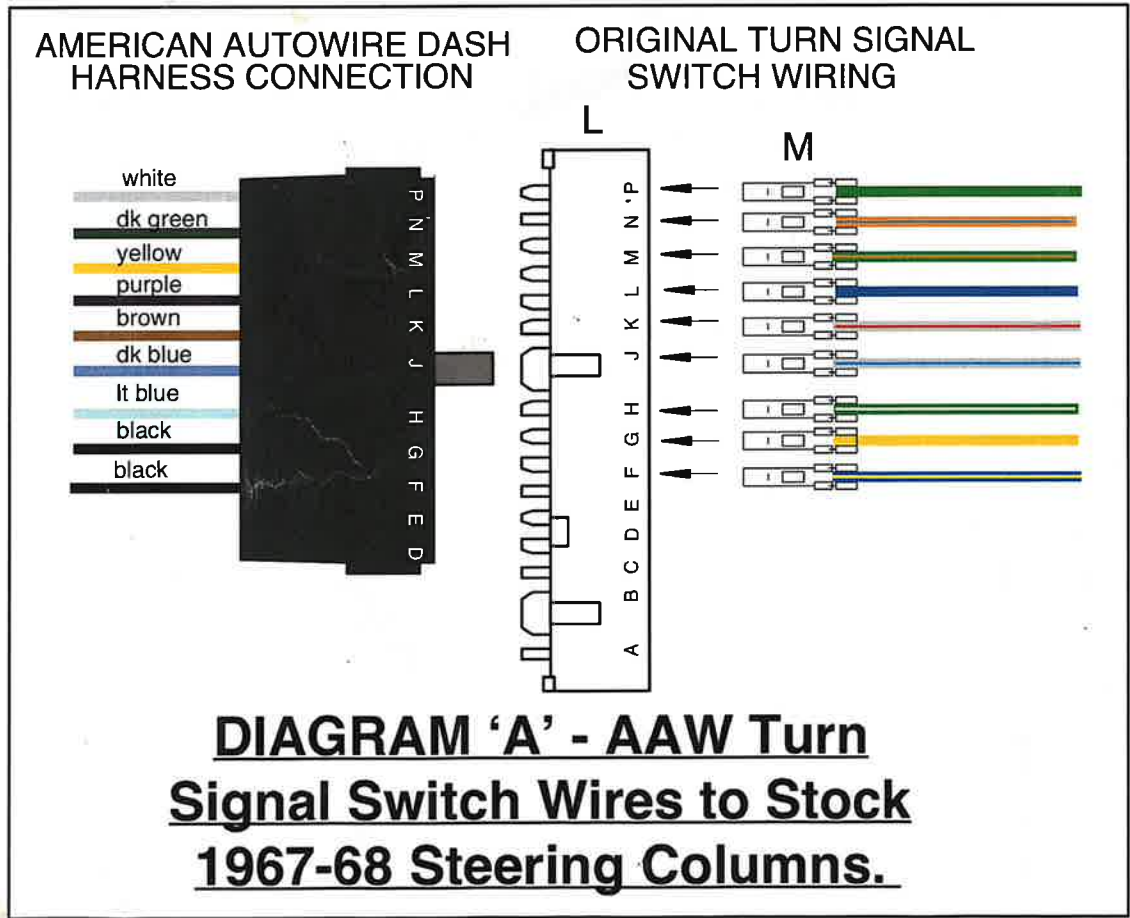


Table 'B' -
AAW Instrument Cluster Kit wires to
stock 1967-68 Mustang instrument cluster wires.

AAW Wire #	AAW Wire color	AAW Wire Printing	Ford Wire Color
4E	Brown		Black with light green stripe This is the accessory feed for the voltage reducer for certain stock gauges.
8	Gray	Dash Lights	Blue with red stripe.
9C	Brown	Park Lights	Connect to any instrument cluster requiring a signal to dim a digital display. When using analog gauges, this wire will not be required.
11B	Light Green	Hi Beam Ind	Green with black stripe.
14A	Light Blue	Left Dash Ind	Green with white stripe.
15B	Dark Blue	Right Dash Ind	White with blue stripe.
30	Tan	Gas Gauge	Yellow with white stripe.
31	Dark Blue	Oil Pressure Sender	White with red stripe.
33	Tan	Brake Light	Purple with white stripe.
35	Dark Green	Water Temp Sender	Red with white stripe.
39A	Pink	12V Ignition	Red with yellow stripe
121	White	Coil-Tach	Sender terminal of the tachometer.
150	Black	Ground	Connect to the Ground terminals of each gauge and dash lamp. An in line splice is necessary to feed each ground requirement in the instrument cluster.
400	Yellow	VSS Ground	Connect to a good chassis ground or the VSS ground terminal on an electronic speedometer. Mechanical speedometers do not require this connection.
401	Purple	VSS Signal	Connect to the VSS pulse signal or sender terminal of the electronic speedometer. Mechanical speedometers do not require this connection.
99	Yellow	Radio Bat	Light blue with white stripe or light blue with black stripe. This is the 12 volt feed for the dash clock. If you are using a radio with a digital clock, it will be necessary to splice into this wire to create 2 leads. One to the dash clock, and one to the radio.



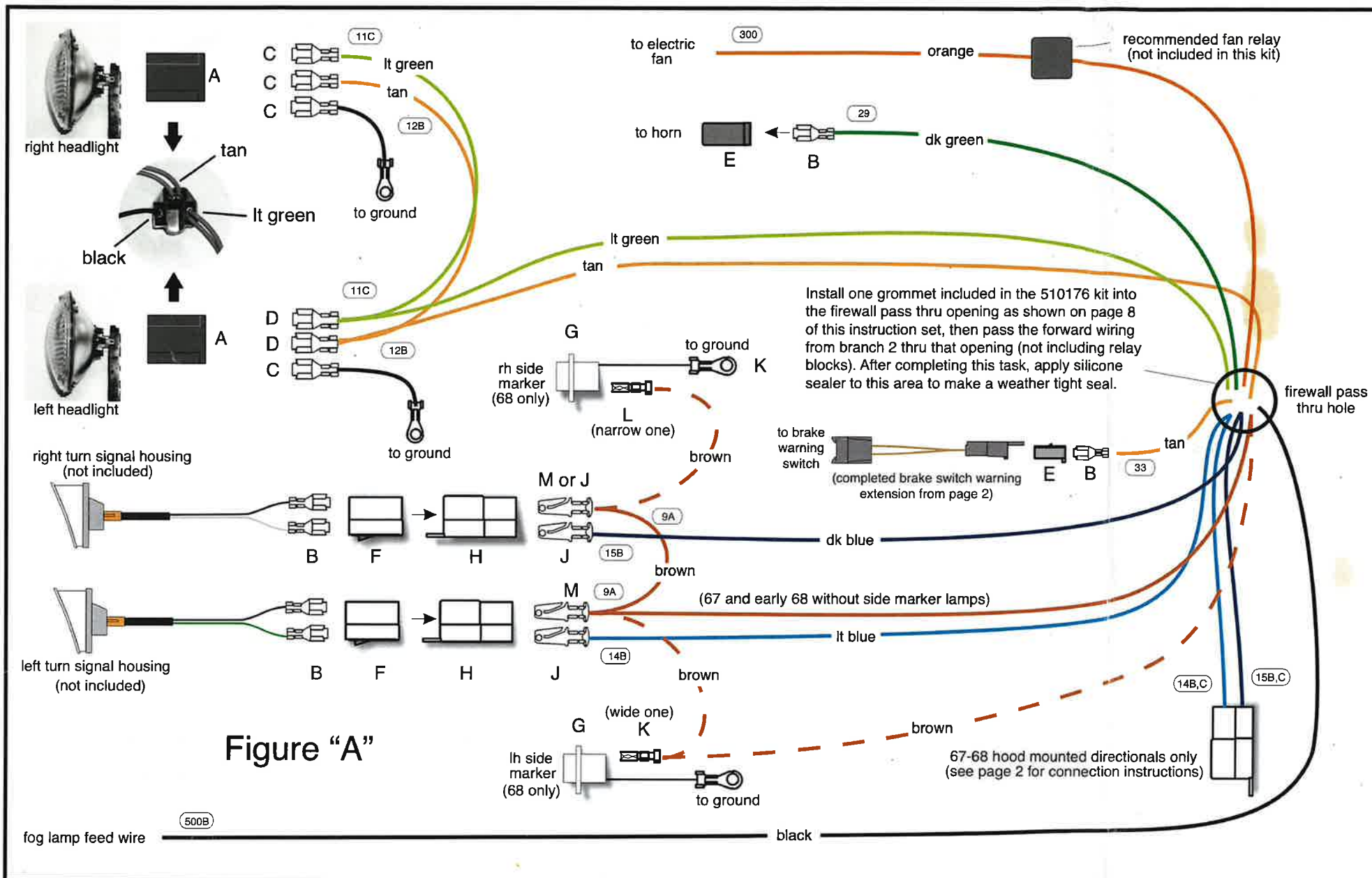
PART #

510055

DESCRIPTION:

1967-68 Mustang Classic Update Series Kit

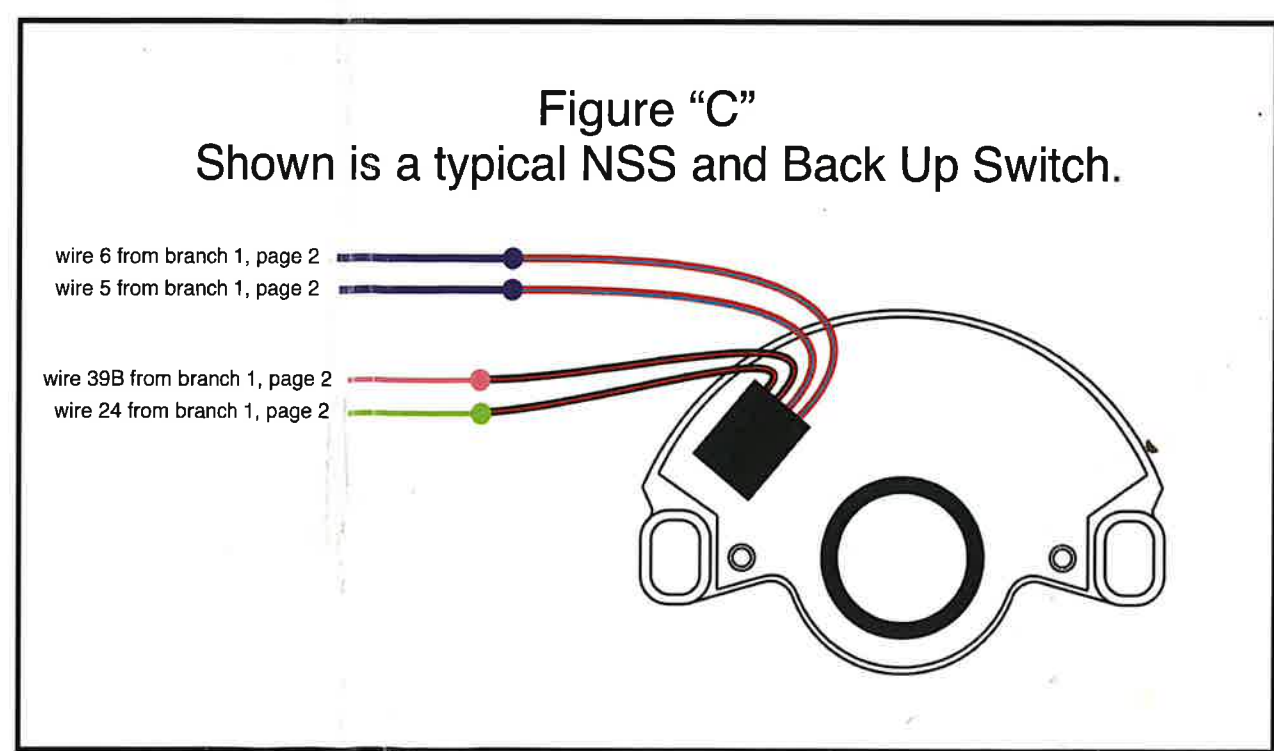
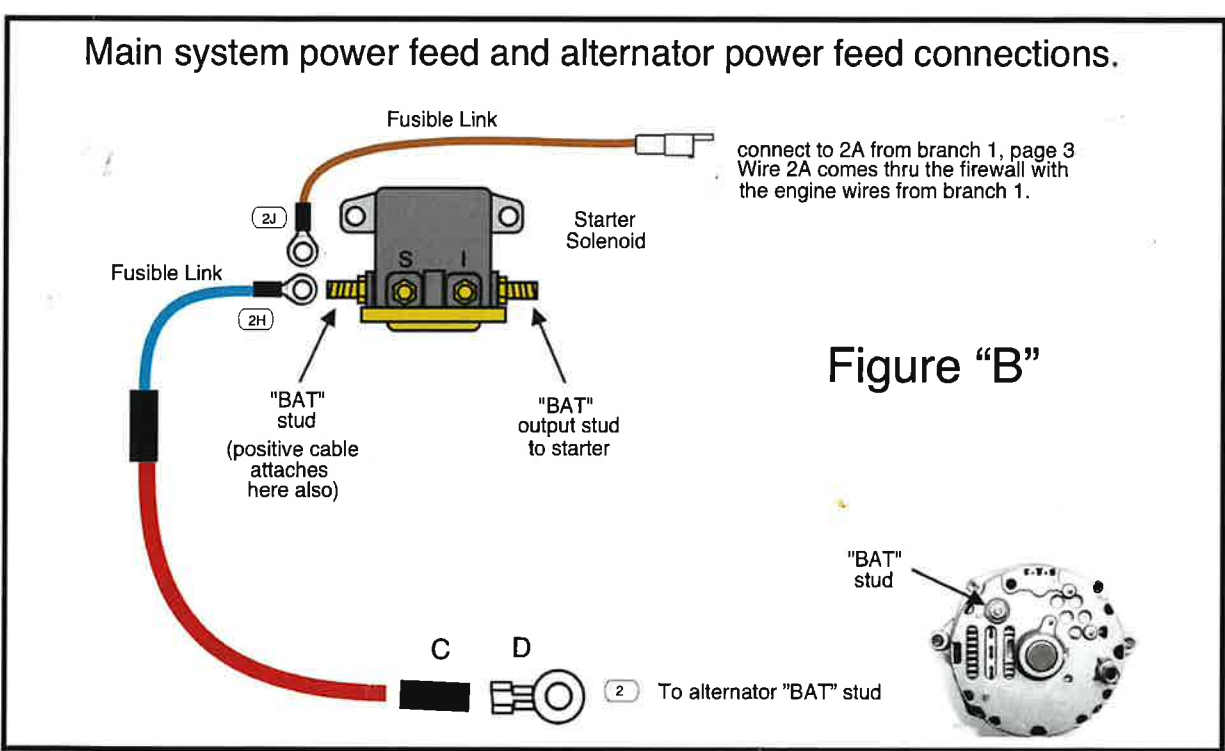
92968935 Rev 15.0 7/19/2017



NOTE: The terminals and connectors listed on this page and denoted with **UPPER CASE LETTERS** to help you complete the various connections to your lamps, horns, switches, etc. can be found in your loose piece grommet and parts kit, P/N 510176.

The identifications, colors, and functions for all of the wires listed in "Figures A, B, and C" on this page can be found on page 3, branches 1 and 2 of this main instruction set. AAW suggests and recommends using both pages 3 and 10 to complete the installation of the forward lamp, main power, alternator power, and neutral safety connections.

AAW kits are all engineered to be used in conjunction with a high output, later model internally regulated, or one wire alternator. We do not suggest or support the use of a stock low amperage generator or alternator as they do not supply sufficient current to recharge the battery in a highly modified car such as this kit was designed for. AAW suggests a Ford Gen III type alternator as a good choice of an alternator to use. An adapter to complete the connection to this style alternator, our P/N 500802, may be purchased separately if needed. Contact our Sales Group or your favorite retailer to purchase this alternator adapter if needed.



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PART # **510055**

DESCRIPTION:
**1967-68 Mustang
Classic Update Series Kit**

92968935 Rev 15.0 7/19/2017

Classic Update Series

1967 - 1968 Ford Mustang

START HERE !

PLEASE READ THIS BEFORE STARTING INSTALLATION !

This wiring kit is designed for ease of installation. Please read the guidelines below, BEFORE STARTING your installation to guarantee a successful job. Use an appropriate crimping tool which folds the wings of the open barrel terminals down into the wire as shown below. ALL TERMINALS THAT YOU INSTALL SHOULD BE PROPERLY SOLDERED. Our factory crimped terminations are installed by GM approved five ton presses, and soldering these terminations is not necessary.



AS THIS HARNESS IS DESIGNED FOR USE IN A MODIFIED CAR REQUIRING A HIGHER RATE OF CHARGE, IT DOES NOT SUPPORT THE USE OF A STOCK (ORIGINAL) ALTERNATOR. IT IS DESIGNED FOR USE WITH AN INTERNALLY REGULATED OR SINGLE WIRE STYLE ALTERNATOR. ADAPTERS (WHICH ARE NOT INCLUDED WITH THIS KIT) ARE AVAILABLE FROM SEVERAL SOURCES WILL BE NECESSARY TO USE ANY ALTERNATOR OTHER THAN A 1 WIRE UNIT.

STEP 1: DISCONNECT YOUR BATTERY:

Disconnect the battery before installing the wiring kit to prevent any accidental shorting caused by loose bare wire ends.

STEP 2: START INSTALLING KIT:

This kit is broken down into individual steps that are identified by a letter printed on the instruction sheets visible through each bag. These letters are the order of operation for installing your kit. Start with bag letter G, then M, etc. The order of installation is shown below. Use this instruction sheet, 92968935, to complete the installation instructions.

G - 510047 Dash Harness Kit
M - 510052 Rear Body Kit
N - 510131 Washer Wiper Harness

STEP 3: RECONNECT YOUR BATTERY:

When you have completed the installation and are ready to reconnect the battery, make sure that the following electrical system grounds are in place:

- A. Battery is grounded to the ENGINE BLOCK.
- B. Battery is grounded to the frame.
- C. Engine block is grounded to the frame.
- D. Body is grounded to the frame.

STEP 4: CHECK ALL ELECTRICAL FUNCTIONS:

Any non-functioning items should be checked for proper installation. Any problems with your wiring and electrical circuit functions should be addressed to American Autowire Systems, Inc. as soon as possible to avoid any warranty problems.

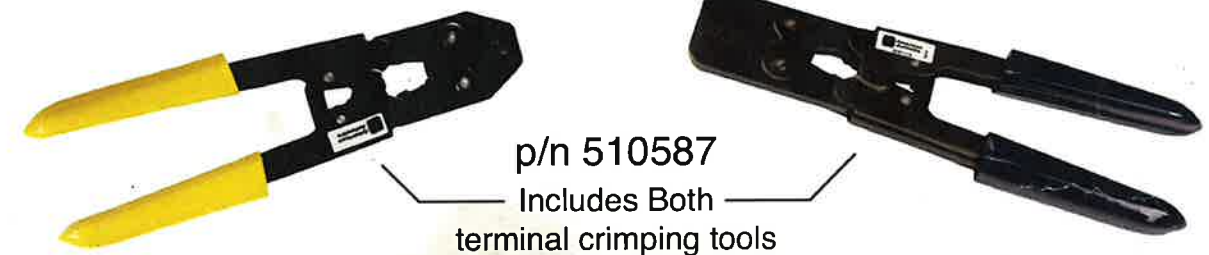
If you have any questions concerning this or any of our products, please feel free to call us at 1-856-933-0801.

AMERICAN AUTOWIRE MAKES IT EASY !!

We carry the following crimping hand tools, to help with your terminal crimping. These hand tools are available, for purchase or rental.

p/n 510585
OEM small terminal crimping
tool (18-14 gauge)

p/n 510586
OEM large terminal crimping
tool (12-8 gauge)



We carry many accessories for your 1967-68 Ford Mustang.

p/n 500479
Universal Relay Kit



p/n 500918
Ford Duraspark
Ignition Harness



p/n 500802
GM "SI" series to Ford "3G" internal
regulated alternator



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PART # **510055**

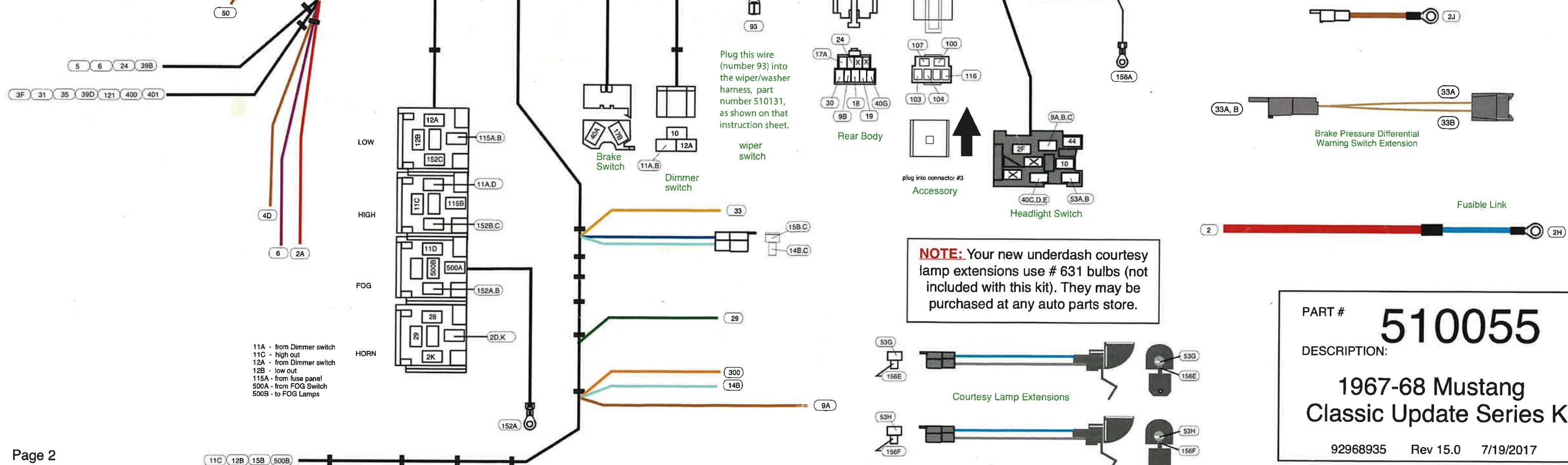
DESCRIPTION:

**1967-68 Mustang
Classic Update Series Kit**

92968935 Rev 15.0 7/19/2017



See page 12 for fuse placement



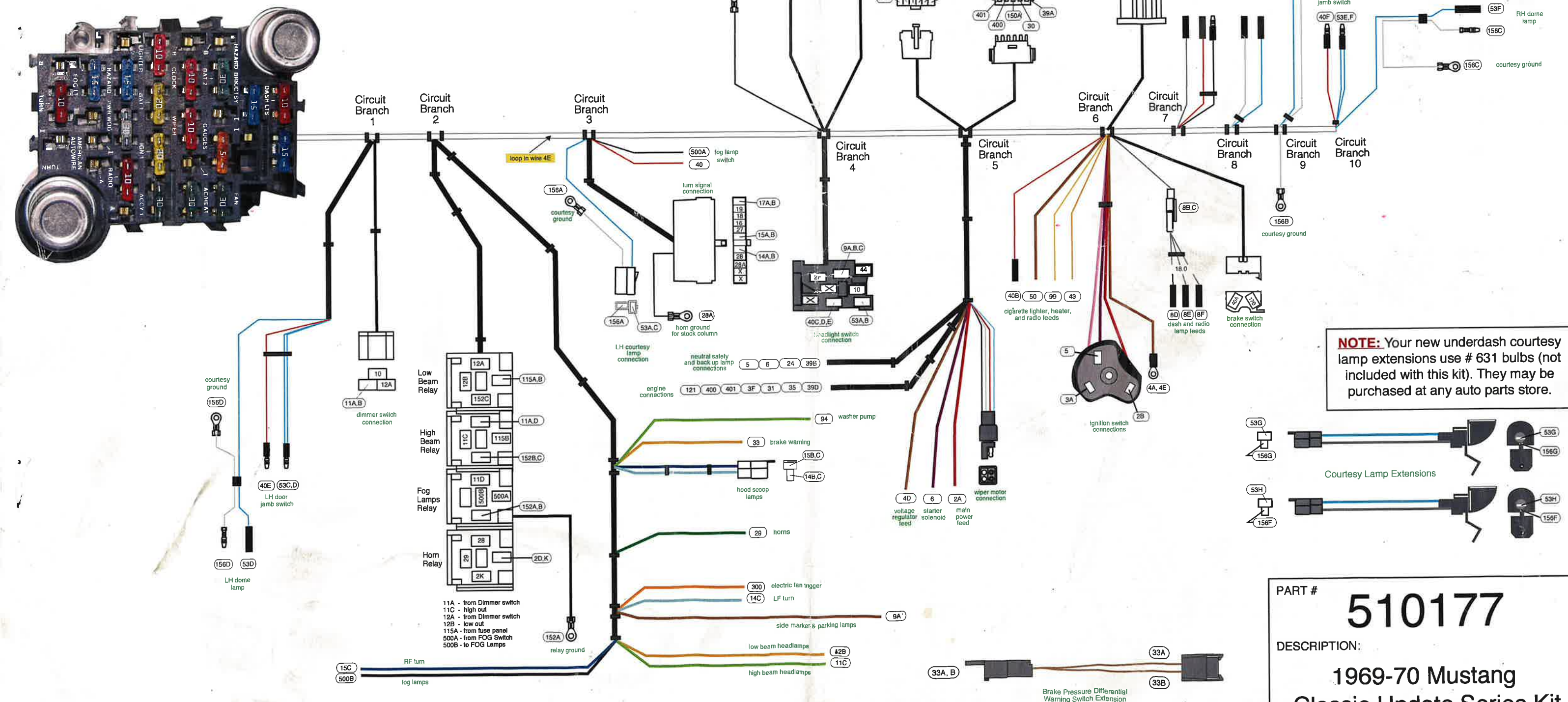
NOTE: Your new underdash courtesy lamp extensions use # 631 bulbs (not included with this kit). They may be purchased at any auto parts store.

PART # **510055**

DESCRIPTION:

**1967-68 Mustang
Classic Update Series Kit**

92968935 Rev 15.0 7/19/2017



Main Fuse Panel Installation Instructions

The Main Fuse Panel harness is designed to be mounted under the dash to the left of the original fusebox / bulkhead pass thru hole in the firewall. Below, you will find a picture showing the fusebox mounted in an actual car. Once mounted in the firewall, the harness will route exactly as the original did. The technical narative representations of the main dash harness on the following pages show each circuit branch and identifies each connection by its color, circuit number, and function. Follow these as well as the detailed drawing on pages 7 and 8 for the individual circuit connections to complete your installation.

Circuit Branch 1- Under Dash connections

Wire	Wire color	Printing
Dimmer Switch connector.		
10	Yellow	Dimmer Switch Feed
11A,B	Light Green	Headlight Hi Beam
12A	Tan	Headlight Low Beam

Procedure

Connect to Dimmer Switch.
Connect to Dimmer Switch.
Connect to Dimmer Switch.

Left Hand Dome Lamp Feed Wires.

53C,D	Light Blue	12V Ctsy Sw
40E	Orange	12V Battery Fused
53D	Light Blue	12V Ctsy Sw
156D	White	Ctsy Ground

Connect to Left Hand door jamb switch provided in the 510181 parts kit.
Connect to Left Hand door jamb switch provided in the 510181 parts kit.
Connect to Left rear dome lamp.
Connect the bullet terminal end to the left rear dome lamp. The ring terminal end must be connected to a good chassis ground.

Circuit Branch 2- Front Lighting connections

See page 7, "Figure A" for typical connections. Loose piece terminals and connectors are located in kit 510181.

Wire #	Wire color	Printing
Relay Pack		
152A	Black	Ground
94	Light Green	Washer Pump Feed

Procedure

The 4 gang relay panel is directly wired and requires no internal wiring. The only connection required is to attach the relay ground wire (152A) to a good chassis ground. Two relays control the headlight low beam and high beam circuits allowing for the use of high powered halogen lamps without creating an extra load on the factory headlamp and dimmer switches. A third relay controls the fog or driving lamp circuit and automatically shuts the fog or driving lamps off whenever the high beam lamps are applied in accordance with 50 state Federal law. The last relay is for your horn circuit.

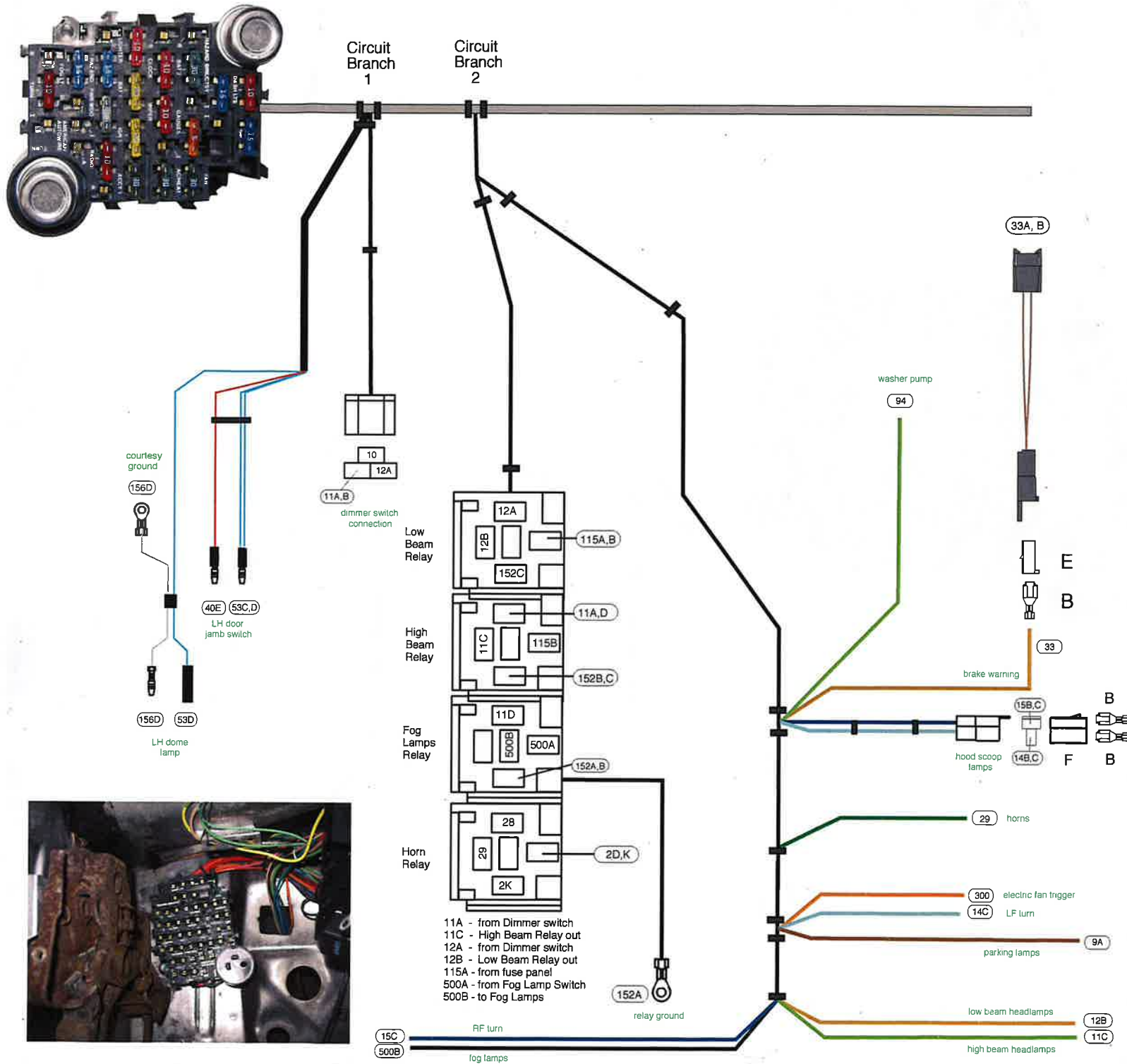
Brake Pressure Differential Switch

33	Tan	Brake Switch
14B,C	Light Blue	Left Front Turn
15B,C	Dark Blue	Right Front Turn
29	Dark Green	Horn
14C	Light Blue	Left Front Turn
15C	Dark Blue	Right Front Turn
300	Orange	Electric Fan
9A	Brown	Park Lights

(NOTE:.) We have provided you with the connection to the original Ford brake warning switch in the form of a wire extension assembly (wires 33A, B on page 1 of this instruction sheet). You will plug this extension onto wire 33, below.

Route this wire to the brake warning switch area near the master cylinder, cut to length, install terminal B, plug into connector E as shown on page 7, figure A, then plug this wire into wire extension assembly 33A, B (from page 1 of this instruction sheet) to complete your brake warning circuit.

This is the connection for the hood scoop mounted directional lights. Mating connector and terminals "B and F" to complete this branch can be found in the 510179 loose piece dash kit if you are using a stock hood with these lamps. Connect to the horn power terminal. NOTE: If your horn has a separate ground terminal, you must supply the wire for that ground terminal as it is not included in the kit. A stock horn is self grounding through it's case and bracket. Connect to the left front directional lamp socket. If you are using a single front directional light with an 1157 or dual filament bulb, this wire would be connected to the high intensity filament of the LH front running light. Connect to the right front directional lamp socket. If you are using a single front directional light with an 1157 or dual filament bulb, this wire would be connected to the high intensity filament of the RH front running light. This is the 12 volt ignition feed to be connected to the trigger wire on your electric fan relay. Connect to both the front park / running and side marker light sockets. If you are using a single front directional light with an 1157 or dual filament bulb, this wire would be connected to the low intensity filament of each of the front running lights. An in-line splice of this wire or a double up of this wire at the left front parking lamp will be necessary to accommodate the wiring of both of the front park / running lights. Connectors, terminals, and lamp sockets have been provided to make the necessary connections and can be found in the 510181 parts kit. Using the terminals and connectors supplied in bag 510181, connect these wires along with the headlight ground wires to the headlight connectors according to the orientation in the diagram on page 7. Figure A. Select the light green Headlight Hi Beam wire (11C), route to the LH outer headlamp, cut to length, double with the cut off portion using terminal W, and plug into connector A as shown on sheet 7. Select the remaining light green wire, route to the LH inner headlamp, cut to length, double with the cut off portion using terminal W, and plug into connector T as shown on sheet 7. Select the remaining light green wire, route to the RH inner headlamp, cut to length, double with the cut off portion using terminal W, and plug into connector T as shown on sheet 7. Select the remaining portion of the light green wire, route to the RH outer headlamp, cut to length, install terminal C, and plug into connector A as shown on sheet 7. Select the tan Headlight Low Beam wire (12B), route to the LH outer headlamp, cut to length, double with the cut off portion using terminal W, and plug into connector A as shown on sheet 7. Select the remaining tan wire, route to the RH outer headlamp, cut to length, install terminal C, and plug into connector A as shown on sheet 7. Connect this wire to your fog lamp power lead wires. An in-line splice or double up of the wire at the left fog lamp before routing to the right fog lamp will be necessary. If the fog lamps have a separate ground wire, you must supply those wires as they are not included in the kit.



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PART # 510177

DESCRIPTION:

1969-70 Mustang
Classic Update Series Kit

92969421 Rev 10.0 8/27/2019

Circuit Branch 5 - Under Dash connections

Instrument Cluster connections.

These connections plug into the Instrument Cluster Kit 510186. See that sub-kit for specific installation instructions and circuit functions. NOTE: In the event that you are using an aftermarket gauge package, there are instructions and terminals to complete that task (92965220) located in the 510186 Instrument cluster kit. If you are using an electronic speedometer, connections to the transmission sending unit can be found on this page to the right in figure "A".

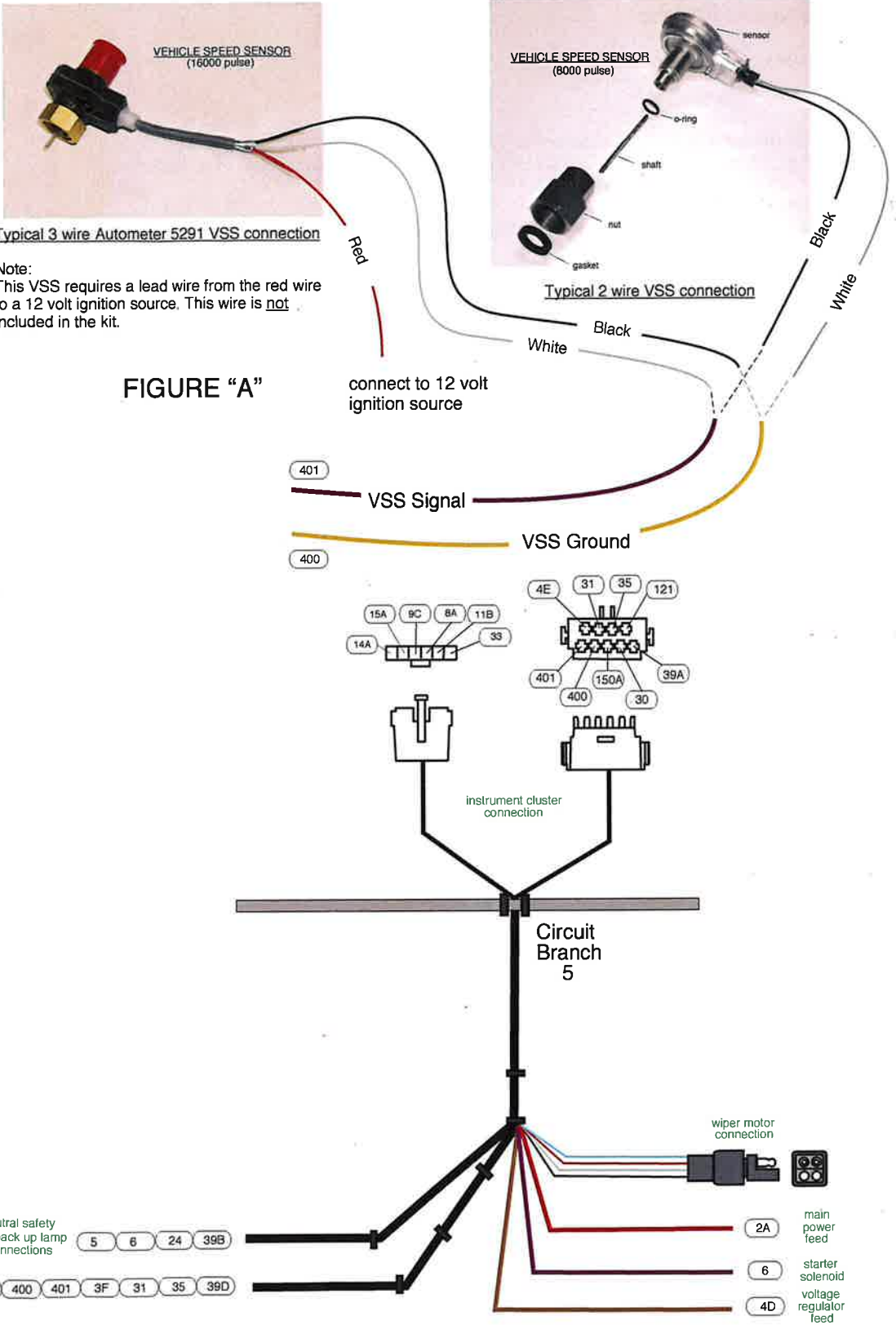
Circuit Branch 5 - Engine and Alt. connections

See page 8, "Figures B and C" for typical connections. Loose piece terminals and connectors to complete these connections are located in kit # 510181.
Procedure

Wire #	Wire color	Printing	Procedure
Alternator connections			
2	Red	12 V Battery	Use the 6ga red wire, boot and ring terminal from the 510476 kit, route it from the alternator to the Megafuse, cut to length. Connect as shown on page 8 of this instruction set and on the 92972153 (510476) instruction set. This wire is the exciter wire for your alternator / voltage regulator. If you are using a one wire alternator, this wire will not be used and should be capped off as it is "hot" in the ignition "on" position. If you are using an alternator that requires an internal voltage regulator, this exciter wire must be connected to the "switched or 12v ignition" terminal on your alternator according to the manufacturer's specifications for the type of alternator / regulator that is being being used. A inline diode or resistor may be necessary to eliminate "run on" after being switched off. (AAW recommends a GEN 3 Internally Regulated or 1 wire alternator unit)
4D	Brown	Alternator Ign	
Starter Solenoid connections			
6	Purple	Starter Solenoid-S	Route the end that comes out with the heavy red main power feed wire to the "S" terminal on your starter solenoid, cut to length, install sleeve R and terminal U which can be found in grommet and loose piece bag 510181. (See Figure D on page 8)
Main Power connections			
2A	Red	12 V Battery	Route this wire to the Megafuse, cut to length, use the ring terminal and shrink tubing from the 510476 kit. Connect as shown on page 8, Figure B.
Neutral safety and back-up connections			
5	Purple	Neutral Safety Switch	Connect to a NSS terminal on the neutral safety switch. (See figure C, page 8)
6	Purple	Starter Solenoid-S	Connect to the opposite NSS terminal on the neutral safety switch as the 5 wire above. (See figure C, page 8)
24	Lt. Green	Backup Lt Sw-Lights	Connect to the backup light terminal on the neutral safety / back up switch. (See figure C, page 8)
39B	Pink	12 V Ignition	Connect to the backup light power terminal on the neutral safety / back up switch. (See figure C, page 8)
Engine connections			
3F	Pink	Ignition Feed - coil	This is your 12 volt switched power source for the distributor. This can be connected directly to the "bat" terminal on a typical HEI distributor, to a ballast resistor as in a points type distributor, or be used as the ignition power source for an aftermarket ignition module such as an MSD or "Duraspark" module. We recommend consulting your ignition system manufacturer's installation instructions for specific connection requirements (See page 8, figure D for some examples).
31	Dark Blue	Oil Pressure Sender	Connect to the oil pressure sender.
35	Dark Green	Water Temp Sender	Connect to the temperature sender.
39D	Tan	Electric Choke	On carbureted cars, connect to the electric choke terminal.
121	White	Coil - Tach	This can be connected directly to the tach terminal on a typical HEI distributor, to the negative side of the coil, or a tach connection in an aftermarket ignition module such as an MSD module. See the installation instructions for the type of ignition system you are using for specific connection requirements.
400	Yellow	VSS Ground	Connect to the Vehicle Speed Sensor ground lead (used only with an aftermarket electronic speedometer).
401	Purple	VSS Signal	Connect to the Vehicle Speed Sensor signal lead (used only with an aftermarket electronic speedometer).

Wiper motor connection

Route the molded 4 position connector containing the blue, black, red, and white wires back in thru your cowl area as original, and plug the molded connector into your wiper motor molded lead. It is a factory indexed connection and will only install 1 way. No other connections are necessary to complete this task.



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PART # **510177**
DESCRIPTION:
**1969-70 Mustang
Classic Update Series Kit**

92969421 Rev 10.0 8/27/2019

Circuit Branch 3 - Under Dash connections

Wire #	Wire color	Printing	Procedure
Fog or driving lamp switch connection wires			
40	Orange	12V Battery Fused	Connect to "Feed In" on your fog lamp switch (if so equipped).
500A	Black	Fog Lamps	Connect to "Feed out" on your fog lamp switch (if so equipped).

LH Courtesy lamp connection
Plug in your Left Hand under dash courtesy lamp assembly here. The function of each wire is as follows:

53A,C	Lt Blue	12V Ctsy Sw	Courtesy Light power.
156A	White	Crtsy ground	Courtesy Light ground. Attach ring terminal to a good chassis ground.

Turn Signal Switch connector
If you are using a stock Ford turn signal switch and steering column, refer to Diagram 'A' and "Table A" on this page, to mate the original wires in your column to the AAW Turn Signal Switch wires. This kit is designed to plug into and function with a GM style turn signal switch. Our dash harness turn signal connector mates to the GM 3 7/8" plug type that was used on most 1969-1974 GM, IDIDIT, and many other aftermarket steering columns. Starting from 1975 on up, the GM switch began using a 4 1/4 inch connector in place of the 3 7/8" one. That connector is from the same family and uses the same terminals. By using the supplied mating connector (L) and terminals (M) located in the loose piece kit bag of the dash harness (510179), it is easy to adapt any steering column to the kit. The function of each of the AAW wires within the cavities are as follows:

28	Black	Horn switch	Horn button ground to the horn relay trigger
28A	Black	Horn Relay Ground	Ground wire for use with stock Ford column only (not used with an aftermarket column).
14A,B	Light Blue	Left Front Turn	Feeds the left front turn lamp bulb high filament ,the left hood mounted turn signal bulb, and the left turn dash indicator lamp.
15A,B	Dark Blue	Right Front Turn	Feeds the right front turn lamp bulb high filament, the right hood mounted turn signal bulb, and the right turn dash indicator lamp.
27	Brown	Turn Sw - Hazard	4 way hazard power feed wire from the Hazard flasher "L" terminal.
16	Purple	Turn Switch Feed	Turn signal power feed wire from the Turn Signal flasher "L" terminal.
18	Yellow	Left Rear Turn	Feeds the left rear turn and brake lamp bulb high filament.
19	Dark Green	Right Rear Turn	Feeds the right rear turn and brake lamp bulb high filament.
17A	White	Brake Switch	Power feed wire from the output side of the brake switch.
17B	Light Blue	Third Brake	Power feed wire from the output side of the brake switch to the third brake light connection at the rear body connector.

Circuit Branch 4 - Under Dash connections

Wire #	Wire color	Printing	Procedure
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Rear Body Wire connections.
This connector plugs into the Rear Body Kit 510052. See that sub-kit for specific installation instructions and circuit functions.

Accessory Feed Wire connections.			
100	Tan	Accessory Fused	Accessory Fused power source.
103	Tan	Fuel pump	Connect to the power input terminal of a fuel pump relay.
104	Red	Power Locks	Connect to the power input of the power locks switch or any other battery powered accessory.
107	Pink	Ignition Fused	Ignition Fused power source.
116	Pink	Power Windows	Connect to the power input of the power windows switch or any other ignition powered accessory.

Instrument Cluster ground.			
150A,B	Black	Ground	Connect to a good chassis ground.

Headlight switch connector. The function of each wire is as follows:			
2F	Red	12V Battery	12 volt battery power to the switch.
9A,B,C	Brown	Park Lights	Power lead wires to the parking and tail light circuits.
44	Dark Green	Dash Lights	Power lead wire to the dash lights .
10	Yellow	Dimmer Sw feed	Headlight power output to the Dimmer Switch.
40C,D,E	Orange	12V Battery	Fused Courtesy Light battery power feed from fusebox.
53A,B	Lt Blue	12V Ctsy Sw	Courtesy Light switched battery power.

NOTE: The courtesy lamp extension from page 1, that plugs onto the connector at branch 3 on this page, uses a # 631 bulb (not included with this kit). They may be purchased at any auto parts store.

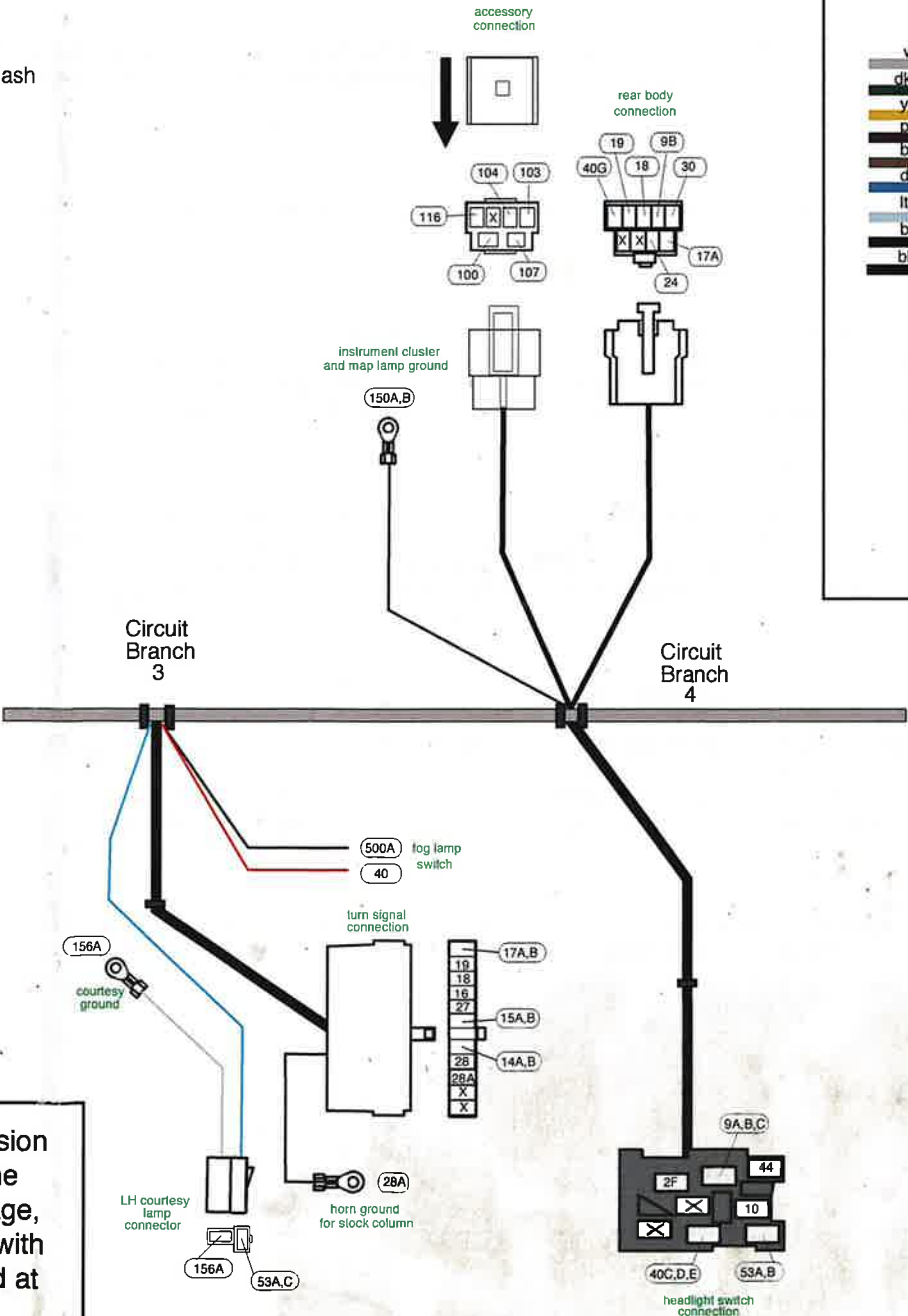


Table "A"

AAW Turn Signal Switch wires to stock 1969-70 Mustang turn signal switch.

AAW Wire #	AAW Wire color	AAW Wire Printing	Ford Wire Color
14A,B	Light Blue	Left Front Turn	Green with white stripe
15A,B	Dark Blue	Right Front Turn	White with blue stripe.
16	Purple	Turn Switch Feed	Blue
17A,B	White	Brake Switch	Green
18	Yellow	Left Rear Turn	Green with orange stripe.
19	Dark Green	Right Rear Turn	Orange with blue stripe.
27	Brown	Turn Sw - Hazard	White with red stripe.
28	Black	Horn Relay Ground	Yellow
28A	Black	Horn Relay Ground	Blue with yellow stripe.

Note: Ford originally switched power to the horns through the steering column horn button. In this kit, ground is being switched through the original steering column switch to ground a horn relay which switches power to the horns.

AMERICAN AUTOWIRE DASH HARNESS CONNECTION ORIGINAL TURN SIGNAL SWITCH WIRING

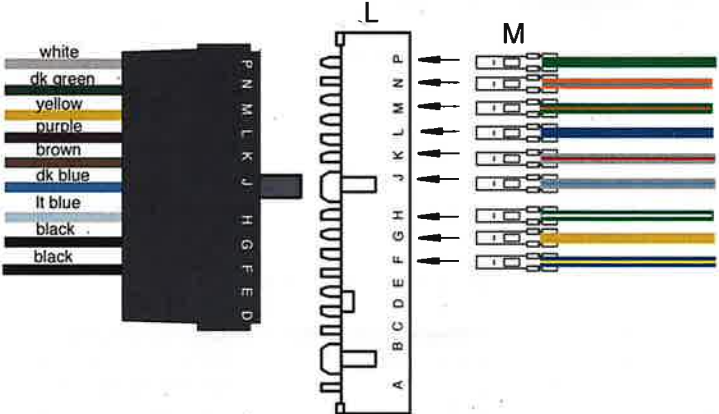


DIAGRAM 'A' - AAW Turn Signal Switch Wires to Stock 1969-70 Steering Columns.



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PART # 510177

DESCRIPTION:
1969-70 Mustang Classic Update Series Kit

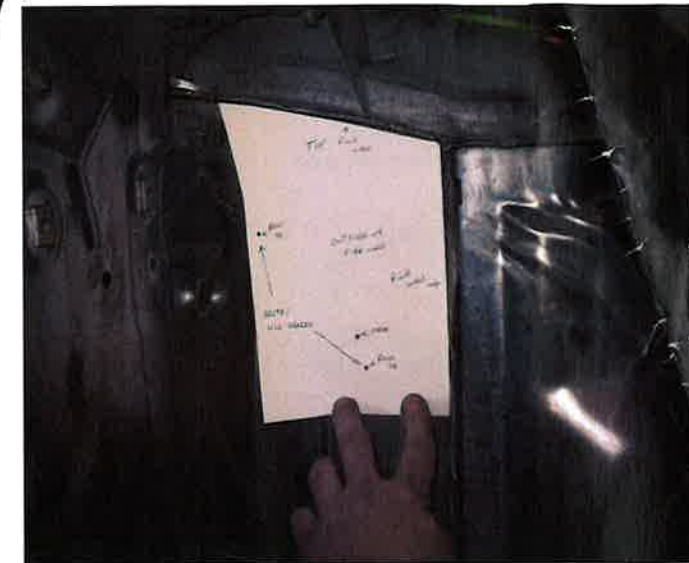
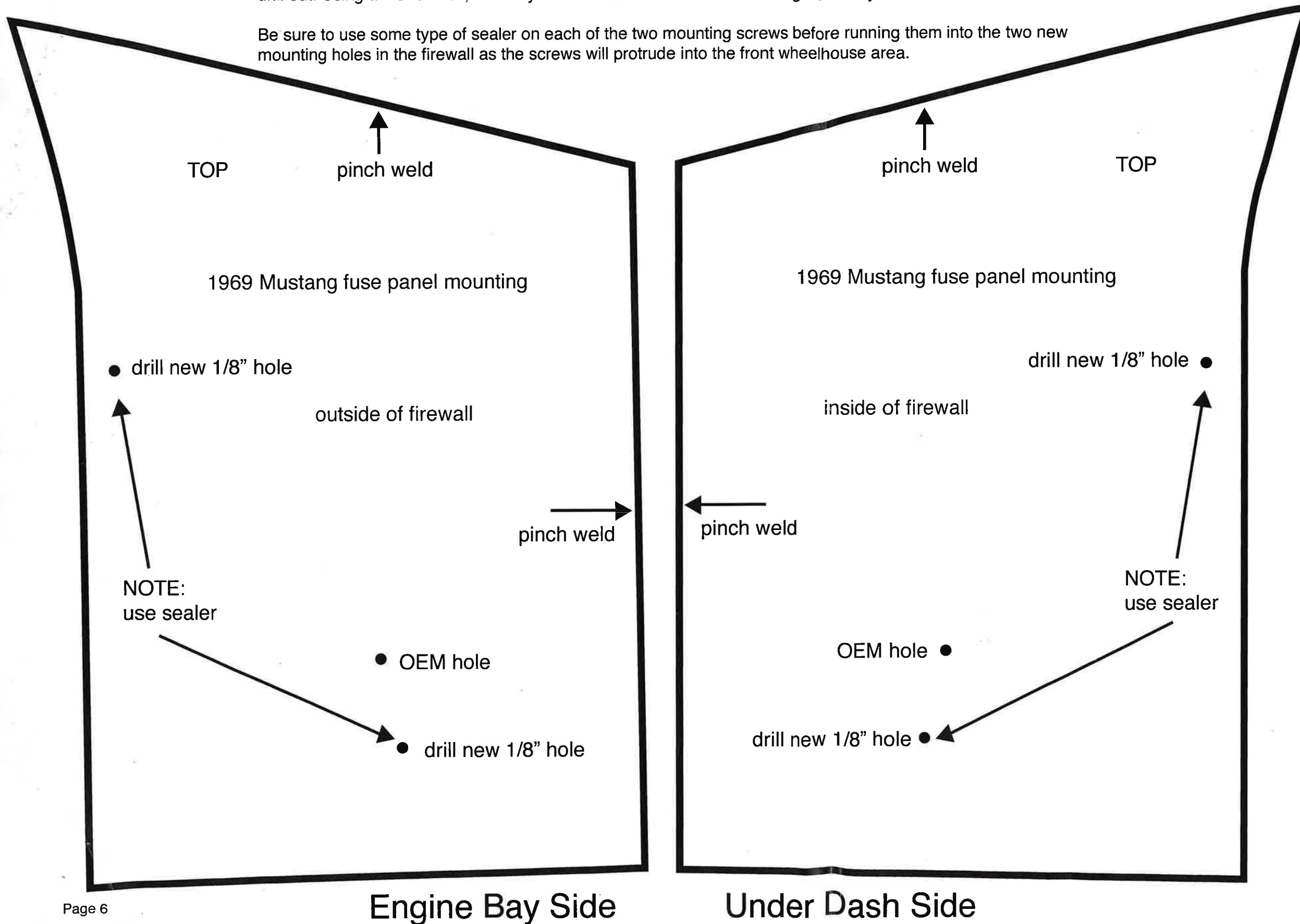
92969421 Rev 10.0 8/27/2019

Fusebox Mounting Hole Template

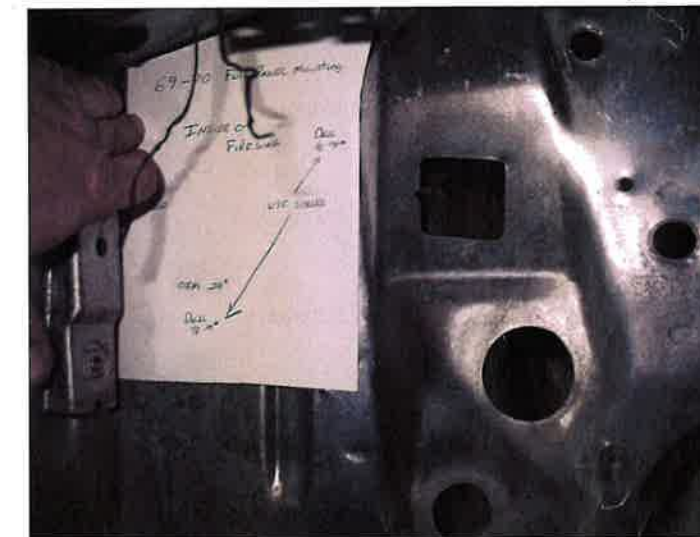
Choose to work either inside or the outside the car and align the template to the upper and outer pinch welds, and then locate the OEM hole in the firewall.

Once the template is located securely in place, use a center punch and set the two points which you will need to drill out. Using a 1/8" drill bit, carefully drill the two new fuse box mounting holes in your firewall.

Be sure to use some type of sealer on each of the two mounting screws before running them into the two new mounting holes in the firewall as the screws will protrude into the front wheelhouse area.



Engine Bay Side



Under Dash Side

PART # **510177**
DESCRIPTION:
**1969-70 Mustang
Classic Update Series Kit**

92969421 Rev 10.0 8/27/2019

Circuit Branch 6 - Under Dash connections

Wire #	Wire color	Printing	Procedure
Wiper Switch connections			
Plug the 8 position washer and wiper switch connector directly onto your stock wiper switch. No other connection is necessary.			
Radio connections			
43	Tan	Radio	Ignition power lead to radio for "off" and "on" functions.
99	Yellow	Radio Bat	Battery power lead to radio for memory.
vv			
Cigarette lighter connection			
40B	Orange	12V battery	Fused connection to cigarette lighter.
Heater A/C power feed connection			
50	Brown	Heater/AC feed	This is the fused power lead for the heater or AC control panel. Connect according to the instructions supplied with your aftermarket heater / AC unit. This can also be used as the 12 volt keyed feed wire to the stock heater or A/C system in your 1969 Mustang.
Dash illumination lamps connection			
8B tru F	Gray	Dash Lights	Spare dash lamp feeds for any accessory dash lamps needed including the radio lamp, ashtray lamp, etc.
Brake Switch connector			
40A	Orange	Brake Switch 12V feed	Connect to Brake Switch. This is the 12 volt fused battery feed to the brake lamp switch.
17B	White	Brake Switch	Connect to Brake Switch. This is the 12 volt output from the brake switch to the turn signal switch.
Ignition Switch connector			
3A	Pink	Ignition Feed	Connect to the provided 1967 style ignition switch.
5	Purple	Neutral Safety Switch	Connect to the provided 1967 style ignition switch.
2B	Red	12V Battery	Connect to the provided 1967 style ignition switch.
4A,E	Brn & Brn/Wt	Ignition Sw Accy	Install on the ignition switch stud after the main switch connector has been plugged in.

Circuit Branch 7 - Under Dash connections

Wire #	Wire color	Printing	Procedure
These connections will plug into your stock map lamp, glovebox, and clock harness.			
40D,F	Orange	12V Battery	12V battery fused power connection for the map lamp, glovebox, and clock.
8C	Gray	Dash Lights	Dash lamp feed for clock
150B	Black	Ground	Ground connection for the map lamp, glovebox, and clock.

Circuit Branch 8- Under Dash connections

Wire #	Wire color	Printing	Procedure
Console rear courtesy light connection.			
53J	Lt Blue	12V Ctsy Sw	Courtesy Light power. Connect to your stock console courtesy lamp harness.
156E	White	Ctsy Ground	Courtesy Light ground. Connect to your stock console courtesy lamp harness.

Circuit Branch 9- Under Dash connections

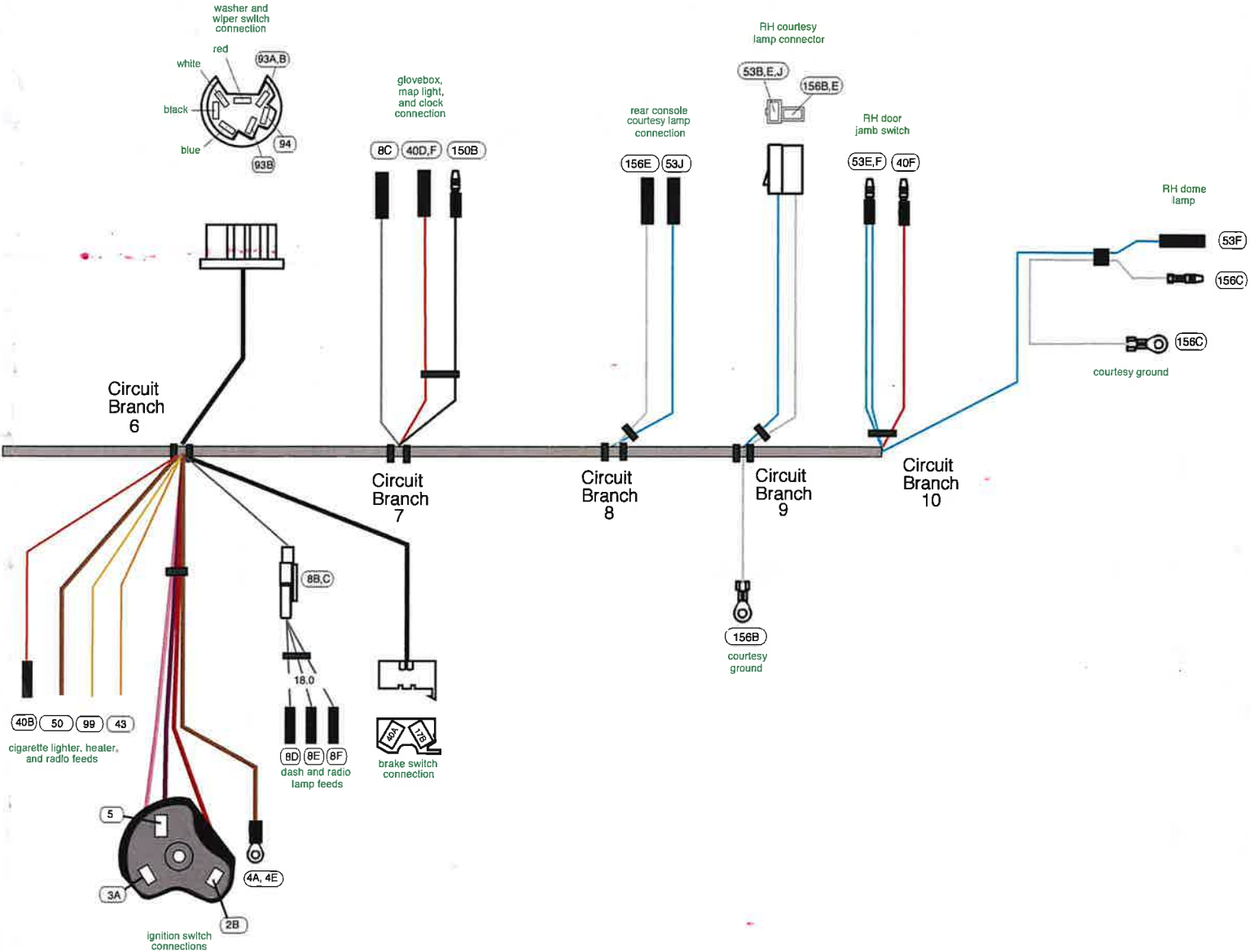
Wire #	Wire color	Printing	Procedure
RH Courtesy lamp connection			
Plug in your Right Hand under dash courtesy lamp assembly here. The function of each wire is as follows:			

53B,E,J	Lt Blue	12V Ctsy Sw	Courtesy Light power provided in the 510181 parts kit.
156B,E	White	Crtsy ground	Courtesy Light ground provided in the 510181 parts kit.
156B	White	Crtsy ground	Attach ring terminal to a good chassis ground.

Circuit Branch 10- Under Dash connections

Wire #	Wire color	Printing	Procedure
Right Hand Dome Lamp Feed Wires.			
53E,F	Light Blue	12V Ctsy Sw	Connect to the Right Hand door jamb switch.
40F	Orange	12V Battery Fused	Connect to the Right Hand door jamb switch.
53F	Light Blue	12V Ctsy Sw	Connect to the Right rear dome lamp.
156C	White Ctsy	Ground	Connect the bullet terminal end to the right rear dome lamp. The ring terminal end must be connected to a good chassis ground.

NOTE: The courtesy lamp extension from page 1, that plugs onto the connector at branch 9 on this page, uses a # 631 bulb (not included with this kit). They may be purchased at any auto parts store.



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PART # **510177**
DESCRIPTION:
**1969-70 Mustang
Classic Update Series Kit**

92969421 Rev 10.0 8/27/2019

Circuit Branch 5 - Under Dash connections

Wire #	Wire color	Printing	Procedure
Wiper Switch connections.			
93	White	Wiper Feed	Power input to wiper and washer switch connection. (This wire and terminal will attach to AAW harness number 510131, "Wiper Washer Harness", to complete your stock windshield wiper harness system. The instructions for the motor and pump connections, as well as, the instructions on where to plug this wire into the "Wiper Washer Harness" can be found on instruction sheet number 510131.)
150	Black	Ground	Instrument Cluster ground. Connect to a good chassis ground.

Circuit Branch 6- Under Dash connections

Wire #	Wire color	Printing	Procedure
Rear Body Wire connections.			
This plugs into the Rear Body Kit 510052. See that sub-kit for specific installation instructions and circuit functions.			
Accessory Feed Wire connections.			
100	Tan	Accessory Fused	Accessory Fused power source.
103	Tan	Fuel pump	Connect to the power input terminal of a fuel pump relay.
104	Red	Power Locks	Connect to the power input of the power locks switch or any other battery powered accessory.
107	Pink	Ignition Fused	Ignition Fused power source.
116	Pink	Power Windows	Connect to the power input of the power windows switch or any other ignition powered accessory.
Headlight switch connector.			
The function of each wire is as follows:			
2F	Red	12V Battery	12 volt battery power to the switch.
9A,B,C	Brown	Park Lights	Power lead wires to the running light circuits.
44	Dark Green		Power lead wire to the dash lights .
10	Yellow	Dimmer Sw feed	Headlight power output to the Dimmer Switch.
40C,D,E	Orange	12V Battery Fused	Courtesy Light battery power
53A,B	Lt Blue	12V Ctsy Sw	Courtesy Light switched battery power

Courtesy light connector.			
Plug in your Left Hand under dash courtesy lamp assembly here. The function of each wire is as follows:			
53A,C	Lt Blue	12V Ctsy Sw	Courtesy Light power.
156A	White	Crtsy ground	Courtesy Light ground

Circuit Branch 7- Under Dash connections

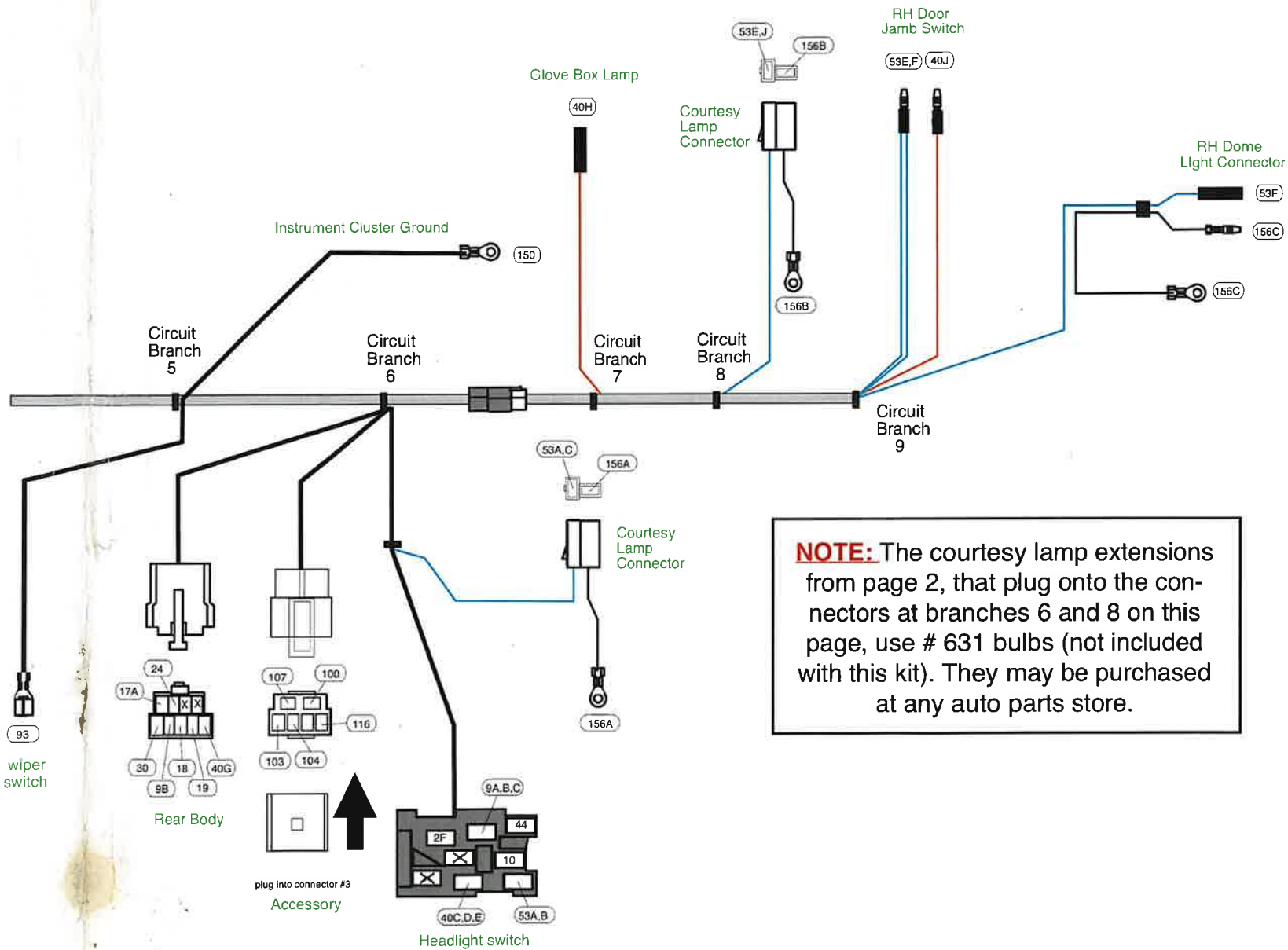
Wire #	Wire color	Printing	Procedure
40H	Orange	12V Battery Fused	Connect to the glove box lamp assembly.

Circuit Branch 8- Under Dash connections

Wire #	Wire color	Printing	Procedure
Courtesy light connector.			
Plug in your Right Hand under dash courtesy lamp assembly here. The function of each wire is as follows:			
53E,J	Lt Blue	12V Ctsy Sw	Courtesy Light power.
156B	White	Crtsy ground	Courtesy Light ground

Circuit Branch 9- Under Dash connections

Wire #	Wire color	Printing	Procedure
Right Hand Dome Lamp Feed Wires.			
53E,F	Light Blue	12V Ctsy Sw	Connect to the Right Hand door jamb switch.
40J	Orange	12V Battery Fused	Connect to the Right Hand door jamb switch.
53F	Light Blue	12V Ctsy Sw	Connect to the Right rear dome lamp.
156C	White	Ctsy Ground	Connect the bullet terminal end to the right rear dome lamp. The ring terminal end must be connected to a good chassis ground.



NOTE: The courtesy lamp extensions from page 2, that plug onto the connectors at branches 6 and 8 on this page, use # 631 bulbs (not included with this kit). They may be purchased at any auto parts store.



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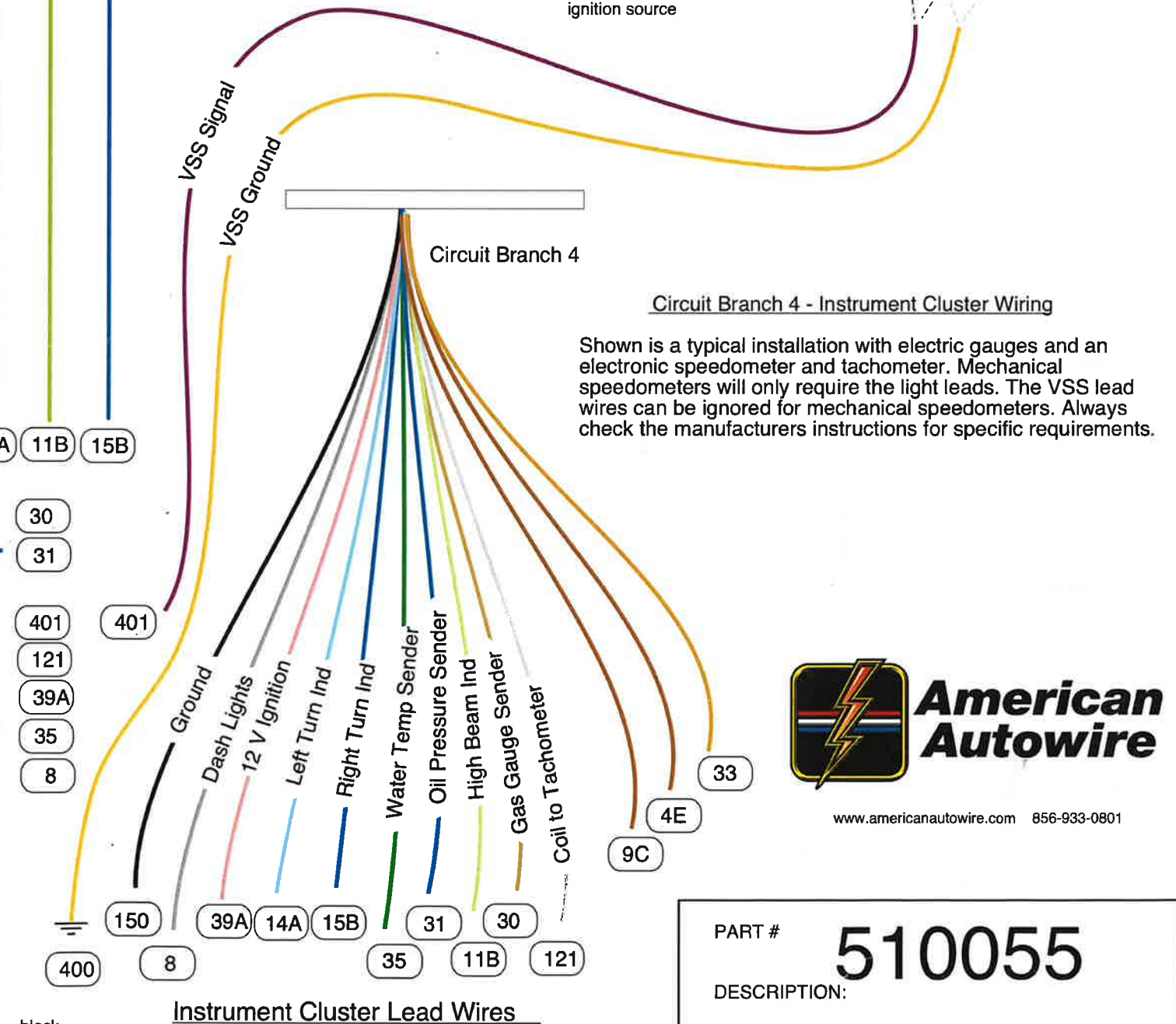
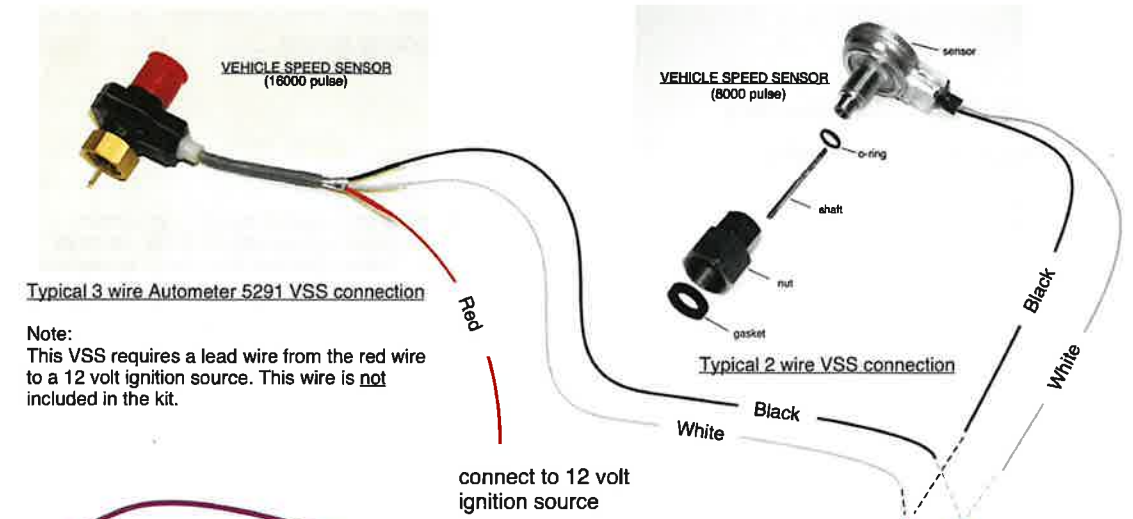
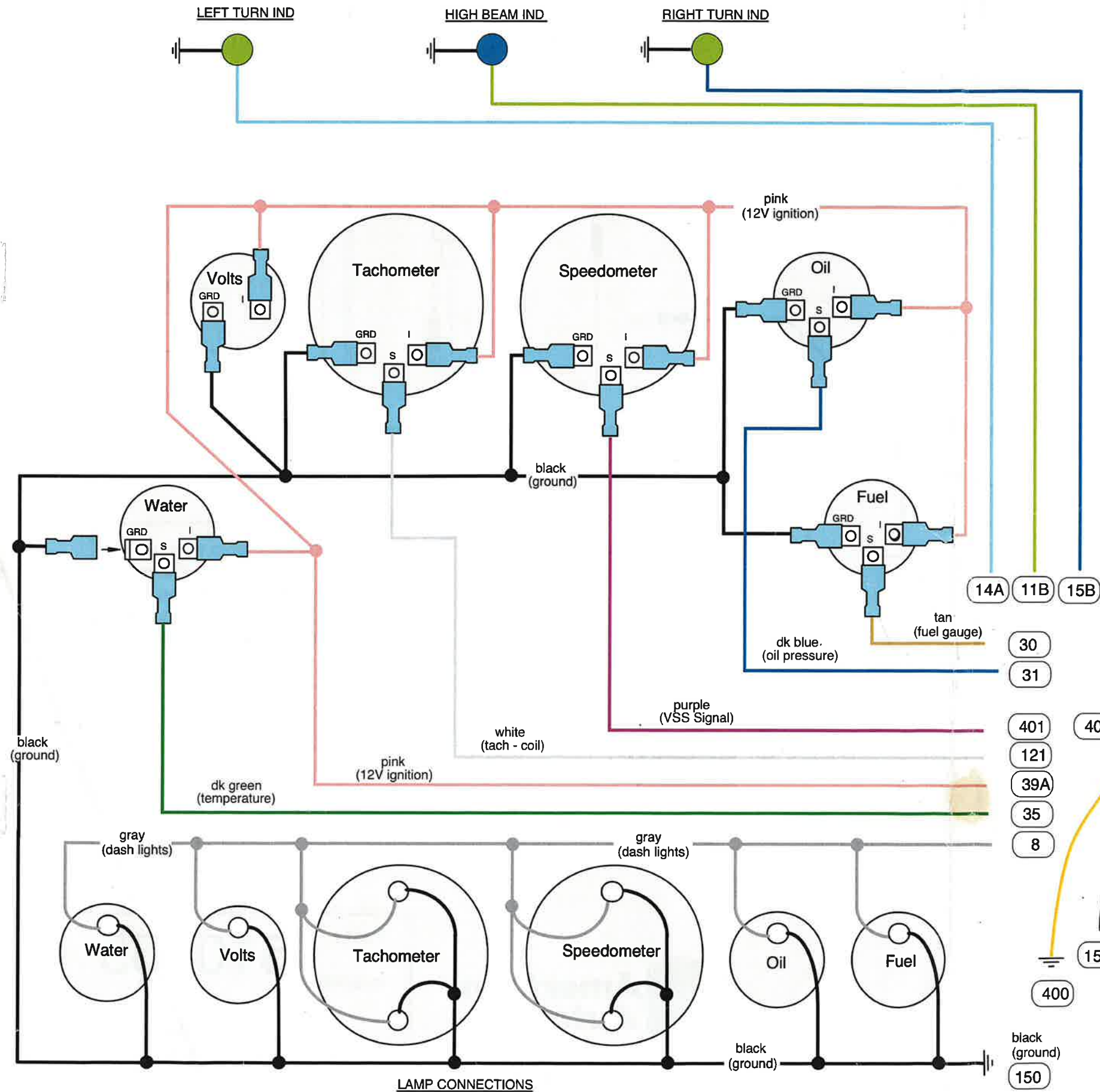
PART # **510055**

DESCRIPTION:

**1967-68 Mustang
Classic Update Series Kit**

92968935 Rev 15.0 7/19/2017

TYPICAL BLADE TYPE GAUGE CONNECTIONS



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PART # 510055

DESCRIPTION:

**1967-68 Mustang
Classic Update Series Kit**

92968935 Rev 15.0 7/19/2017

On the next 4 pages, you will find several detailed specialized instructions that will help you install our '69 Mustang Classic Update Dash/Main Kit, P/N 510179, into your 1970 Mustang. These instructions along with the specialized harnesses and parts from the 510245 wire kit will need to be used in conjunction with the corresponding instructions and many parts, from the 510179 dash/main kit. These modifications to the dash/ main harness include the following specialized harnesses: ignition switch relay jumper harness (this is necessary due to the fact that the Ford column mounted ignition switch has a very low amperage output on the ignition circuit), and turn signal switch jumper extension harness (to allow the turn signal connection to be routed over to the RH side of the steering column as it was in 1970). Also, instructions for connecting up a single headlight system as was utilized on the 1970 Mustang are addressed on sheet number 4. The balance of the 1969 Mustang dash/main harness kit should install into any 1970 Mustang without any further modifications or issues.

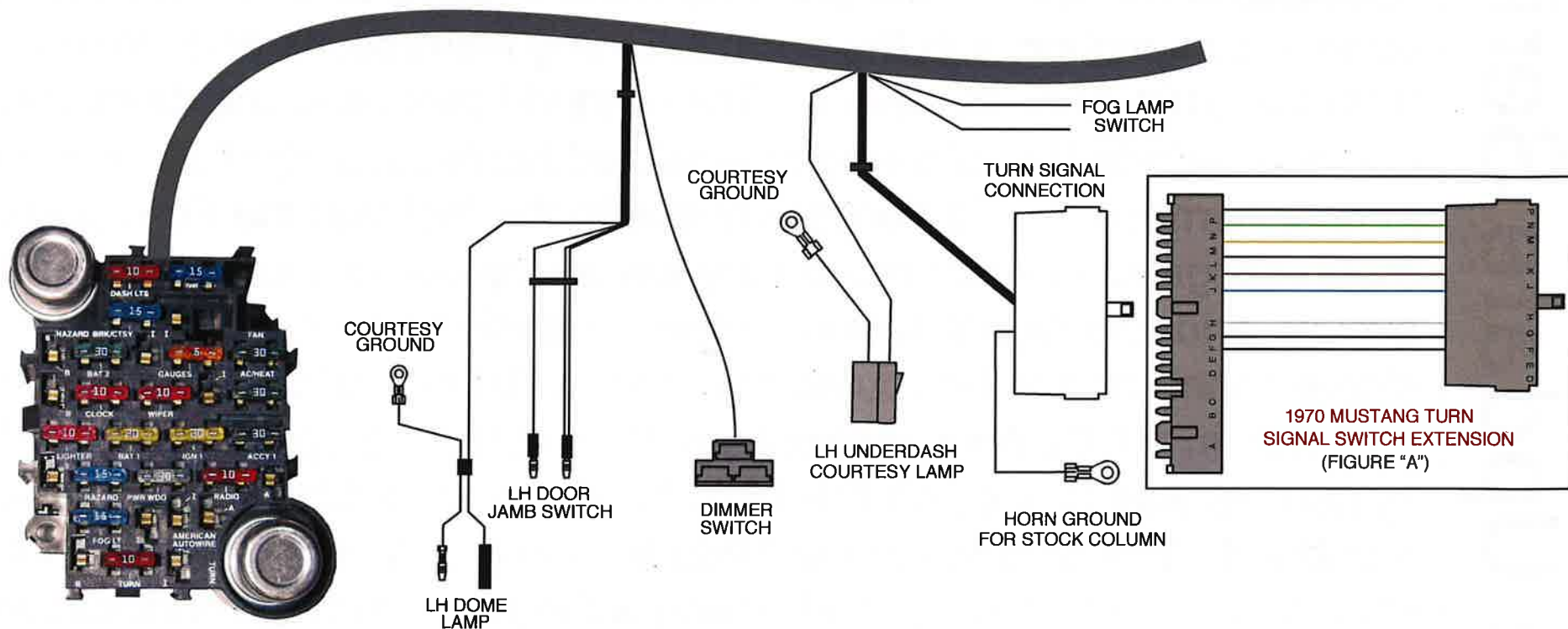


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AAW 1969 MUSTANG MAIN DASH HARNESS



1. In a stock 1969 Mustang configuration, the steering column turn signal switch connection on the dash harness dropped down off of the main trunk of the dash harness to the LH side of the steering column and pedal assembly, whereas on the 1970 Mustang, it was relocated to drop down to the RH side of the steering column and pedal assembly. The AAW dash harness (510179) is built so that the turn signal connection also drops down off to the LH side of the column. For this reason, this "add-on" kit provides a turn signal switch connection extension harness (see figure "A" above) so that our dash harness can be easily installed into your 1970 Mustang. Simply plug the extension harness onto the dash harness (510179) as shown above, and route the extension over top of your column so that it can mate to the stock or aftermarket turn signal switch to the RH side of the steering column as was done on the 1970 Mustangs. Follow the balance of the instructions on the 510178 instruction sheets, page 3, branch 3 for connecting the extended dash harness to your specific steering column turn signal switch.

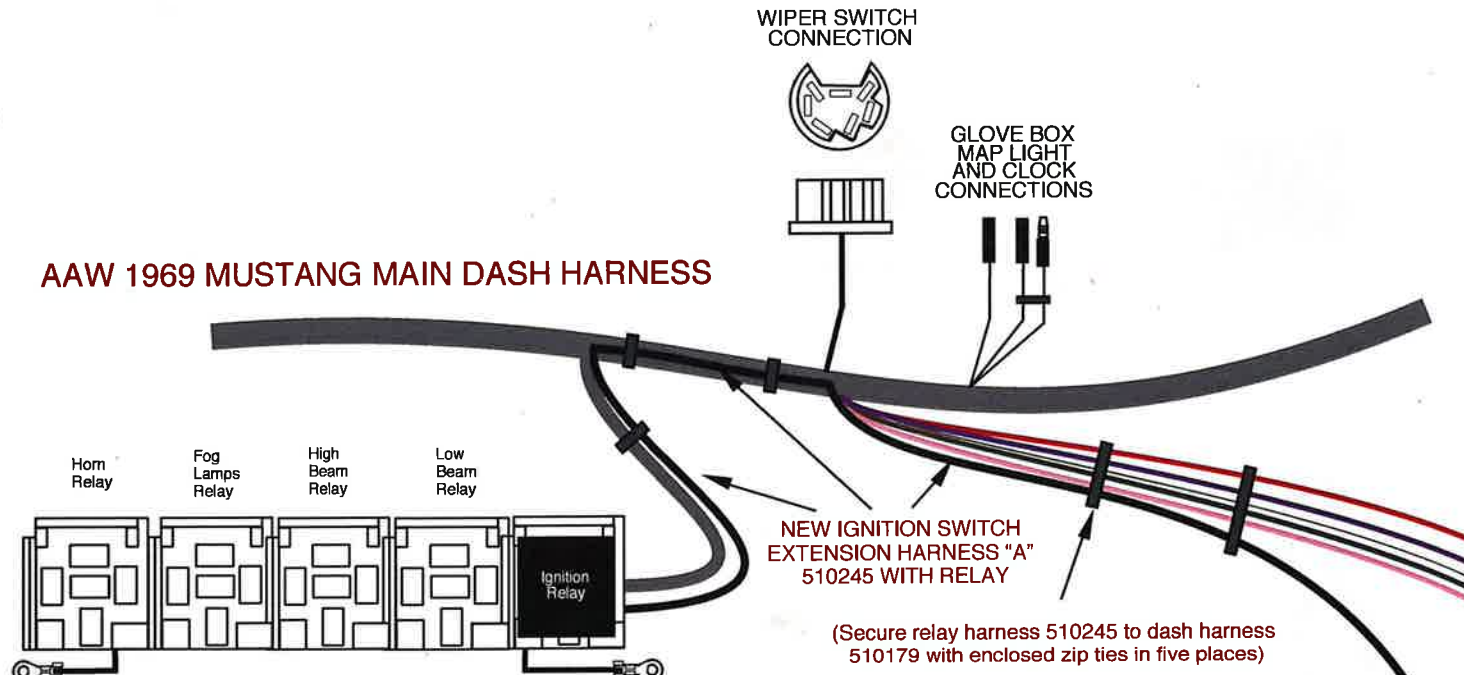


**American
Autowire**

Turn Signal
Switch Extension
1970 Mustang

510243

AAW 1969 MUSTANG MAIN DASH HARNESS



4 RELAY BASES ON THE PRODUCTION AAW 1969 MUSTANG DASH HARNESS

1. Locate the ignition switch connector on the 510179 dash/main harness. This can be found on the 510178 instruction sheet at branch #6, page 5. Approximately 1" back from that connector, cut the red, purple, and pink wires and remove the ignition switch connector as shown in "figure B" above at the right. Also, cut the large and small brown wires located at the same area that are crimped together in a ring terminal so that they are even with the red, purple, and pink wires.

2. Crimp the enclosed terminals "B" onto the red, purple, and pink wires from the ignition switch connection of the dash harness from step 1. Also, take the large and small brown wires, double them together, and crimp terminal "B" onto them as well. Inspect your crimps well and solder these connections if necessary as these are your main power distribution wires.

3. Next, install ignition jumper harness "A" onto the main dash harness 510179 as shown above. Start by sliding the relay assembly onto the 4-gang relay bases found at branch 2, page 2, of the 510178 instruction sheet. Route the harness along the side of, and attach it to the main dash harness as shown above using the 5 provided zip ties. Install the 4 "crimped-on terminals" from step 2 into connector "C" as shown above being **VERY** certain to maintain color continuity with the New Ignition Switch Extension Harness "A" (red to red, pink to pink, etc). Attach the ring terminal from 510245 Ignition Jumper harness to a good known ground.

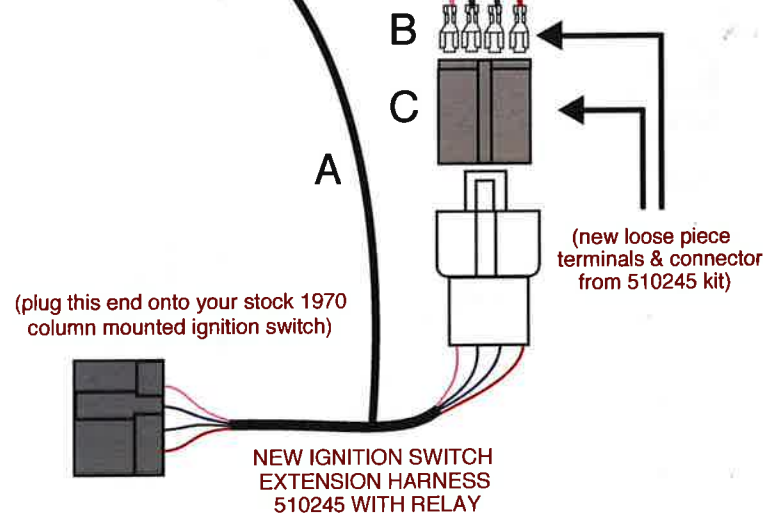
4. Plug one end of the New Ignition Switch Extension Harness "A" onto the connection that you just made using terminals "B", and connector "C" (from steps 2 and 3) as shown to the right, and plug the other end onto your original column mounted ignition switch. This completes the ignition switch circuit of your 1970 Mustang.



AAW 1969 DASH IGNITION SWITCH CONNECTION

(cut off this connector and ring terminal from 510179 dash harness)

(FIGURE B)



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Ignition
Switch Extension
1970 Mustang

510243

right headlights



outer
3 pin



A

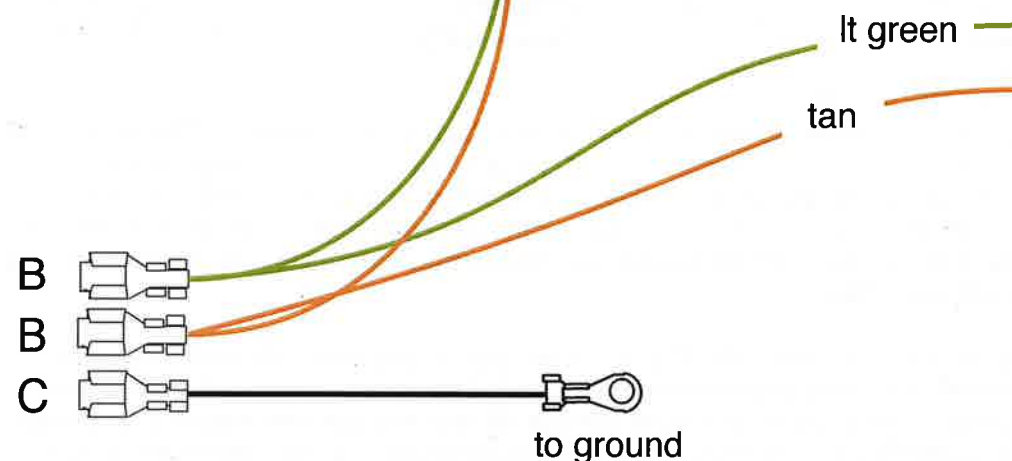


outer
3 pin



A

left headlight



The 1970 Mustang utilized a single headlamp system as opposed to the dual headlamp system used on the 1969 Mustangs. On this sheet, you will find instructions that depict how to connect your headlamps. The function of each of the wires (lt. green, tan, and black) remains the same as on the main instruction sheet 510178, page 2, branch 2. AAW recommends that you use both this sheet and the 510178 sheet for installation of your headlamps.



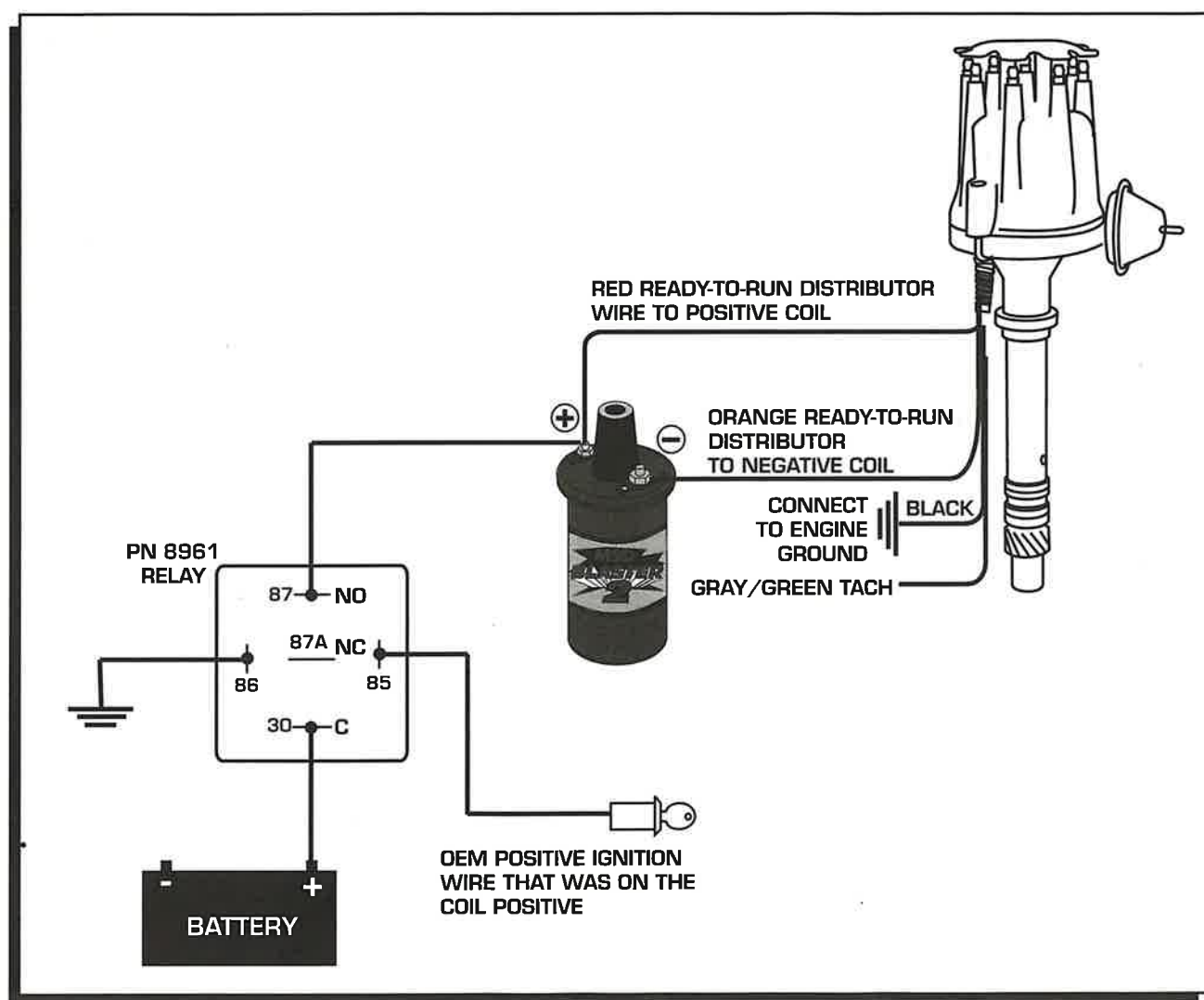
Headlamp
Connections
1970 Mustang

510243

MSD ADDENDUM

Supplying 12 Volts to the Ready-to-Run Distributor

Many vehicles, primarily those that were originally equipped with breaker points, have resistance wiring or a ballast resistor in the coil positive (+) wiring. This reduces the voltage at the coil positive terminal. An MSD Ready-to-Run Distributor requires a solid 12 volts to perform at its full potential. By adding a Relay, PN 8961, you can ensure that the distributor receives a full 12 volts during cranking and while running. The diagram below shows the installation.



Chet's Courtesy Automotive
1863 Tamiami Trail N
Naples FL 34102
(239) 262-4565

11/22/2025

11:27

SALE

Trans #:3 Batch #:415
MASTERCARD CHIP
MODE: Issuer
*****0524 **/**
Base Amt: \$4988.42
Resp: APPROVED 00
Code: 39286Z
Ref#: 532616769147

App Name: Mastercard
AID: A0000000041010

TVR: 0000008000
TSI: E800

Invoice No: 158526

Cardholder acknowledges
receipt of goods and
obligations set forth by
the cardholder's
agreement with
issuer.



Signature
HOWARD/RICH
CUSTOMER COPY

Thank You.
We Value Our Customers!



Courtesy Automotive
1863 Tamiami Trail North
Naples, FL 34102
239-262-4565
M-458680

Howard, Anna

3435 Enterprise Ave Suite #1
Naples, FL 34104
Phone: 224-392-1290

Vehicle: 1966 FORD GT40 MKII CLONE
VIN:
License:
Miles: 33

Invoice #: 158526
Service: 09/11/2025

Description	Each	Total
Subtotal for Items	-	0.00
CUST. STATES, WHEN A/C IS ON HIGH SETTING, ENGINE WILL STALL.		1860.00
DIAGNOSE PROBLEM AND FOUND BREAKER BLOWING. (MAIN BREAKER TRIPS AFTER 20 MIN. OF ENGINE RUNNING AND REPEATS IT SELF EVERY 4 MIN.)		
REWIRE MAIN POWER THROUGH TWO BREAKER TO FUSE BOX USING LOAD RELAYS.		
REPLACE CUT-OFF SWITCH DUE TO BURNT CONTACTS.		
2.0 5-PIN RELAY	45.96	91.92
1.0 PIGTAIL CONNECTOR KIT (CONNECTOR W/ HARNESS - 2)	361.04	361.04
2.0 CIRCUIT BREAKER	19.87	39.74
1.0 CUT-OFF SWITCH	101.25	101.25
1.0 ASSORTED ELECTRICAL SUPPLIES	189.25	189.25
Subtotal for Drivability	-	2643.20
STARTER		365.00
REPLACE STARTER ASM. (STARTER FAILED WHILE WORKING ON VEHICLE)		
1.0 STARTER ASM.	349.50	349.50
Subtotal for STARTER	-	714.50
FUEL GAUGE		480.00
CHECK IF GAS GAUGE READS ACCURATE. (GAUGE READS DIFFERENT WHEN VEHICLE IS PARKED ON AN INCLINE / DECLINE)		
REMOVE FUEL SENDER FROM BOTH TANKS TO CHECK TANK LEVEL AND SENDER OPERATION.		
RIGHT TANK 50% -- LEFT TANK 20% FULL AND GAUGE READING 1/4.		
VEHICLE HAS VERY LONG TANKS ANY ANGLE OF VEHICLE WILL CHANGE LEVEL.		
TANKS HAS EXCESSIVE FUEL SLOSH DUE NON BAFFLE TANKS.		
1.0 Gas - Unleaded	36.67	36.67
Subtotal for FUEL GAUGE	-	516.67
		458.00

STEERING

CHECK FOR LOOSENESS IN STEERING.

- NOTE, STEERING COMPONENTS ARE IN GOOD CONDITION, HOWEVER VEHICLE IS OUT OF ALIGNMENT.
ALIGN VEHICLE.

Subtotal for STEERING		-	458.00
-----------------------	--	---	--------

Department	Amount
Labor	3163.00
Service Fee	168.69
Parts	1169.37
Sales Total	4501.06
Shop Supplies	216.62
Other	0.00
Enviromental fees	0.00
Subtotal	4717.68
Sales Tax	270.74
	0.00
Grand Total	4988.42

Method	Amt
PAYMENT	4988.42

SHOP SUPPLIES: This charge represents costs and profits to the motor vehicle repair facility for miscellaneous shop supplies or waste disposal.
ENVIRONMENTAL FEES: The state of Florida requires a \$1.00 fee to be collected for each new tire sold in the state [s.403.718] and a \$1.50 fee to be collected for each new or remanufactured battery sold in the state. [s.403.7185]

CERTIFICATE OF ORIGIN

ARDERN CARS

I, the undersigned authorized representative of the company, hereby certify that the component part described below is the property of the said company and is transferred on the date and under the invoice number indicated.

DATE: 4/27/2022


INVOICE: 1131

SERIAL NO. ACXF9518436572050

DESCRIPTION OF COMPONENT:

1968 Ford GT40 Reproduction Body and Chassis

BY:


Christopher M. Ardern

TRANSFER OF OWNERSHIP

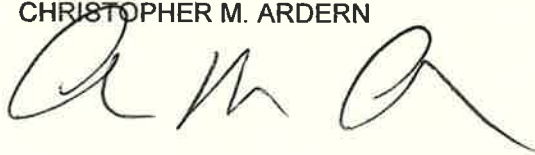
For the value recieved, I the undersigned, transfer the component part described on the face of this certificate to:

NAME OF PURCHASER: Robinson Restoration
ADDRESS: 413 north st
Ryan, Iowa 52330

And certify to the best of my knowledge, information and belief under penalty of law; that the component part herein described will be utilized as part of a "car-kit" for a vehicle which has not been registered in this state or any state and at the time of delivery, the part was not subject to a security interest.

MANUFACTURER: Ardern Cars
2597 Townline Rd
Madison, OH 44057

AUTHORIZED BY: CHRISTOPHER M. ARDERN

A handwritten signature in black ink, appearing to read 'C M A', is written over the printed name 'CHRISTOPHER M. ARDERN'.

Ardern Cars

2597 Townline Rd.
Madison OH 44057

440-983-0772
gt-reproductions.com

Name: Robinson Restoration
Address: 413 North Street
Ryan, IA 52330

Invoice # 1131
Phone:
Email:

At Ardern Cars we offer modern technology with classic styling. At the heart of every GT Coupe is our ZSR Chassis, a semi monocoque/ tubular steel space frame with aluminum skin. using modern zero scrub radius technology, taking full advantage of the current generation tire. Standard features include rack and pinion steering, with fully adjustable camber, caster and bumpsteer. Suspension geometry has been engineered by Race Car Designer Jim Griffith.

Our chassis uses Corvette C5/ C6 suspension.

Our Coupes also come standard with a high quality, hand laid fiberglass body manufactured using state of the art open mold technology. Highest quality materials are used for distortion free panels.

Complete Fiberglass Body includes:

Class A gel coat finish
Nose. Tail. Center Section
L & R Door
Single or Twin Nostril Hood
L & R Side Pods
Dash Unit
Safety Glass windsceen
Poly side windows and headlight covers

Builder Kit includes all the above plus fit up of body, doors hinged and latched

Complete Semi Monocoque Frame includes:

Fully welded in our chassis fixture mild steel tubing with semi stressed skin pedal box
DOM .134 wall roll bar
Front and Rear body supported and hinged
Chassis is delivered in a satin black powdercoated finish
Aluminum skin pre fitted and fastened, side pods, firewall
Custom steering rack installed
Steering column with quick release hub installed

Ford GT Replica Builder Kit Mark 1 or Mark 2	21,995.00	20,000.00
Fuel tanks pre installed	1,800.00	1,800.00
Refurbished C5/6 Suspension installed	1,500.00	1,500.00
Coil Over Shock Kit	850.00	850.00
Shifter Kit cable operated	550.00 Incl. N/C	-
Aluminum wheels 17x8 F 17x11 R Halibrand style	2,400.00	
Tires 235 45 17 fronts 315 35 17 rears	750.00	
Base Roller includes Builder Kit plus all items described above w/ package discount.	27,995.00	

Options:

Brake kit, pedal assy with master cylinders for clutch and brakes, adjustable bias

	950.00	950.00	CLUTCH PEDAL
Coolant Tubes		200.00	-
Bundle of Snakes Exhaust System for GT40 Style Specifiy Engine	Jet Hot Coated mild steel	2,695.00	
	Stainless Steel	3,495.00	3,495.00 -
VDO Gauge package		595.00	
Electric wiper kit		395.00	395.00 -
14 circuit wire harness		279.00	
Lighting kit		750.00	750.00 ✓
Flip up gas cap kit	pr	600.00	
Kennedy Engine to Porsche transaxle adapter	Windsor	1,850.00	
	Coyote	2,250.00	
Axle conversion kit C5 to Porsche		275.00	275.00
Air conditioner, heater, defroster kit		1,295.00	
Mid engine acelerator pedal kit		225.00	
Parking brake kit		240.00	240.00
Fiberglass Mid-Engine Seat Shells, 3 styles available	ea	350.00	350.00 -
Chin Spoiler		450.00	
John Wyer style wide hip rear flares installed		1,500.00	
Custom Aluminum Wheels BRM or Halibrand Style with pin drive center locks	call		
<u>Competition Components:</u>			
FIA Approved fuel cells, foam filled bladders	pr call		
Roll Cage front hoop upgrade		1,800.00	
SCCA/ NASA approved competition roll cage upgrade of standard roll bar		2,675.00	

Total		30,805.00
Deposit of 1/3 down required at time of order,	Paypal chrisardern@gmx.com	-8,000.00
Progress payment at the midpoint of the build.		-8,576.35
Balance	Paid in full	14,228.65

HOOD
HEADLITC
COVERS



KENNEDY

ENGINEERED PRODUCTS



Instructions

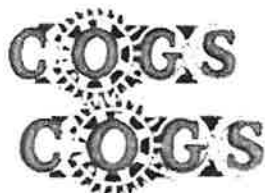
38822 17th Street East
Palmdale, California 93550
(661) 272-1147
www.kennedyeng.com

Order Shipped # 3D- 3155

From: cogscogs@gmail.com

To: robinsonchris87@yahoo.com

Date: Sunday, August 21, 2022 at 09:07 AM CDT



Phone: 706.865.5200

Order Confirmation

Chris Robinson,

This email confirms that your order was Shipped
Contact us if you have any questions about your order.

Thanks for using Cogs Cogs.

Order Information

Order number: 3D-3155

Order Date: 2/24/2022

Billing Address

Chris Robinson
robinsonchris87@yahoo.com
563 932 2034
413 North Street
Ryan, IA 52330 US

Order Summary

Additional Information

Account Info:

Login: robinsonchris87@yahoo.com

Pass: *****

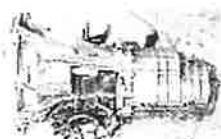
Payment Information

Payment Method

Online Credit Card

Shipping To: Chris Robinson
413 North Street Ryan, IA 52330 US
Shipped Date: 08/21/2022

Shipping Method
Custom Shipping
Tracking Number



986-03 Porsche Boxster S
Transmission 6 Speed
Complete, G86.20, 2000-04

\$3,700.00 x 1

\$3,700.00

Rebuilt: Rebuilt
Differential: Open
Refundable Core
Charge: Refundable Core
Required - \$750.00



wv.40165wk Wavetrac
Limited Slip Differential
911(996) 1998-2005,
Boxster S 2000-2005

\$1,295.00 x 1

\$1,295.00

986-423.assy Porsche Boxster 6
speed complete shifter and cables
with shift knob

\$455.00 x 1

\$455.00

Subtotal: \$5,450.00

Discount: \$0.00

Shipping: \$245.00

Sales Tax: \$0.00

Total: \$5,695.00

Cogs Cogs

4404 New Bridge Road Cleveland, GA 30528
Phone: 706.865.5200



KENNEDY ENGINEERED PRODUCTS, INC.

38822 17th St. East, Palmdale CA 93550 Tel. (661) 272-1147

Fax: (661) 272-1575

www.kennedyeng.com

KIT #2900-996, 2900-997, 2900-Box S Small Block Ford 302/351 to Porsche 996 '99-'05, Porsche 997 '05-'08, '00-'04 BOXSTER-S

Fit adapter to engine to check that everything sits flush and to make sure everything clears, then remove.

Install the 2 - 16mm dowels provided in the kit, into the adapter. Put the adapter on the trans, mark area on trans through starter pocket hole. This must be machined on trans to clear starter gear when it shoots out.

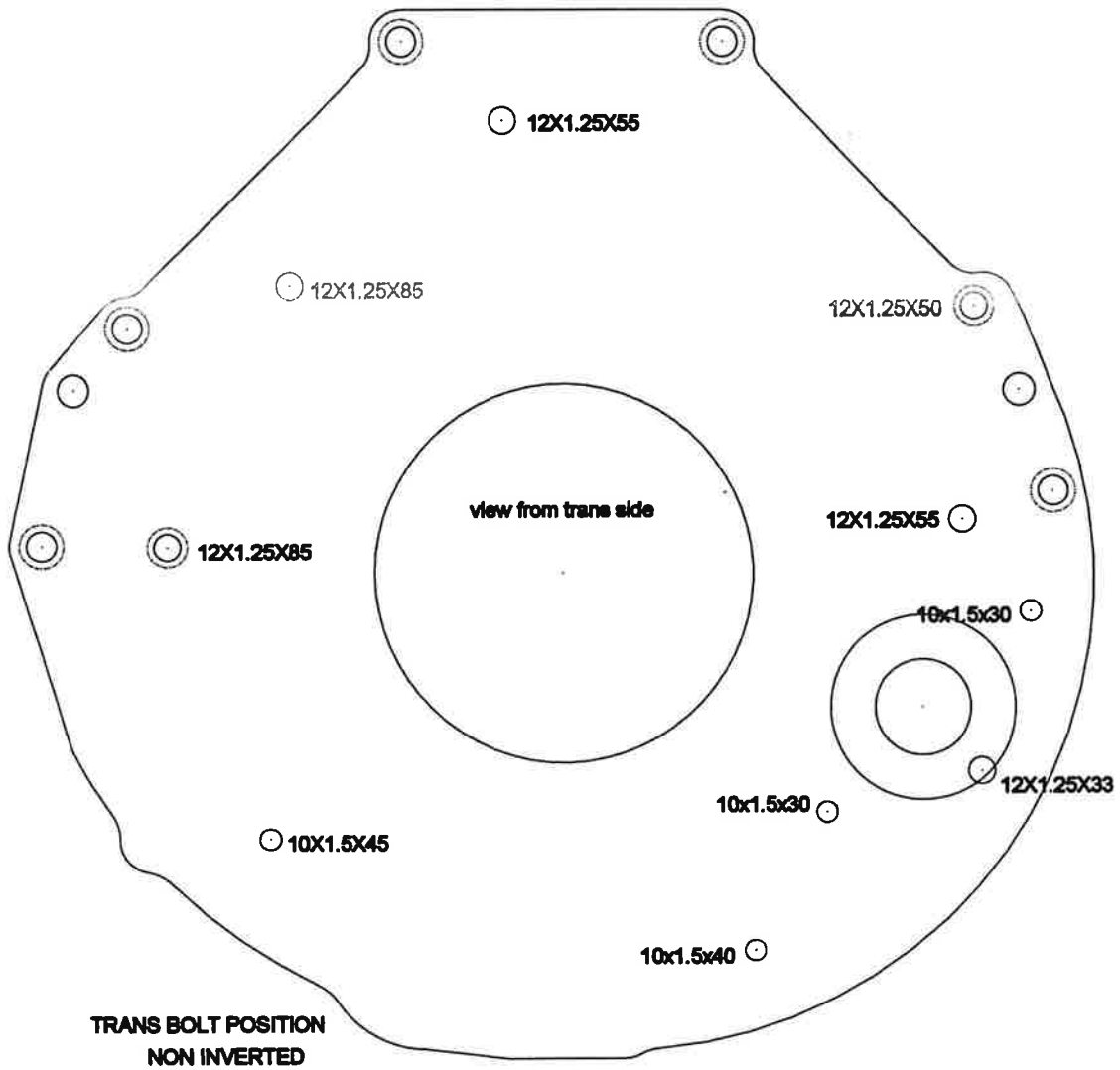
Bolt the adapter to the engine using the 6 – 7/16 NC 1 Allen head bolts, making sure your engine 1/2 dowel pins are in the block to center the adapter. Torque the bolts to 40 – 45 ft. lbs.

Bolt the flywheel down to the crankshaft using the 6 - 7/16 NF 1 ¾ bolts, torque to 60 ft. lbs. You can use Loctite on bolt threads if you want but torque immediately after installing bolts so you get a proper torque reading.

Put the clutch disc on the flywheel with hub extension side facing the flywheel. Use the input shaft tool to locate. Align the pressure plate with the 3 dowel pins, bolt the pressure plate down and torque the 8 x 1.25 x 20 bolts to 22 – 25 ft. lbs. in an even star pattern. Remove the input shaft tool after the pressure plate is bolted down. Install release bearing into the trans on the cross shaft over the input shaft.

Bolt the trans onto the adapter using the bolt guide for trans that is provided with the kit instructions. Torque the 12mm bolts with washers to 45 – 50 ft. lbs. Torque the 10mm bolts with washers to 35 – 40 ft. lbs.

Bolt starter to the adapter using 2 – 10 x 1.5 x 30 bolts and torque to 35 – 40 ft. lbs. Make sure trans is clearanced for gear. Test start to make sure starter gear clears the trans.



Kennedy Engineered Products, Inc.

38822 17th Street East
Palmdale, CA 93550
U.S.A.

Voice: (661) 272-1147
Fax: (661) 272-1575
Email: kennedy@kennedyeng.com



INVOICE

Invoice Number: 39054
Invoice Date: May 5, 2022
Page: 1

Bill To:

CHRIS ROBINSON
413 North Street
Ryan, IA 52330

Ship to:

CHRIS ROBINSON
413 North Street
Ryan, IA 52330

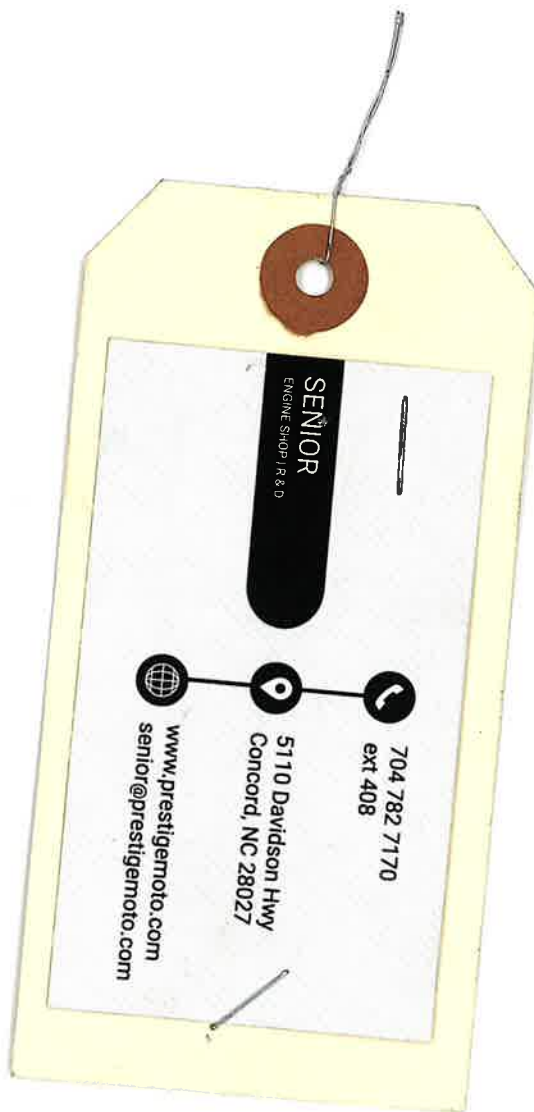
Customer ID	Customer PO	Payment Terms	
ROB90		Master Card	
Sales Rep ID	Shipping Method	Ship Date	Due Date
	UPS GROUND	5/5/22	5/5/22

Quantity	Item	Description	Backorder Qty	Unit Price	Amount
1.00	18312901	Adapter Kit Ford 351 Windsor V8 engine (neutral balance) to 2002 Porsche Boxster S		900.00	900.00
1.00	28000160	Starter AC Delco Toyota		135.00	135.00
1.00	1199601L	KEP Boxster S ('99 - '04) 240mm Pressure Plate Stage 1		500.00	500.00
1.00	13996SRG08	KEP Early Boxster S Spring Center Street Race Organic Clutch Disc		269.00	269.00
1.00	1429996	Release Bearing for Porsche Boxster S 2 boxes. 1 @ 29 lbs & 1 @ 46 lbs.		88.00	88.00
Subtotal					1,892.00
Sales Tax					
Shipping and/or handling					149.00
Total Invoice Amount					2,041.00
Payment/Credit Applied					2,041.00
TOTAL					0.00

Payment Type Or
Check No.: VISA050522

Thank you for your business

Claims for shortages or wrong parts received must be made within 24 hours of receipt of goods.



Prestige Motorsports Inc.

Engine # - 4447

Thermostat - 180 deg.

Valve Lash Hot -

Oil Capacity - 67

Balance Int.

Firing Order - 13726548

Engine Timing - 1000 217 12 4500 3200

Fuel Octane - 43

J Inglese Company
LLC

242 SE Mimosa Place, Lake City, FL 32025

TRANSACTION #	10817106-8310
DATE	05/17/2022 2:14 PM
RESULT	APPROVED
AUTH CODE	317141
TRANSACTION METHOD	KEYED
TRANSACTION TYPE	SALE
CARDHOLDER NAME	CHRIS ROBINSON
CARD	XXXX-XXXX-XXXX-0272
CARD TYPE	VISA

1 × Quick Item	\$3,944.90
Subtotal	\$3,944.90

TOTAL (USD)	\$3,944.90
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J Inglese Company
LLC

242 SE Mimosa Place, Lake City, FL 32025

TRANSACTION #	10897463-0206
DATE	03/29/2022 3:23 PM
RESULT	APPROVED
AUTH CODE	09923P
TRANSACTION METHOD	KEYED
TRANSACTION TYPE	SALE
CARDHOLDER NAME	CHRISTOPH ROBERTSON
CARD	XXXX-XXXX-XXXX-0114
CARD TYPE	MASTERCARD

1 × Quick Item	\$3,900.00
Subtotal	\$3,900.00

TOTAL (USD)	\$3,900.00
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J Inglese Company
LLC

242 SE Mimosa Place, Lake City, FL 32025

TRANSACTION #	10210710-5239
DATE	05/26/2022 10:02 AM
RESULT	APPROVED
AUTH CODE	906220
TRANSACTION METHOD	KEYED
TRANSACTION TYPE	SALE
CARDHOLDER NAME	CHRIS ROBINSON
CARD	XXXX-XXXX-XXXX-0272
CARD TYPE	VISA

1 × Quick Item	\$135.82
Subtotal	\$135.82

TOTAL (USD)	\$135.82
-------------	----------

Jim Inglese Eight Stack Systems

242 SE Mimosa Place
Lake City, FL 32025 US
jiminglese@att.net
www.jiminglese.com

INVOICE

BILL TO

Chris Robinson
413 North St.
Ryan, IA 52330 USA

SHIP TO

Chris Robinson
413 North St.
Ryan, IA 52330 USA

INVOICE # 1585**DATE** 03/29/2022**DUE DATE** 03/29/2022**TERMS** Due on receipt**PHONE NUMBER**

(563) 932-2034

JOB I.D. #

GT40 / 427W

ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
EFI, 351W w/Weber TB's	Ford 351W EFI, complete assembly, Weber-style throttle bodies. GT40; front activation from center. No vacuum req'ts.	1	6,339.00	6,339.00
Holley Terminator X universal	Terminator X self-learning ECU; includes hand held touch screen with laptop capability, part # 550-937	1	1,224.95	1,224.95
Holley 900 hp EFI fuel pump	Holley frame-mounted EFI fuel pump #12-170, 100 GPH Universal In-line for up to 900 hp. Compatible with Pump Gas, Race gas, or E85. Part #12-170	1	158.95	158.95
Debris screens	Set of (8) stainless steel screen insert / medium #4020	1	122.00	122.00

UPS charges consist of pickup fee, transportation charge, and insurance cost of \$74.75 based on stated value of \$6461.

SUBTOTAL	7,844.90
TAX	0.00
SHIPPING	135.82
TOTAL	7,980.72
BALANCE DUE	\$7,980.72



MOTOR STATE DISTRIBUTING, INC.
8300 Lane Drive
Watervliet, MI 49098
Phone (269) 463-4113
Fax (269) 463-6708

INVOICE

E-mail us at sales@motorstate.com
Visit our website at www.motorstate.com

Invoice	12698741-00
Customer #	833237
Date	04/08/22
Page	1

Bill To: **ACTIVE POWER, INC.**
2597 TOWNLINE RD
MADISON, OH 44057-2342

Ship To: **ACTIVE POWER, INC.**
2597 TOWNLINE RD
MADISON, OH 44057-2342

Instructions				Terms	Customer PO	Ship Via	Taken By
				Credit Card	173	Fedex Ground	WEB
Qty	Qty	Qty	Item & Description	Jobber Price	% Disc	Your Price	Extended Amount
Ord	Ship	Bkord					
2	2	0	ALL18300 Aluminum Line Clamps 3/16in 10pk	4.11	15	3.49	6.98
1	1	0	ALL18301 Aluminum Line Clamps 1/4in 10pk	4.58	15	3.89	3.89
1	1	0	ALL48040 3/16in Brake Line Coil Steel 25ft	15.28	15	12.99	12.99
1	1	0	ALL48326 1/4in Brake Line 25ft Steel	17.28	15	14.69	14.69
1	1	0	ALL50030 Adapter Fittings -4 to 3/8-24 2pk	5.64	15	4.79	4.79
1	1	0	ALL50091 Flare Union Black -4	3.16	15	2.69	2.69
2	2	0	ALL50136 Inverted Flare Tee 3/16in 2pk	7.99	15	6.79	13.58
1	1	0	ALL50300 Tube Nuts -3 4pk	3.52	15	2.99	2.99
2	2	0	ALL56214 Ball Joint Upper Scrw-In	16.11	15	13.69	27.38
1	1	0	ALL76251 Brake Light Switch Pressure Type Bullet	9.40	15	7.99	7.99
2	2	0	FRG481804-BL #4 Tube Nut Black	1.74	31	1.20	2.40
1	1	0	FRG495000-BL #4 Male x #4 Female Gauge Adapter Inline	14.90	36	9.53	9.53
4	4	0	FRG581904 #4 Tube Sleeve - Steel	1.45	31	1.00	4.00
2	2	0	WIL260-3374 3/4in Master Cylinder Kit	96.70	26	71.19	142.38
1	1	0	WIL260-3376 7/8in Master Cylinder Kit	96.70	26	71.19	71.19

Motor State Distributing Terms & Conditions - Returns, Disclaimer of Warranty, Damages & Other

RETURN POLICY - An RM (Return Merchandise) number must be issued by the Motor State Sales Department. Each RM will be assessed a \$4.50 processing fee. Returns from outside the U.S. will be subject to any brokerage fees acquired. Returns will be shipped prepaid.

No COD's will be accepted. Special order, non-stocking and custom built products are non-returnable.

DISCLAIMER OF WARRANTY - Motor State Distributing makes no warranties of merchantability, fitness for a particular purpose, or any other kind with respect to the goods described in this document.

DAMAGES - All shortages must be reported to Motor State Distributing within 48 hours of receipt.

ADDITIONAL TERMS & CONDITIONS - For a full list of all Motor State Distributing Terms & Conditions, please visit the Motor State Distributing website at www.motorstate.com, or refer to the printed Motor State Wholesale Price Guide.



INV

12698741-00



Bill of Lading

Work Order Nos.

	3148

MDF Transportation, LLC

180 Brookstone Place

Jackson, TN 38305

Tel: 731-467-1187

Driver: Mike Freeman

PICK UP

Name: Robinson Restoration
 Address: 413 North St.
 City: Ryan ST: IA
 Phone: 563-932-2034
 Contact: _____

DELIVERY

Name: Architectural Builders Supply
 Address: 3435 Enterprise Ave STE 1
 City: Naples ST: FL 34104
 Phone: 713-470-6157
 Contact: _____

VEHICLES

	STOCK #	YEAR	MAKE	MODEL	VIN	MILEAGE	PRICE
1		1966	Ford	GT40			
2							
3					pack ck #12368		
4							
5							
6							

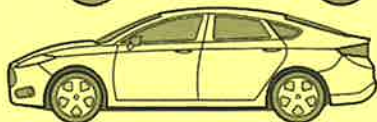
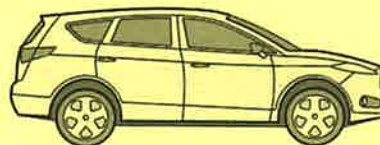
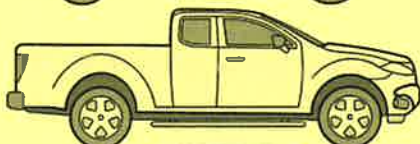
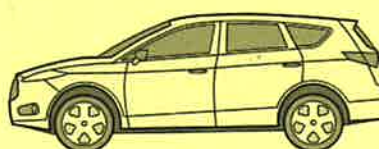
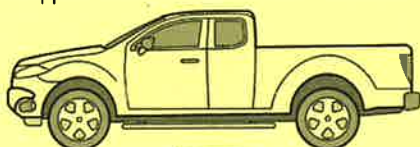
CONDITION ILLUSTRATED BY LETTER CODE

A - Broken D - Dented G - Gouged K - Cracked N - Painted over R - Punctured W - Wavy
 B - Bent E - Defective H - Stained L - Loose O - Hail Damage S - Scratched X - Present
 C - Chipped F - Scuffed J - Cut M - Missing P - Paint defect T - Torn Z - Other

\$ 1,350.00

TOTAL

Terms: Net C.O.D.



REMARKS

* Note - No claims will be honored unless noted on this Bill of Lading at time of delivery

Receiving agent must have driver sign here acknowledging damages

Shipper / Agent At Pick Up

Pick Up Date

Shipper / Agent At Delivery

Delivery Date

PRINTED NAME AND SIGNATURE
MUST ACCOMPANY DELIVERY

APPENDIX 1.0 – ECU PINOUT

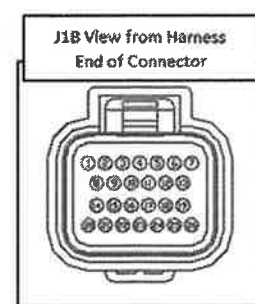
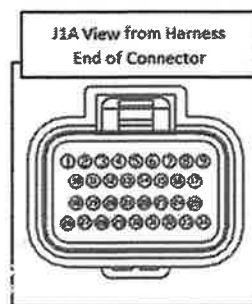
The following shows pins that are used on TERMINATOR X™ systems. Pins that are not populated on TERMINATOR™ systems are denoted with an asterisk (*).

J1A Connector

Pin	Function
A1	Coil – Input
A2	Fuel Pump Relay Out (+12v) (10A Max)
A3	Input #2 (F,5,2,T,H,G)
A4	Input #4 (F,G,5)
A5	TPS Input
A6	Points Output
A7	WB1 COMPR2
A8	WB1 Shield
A9	WB HTR -
A10	Switched +12v Input
A11	Manifold Air Temp Input
A12	Input #1 (F,5,2,T,H,G)
A13	Input #3 (F,G,5)
A14	Cam/Crank Ground
A15	Gauge Output
A16	WB1 COMPR1
A17	WB1 VS-/IP+
A18	Sensor Ground
A19	Engine Coolant Temp Input
A20	Oil Pressure Input
A21	Knock Sensor #2 Input
A22	Cam Input / Bypass Out
A23	Map Sensor Input
A24	CAN Lo
A25	WB1 VS+
A26	Sensor +5v
A27	Bypass Out
A28	EST/Spout Output
A29	Knock Sensor #1 Input
A30	Crank Speed Input
A31	Fuel Pressure Input
A32	CAN Hi
A33	WB1 IP+
A34	WB HTR +

J1B Connector

Pin	Function
B1	IAC A Lo
B2	IAC A Hi
B3	PWM #4 Output (HG)
B4	Injector F (Cylinder 6)
B5	Injector G (Cylinder 7)
B6	Injector H (Cylinder 8)
B7	Injector E (Cylinder 5)
B8	IAC B Lo
B9	IAC B Hi
B10	PWM #3 Output (HG)
B11	PWM #2 Output (HG)
B12	PWM #1 Output (HG)
B13	Injector D (Cylinder 4)
B14	Ground
B15	EST B (Cylinder 2)
B16	EST D (Cylinder 4)
B17	EST F (Cylinder 6)
B18	EST H (Cylinder 8)
B19	Injector A (Cylinder 1)
B20	EST 12V Output
B21	EST A (Cylinder 1)
B22	EST C (Cylinder 3)
B23	EST E (Cylinder 5)
B24	EST G (Cylinder 7)
B25	Injector C (Cylinder 3)
B26	Injector B (Cylinder 2)





Holley Sniper EFI HyperSpark Distributors are designed to plug and play with Sniper EFI systems. This design includes a single Hall Effect sensor providing crankshaft speed to the ECU. The precision machined shutter wheel design ensures accurate timing, even at very high engine speeds. They can also be used with other EFI systems that support a Hall Effect crank signal input.

NOTE: The distributor comes with a cast distributor gear*. It is recommended to consult your camshaft manufacturer prior to installation to confirm what distributor gear material they require. When changing distributor gears, it is critical to measure the shaft diameter OD and gear ID, before installing the new gear on the shaft.

* 565-322 comes with a hardened steel distributor gear

Read this before proceeding:

Before beginning the HyperSpark Distributor installation, we recommend that you locate a CLEAN Switched 12v Ignition source. This source needs to have 12v while cranking, and with the key in the run position. Label this source now, as you will need to use it for Step 9 of the Distributor Installation. Do NOT connect the switched 12v wire to a source such as the ignition coil, or starter solenoid. It may be necessary to install a 4 pole relay to provide a clean switched 12v Ignition source, Mr. Gasket 40100G will work perfectly for this application.

DISTRIBUTOR REMOVAL:

1. Disconnect the battery NEGATIVE (-) cable.
2. Disconnect the power and or ground connection at the coil. Tape up any non-insulated power and ground terminals to eliminate any chance of a short circuit.
3. Disconnect the power and or ground connection at the coil. Tape up any non-insulated power and ground terminals to eliminate any chance of a short circuit.
4. Rotate the crankshaft in the direction of engine rotation until it reads 0 degrees on the harmonic balancer. IT IS CRITICAL TO VERIFY THE ENGINE IS ON THE COMPRESSION STROKE AT THIS POINT!
5. Remove spark plug wires and all other wiring/vacuum hoses from distributor. Now is a good time to clean off any debris that may fall into the oil pump galley.
6. Remove distributor hold-down. Lift the distributor upwards and remove.
7. As you are removing the distributor, note that the rotor rotates as you lift the distributor out of the engine. This is due to the helical cut gear and should be taken into consideration when installing the new distributor.

Your distributor will rotate clockwise or counter-clockwise. You will need to determine the proper direction of rotation before proceeding. See chart below.

Part #	Make	Rotation
565-300	Hall Effect EFI Distributor - Chevy	CW
565-301	Hall Effect EFI Distributor - Ford Small Block (260/289/302)	CCW
565-302	Hall Effect EFI Distributor - Ford Small Block (351W)	CCW
565-303	Hall Effect EFI Distributor - Ford Big Block (351-C/429/460)	CCW
565-304	Hall Effect EFI Distributor - Chrysler 318 / 360	CW
565-305	Hall Effect EFI Distributor - Chrysler 383 / 400	CCW
565-306	Hall Effect EFI Distributor - Chrysler 426 / 440	CCW
565-307	Hall Effect EFI Distributor - Jeep 258 CID I6	CW
565-308	Hall Effect EFI Distributor - AMC 290-401	CW
565-309	Hall Effect EFI Distributor - Tall Deck BBC	CW
565-310	Hall Effect EFI Distributor - Oldsmobile	CCW
565-311	Hall Effect EFI Distributor - Buick SB	CW
565-312	Hall Effect EFI Distributor - Buick BB	CW
565-313	Hall Effect EFI Distributor - Buick Nailhead	CW
565-314	Hall Effect EFI Distributor - Pontiac	CCW
565-315	Hall Effect EFI Distributor - 144-250ci Ford Straight 6	CW
565-316	Hall Effect EFI Distributor - 250 Chevy Straight 6	CW
565-317	Hall Effect EFI Distributor - GM 4.3L V6	CW
565-318	Hall Effect EFI Distributor - Ford 300 Straight 6	CW
565-319	Hall Effect EFI Distributor - Toyota 22RE	CW
565-320	Hall Effect EFI Distributor - GM 348/409	CW
565-321	Hall Effect EFI Distributor - Holden	CW
565-323	Hall Effect EFI Distributor - Ford FE	CCW
565-324	Hall Effect EFI Distributor - Buick Even-Fire V6	CW

DISTRIBUTOR INSTALL:

NOTE: If the engine block or heads have been milled, make sure that the distributor will fully seat and not bind or bottom out on the oil pump drive. A quick check is to remove the distributor gasket, and make sure that the distributor still fully seats on the mounting surface. If it does not, further investigation is needed.

NOTE: If using 565-322, it will be necessary to lift the distributor about 1/2 inch out of the engine block in order to install the hold down clamp and fastener.

1. Install the distributor gasket on the base of the distributor. If desired, apply adhesive between the gasket and distributor to hold it in place.
2. If the engine has already been broken in/run previously and is about to be fired immediately after the distributor install, coat the gear with motor oil. If the engine is new or will sit a while before it is fired, coat the distributor gear with a moly paste or camshaft break-in lube. Ensure no synthetic oils are used during the installation or break-in period. We recommend a standard 30 or 40 weight or Multi-Viscosity oil such as 10W-30 or 20W-50 to be used for the break-in period. Engines that produce oil pressure over 70psi when COLD should utilize a racing grade mineral oil for break-in. It is also recommended to monitor gear wear after the break-in period for several hours. Check the gear for proper mesh, tooth alignment, and for excessive tooth wear.
3. Position the rotor contact so it is pointing to the desired direction of the #1 spark plug wire. Insert the distributor into the engine, ensuring that it is fully seated (**see NOTE above**). The rotor will rotate as you install the distributor. If it does not land in the location you desire, remove the distributor and back it up a tooth or two at a time until you are satisfied with its location. You will need to make sure the oil pump drive shaft is turned in a direction that allows for the distributor shaft to mesh with it. **NOTE:** An engine oil priming tool is an ideal alternative to aid in aligning the oil pump drive shaft. Make sure that the drive shaft meshes and the distributor fully seats.
4. Next, place the provided clear distributor cap over the rotor, the cap is formed to accept the rotor, as seen below in (**Figure 1**).
5. Now, rotate the distributor housing until the housing locks into the cap, this process phases the distributor housing. The below image shows the cap and distributor housing in their "locked" position (**Figure 2**).



Figure 1



Figure 2

6. Tighten the distributor hold down bracket.

7. Once step 5 (**Distributor Alignment**) is completed, the indentation at the base of the phasing cap can be used to mark the distributor housing to indicate where the #1 terminal on the cap will be (**Figure 3**). Note which position this is on the distributor cap. Install the cap and install the #1 plug wire. Install the rest of the plug wires based on the engine's firing order and rotor rotation.



Figure 3

NOTE: A spark plug wire retainer is supplied to secure the plug wires in place. Align the mounting bosses and use the supplied 1.5" self-tapping Phillips screws to hold the retainer in place.

8. Next, locate the wiring harness supplied with the distributor, plug the 2 pin connector from the distributor harness into the 2 pin connector on the Sniper EFI Main Harness (7 pin Connector). These connectors are keyed, however the Purple and Green wires should plug into each other (**Figure 4**).



Figure 4

9. Now, plug the 3 pin distributor connector into the 3 pin connector on the provided wiring harness (**Figure 5**).

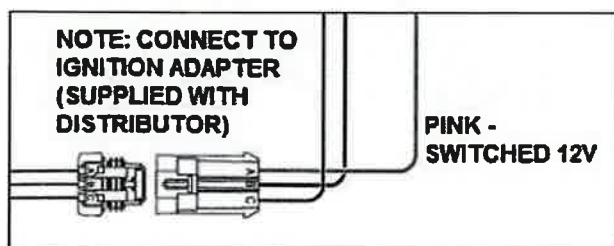


Figure 5

10. Next, terminate the Pink switched 12v wire on the 3 pin distributor wiring harness, to the clean switched 12v ignition source that you labeled earlier.

UPDATE FIRMWARE:

NOTE: To use a HyperSpark Distributor with a Sniper, the system must be using these versions of firmware or later:

Handheld: 1.1.7 (tslcd35st_sniper_fw_01_01_0070.fwu)

ECU: 1.1.1 (SNIPER_01010000.eep)

Software: Version 1.1 Build 2



ECU Firmware: From Main Screen. Files>ECU HW/FW



Handheld Firmware: From Main Screen. Files> Local Setup

Handheld Setup:

For New Sniper EFI Installations:

From the HOME Screen select Wizards, follow the prompts, on Step 7 you will be prompted to select your ignition type, highlight HyperSpark Distributor (**Figure 6**), and press Next. Then follow the wizard prompts in the Sniper EFI handheld to complete the setup Wizard.



Figure 6

Or:

If you already have a running engine with Sniper EFI and are upgrading the ignition system. Instead of re-running the wizard, you can manually change your ignition type.

From the HOME Screen, select Tuning, next select System, then Ignition Setup, now press Ignition Type, and select HyperSpark.



Home Screen, Select Tuning
Figure 7



Tuning Screen, Select System
Figure 8



System Screen, Select Ignition Setup
Figure 9

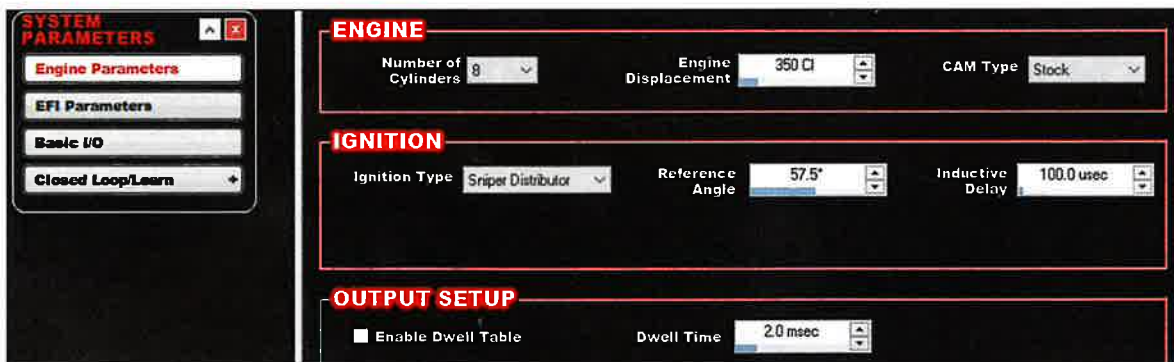


Ignition Setup, Press Ignition Type, Select HyperSpark
Figure 10

NOTE: An ignition key cycle must be completed before the change will occur in the ECU. It is also ideal after you have cycled the ignition, to double check that the change has been saved.

Sniper EFI Software Setup:

System Parameters > Ignition > Select Ignition Type of "Sniper Distributor" from the drop-down menu.



Sniper EFI Software - System Parameters
Figure 11

Ignition Reference Angle – 57.5 degrees

Inductive Delay – This parameter is used such that ignition timing does not under or over-advance as engine speed is increased. A starting value of 100.0 usec can be used. But once the engine is running, the engine should (safely) be run up to 3000-4000 RPM, and timing be checked such that it matches the commanded value. If it is lower than commanded, the Inductive Delay should be increased, if higher, the delay decreased.

OUTPUT SETUP

The following should be used if triggering a MSD Capacitive Discharge type ignition box.

Dwell Time – 2.0 msec

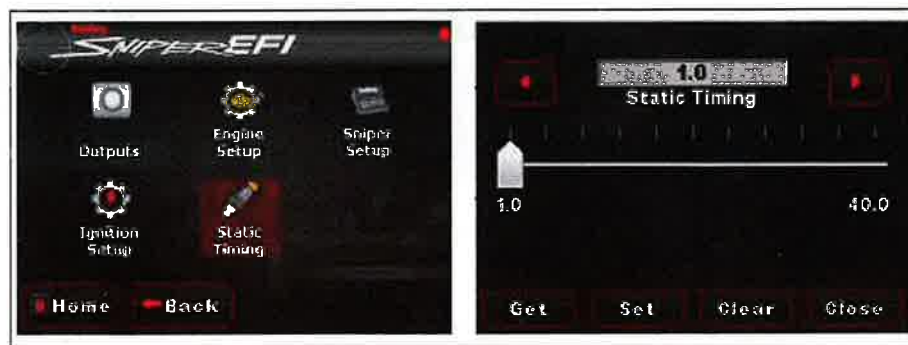
11. It's time to check the timing. Remove the fuel pump relay. This will ensure that no fuel will be sprayed from the injectors. Crank the engine over and check the timing with a timing light.
12. To make sure the ECU is getting an RPM signal, look at the "RPM" on the Initial Startup screen of the Sniper EFI handheld. Crank the engine over and make sure it shows RPM (**Figure 12**). To locate this screen, from the HOME SCREEN of the handheld, select the MONITOR icon, then select the "Monitors" screen. Here you should see an icon named "Initial Startup". Select this icon.

Engine RPM – This gauge should show "Stall!", once you begin cranking the engine it will show actual engine RPM.



Figure 12

13. Next, check the timing with a timing light, it should be whatever the cranking timing is programmed to in the software (Sniper EFI Systems use 15 degrees as the default cranking timing value). Shoot the balance with the timing light, it should read 15 degrees on the balancer. If not, it may be necessary to loosen the distributor hold down bracket and slightly advance or retard the ignition timing by rotating the distributor housing to make these values match. Once this value has been met, re-tighten the distributor hold down bracket.
14. Reinstall the fuel pump relay.
15. Start the engine.
16. Once running, check the timing with a timing light and make sure it matches the commanded timing of the ECU. It is helpful to use the "Enable Static Timing Set" feature in the handheld, this feature can lock the timing to a single value. To find the Static Timing Menu, from the HOME SCREEN, select TUNING, then select SYSTEM. Static Timing will be the Bottom Right icon of this screen (**Figure 13**). Move the sliding bar to 15 Degrees, then press the SET Icon, this will command the engine to run at 15 Degrees of Ignition Timing.



System Menu, Select Static Timing

Slide the pointer to 15, Press Set

Figure 13

17. Once synced, CAREFULLY rev the engine up to 3000-4000 RPM and make sure the timing still matches. If it is advanced, lower the Inductive Delay value by about 20. If it is retarded, raise the Inductive Delay value about 20. Cycle the ignition power after making this change.

MISCELLANEOUS COMPONENTS:

Replacement Black Cap: MSD 84313 or Holley 566-105

P/N 8583 Bronze Gear, P/N 85832 Cast Iron Gear, P/N 85833 Replacement Steel Gear – Ford 302

P/N 8581 Bronze Gear, P/N 85812 Cast Iron Gear, P/N 85813 Replacement Steel Gear – Ford 351C-460

P/N 8585 Bronze Gear, P/N 85852 Cast Iron Gear, P/N 85834 Replacement Steel Gear – Ford 351W

P/N 8531 Replacement Cast Melonized Gear, 8472 Oversized Bronze Gear (+0.006) – Chevy

P/N 8471 Bronze Gear – (0.500") ID Chevy

P/N 85631 Bronze Gear – Pontiac

GEAR INSTALLATION ON FORD DISTRIBUTORS:

It is recommended to send your Ford Distributor to MSD to have a new gear installed. The MSD Tech Department can be reached at 888-258-3835. The installation process requires a press fit and the need for special tools to achieve proper installation without damaging the shaft, gear or housing. If returning the distributor to MSD is not an option, a quality machine shop may also be able to install your new gear.

CAUTION: If the gear is installed improperly, severe damage to the distributor and/or engine block will occur!

1. With the endplay of the distributor shaft removed, measure the distance from the bottom of the gear to the bottom of the mounting flange (**Figure 14**). It should be within the specifications shown.
2. Scribe a mark on the shaft at the bottom of the gear. This will aid in the installation position of the new gear.
3. Remove the original roll pin and remove the press fit gear. Use extreme care not to damage the end of the shaft where it meshes with the oil pump.
4. Position the gear so the new roll pin will enter the shaft 90° from the original hole. (Lining up the original hole is possible, but a new hole will likely be machined.)
5. Press the new gear into position on the shaft. Measure the distance as shown in (**Figure 14**) before drilling the new roll pin hole.
6. Carefully drill a 0.125" hole through the shaft using the gear as a guide.
7. Install the new 1/8" spiral roll pin.

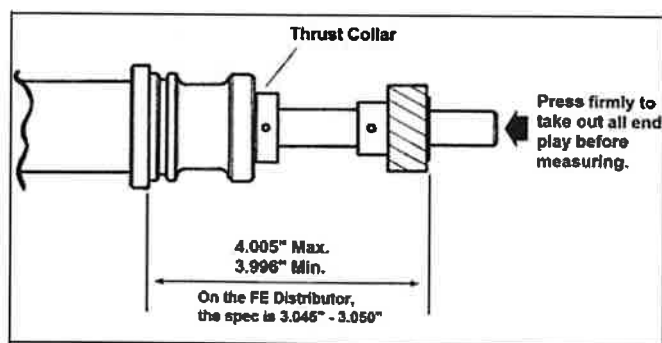


Figure 14 Gear Installation Specifications

CHECKING GEAR MESH:

It is recommended to check for proper gear mesh between the cam gear and distributor gear. To do this, coat the distributor gear with moly grease and install the distributor. Next, crank the engine over several times. Before pulling the distributor out, make sure the rotor is in the position that lines up with the original removal mark. Then pull the distributor out and inspect the gear pattern shown on the grease. The proper mesh will leave an even pattern in the middle of the gear. Adjust the slip collar to obtain the correct mesh.

Checking the Oil Pump to Distributor Shaft Overlap:

The proper overlap between the distributor shaft and the oil pump shaft is very important. The tongue of the distributor shaft should fit into the groove of the oil pump shaft by at least 1/4". To check this:

Measure the distance between the base of the slip collar to the tip of the distributor shaft (**Figure 15**).

Using a straight edge, measure the distance from the intake manifold distributor flange to the top of the oil pump intermediate shaft (**Figure 15**).

Take the two measurements and subtract them. The difference is the overlap. If there is not enough clearance or too much clearance, a different oil pump intermediate shaft is required.

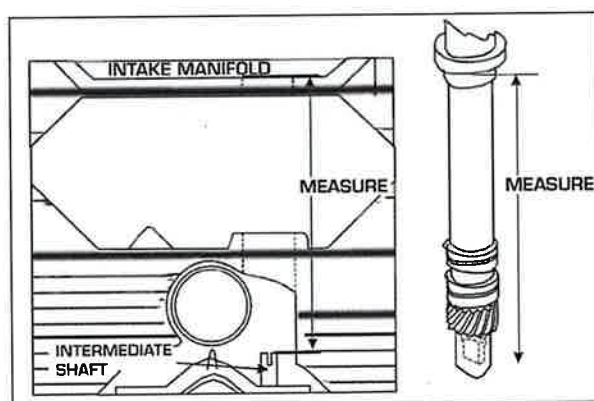


Figure 15 – Measuring Oil Pump Shaft Overlap

Technical Support: 1-866-464-6553

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199R11525

Revision Date: 9-1-21

FRM34827

ADDENDUM

IMPORTANT

Enclosed in this kit is a tube of camshaft and lifter lubricant to be used in the installation of your Distributor.

Apply a liberal amount to the distributor drive gear before installing in engine.

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FRM34891

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WIRING:

Wire Length: All of the wires of the ignition may be shortened as long as quality connectors are used or soldered in place. To lengthen the wires, use one size bigger gauge wire (10 gauge for the power leads and 16 gauge for the other wires) with the proper connections.

Grounds: A poor ground connection can cause many frustrating problems.

When a wire is specified to go to ground, it should be connected to the battery negative terminal, engine block or chassis. There should always be a ground strap between the engine and the chassis. Always securely connect the ground wire to a clean, paint free metal surface.

WIRE FUNCTIONS:

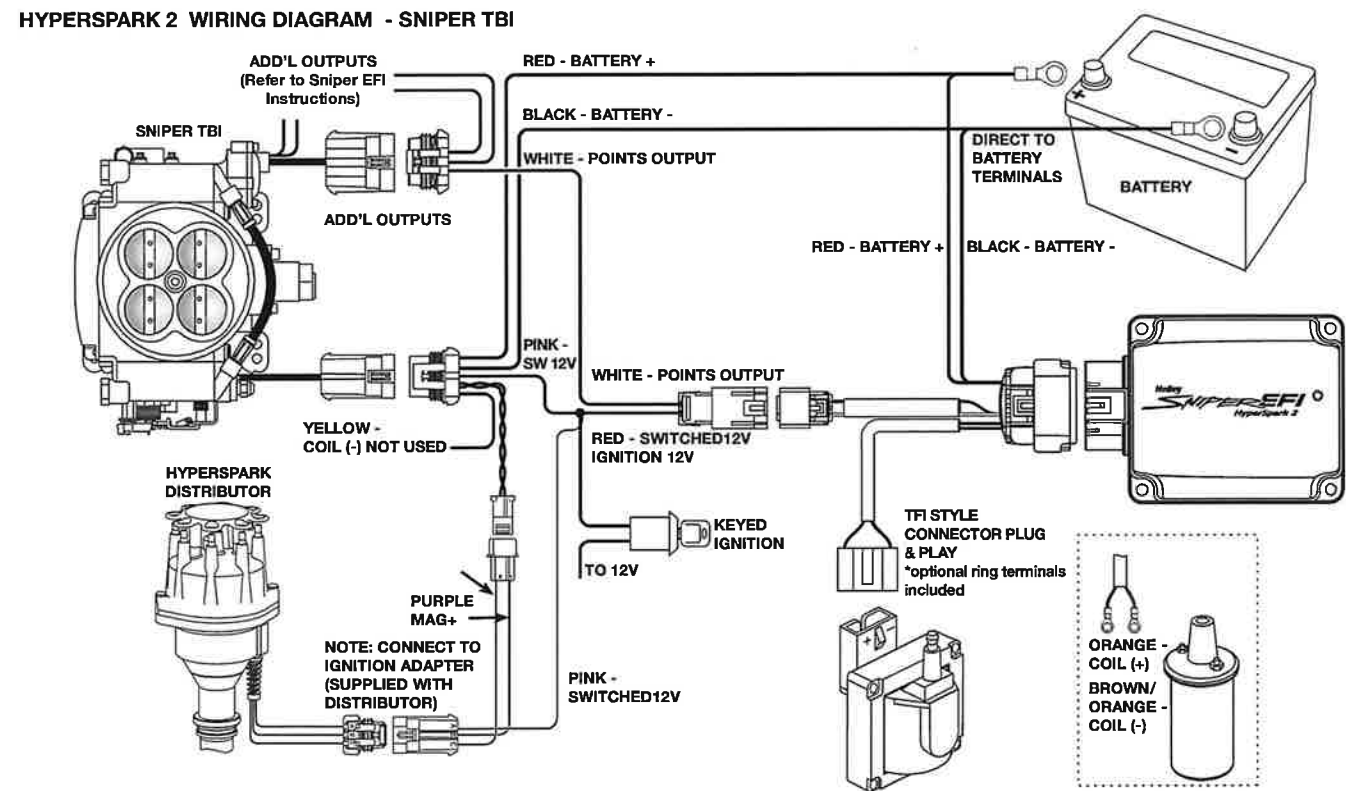
POWER LEADS	These are the two heavy gauge wires (14 gauge) and are responsible for getting direct battery voltage to the ignition.
HEAVY RED	This wire connects directly to the battery positive (+) terminal or to a positive battery junction or the positive side of the starter solenoid. Note: Never connect to the alternator.
HEAVY BLACK	This wire connects to a good ground, either at the battery negative (-) terminal or to the engine.
RED	Connects to a switched 12 volt source, such as the ignition key or switch.
ORANGE	Connects to the positive (+) terminal of the coil. This is the only wire that makes electrical contact with the coil positive terminal.
BROWN/ORANGE	Connects to the negative (-) terminal of the coil. This is the only wire that makes electrical contact with the coil negative terminal.
WHITE	This wire is used to connect to the points or electronic ignition amplifier output.

Ballast Resistor: If your vehicle has a ballast resistor in line with the coil wiring, it is recommended to bypass it.

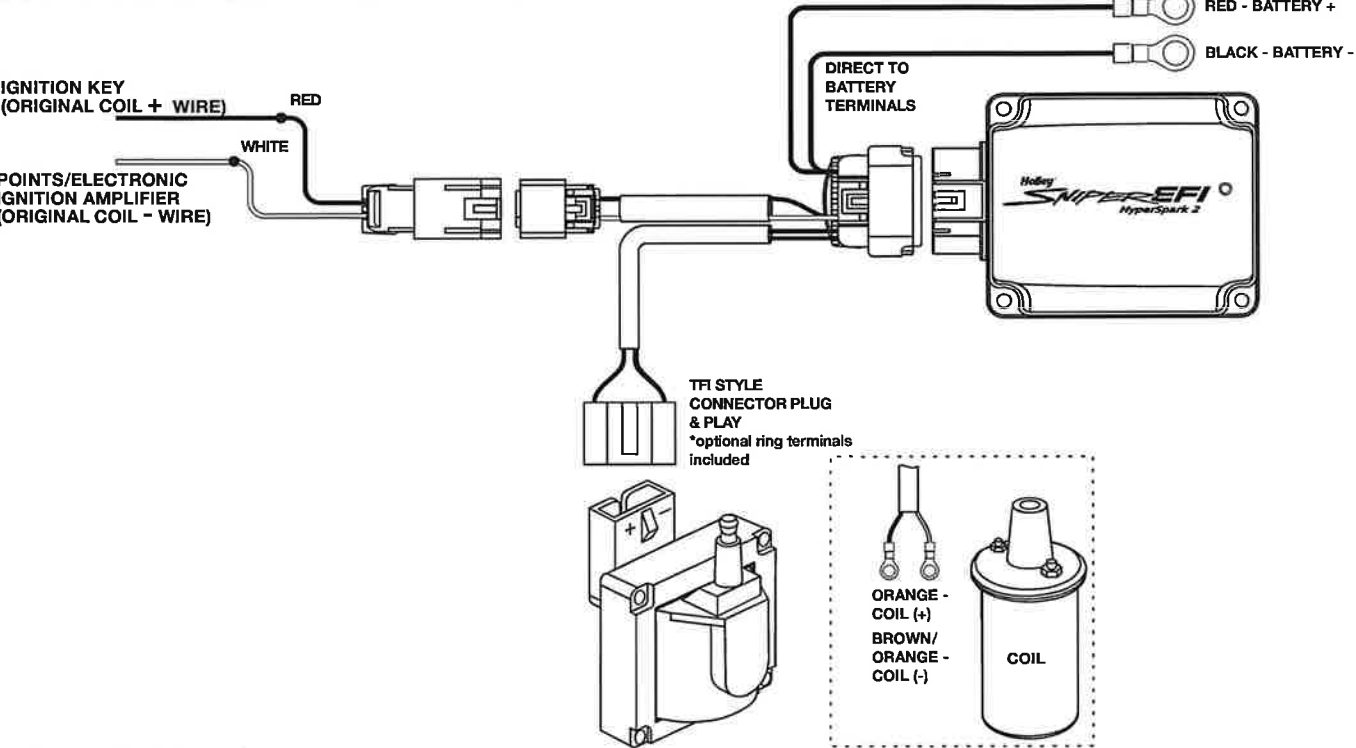
ROUTING WIRES:

The spark plug wires should be routed away from direct heat sources, such as exhaust manifolds and headers and any sharp edges. The trigger wires should be routed separate from the other wires and spark plug wires. It is best if they are routed along a ground plane such as the block or firewall which creates an electrical shield.

WARNING! The HyperSpark 2 EFI Ignition is a capacitive discharge ignition. High voltage is at the coil primary terminals. Do not touch the coil or connect test equipment to the terminals.



HYPERSPARK 2 WIRING DIAGRAM
INSTALLING TO POINTS/AMPLIFIER STYLE IGNITION



TROUBLESHOOTING:

Every HyperSpark 2 EFI Ignition undergoes numerous quality control checks including a four hour burn-in test. If you experience a problem with your ignition, our research has shown that the majority of problems are due to improper installation or poor connections.

The Troubleshooting section has several checks and tests you can perform to ensure proper installation and operation of the HyperSpark 2 EFI Ignition. If you have any questions, call our Technical Support Department at 866-464-6553.

LED:

The LED on the HyperSpark 2 EFI Ignition monitors several operating conditions of the ignition. If the LED indicates that there is a problem with the ignition system, follow the steps through the Troubleshooting section. The LED will appear to be on steady at above idle speeds when everything is functioning properly.

- If there is an ignition problem (coil or converter shorted), the LED will be **SOLID RED**.
- If the engine is OFF (no RPM), the LED will be **SOLID ORANGE**.
- If the engine is ON (there is RPM), the LED will be **SOLID GREEN**.

MISSES AND INTERMITTENT PROBLEMS:

Experience at the races has shown that if your engine is experiencing a miss or hesitation at higher rpm, it is usually not directly ignition. Most probable causes include a coil or plug wire failure, arcing from the cap or boot plug to ground or spark ionization inside the cap. Several items to inspect are:

- Always inspect the plug wires at the cap and at the plug for a tight connection and visually inspect for cuts, abrasions or burns.
- Inspect the Primary Coil Wire connections. Because the HyperSpark 2 EFI Ignition is a Capacitive Discharge ignition and it receives a direct 12 volt source from the battery, there will not be any voltage at the Coil Positive (+) terminal even with the key turned ON. During cranking or while the engine is running, very high voltage will be present and no test equipment should be connected.

WARNING! Do not touch the coil terminals during cranking or while the engine is running!

- Make sure that the battery is fully charged and the connections are clean and tight. If you are not running an alternator this is an imperative check. If the battery voltage falls below 10 volts during a race, the CDI output voltage will drop.
- Is the engine running lean? Inspect the spark plugs and complete fuel system.
- Inspect all wiring connections for corrosion or damage. Remember to always use proper connections followed by soldering and seal the connections completely. If everything checks positive, use the following procedure to test the ignition for spark.

White Wire Trigger:

If you are using the White wire (points or electronic amplifier) of the HyperSpark 2 to trigger the ignition, follow these steps:

1. Make sure the ignition switch is in the OFF position.
2. Remove the coil wire from the distributor cap and position the terminal so it is approximately 1/2" from a good ground.
3. Disconnect the HyperSpark 2 White wire from the distributor points or the ignition amplifier.
4. Turn the ignition to the ON position. DO NOT CRANK THE ENGINE.
5. Tap the White wire to ground several times. Each time the wire is pulled away from ground a spark should jump from the coil wire to ground. If spark is present, the ignition is working properly.

Ignition Testers, PN 8998 or PN 89981, are available for troubleshooting. This tool allows you to check your complete ignition system while it is in the car as well as the operation of RPM limits, activated switches, and shift lights.

Technical Support: 1-866-464-6553

Date: 02/03/23
FRM36389

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HYPERSPARK 2 EFI IGNITION BOX
556-154

Qty	Description
1	Ignition
1	Harness
4	Mounting Screws
4	Lock Washers
4	Ring Terminals

WARNING! During installation, disconnect the battery cables. When disconnecting the battery, always remove the **NEGATIVE** cable first and install it last.

NOTE: Solid Core spark plug wires cannot be used with the HyperSpark 2 EFI Ignition Box.

NOTE: The HyperSpark 2 EFI Ignition Box cannot be used with distributorless ignition systems (DIS).

GENERAL INFORMATION:

BATTERY:

The HyperSpark 2 EFI Ignition box will operate on any negative ground, 12 volt electrical system with a distributor. It can be used with 16 volt batteries and can withstand a momentary 24 volts in case of jump starts. The ignition will deliver full output with a supply of 7 - 28 volts and will operate with a supply voltage as low as 7 volts.

COILS:

The HyperSpark 2 EFI Ignition can be used with most stock coils and aftermarket coils designed to replace the stock coils. If you have any questions concerning coils, contact Technical Support at 866-464-6553.

SPARK PLUGS & WIRES:

Spark plug wires are very important to the operation of your ignition system. A good quality, helically wound, suppression-type wire and proper routing are required to get the best performance from your ignition, such as the super conductor MSD spark plug wires.

NOTE: Solid Core spark plug wires cannot be used with the HyperSpark 2 EFI Ignition.

Spark Plugs: Choosing the correct spark plug design and heat range is important when trying to get the best performance possible. It is recommended to follow the engine builder or manufacturer's specification for spark plugs. With that, you can then experiment with the plug gap to obtain the best performance. The gap of the plugs can be opened in 0.005" increments, then tested until the best performance is achieved.

MISCELLANEOUS INFORMATION:

Welding: If you are welding on your vehicle, to avoid the chance of damage, always disconnect both Heavy Power cables of the HyperSpark 2 Ignition box from the Battery. You should also disconnect the tach ground wire.

MOUNTING:

The HyperSpark 2 EFI Ignition can be mounted in most positions, except directly upside down (if upside down, moisture or water cannot escape). It can be mounted in the engine compartment as long as it is away from direct engine heat sources. It is not recommended to mount the unit in an enclosed area, such as the glove box.

When you find a suitable location to mount the unit, make sure the wires of the ignition reach their connections.

Hold the ignition in place and mark the location of the mounting holes. Use a 1/8" drill bit to drill the holes. Use the supplied screws to mount the box.

INSTALLATION INSTRUCTIONS

MSD Pro-Billet Small Diameter Ready-to-Run Ford V8 Distributor **PN 8350/835031; 351C-460, PN 8354; 351W PN 8352/83521/83523/835231/83525/835251; 289/302**

ONLINE PRODUCT REGISTRATION: Register your MSD product online. Registering your product will help if there is ever a warranty issue with your product and helps the MSD R&D team create new products that you ask for! Go to www.msperformance.com/registration.

Important: Read these instructions before attempting the installation.

Parts Included:

- | | |
|--|---------------------------------|
| 1 - Pro-Billet Distributor | 1 - O-ring Seal |
| 1 - Rotor, PN 8467 | 1 - Vacuum Advance Lock-Out Kit |
| 1 - Distributor Cap, Red PN 8431 or Black PN 84313 | 1 - Tube of Gear Lubricant |
| 1 - Advance Kit | 1 - Wiring Harness |
| | 1 - Gray Tach Jumper |

Note: The terminals of the Ready-to-Run Ford Distributors require spark plug style terminals. You may need to change the terminals and boots of your wires. MSD offers two kits, PN 8849 or PN 8848 that are supplied with nine boots and terminals.

TIMING FUNCTIONS

Before continuing with the installation, here are a few definitions you should be aware of:

Initial Timing: This is the base timing (also referred to as idle timing) of the engine before the centrifugal advance begins.

Centrifugal Advance: The centrifugal (or mechanical) advance mechanism is made up of weights, springs, advance cams, and an advance stop bushing. The amount and rate of advance that your distributor is capable of is determined by the centrifugal timing. If you ever wish to lock out the centrifugal advance, refer to the centrifugal advance section.

Total Timing: This is the total of the initial timing plus the centrifugal advance added together. Example: 10° Initial + 25° centrifugal = 35° Total Timing. (When checking Total timing, disconnect and cap the vacuum canister and plug the vacuum line.)

Vacuum Advance: The vacuum advance will advance the timing up to approximately 12° during partial throttle driving (with 15 lbs of vacuum). The vacuum line should be routed to a ported vacuum outlet above the throttle plates.

Note: MSD Distributors are supplied with the heavy (slow) advance springs and the 21° stop bushing installed. This is to prevent detonation in certain applications. Review the information on pages 2-3 to determine the best advance curve for your application.

RPM LIMIT AND TACHOMETER INFORMATION

Tach Signal: The Ready-to-Run Distributor features a Gray Tach Output wire which provides a clean signal for most tachometers and even some aftermarket fuel injection systems. The signal output is a 12 volt square wave, 20° duty cycle. This wire is also responsible for programming the built-in rev limiter.

Rev Limiter: The Ready-to-Run Distributor has a built-in rev limit that can easily be adjusted from 2,000 rpm to over 10,000 rpm. The default is 10,000 rpm. To set the rev limiter, run the engine to half the desired rpm then ground the Gray Tach wire (a jumper is supplied) for approximately one second. Every time the key is turned to the On position, the tach will display the programmed rpm limit. See page 8 for the programming procedure.

CHOOSING AN ADVANCE CURVE

The function of the advance curve is to match the ignition timing to the burning rate of the fuel and speed (rpm) of the engine. Any factor that changes the burning rate of the fuel or the engine speed can cause a need for an ignition timing change. Figure 1 shows some of the factors that will affect engine timing.

FACTOR	Advance Timing	Retard Timing
	For	For
Cylinder Pressure	Low	High
Vacuum	High	Low
Energy of Ignition	Low	High
Fuel Octane	High	Low
Mixture (Air/Fuel)	Rich	Lean
Temperature	Cool	Hot
Combustion Chamber Shape	Open	Compact
Spark Plug Location	Offset	Center
Combustion Turbulence	Low	High
Load	Light	Heavy

Figure 1 Ignition Timing Factors.

As you can see from the chart, most factors will change throughout the range of the engine operation. The timing mechanism of the distributor must make timing changes based on these factors.

Example: An engine has 11:1 compression with a high energy ignition. With the specifications given, you will have to retard the timing for the high compression and high energy ignition. By comparing the engine's specifications against the chart, a usable timing guideline can be found. Engines with a combination of items from both columns will require a timing that is set in the mid range.

Obviously a full technical explanation of correct ignition timing would be very complicated. The best way to arrive at a suitable ignition curve for your engine is to use the Ignition Timing Factors Chart as a guide and compare it to the Advance Graphs in Figure 4 until a suitable curve is found. When selecting your advance curve, use detonation (engine ping) as an indicator of too much advance, and a decrease in power as an indicator of too little advance.

TIPS ON SELECTING AN ADVANCE CURVE

- Use as much initial advance as possible without encountering excessive starter load.
- Start the centrifugal advance just above the idle rpm.
- The starting point of the centrifugal advance curve is controlled by the installed length and tension of the spring.
- How quickly the centrifugal advance (slope) comes in is controlled by the spring stiffness. The stiffer the spring, the slower the advance curve.
- The amount of advance is controlled by the advance bushing. The bigger the bushing, the smaller the amount of advance.

CENTRIFUGAL ADVANCE CURVE

SELECTING THE ADVANCE SPRINGS

The rate, or how quick the advance comes in is determined by the type of springs which are installed on the distributor. The MSD distributors are equipped with two Heavy Silver springs installed. These

will give you the slowest advance curve possible (Figure 2). The parts kit contains two additional sets of springs which can be used to match the advance curve to your particular application. Refer to the Spring Combination Chart (Figure 3) for combinations that can be achieved.

To change the springs, remove the cap and rotor and use needlenose pliers to remove the springs. Be sure the new springs seat in the groove on the pin.

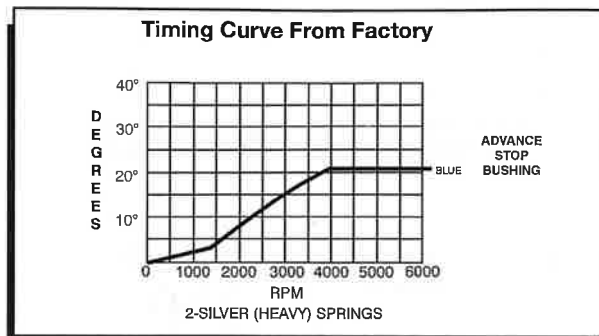


Figure 2 The Factory Equipped Curve.

SPRING COMBINATION	RATE OF ADVANCE	FIGURE 4
2- Heavy Silver	SLOWEST	A
1- Heavy Silver		B
1- Light Blue		C
1- Heavy Silver		D
1- Light Silver		E
2- Light Blue		F
1- Light Silver	FASTEST	
1- Light Blue		
2- Light Silver		

Figure 3 Spring Combination Chart.

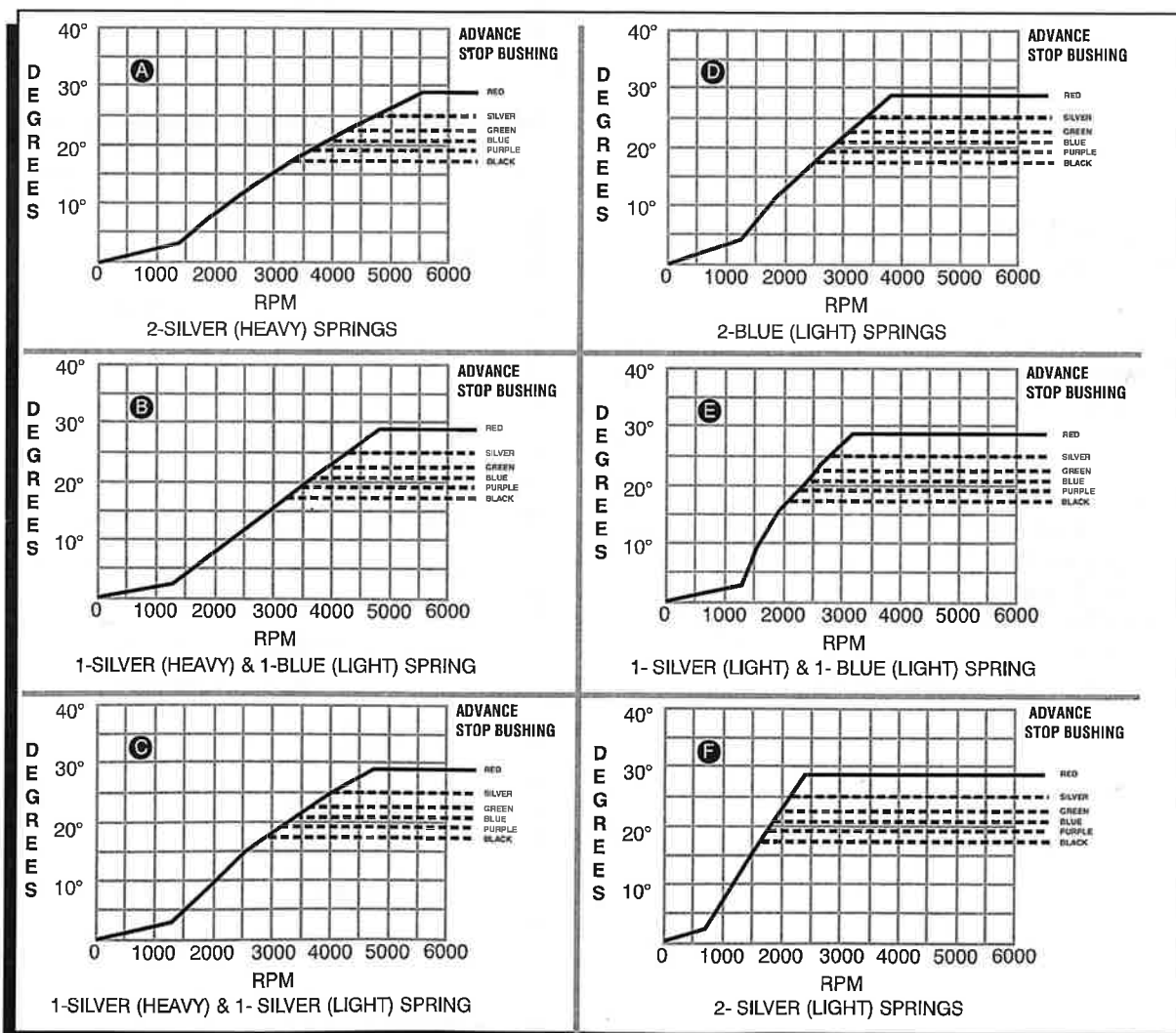


Figure 4 Advance Curves.

will give you the slowest advance curve possible (Figure 2). The parts kit contains two additional sets of springs which can be used to match the advance curve to your particular application. Refer to the Spring Combination Chart (Figure 3) for combinations that can be achieved.

To change the springs, remove the cap and rotor and use needle-nose pliers to remove the springs. Be sure the new springs seat in the groove on the pin.

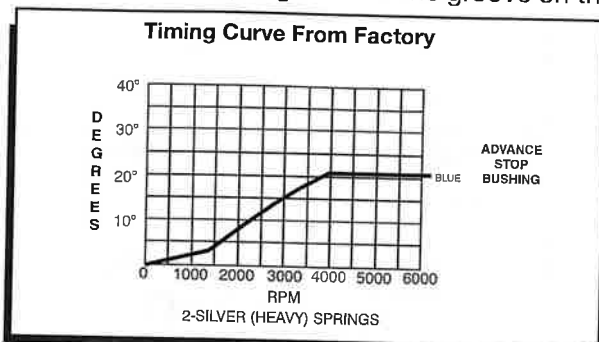


Figure 2 The Factory Equipped Curve.

SPRING COMBINATION	RATE OF ADVANCE	FIGURE 4
2- Heavy Silver	SLOWEST	A
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1- Light Blue		C
1- Heavy Silver	FASTEST	D
1- Light Silver		E
2- Light Blue		F
1- Light Silver		F

Figure 3 Spring Combination Chart.

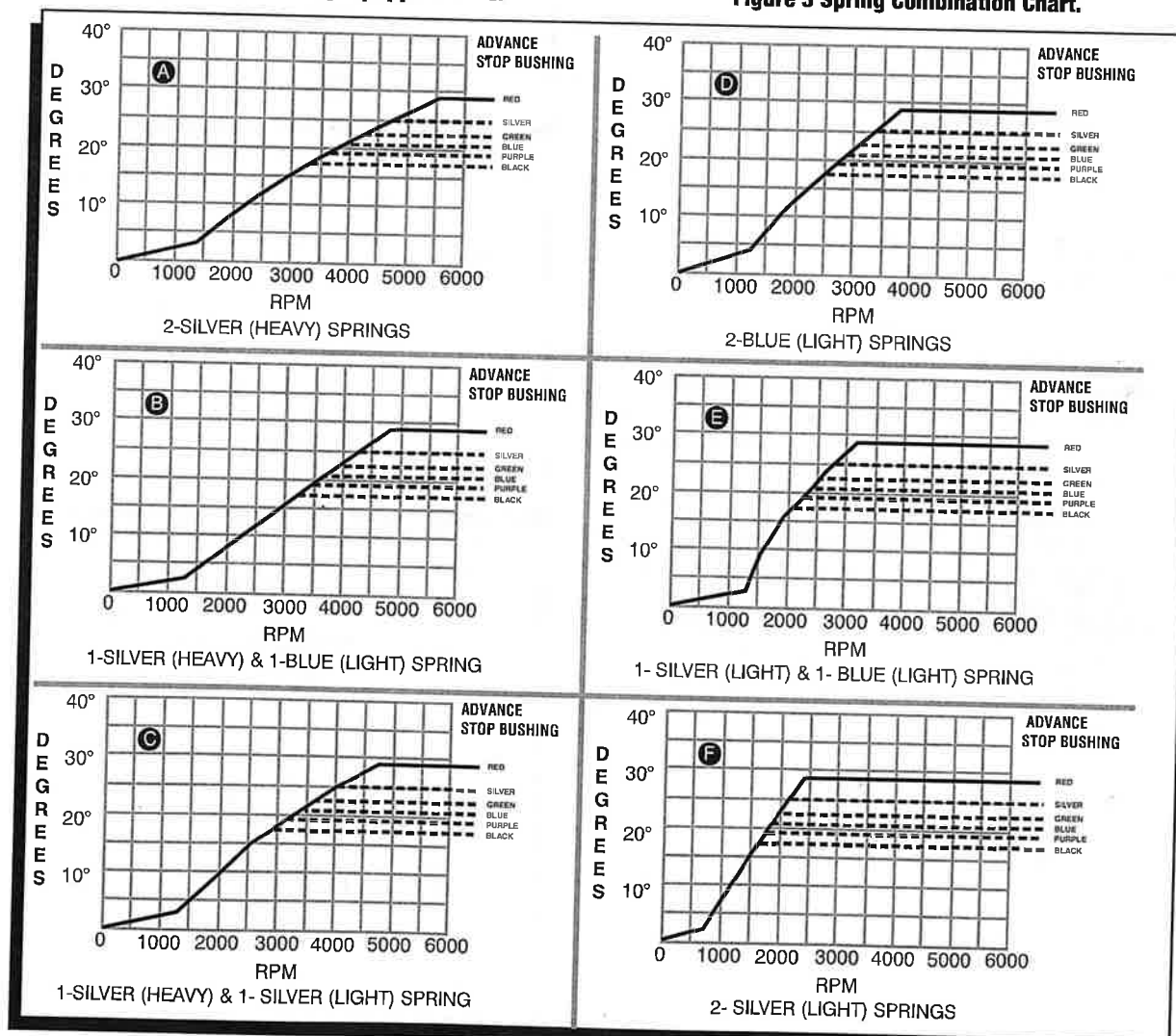


Figure 4 Advance Curves.

SELECTING THE ADVANCE STOP BUSHING

Five different advance stop bushings are supplied in the distributor kit. The distributor comes with a Blue (21°) bushing already installed. If a different amount of centrifugal advance is desired, follow the next procedure to change the bushings. The chart in Figure 5 gives the size and approximate degrees for the corresponding bushings.

BUSHING SIZE	APPROXIMATE CRANKSHAFT DEGREES
Red-Smallest	28
Silver	25
Green	23
Blue	21
Purple	19
Black-Largest	18

Figure 5 Advance Stop Bushing Chart.

CHANGING THE ADVANCE STOP BUSHINGS

1. Remove the distributor cap and rotor.
2. Remove the locknut and washer on the bottom of the advance assembly (Figure 6).
3. Remove the bushing and install the new one. Install the washer and locknut.

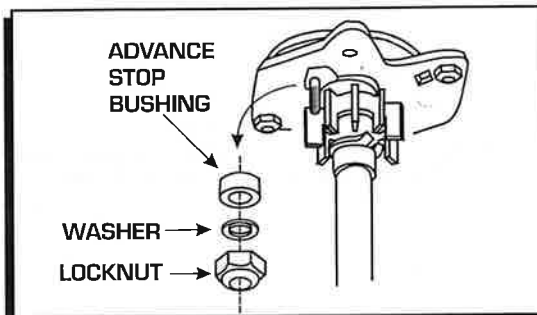


Figure 6 Changing the Advance Stop Bushing.

LOCKING OUT THE CENTRIFUGAL ADVANCE

1. Remove the cap and rotor.
2. Remove the advance springs, weights and the advance stop bushing from the advance assembly.
3. Remove the roll-pin from the shaft and slide the retaining sleeve down. It should not be necessary to remove the gear (Figure 7).
4. Slide the shaft two inches out of the housing.
5. Rotate the shaft 180° and insert the advance stop bushing pin into the small hole on the advance plate (Figure 8).
6. Install the locknut and washer to the advance stop bushing pin.
7. Install the retaining sleeve and roll-pin.

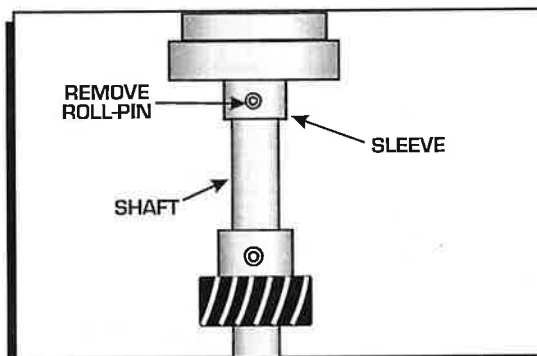


Figure 7 Removing the Retaining Sleeve.

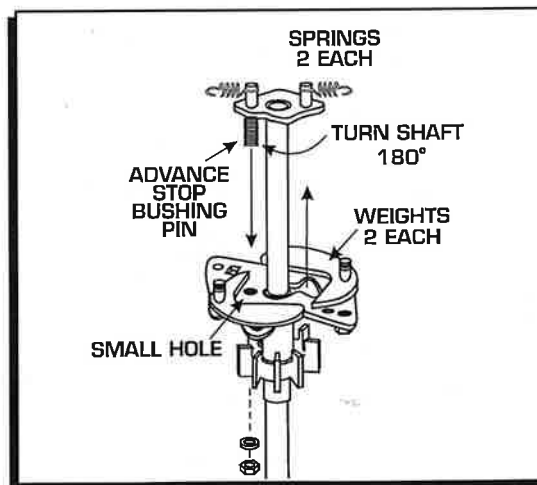


Figure 8 Locking Out the Centrifugal Advance.

INSTALLATION INSTRUCTIONS

Gear Installation on Ford Distributors

It is recommended to send your Ford Distributor to have a new gear installed. For proper installation, special tools are required to press fit the new gear into place without damaging the shaft, gear, or housing.

If returning the distributor for the gear installation is not possible, a quality machine shop will be able to install it for you.

CAUTION: If the gear is installed improperly, severe damage to the distributor and/or engine block will occur!

1. With the endplay of the distributor shaft removed, measure the distance from the bottom of the gear to the bottom of the mounting flange (Figure 1). It should be within the specifications shown.
2. Scribe a mark on the shaft at the bottom of the gear. This will aid in the installation position of the new gear.
3. Remove the original roll pin and remove the press fit gear. Use extreme care not to damage the end of the shaft where it meshes with the oil pump.
4. Position the gear so the new roll pin will enter the shaft 90° from the original hole. (Lining up the original hole is possible, but a new hole will likely be machined.)
5. Press the new gear into position on the shaft. Measure the distance as shown in Figure 1 before drilling the new roll pin hole.
6. Carefully drill a 0.125" hole through the shaft using the gear as a guide.
7. Install the new 1/8" spiral roll pin.

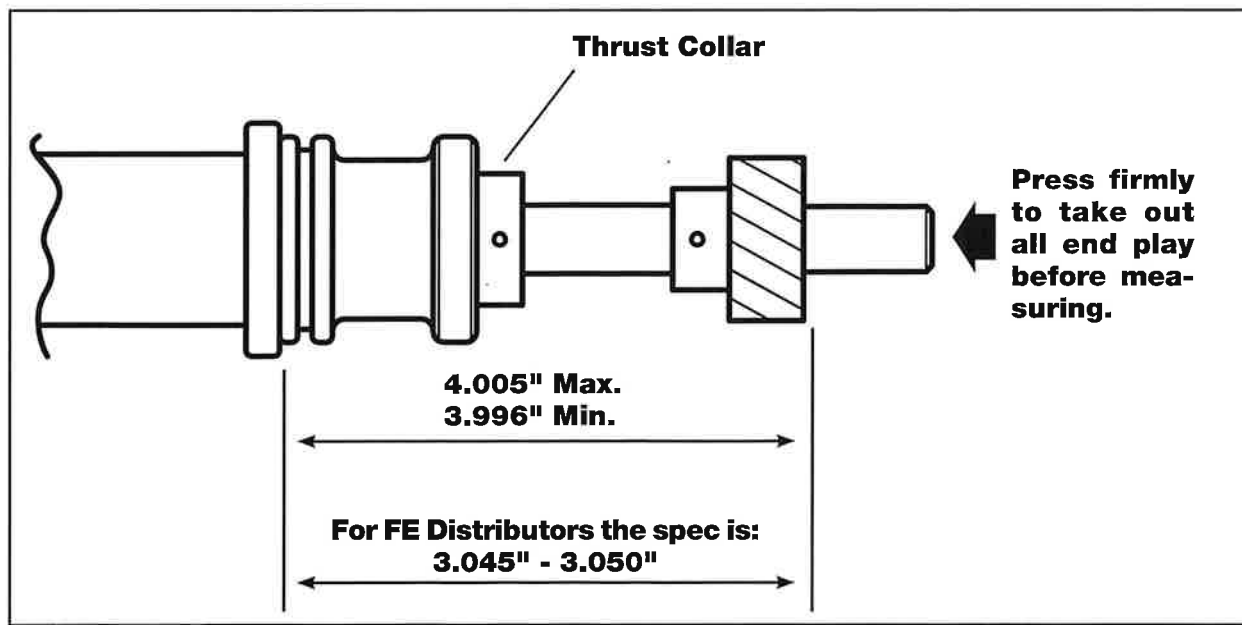


Figure 1 Gear Installation Specifications

VACUUM ADVANCE

Your distributor is equipped with an optional vacuum advance canister. Vacuum advance is generally used to improve cruising economy and driveability, depending on the application.

The chart in Figure 9 shows the relationship between engine vacuum and the amount of ignition timing advance.

To connect the vacuum advance, connect a vacuum hose from the canister to a ported vacuum source on the carburetor or throttle body. Ported vacuum sources are located above the throttle plates so there will not be an excessive amount of timing advance at idle and lower engine speeds.

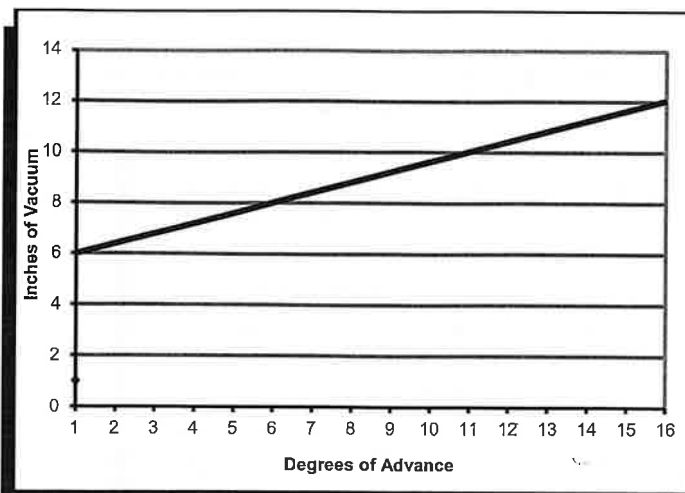


Figure 9 Vacuum Advance and Timing Chart.

OPTIONAL VACUUM ADVANCE LOCKOUT

If you do not want to use the vacuum advance canister of the MSD Distributor, MSD has supplied the distributor with a lockout mechanism. The Lockout bolts in the position of the vacuum canister and will hold the pickup assembly firmly in place. The installation is easiest with the distributor out of the engine.

1. Remove the two Allen head screws that hold the advance canister (Figure 10).
2. Remove the snap ring that holds the magnetic pickup assembly in place. This is easy to do with a set of snap ring pliers by straddling one of the reluctor paddles.
3. Gently lift up on the mag pickup plate and slide the vacuum canister out.
4. Install the Lockout Plate in place of the canister. Install the two retaining screws.
5. Install the supplied screw and washer through the Lockout and tighten. It is important to make sure the pickup plate is parallel with the housing of the distributor (Figure 11). If it is cocked or slanted, the paddles of the reluctor may contact the pickup. Check the clearance by rotating the distributor shaft. If necessary, use the supplied shims under the Lockout hold-down to correctly position the pickup plate.

Note: If no shims were required, use one beneath the washer of the Lock-Out Hold Down Screw.

6. After checking the reluctor to pickup clearance, tighten the Lockout retaining screws and install the snap ring.
7. Install the distributor rotor and cap. Check the timing when complete.

Note: Do not forget to plug the vacuum advance hose.

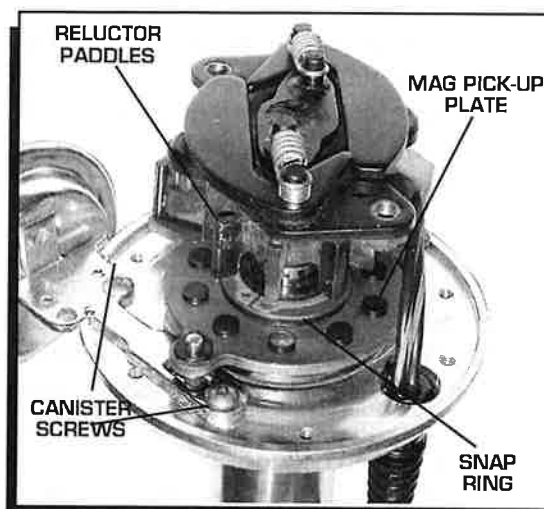


Figure 10 Removing the Vacuum Canister.

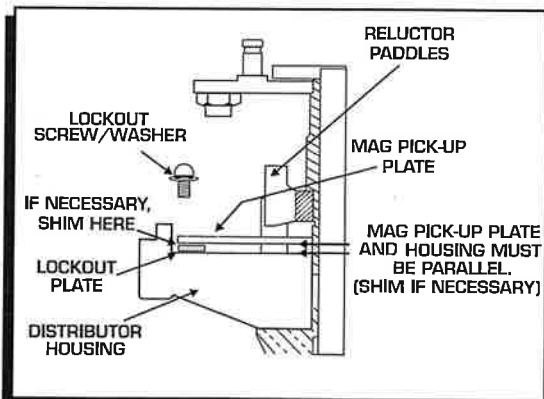


Figure 11 Checking Installation of the Lockout Plate.

INSTALLING THE DISTRIBUTOR

1. Remove the existing distributor cap without disconnecting any of the spark plug wires.
2. With the cap off, crank the engine until the rotor is aimed at a fixed point on the engine. Note this position by making a mark (Figure 12).
3. Place the distributor cap back on and note which plug wire the rotor is pointing to. MARK THE SPARK PLUG WIRES and remove the distributor cap.
4. Disconnect the wiring from the distributor.
5. Loosen the distributor hold-down clamp, slide the clamp out of the way and lift the distributor out of the engine.
6. Install the supplied O-ring seal in the groove on the distributor land. Apply a thin layer of oil to the housing O-ring.
7. Apply a liberal amount of the supplied break-in lubricant to the gear.
8. Install the distributor making sure that the rotor comes to rest pointing at the fixed mark. If the distributor will not fully seat with the rotor pointing to the marked position, you may need to rotate the oil pump shaft until the rotor lines up and the distributor fully seats.
9. Position and tighten the hold-down clamp onto the distributor.
10. Install the rotor and distributor cap. It is recommended to use a drop of Blue Loctite on the distributor cap hold down bolts.
11. Install the spark plug wires from the old cap one at a time to ensure correct location.
12. Connect the supplied wiring harness to the distributor. Route the wires to their connections as shown in Figure 12.
13. Page 8 shows how to set the rev limiter and connect the tachometer.

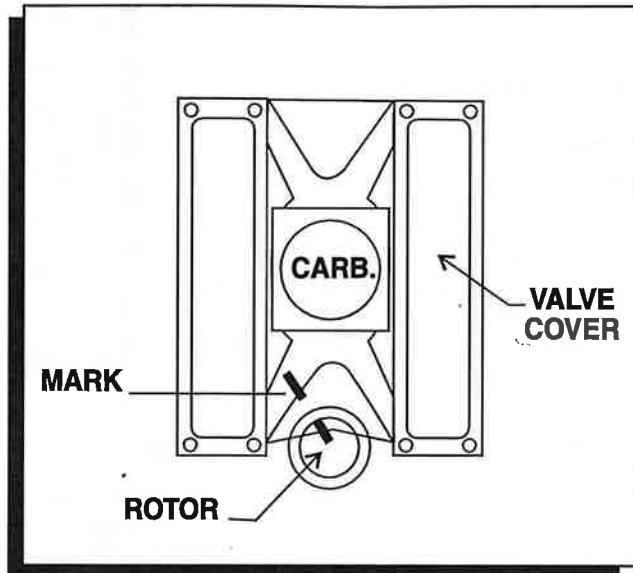


Figure 12 Marking the Rotor Location.

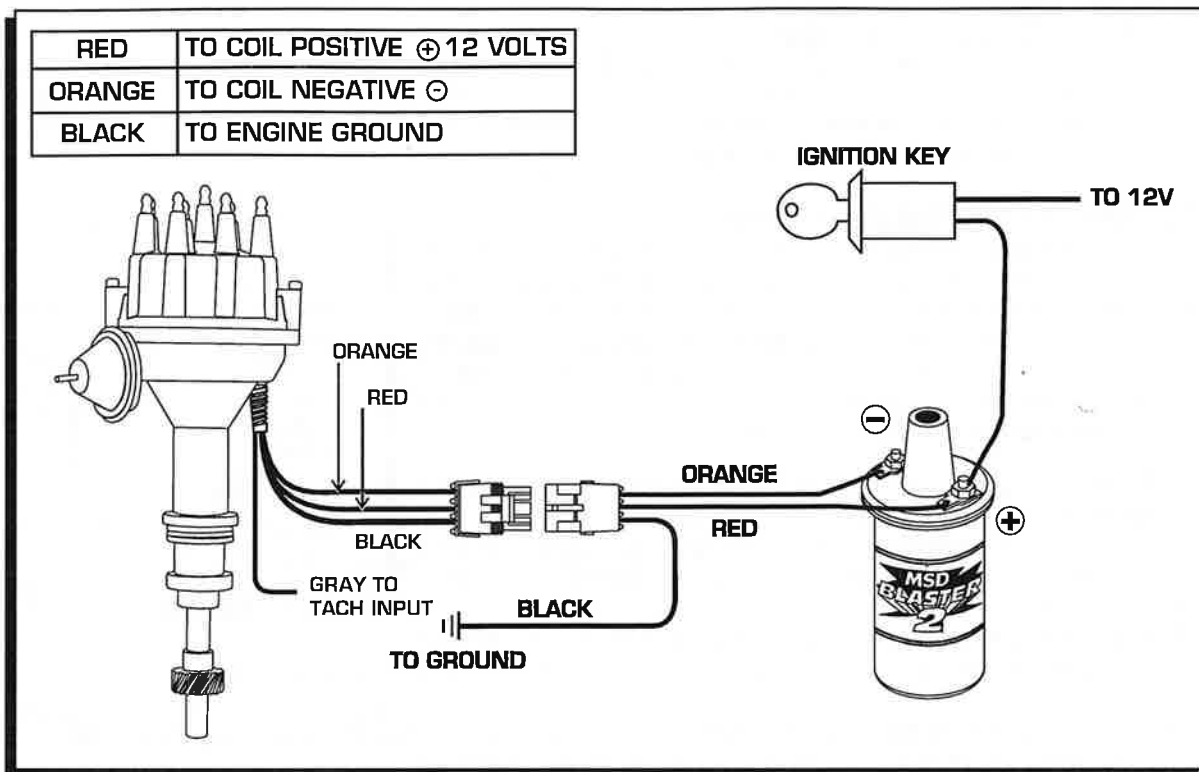


Figure 13 Wiring the Ready-to-Run Ford Distributor.

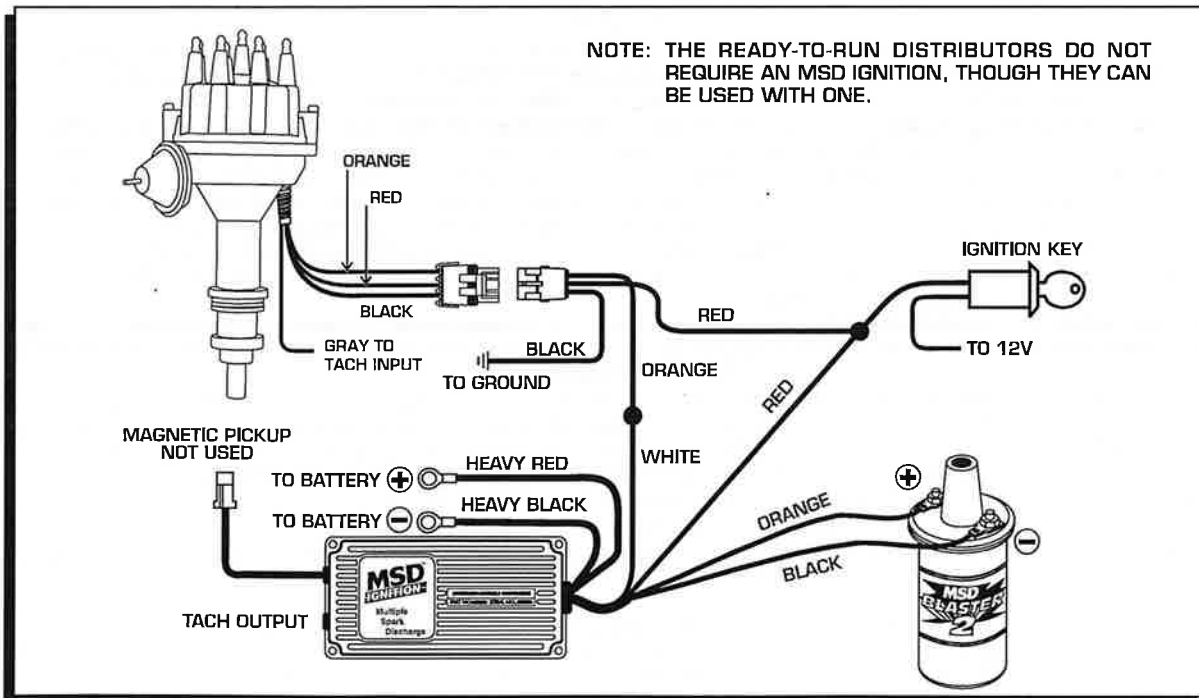


Figure 14 Connecting an MSD Ignition Control.

MSD INSTALLATION INSTRUCTIONS

TACHOMETER INFORMATION

The MSD Ready-to-Run has a Gray wire that provides a 12 volt square wave, 20° duty cycle tachometer signal that will trigger most tachometers. It is recommended to connect this lead to your tach's trigger input wire and check its operation. Note that the rpm limiter is extremely accurate and due to the variety of tachometers available, there may be differences in the displayed rpm.

PROGRAMMING THE REV LIMIT

A tachometer is required to set the rev limit. The limit is programmed by running the engine at half the desired rpm, then momentarily grounding the Gray tach output wire from the MSD. A Gray jumper wire is supplied to connect to the tach with another tee-splice coming off to use for programming. A switch may also be installed to ease adjustments of the limiter (Figure 15). The default rpm limit is 10,000 rpm and the limit is adjustable from 2,000 - over 10,000 rpm..

1. Start the engine and bring the rpm to half the desired rev limit (for a 6,000 rpm limit, raise and hold the rpm to 3,000).
2. While holding the rpm steady, short the Gray tach wire to ground for approximately one second. Note that the tach will go to zero while grounded.
3. The tach will now display the programmed rev limit amount for two seconds. If this value does not register on the tach, repeat the procedure and try a different ground source.
4. To confirm the rev limit value, turn the ignition key to the On position (without cranking the engine). The rev limit value will be displayed for two seconds on the tachometer.

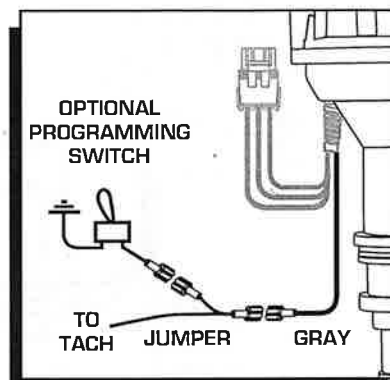


Figure 15 Setting the Rev Limiter.

Note: This rpm confirmation only displays when the Gray wire is being used to trigger the tachometer.

Service

In case of malfunction, this MSD component will be repaired free of charge according to the terms of the warranty. When returning MSD components for warranty service, **Proof of Purchase** must be supplied for verification. After the warranty period has expired, repair service is based on a minimum and maximum fee.

All returns must have a Return Material Authorization (RMA) number issued to them before being returned. To obtain an RMA number please contact MSD Customer Service at 1 (888) MSD-7859 or visit our website at www.msdpowerperformance.com/rma to automatically obtain a number and shipping information.

When returning the unit for repair, leave all wires at the length in which you have them installed. Be sure to include a detailed account of any problems experienced, and what components and accessories are installed on the vehicle. The repaired unit will be returned as soon as possible using Ground shipping methods (ground shipping is covered by warranty). For more information, call MSD at (915) 855-7123. MSD technicians are available from 7:00 a.m. to 5:00 p.m. Monday - Friday (mountain time).

Limited Warranty

MSD warrants this product to be free from defects in material and workmanship under its intended normal use*, when properly installed and purchased from an authorized MSD dealer, for a period of one year from the date of the original purchase. This warranty is void for any products purchased through auction websites. If found to be defective as mentioned above, it will be repaired or replaced at the option of MSD. Any item that is covered under this warranty will be returned free of charge using Ground shipping methods.

This shall constitute the sole remedy of the purchaser and the sole liability of MSD. To the extent permitted by law, the foregoing is exclusive and in lieu of all other warranties or representation whether expressed or implied, including any implied warranty of merchantability or fitness. In no event shall MSD or its suppliers be liable for special or consequential damages.

*Intended normal use means that this item is being used as was originally intended and for the original application as sold by MSD. Any modifications to this item or if it is used on an application other than what MSD markets the product, the warranty will be void. It is the sole responsibility of the customer to determine that this item will work for the application they are intending. MSD will accept no liability for custom applications.

INSTALLATION INSTRUCTIONS

Gear Installation on Ford Distributors

It is recommended to send your Ford Distributor to have a new gear installed. For proper installation, special tools are required to press fit the new gear into place without damaging the shaft, gear, or housing.

If returning the distributor for the gear installation is not possible, a quality machine shop will be able to install it for you.

CAUTION: If the gear is installed improperly, severe damage to the distributor and/or engine block will occur!

1. With the endplay of the distributor shaft removed, measure the distance from the bottom of the gear to the bottom of the mounting flange (Figure 1). It should be within the specifications shown.
2. Scribe a mark on the shaft at the bottom of the gear. This will aid in the installation position of the new gear.
3. Remove the original roll pin and remove the press fit gear. Use extreme care not to damage the end of the shaft where it meshes with the oil pump.
4. Position the gear so the new roll pin will enter the shaft 90° from the original hole. (Lining up the original hole is possible, but a new hole will likely be machined.)
5. Press the new gear into position on the shaft. Measure the distance as shown in Figure 1 before drilling the new roll pin hole.
6. Carefully drill a 0.125" hole through the shaft using the gear as a guide.
7. Install the new 1/8" spiral roll pin.

3.973
- 0.30

4.003

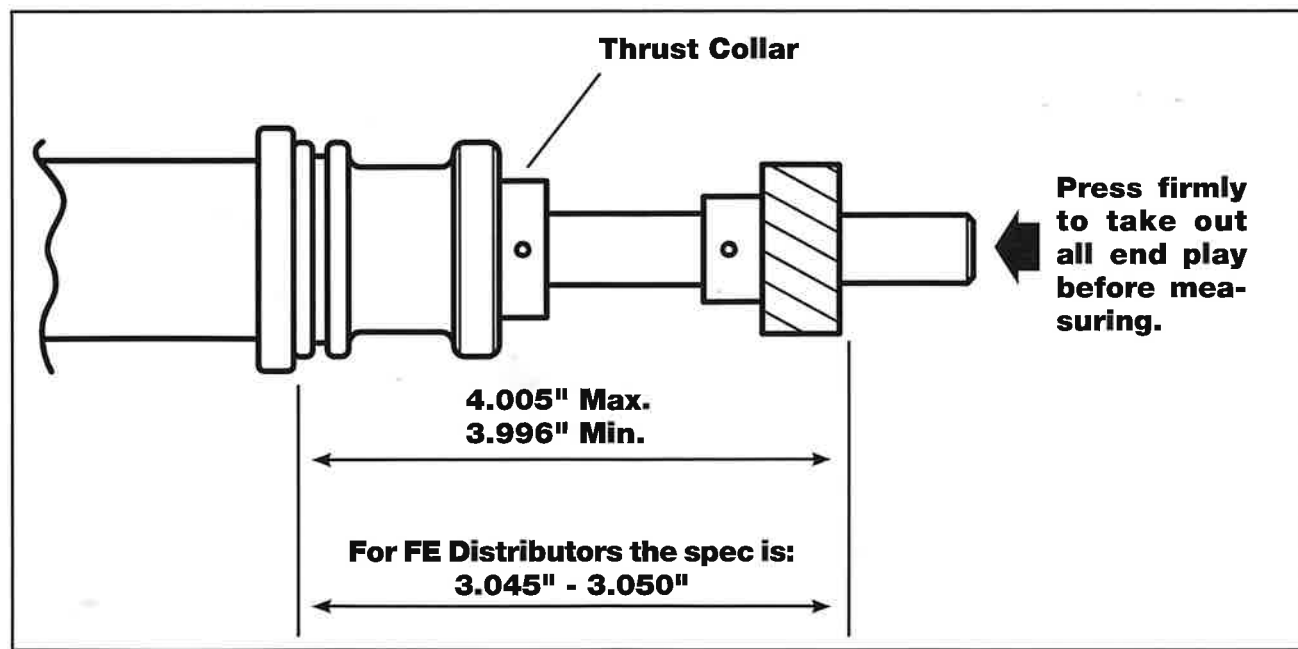


Figure 1 Gear Installation Specifications



The Auto Shop
1095 Cedar Valley Road
Tipton, IA 52772
www.theautoshop.net
(563) 886-2821

CHRIS ROBINSON
ROBINSON RESTORATION
413 NORTH ST
RYAN, IA 52330

Year	1966	Engine	V8 427CI WINDSOR 8-STACK	Page 1	
Make	FORD	Trans	6-SPEED		
Model	GT40	Job Type	INVOICE	Date Started	05/05/25
License #	CAR 59	Odometer In	0	Date Completed	07/10/25
Vin #		Odometer Out	0	Invoice #:	9066
Part Number	Qty	Description	Price	Extension	

A NOTES

Reported Problem

ENGINE WILL NOT START EXCEPT WITH
STARTING FLUID. HOLLEY ECU REPLACED,
OLD ECU ON SEAT.

A NOTES Total

0.00

LABOR

TEST SIGNAL TO ECU. FOUND NO RPM
PICKUP. 3500.00
DOWNLOAD FILE FROM ECU, FOUND IGNITION
SETTING INCORRECT FOR THIS SETUP.
SET IGNITION TYPE, ATTEMPT TO START
ENGINE. ADJUST DISTRIBUTOR FOR ENGINE
START ATTEMPT. NOTED INCORRECT READING
FROM MAP SENSOR. FOUND MAP SENSOR
WIRING INCORRECT. SWAP PINS 1 AND 3 IN
MAP SENSOR CONNECTOR, VERIFY CORRECT
SIGNAL.
RUN ENGINE, ADJUST IDLE MIXTURE AND
THROTTLE BASE SETTINGS. ENGINE WILL
START AND RUN, BUT REQUIRES BETTER
IGNITION TIMING CONTROL
INSTALL HYPERSPARK DISTRIBUTOR,
IGNITION COI AND COIL.
SET HYPERSPARK BASE TIMING.
PERFORM FIRWARE UPDATE TO HOLLEY ECU
AND HANDHELD CONTROLLER.
ADJUST IGNITION SETTINGS FOR HYPERSPARK
DISTRIBUTOR.
RUN ENGINE AND BASELINE IDLE AND PART
THROTTLE. NOTED UNSTABLE RESPONSE FROM
IDLE AIR CONTROL. FOUND PINS A AND C
SWAPPED ON IAC CONNECTOR.
RESET IAC, VERIFY PROPER RESPONSE.
ADJUST ECU CALIBRATION TO MATCH ENGINE

Phone (563) 932-2034

<u>Sub Total</u>	<u>4,996.51</u>
<u>Sales Tax</u>	<u>0.00</u>
<u>Total</u>	<u>4,996.51</u>

Estimate good for 30 days. Not responsible for damage caused by theft, fire or acts of nature. I hereby authorize the above repairs, including sublet work, along with the necessary materials. You and your employees may operate my vehicle for the purpose of testing, inspection and delivery at my risk. If I cancel repairs prior to their completion for any reason, a teardown and reassemble fee will be applied. All prices quoted are cash or check. If credit or debit card is used a fee of 3% will be added.

x _____ Date _____



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RYAN, IA 52330

Year	1966	Engine	V8 427CI WINDSOR 8-STACK	Page 2
Make	FORD	Trans	6-SPEED	
Model	GT40	Job Type	INVOICE	Date Started 05/05/25
License #	CAR 59	Odometer In	0	Date Completed 07/10/25
Vin #		Odometer Out	0	Invoice #: 9066

Part Number	Qty	Description	Price	Extension
-------------	-----	-------------	-------	-----------

MODIFICATIONS.

MAP SENSOR MELTED DUE TO EXHAUST HEAT.
INSTALL TEMPORARY HEAT SHIELD FOR
TESTING. WILL REQUIRE ADDITIONAL HEAT
SHIELDING TO PROTECT MAP SENSOR, IAC
AND FUEL SYSTEM FROM EXHAUST HEAT.
DUE TO SHORT EXHAUST AFTER OXYGEN
SENSOR, THIS SYSTEM IS SET FOR OPEN
LOOP OPERATION BELOW 1400 RPM.

TACH OUTPUT SIGNAL IS BLUE WIRE TAGGED
COMING FROM ENGINE HARNESS TO DRIVER'S
SIDE FRAME RAIL.

THERE ARE TWO POTENTIAL TACH WIRES, ONE
WHITE THAT WAS CONNECTED TO COIL
NEGATIVE AT ENGINE ON DRIVER'S SIDE.
THIS WIRE APPEARS TO GO INTO PASSENGER
SIDE ABOVE FRAME RAIL. THE OTHER WHITE
WIRE WAS TIED TO HOLLEY POINTS SIGNAL
AND IS ALONG DRIVER'S FRAME RAIL, ALSO
TAGGED.

THERE IS A YELLOW WIRE THAT WAS
CONNECTED TO IGNITION COIL THAT IS NOW
LAYING ON DRIVER'S FUEL TANK.
CONNECTING EITHER OF THE WHITE WIRES TO
THE TACH OUTPUT DID NOT CAUSE THE TACH
TO OPERATE.

ECU CALIBRATION IS DOWNLOADED TO SD
CARD IN HANDHELD CONTROLLER AND CAN BE
UPLOADED TO ECU IF REPLACEMENT IS
NECESSARY.

LABOR Total 3500.00

PARTS

Phone (563) 932-2034

Sub Total	4,996.51
Sales Tax	0.00
Total	4,996.51

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x _____ Date _____



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Year	1966	Engine	V8 427CI WINDSOR 8-STACK		Page 3
Make	FORD	Trans	6-SPEED		
Model	GT40	Job Type	INVOICE	Date Started	05/05/25
License #	CAR 59	Odometer In	0	Date Completed	07/10/25
Vin #		Odometer Out	0	Invoice #:	9066

Part Number	Qty	Description	Price	Extension
565302	1.00	HOLLEY HPYERSPARK DISTRIBUTOR	494.95	494.95
556154	1.00	HOLLEY HYFERSPARK IGNITION BOX	439.95	439.95
556152	1.00	HOLLEY HYPERSPARK IGNITION COIL	70.37	70.37
M2HSV2	1.00	DISTRIBUTOR HARNESS	43.45	43.45
85834	1.00	DISTRIBUTOR GEAR	182.80	182.80
PS10000	1.00	MAP SENSOR	89.42	89.42
PARTS Total				1320.94
<u>SUBLET</u>				
	1.00	INSTALL STEEL GEAR TO DISTRIBUTOR	75.00	75.00
SUBLET Total				75.00
<u>SUPPLIES</u>				
Supplies	1.00		45.00	45.00
SUPPLIES Total				45.00
<u>Y_FUEL</u>				
	15.02	FUEL, 91 OCTANE UNLEADED	3.70	55.57
Y_FUEL Total				55.57

Phone (563) 932-2034

Sub Total	4,996.51
Sales Tax	0.00
Total	4,996.51

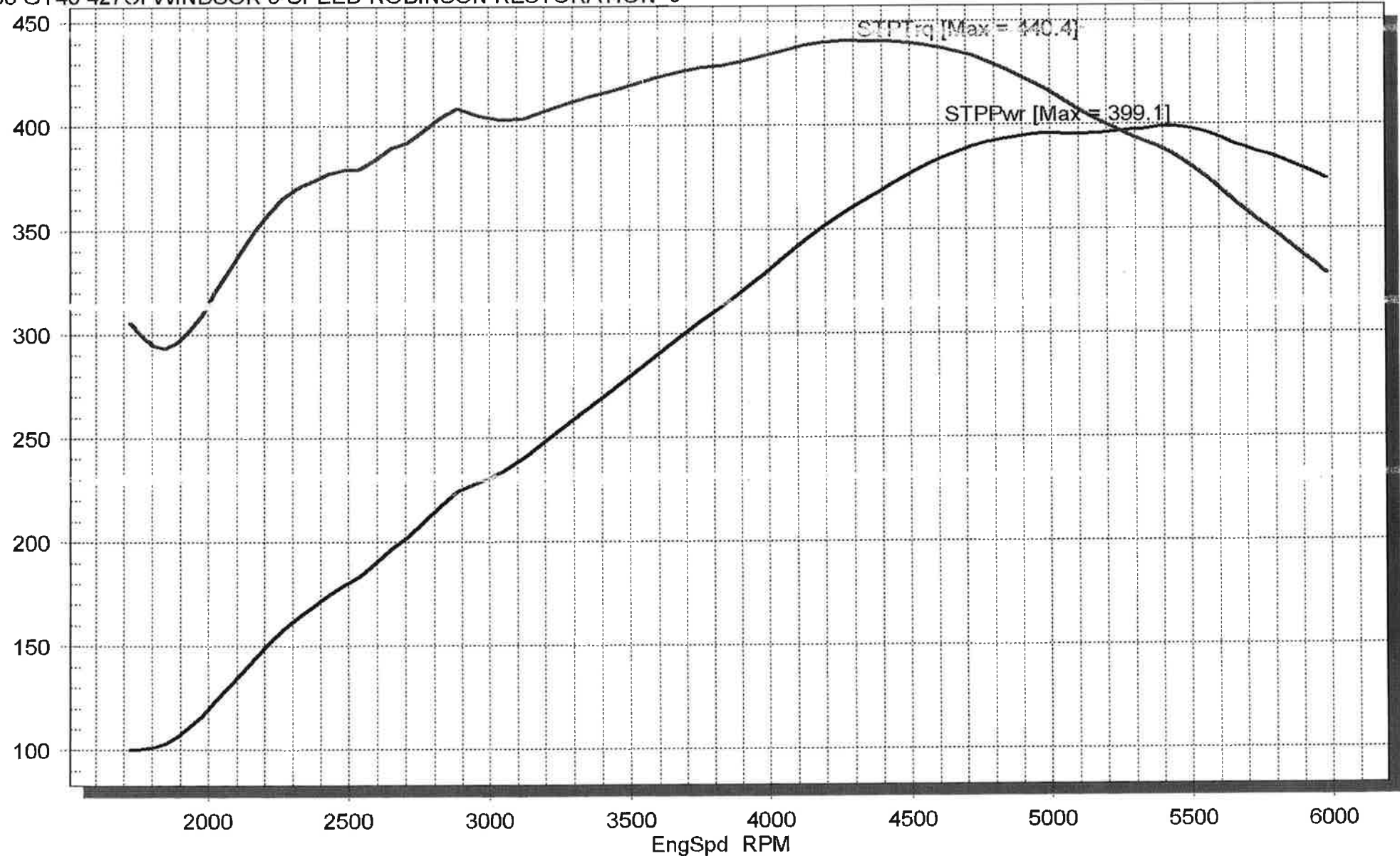
Estimate good for 30 days. Not responsible for damage caused by theft, fire or acts of nature. I hereby authorize the above repairs, including sublet work, along with the necessary materials. You and your employees may operate my vehicle for the purpose of testing, inspection and delivery at my risk. If I cancel repairs prior to their completion for any reason, a teardown and reassemble fee will be applied. All prices quoted are cash or check. If credit or debit card is used a fee of 3% will be added.

x _____ Date _____

1966 FORD GT40

427CI JIM INGLESE EIGHT STACK 6-SPEED

1966 GT40 427CI WINDSOR 6-SPEED ROBINSON RESTORATION 6



Holley® EFI

ELECTRONIC FUEL INJECTION

EFI HARNESS KIT 558-503, 558-504 & 558-508

Kit Contents:



Main Harness

558-104: Kits 558-504 & 508
558-100: Kit 558-503



Power Harness

558-308: All Kits



Injector Harness

558-200: Kits 558-503 & 504
558-209: Kit 558-508



HEI Adapter

558-304: Kit 558-503



Tach Adapter

271R1012A: All Kits

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.

Holley EFI 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.
- Use quality connectors or 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

- **DO NOT EVER** 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 let Crank and Cam signal wiring near spark plugs 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 the 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 quality connectors or 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.

Main Harness

The following quick guide overviews all connections on the "Main Harness". The Main Harness supports all the primary engine sensors, fuel and ignition for 8 cylinder engines, the #1 wideband oxygen sensor, and the first four programmable input and output channels. There are two connectors for this harness designated as "J1A" (pin designations below that start with an A) and "J1B" (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 is shown in parenthesis. The pinout for the ECU is then shown. If the wires are terminated into the same connector on every type of main harness, the connector pinout is given as well. If the connector may vary by application, such as a TPS or IAC, the connector pinout is not given. To see the connector pinout for a specific application, locate the wiring diagram themselves contained in the WIRING APPENDIX, located in the software.

Primary Sensors

Throttle Position Sensor (TPS)

Holley EFI systems work with any 0-5V throttle position sensors. The connector on this harness will plug directly into Holley PN 543-111.

- A5 – TPS Signal
- A18 – Sensor Ground
- A26 – Sensor +5V Reference Out

Manifold Air Pressure Sensor (MAP)

Holley EFI systems work with 1 to 5 Bar MAP sensors. Make sure to select the proper sensor used in the handheld or software.

Note: Terminator X and X Max ECU's have an internal 1 bar MAP sensor. For naturally aspirated & nitrous engines, you can connect the 1Bar MAP sensor located on the ECU to an available intake manifold port by using the appropriately sized quick-turn adapter. Other MAP sensors can be used by plugging the MAP sensor connector into the sensor, or using an adapter harness.

- A18 – Sensor Ground
- A23 – MAP Sensor Signal
- A26 – Sensor +5v Reference Out

Coolant Temperature Sensor (CTS)

Holley EFI systems work with any 2 wire thermistor style coolant temperature sensors. Make sure to select the proper sensor in the software.

- A18 – Sensor Ground
- A19 – Coolant Temp In

Manifold Air Temperature Sensor (MAT)

Holley EFI systems work with any 2 wire thermistor style manifold air temperature sensors. Make sure to select the proper sensor in the software.

- A11 – Manifold Air Temp In
- A18 – Sensor Ground

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

- A21 – Knock Sensor #2 Input (Pin A)
- A29 – Knock Sensor #1 Input (Pin B)
- A18 – Sensor Ground (Pin C)

Wide Band Oxygen Sensor (WB02)

HP and Dominator 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. Terminator X and X Max systems require a Bosch 4.9 (PN 554-155) wide band oxygen sensor and require the adapter harness included with the Terminator X be used.

- A34 – WB1 HTR+ (Pin A)
- A9 – WB1 HTR - (Pin B)
- A16 – WB1 COMPR1 (Pin C)
- A7 – WB1 CCOMPR2 (Pin D)
- A17 – WB1 VS-/IP- (Pin E)
- A33 – WB1 IP+ (Pin F)
- A25 – WB1 VS+ (Pin G)
- A8 – WB1 Shield (Pin H)

Fuel Pressure (Fuel)

A fuel pressure input is a standard feature on Holley EFI. A connector is installed that is plug-and-play with Holley 100 PSI pressure transducer 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.

- A18 – Sensor Ground (Pin A)
- A26 – Sensor +5V Reference Out (Pin B)
- A31 – Fuel Pressure Signal (Pin C)

Oil Pressure (Oil)

An oil pressure input is a standard feature on Holley EFI. A connector is installed that is plug-and-play with Holley 100 PSI pressure transducer 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.

- A18 – Sensor Ground (Pin A)
- A26 – Sensor +5V Reference Out (Pin B)
- A20 – Fuel Pressure Signal (Pin C)

CANbus (CAN)

All harnesses have a CANbus communications connector. This is used to communicate with CANbus devices, such as the Pro Dash or 3.5" Terminator X handheld. 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)

Primary Outputs

Idle Air Control (IAC)

The terminated IAC connector is for a 4 wire stepper type IAC (Holley PN 543-105). A 2 wire PWM (Pulse Width Modulated) IAC can be used, see section 9.2. The following shows the outputs for a stepper IAC.

- B1 – IAC A Lo
- B2 – IAC A Hi
- B8 – IAC B Lo
- B9 – IAC B Hi

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. Pin's A-H are routed to the cylinder number designation for the engine (i.e. A goes to cylinder #1, B goes to cylinder #2, etc). V8 harnesses offered by Holley are labeled for GM, Ford, and Chrysler engines.

- B19 – Injector A (Pin A)
- B26 – Injector B (Pin B)
- B25 – Injector C (Pin C)
- B13 – Injector D (Pin D)
- B7 – Injector E (Pin E)
- B4 – Injector F (Pin F)
- B5 – Injector G (Pin G)
- B6 – Injector H (Pin H)
- +12V Power – (Pins J/K)

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.

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:

- 271R1012A – “Tach Out” – This adapter connects into the “Tach Out” on a CD ignition box when the ECU is NOT controlling ignition timing. This adapter is included with all HP and Avenger TBI and Multiport Fuel Injection systems.
- 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
- 558-305 – Ford TFI – Connects to a Ford TFI 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.
- 558-323 – HyperSpark Distributor – Connects to a Holley Sniper EFI HyperSpark distributor.
- 558-324 – MSD Pro Billet Distributor – Connects to an MSD Pro Billet Distributor (Green and Purple 2-Wire Connection)

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.

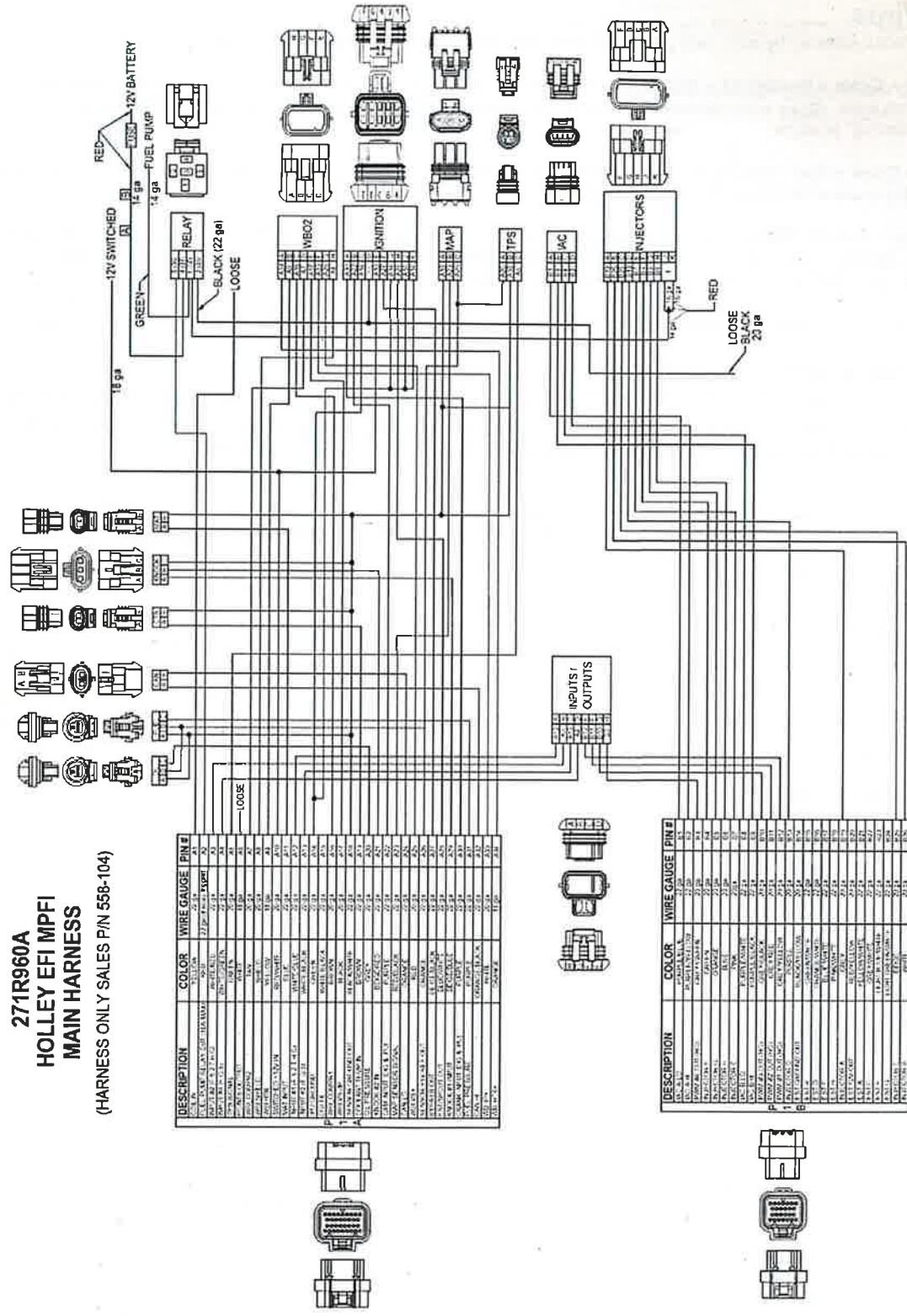
12V Fuel Pump – Color = Green - Used to directly power a fuel pump (+12 volt). Fully terminated harnesses utilize a relay to supply this power. 14 gauge wire is used. Due to this, it is not recommended for pumps that draw over 10-12 Amps to use this wire. For high current pumps, use this wire to trigger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

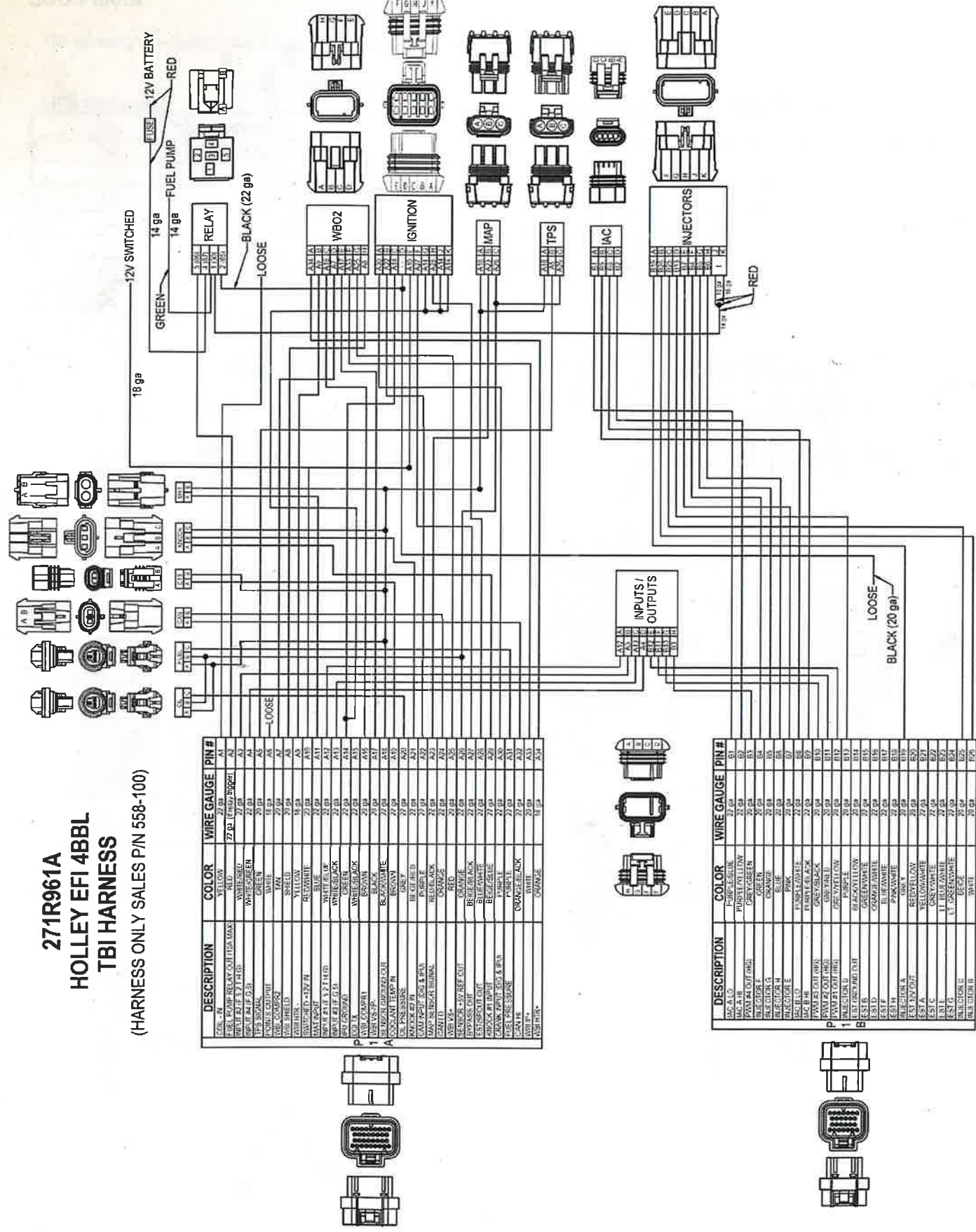
Ignition/DIS Chassis Ground – Color = Black – Connect to a ground point that has excellent connectivity with both the engine and the battery.

“Coil – ” – Color = Yellow – Used for an RPM input signal when not controlling timing and NOT running a Capacitive Discharge (MSD) ignition system. WARNING! Connecting this wire to the coil of a CD ignition will damage the ECU.

271R960A
HOLLEY EFI MPFI
MAIN HARNESS
 (HARNESS ONLY SALES P/N 558-104)



271R961A
HOLLEY EFI 4BBL
TBI HARNESS
 (HARNESS ONLY SALES P/N 558-100)



ECU Pinout

The following is a list of the pins and their functions.

Pin Connector

Pin	Function
1	Ground
2	Ignition
3	Ignition
4	Ignition
5	Ignition
6	Ignition
7	Ignition
8	Ignition
9	Ignition
10	Ignition
11	Ignition
12	Ignition
13	Ignition
14	Ignition
15	Ignition
16	Ignition
17	Ignition
18	Ignition
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Holley Technical Support
1-866-464-6553

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199R10837
Date: 9-25-19

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F.O.

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SETUP INSTRUCTIONS

AND INPUT DATA

CHRIS ROBINSON

Jim Inglese Eight Stack Systems
Lake City, Florida

(203) 623-0659

JIM INGLESE EIGHT STACK SYSTEMS
Lake City, Florida • (203) 623-0659

Introduction

Your assembly has been crafted with the utmost attention to detail and is the most complete EFI system available today. It is ready for you to install on your engine just as it comes out of the box.

I share your anticipation for this EFI installation to be an enjoyable experience and a complete success.

To ensure a smooth process, this information packet will provide all the information you need to get your engine up and running for the first time with your EFI. I'd love to make this into a manual, but I know as soon as I do there will be more information to add.

This packet was assembled with information I've assembled whenever customers called or emailed me for more information. This is the most up-to-date version and it should be all you need.

If you have any questions that are not answered by the information contained in this information package, however, please call me and I will promptly provide any answers you need.

In the meanwhile, good luck setting up your first tune and *Happy Motoring*.

Sincerely,

A handwritten signature in black ink, appearing to read 'Jim Inglese', with a stylized flourish at the end.

Jim Inglese

(203) 623-0659 Mobile

Do not discard your box and shipping materials. In the event of a problem necessitating a return, the original packaging is required.

Important update information

Before startup, it is important to update your Terminator X to Version 2 software and Version 2 firmware!

Holley is continuously updating its software, however it's impossible to make changes to the Terminator X each time there is a new upgrade, so the latest changes can be downloaded to your SD card online.

So before starting the engine, the first thing you should do is update the Terminator X with Holley's newest software and firmware, which is version 2. The Terminator X comes in Version 1. Version 2 is not installed by Holley in the Terminator X ECU as yet. This update is important and provides the latest data available.

The next 2 pages following this one are from Holley's tech library. To see them online, go to:

([https://documents.holley.com/techlibrary_terminatorxrevisionloginitialv2 .pdf](https://documents.holley.com/techlibrary_terminatorxrevisionloginitialv2.pdf))

I have included Holley's 2-page info in this packet for your convenience, as it provides useful information regarding the V2 update.

Below is the website for a comprehensive Holley video that will guide you through the firmware update process:

https://www.holley.com/blog/post/how_to_update_your_terminator_x_efi_firmware/

On the same website where you will find the firmware update, you will also see the SD Card Updater. Be sure to download the updater as well as the firmware onto your SD card.

After the upgrade, select **GM LSX** as your MAP sensor.

Jim Inglese Eight-Stack Systems
jiminglese@att.net



TERMINATOR X FIRMWARE & SOFTWARE REVISION LOG

The latest Terminator X ECU Firmware, Terminator X Handheld Firmware and Terminator X PC Software is available for download at www.Holley.com. The ECU and Handheld firmware are included in the Terminator X SD Card Contents.

It is recommended to update to the latest firmware on both the ECU and the Handheld at the same time. When updating the ECU the current calibration will be removed, requiring that the wizard be re-run or a saved calibration be loaded. It is recommended to download the calibration and save it to a computer before updating the ECU, you can then upload it back to the Terminator X.

Terminator X V2 Software is not compatible with Terminator X V1 ECU Firmware. To use V2 software with a V1 ECU, the ECU and handheld MUST be updated to V2 Firmware. Opening a Terminator X V1 calibration with Terminator X V2 software, will update the calibration from V1 to V2. A V2 calibration cannot be loaded into a V1 ECU. A Terminator X V1 calibration cannot be used in a Terminator X ECU with V2 Firmware. When upgrading a Terminator X from V1 to V2, you MUST use the Terminator X V2 software to convert the calibration from V1 to V2.

Any Terminator X or Terminator X Max ECU can be updated to use V2 Firmware.

Latest Version 2 Compatible Firmware and Software		Latest Version 1 Compatible Firmware and Software	
Handheld Firmware	tslcd35-terx.2.0.20.fwu	Handheld Firmware	tslcd35-terx.1.8.2.fwu
ECU Firmware	SNEFI_02000300.eep	ECU Firmware	SNEFI_010001300.eep
Software	VERISON 2.0 BUILD: 30	Software	VERISON 1.0 BUILD: 121

VERSION 2

GM LTx Direct Injection Support:

HANDHELD FIRMWARE: **tslcd35-terx.2.0.20.fwu** – Wizard Support for GM Gen V LTx Direct Injection (L83, L86, LT1) & 4500 Terminator X Stealth Throttle Bodies

- Added additional system types and functionality to the wizard for new Engine Types
- When Non Timing Controlled Ignition type is chosen, “Ign Timing” parameter displays “N/A”
- Added additional injector lists and individual injectors to the Wizard Options:
 - Accel Injectors, FRPP Injectors, Bosch 210 & Siemens Deka 80

TERMINATOR X ECU FIRMWARE: **SNEFI_02000300.eep** – Phase 4 Terminator X ECU Firmware, Support for GM Gen V LTx Direct Injection engines

- Added support for GDI controller
 - GM LTx VVT Control
 - GM LTx DI Fuel Pressure Control
- Added Pro-Dash Can Input Support (using V2 Pro Dash Firmware)

TERMINATOR X PC SOFTWARE: **VERISON 2.0 BUILD: 30** – Terminator X PC Software: Phase 4 Terminator X ECU Firmware

- GM Gen V LTx Direct Injection Calibrations added to the “Base Cals” folder
- Opens up supporting parameters for GM Gen V LTx Direct Injection Engines (L83, L86, LT1)
- Opens up Variable Cam Timing Table for GM Gen V LTx Engines
- Opens up parameter to support for Direct Injection Type
 - DI Target Fuel Pressure Table
- Opens up parameter to support TBI Injection Type: Terminator X Stealth 4500 8 Inj Throttle Body
- Added Ignition Types: GM GEN V LTx W/VVT & GM GEN V LTx Non-VVT (Locked Cam)
- Added additional injector drop downs
 - Accel Injectors
 - Ford/FRPP Specific
 - 210 lb/hr Bosch
 - 80LB Siemens Deka IV
 - GM GEN V LTx DI Injectors
- Added Pro-Dash Can Input Support (using V2 Pro Dash Firmware)

VERSION 1

Phase 1: LS Engines:

HANDHELD FIRMWARE: `tslcd35st_terx_01_04_0330.fwu` – Initial Terminator X Handheld Firmware

TERMINATOR X ECU FIRMWARE: `SNEFI_01000280.eep` – Initial Terminator X ECU Firmware, GM LS support

TERMINATOR X PC SOFTWARE: **VERISON 1.0 BUILD: 5** – Initial Terminator X PC Software Release

Phase 2: Universal MPFI:

HANDHELD FIRMWARE: `tslcd35st_terx_01_06_0440.fwu` – Wizard Support for Universal MPFI

- Added additional system types and functionality to the wizard for Universal MPFI
- Added Ignition Types: CD Box, Coll (-), Ford TFI, GM HEI, Holley Dual Sync, Magnetic, Sniper Hyperspark Distributors
- Added additional Map Sensor Selections:
 - N/A & Nitrous: 1 Bar (538-24), 1 Bar SS (554-133)
 - Turbo & Supercharged: 2Bar(538-13), 3Bar(554-107), 3.5Bar SS (554-134), 5Bar SS (554-108)
- Added 4 Cylinder & 6 Cylinder Support

TERMINATOR X ECU FIRMWARE: `SNEFI_01000101.eep` – Phase 2 Terminator X ECU Firmware, Universal MPFI support

- Bug Fix – Timing Modifiers based on CTS and MAT allows for X axis scale adjustment

TERMINATOR X PC SOFTWARE: **VERISON 1.0 BUILD: 102** –Terminator X PC Software: Phase 2 Terminator X ECU Firmware

- Various Calibrations added to the "Base Cals" folder
- Opens up parameters to support Universal MPFI ECU Firmware
- Added Ignition Types: CD Box, Coll (-), Ford TFI, GM HEI, Holley Dual Sync, Magnetic, Sniper Hyperspark Distributors,
 - Custom Crank Options Include: 1X, 36-1 58x & 60-2
 - Custom Cam Options Include: 1X, 4X LS
- Added Transmission Support: 2009+ 4L70E, AODE, 4R70W Early and Late
- Added 4 Cylinder & 6 Cylinder Support
- Added Support for High Flow Boost Control Solenoids (557-201)
- Added Support for 1 Channel Can EGT (554-184C) and 8 Channel Can EGT (554-186)
- Bug Fix – User now allowed to edit top scaling cell of Y axis in fuel table to match MAP sensor

Phase 3: Ford Coyote, Ford Mod Motor, Chrysler Gen 3 HEMI & TBI:

HANDHELD FIRMWARE: `tslcd35-terx.1.7.7.fwu` – Wizard Support for Ford Coyote, Ford Mod Motor, Chrysler Gen 3 Hemi & 4150 Terminator X Stealth Throttle Bodies

- Added additional system types and functionality to the wizard for new Engine Types
- Added filtering of selections in the wizard, dependent upon previous choices
- Added Ignition Types: Ford Coyote w/ Ti-VCT, Ford Mod Motor 2V/4V Waste-Spark Coils, Ford Mod Motor 2V/4V COP, Gen 3 Hemi 36-2+2 Waste Spark, Gen 3 Hemi 36-2+2 COP, Gen 3 Hemi 60-2 non-VVT

`tslcd35-terx.1.8.0.fwu` – Updated Wizard, Programmed Injector Data Updated

`tslcd35-terx.1.8.2.fwu` – Updated Wizard and Table Scaling Bug Fixed

- Gen 3 Hemi Spark Tables Updated
- Tables using CTS and MAT or MAP for X or Y axis scaling, now matches respective sensor scaling within Calibration

TERMINATOR X ECU FIRMWARE: `SNEFI_010001200.eep` – Phase 3 Terminator X ECU Firmware, Support for Ford Coyote, Ford Mod Motor, Chrysler Gen 3 Hemi & 4150 Terminator X Stealth Throttle Bodies

- Added support for Coyote Ti-VCT
`SNEFI_010001300.eep` – Update for Chrysler DBW parameters

TERMINATOR X PC SOFTWARE: **VERISON 1.0 BUILD: 120** –Terminator X PC Software: Phase 3 Terminator X ECU Firmware

- Coyote, Mod Motor & Gen 3 Hemi Calibrations added to the "Base Cals" folder
- Opens up supporting parameters for Coyote, Mod Motors, Gen 3 Hemi
- Opens up parameter to support TBI Injection Type
 - Support for Terminator X Stealth 4150 4 & 8 Injector Throttle Bodies
 - Support for the Legacy Terminator TBI throttle bodies (550-405/406)
- Added Ignition Types: Ford Coyote Locked Cams, Ford Coyote w/ Ti-VCT, Ford Mod Motor 2V/4V Waste-Spark Coils, Ford Mod Motor 2V/4V COP, Gen 3 Hemi 36-2+2 Waste Spark, Gen 3 Hemi 36-2+2 COP, Gen 3 Hemi 60-2 non-VVT
 - Additional Custom Crank Options Include: Chrysler NGC 36-2+2
 - Additional Custom Cam Options Include: Chrysler V8 NGC, Ford Coyote Pass Side Intake Cam Locked, Ford Coyote Pass Side Intake cam w/ Ti-VCT
- Added additional Injector drop downs
 - Coyote Specific
 - Gen 3 HEMI Specific
 - Ford/FRPP Specific (19 lb/hr, 24 lb/hr, 30 lb/hr)
 - Snake Eater Performance (SEP 850cc, SEP 1000cc, SEP 1500cc)

VERISON 1.0 BUILD: 121 –Terminator X PC Software: Updated Data in Injector Drop Downs

STARTUP INSTRUCTIONS

If you're like most first-time EFI owners, you may be wondering whether you can do this by yourself. You can. It's really not very hard, just a completely different process that requires you to work with the computer to establish some baselines. We sell the Holley ECU's because I think they're the easiest to use, but if you want to bring your car to a Holley-authorized tuner, here's a link to help you find one near you:

https://www.holley.com/holley_efi_dealers/

FIRST-TIME STARTUP

Ignition

The EFI systems use computer-operated timing to maximize the advantages of EFI control. If your engine is equipped with a distributor, we highly recommend using a Holley plug-and-play Dual Sync (digital) distributor but you can use your existing MSD magnetic pick-up distributor if that is what you have. An ignition box is required, such as an MSD 6-series. If using the MSD, it will need to be locked-out by removing the weights and springs along with the gear so you can spin the shaft. You will also need to purchase a 84211 MSD adjustable rotor to correct rotor phasing.

To watch a video showing how to lock out an MSD distributor, here is another link you can copy into your computer:

<https://www.youtube.com/watch?v=7MzGPRToi54>

Initial Start-Up

Once you have all the wires connected according to the Terminator X installation instructions, you may be a little apprehensive about turning the key for the first time. As long as you've wired everything correctly, the engine will start right up and the computer will take over from there. With your handheld device in hand, just follow the Startup Wizard's directions.

Once you have completed the Start Up Wizard, verify correct sensor values:

- MAP Sensor: 95-100 KPA
- Coolant Sensor: Close to ambient temperature
- Air Temp Sensor: Close to ambient temperature
- O2 Sensor: There will be no value until the engine is started
- Perform TPS Autotest

If any sensor is out of range, please call me for tech help before continuing.

With the engine running, the following procedures will need to be performed next:

Timing Synchronization

Get out your timing light. Following the handheld instructions, lock the ignition timing @30 degrees. That commanded valve number must match what you see on the balancer with your light. If not, rotate the distributor to match the balancer to the command valve number and lock the distributor down.

If using a Holley Dual Sync, this operation is now complete.

If using a standard type MSD distributor, perform rotor phasing using the adjustable rotor by spinning the engine to 30 degrees BTDC and lining the rotor up with the number terminal on the cap. Lock the screw on the rotor down with blue Loctite to complete the procedure.

Throttle Plate Synchronization.

Synchronize the unit using your supplied synchrometer and follow the synchronization directions provided on another page in this instruction packet.

Idle Speed/IAC Settings

1. Input target idle speed (this was initially set during the Start-up Wizard but can be adjusted as needed)
2. Warm up the engine and identify the IAC (Idle Air Control) position in the handheld. The target is 10-15%. If the IAC is below this target, slowly reduce the throttle plate opening to reach this target. If the IAC is above this target, slowly increase the throttle plate position.
3. Recalibrate the TPS (throttle position sensor)

When the above steps are complete, you're ready for a road test. On your first trip, bring the rpm's up gradually in each gear to give the computer a chance to complete the learning process. It's okay to hammer it and redline it, but just make sure to let the computer learn everything about your everyday driving habits. After 100 miles or so, the computer will have everything pretty well sorted out.

If you have any questions or issues along the way, feel free to call my cell between 9am-5 pm Monday through Friday. If it's a weekend, send me an email: jiminglese@att.net and I'll be glad to help.

Happy Motoring,
Jim

(203) 623-0659 Mobile

Notes on idle and re-starting

If you are relying on the “learn” feature, engine temp must be @ 170+ degrees Fahrenheit.

For the settings, the LSX IAC is a “stepper type”.

The idle speed target “hot” is 850rpm. Therefore with the engine hot, the goal is to open/close the butterflies with the idle stop screws so the IAC position while running falls in the **10-15% range**. If the car idles hot well below the target range and the IAC is reading too high, you will need to open the throttle. As you do, the IAC will start to drop.

If you have not set the idle speed as described, the engine will never start cold.

Once the idle speed is set correctly you can raise the idle target in the computer while the car is running and the RPM should go up. Or, you can open/close the IAC with the “IAC Park” setting while key on/engine off.

The “Advanced Idle Control” are just preset PID’s for IAC control. You can experiment with the Fast Medium and Slow setting to find the one that works best.

As you open the throttle, the IAC moves from the “Idle” settings to the “IAC Hold” settings. When the idle is set correctly, the IAC % will increase as the throttle opens to the “IAC Hold” setting.

You can find the IAC position in the “Idle Tuning” monitor or on the main dash.

IAC Parked is the pre-start opening position of the IAC. Think of it as putting the foot on the throttle to open the butterflies while cranking. Once the engine starts, the IAC Parked is no longer in use. Adjust IAC Parked for easy start and small rpm flair if desired. With too much IAC Parked, the engine will flair very high, much like having the throttle open too much during cranking.

JIM INGLESE EIGHT STACK SYSTEMS

Fuel injector information

Injector Type:

Bosche EV6 / USCAR

BOSCHE Part number: 0 280 158 117

Ford Racing Part Number: FRPP M-9593-G302

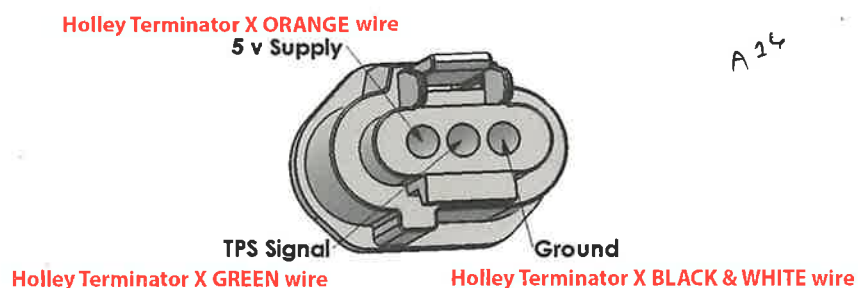
Flow Rate:

47lb./hr.

Fuel Pressure setting:

43-45psi

TPS Connector



Remote Idle Air Motor Wiring

(the Remote IAC is the type mounted on a threaded stand)

Connector Pin	Signal	FAST wire color	Holley wire color
A	A hi	Red	Purple/Yellow
B	A lo	Blue	Purple/Blue
C	B hi	Yellow	Purple/Black
D	B lo	Black	Purple/White

MAP Sensor Pinout

Pin	Wire color (FAST)	Wire color (Holley)	Signal	Connector position (clip up)
C	Red	Orange	+5V	Left
B	White	Red/Black	Signal	Center
A	Black	Black/white	Ground	Right

Integral Idle Air Motor Wiring

(for IAC's that mount directly to the manifold with two small screws)

Pin	Signal/Wire color (FAST harness)	Signal/Wire color (Holley harness)
A	B lo/Black	B lo/Purple w/ White
B	B hi/Yellow	B hi/Purple w/ Black
C	A lo/Blue	A lo/Purple w/ Blue
D	A hi/Red	A hi/Purple w/ Yellow

Terminating your injector wires for different ECU's

The supplied adapters allow the wires from the throttle bodies, which are terminated with pins, to connect to an ECU harness equipped with EV6 USCAR-type injector plugs.

Insert the pins into the adapters and note that four adapters will have two wires and four adapters will have just one wire.

Holley controllers:

Insert red wire into hole nearest retaining clip. Insert colored wire (brown, yellow, orange, etc.) into hole farthest from retaining clip.

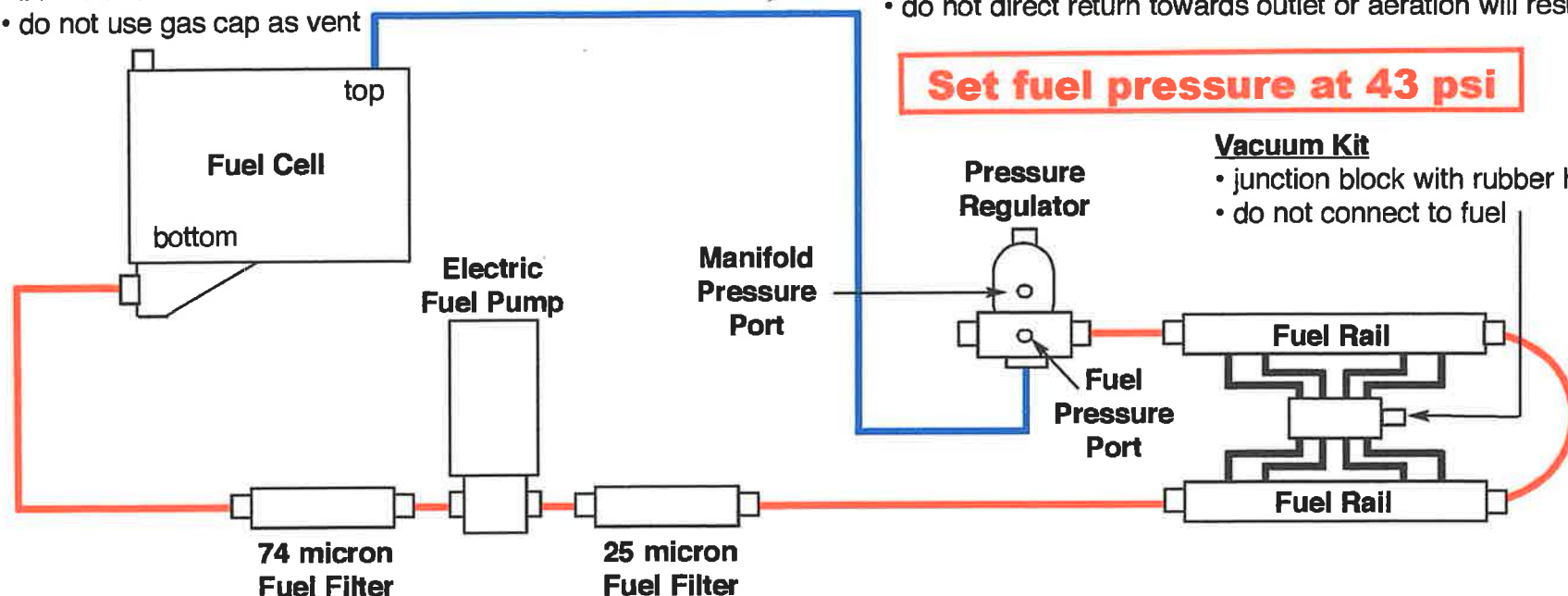
FAST controllers:

Insert red wire into hole farthest from retaining clip. Insert colored wire (brown, yellow, orange, etc.) into hole nearest retaining clip.

Fuel System #2

Vent

- #6 minimum
- do not use gas cap as vent



Return Line

- #6 - unblown engines up to 700 HP.
- #8 - unblown engines over 700 HP and all blown engines.
- position return on top of cell and as far forward as possible.
- do not direct return towards outlet or aeration will result.

Set fuel pressure at 43 psi

Vacuum Kit

- junction block with rubber hoses
- do not connect to fuel

Fuel Cell or Tank

- for optimum installation position outlet as low on cell and as far rearward as possible.
- avoid sharp bends and machined fittings.
- use only full flow hose ends.
- do not use an intank filter.
- clean and flush tank before installation.
- inspect and clean filters frequently if tank is dirty.

Pressure Regulator

- mount within 3 feet of fuel rail or junction block of fuel supply.
- side fittings are pressure - in or out.
- bottom fitting is return to tank.
- do not boost - reference regulator.
- vacuum to regulator can be used to reduce fuel pressure at idle.

Fuel Lines

- consult factory for specific fuel line size.
- thoroughly flush all fuel lines before use.

Ignition control with Terminator X

When the ECU controls timing, the distributor **MUST** be locked out. This way you are not doubling up on the advance curve commanded by the ECU with the mechanical advance working as well. Not only do you need to lock the distributor, but you must also use an MSD 84211 adjustable rotor.

If you have a typical distributor like an MSD using a 6AL box and Blaster 2 coil, the Terminator X will work with that type of distributor and ignition. The 2-wire magnetic pickup in the distributor can be plugged into an ignition adapter harness.

To tie the Holley harness into the MSD, you'll need to put an adapter harness together with components that are available from Holley. You'll need a Holley EFI Systems Wiring Harnesses 558-303 with a Holley 2-pin connector kit, part number 8824.

These components will allow you to connect and use the MSD distributor and timing control through the Terminator X.

Best ignition technology for EFI

Standard electronic distributors with magnetic pick-ups are notorious for being susceptible to noise, and some ECU's tolerate it better than others. The Holley ECU's are great controllers but only so-so for noise susceptibility. It becomes even more critical when the distributor is mounted in the front of the engine.

For this reason, it is wise to consider switching over to a Holley dual sync distributor, which is a discrete hall effect digital ignition and is much more robust concerning noise issues. These are excellent when paired with MSD's new universal EFI ignition box #6415.

Dual sync ignitions

The Holley Dual Sync distributor talks to the ECU and the ECU talks to the box and eliminates any "noise" issues. It's a digital unit with a Discrete Hall Effect digital pickup rather than a magnetic pickup. The digital signal is hard for the ECU to confuse, providing a much cleaner and more robust signal. Dual Synch distributor must be paired with an ignition box. Below is a list of distributor part numbers and dimensions for most popular applications:

SBC and BBC

Holley distributors:

BBC and SBC Holley #565-200 (silver body, 4.67" diameter, 6.88" height above manifold)

BBC and SBC Holley #565-200BK (black body, 4.67" diameter, 6.88" height above manifold)

302 Ford

Holley distributors:

Ford 302: Holley #565-202 (silver body, 4.62" diameter, 6.95" height above block)

Ford 302: Holley #565-202BK (black body, 4.67" diameter, 6.95" height above block)

302 Ford, cont'd.

MSD distributors:

Ford 302: #2377MSD (silver body, 4.67" diameter, 6.95" height above block)

Ford 302: #23773 (black body, 4-5/8" diameter, 6-15/16" height above block)

Ford 351W

Holley distributors:

Ford 351W: Holley (silver body, 4-5/8" diameter, 7-5/8" height above block)

Ford 351W: Holley #565-201 (black body, 4-5/8" diameter, 7-5/8" height above block)

MSD distributors:

Ford 351W: #2378 (silver body, 4-5/8" diameter, 7-5/8" height above block)

Ford 351W: #23783 (black body, 4-5/8" diameter, 7-5/8" height above block)

Ford FE

MSD distributors:

Ford FE: Holley #2380 (silver body, 4.67" diameter, 6.95" height above block)

Ford FE: Holley #23803 (black body, 4-5/8" diameter, 7-3/8" height above block)

Holley distributors:

Ford FE: Holley #565-205 (silver body, 4.67" diameter, 7.40" height above block)

Ford FE: Holley #565-205 BK (black body, 4.67" diameter, 7.40" height above block)

MSD box and coil:

MSD #6415 box for EFI

MSD Blaster coil #82073 for use with above box

Wires:

MSD Streetfire wires, black, 8mm, #5552

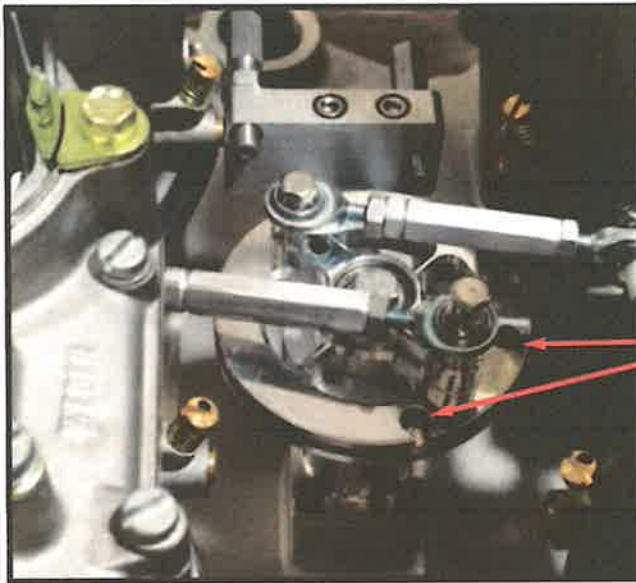
ATTACHMENT OF CABLES ON EFTS

If you have a transmission that requires the connection of a TV cable, the photos below show the attachment points for both your throttle and TV cables. If you have one cable for the throttle only, there is no bottom wheel on your center linkage tower.

Step #1 is to attach the provided brass "barrel" ends to your cable(s).

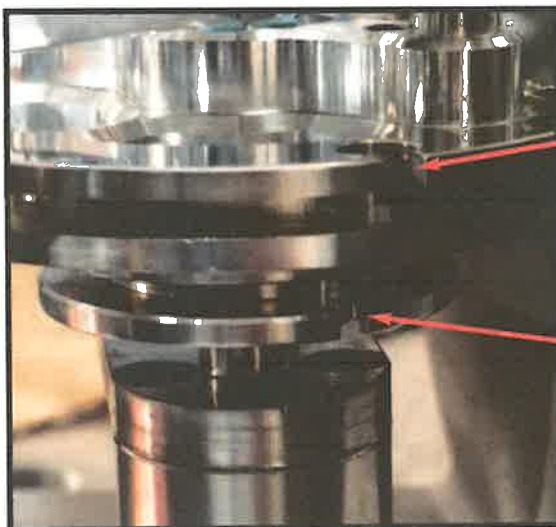
Extend the cables out of their outer cable jackets and lock the ends into the wheel notches shown below before permanently anchoring your cables to the manifold.

Assembly tip: Attaching the cables requires you to work in a tight space. It will be easier to attach the cables to the two wheels while the unit is still on the bench, rather than after it's on the car. After the cables are attached to their wheels, curl-up the cable jackets and temporarily tie them out of the way so they won't interfere with the installation of the unit onto the engine. Once the unit is bolted on, unravel the cables and run them where they need to go. After you attach the cables, the rest is easy.



View from the top

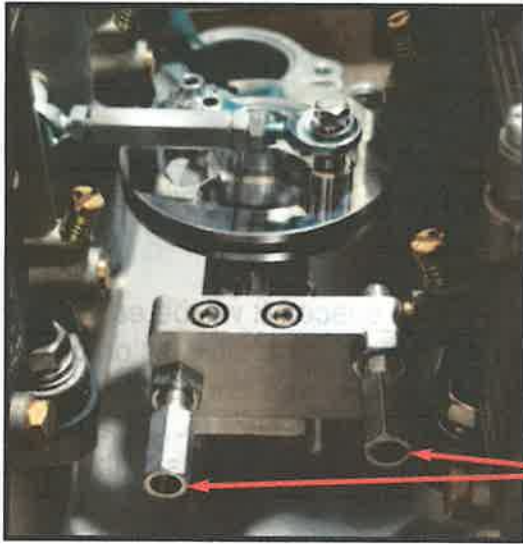
The top wheel is for your throttle cable. Attach the provided brass barrel fixture to your cable. Wrap it around the wheel from the left side and insert the brass barrel-end into the wheel. Note that there are two locations provided. The one to the lower left is usually the ideal connection point.



TV cable connection
viewed from the front

Another view of the upper wheel's notch for your throttle cable

The lower wheel is for your TV cable, and it has a smaller diameter than the top wheel. Bring your TV cable in from the right side and lock its end into this notch so as your throttle cable pulls the top wheel around, this bottom wheel will pull your TV cable forward.



Finishing the cable attachments

Insert your cable jackets into the fixture behind the linkage wheel and route both cables where they need to go.

On rear engine cars, this fixture will be located ahead of the wheel.

Single cable applications will only have one cable fixture here.



Synchronizing the throttle plate openings of the four throttle bodies at idle is a simple procedure. Each throttle body has a common throttle shaft, so you only need to take a flow reading on the center four velocity stacks.

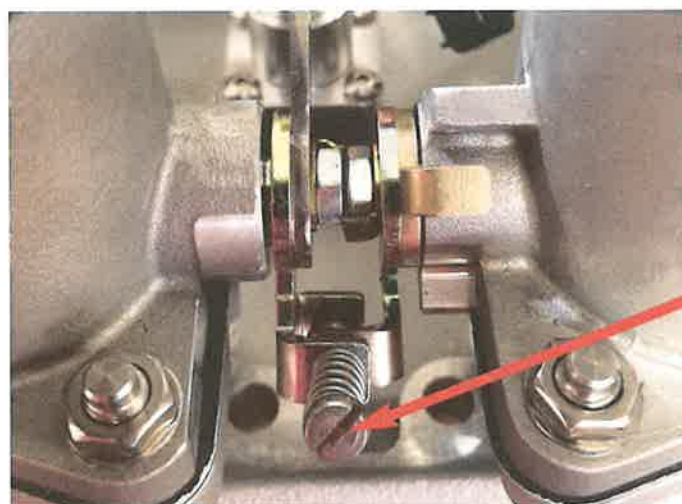
Using your synchronometer, start at the driver's front and work your way to the driver's rear, then the passenger rear, and finally to the passenger front.

The throttle opening adjustment for each throttle body is accomplished via four screws.



There are two master speed screws, one on each side. These are located at the left front and right rear corners. The left front one is shown in the photo at left. The throttle bodies with these speed screws are the "drive" throttles.

These screws adjust the throttle plates in the body it is attached to and also the one coupled to it.



To separately adjust the throttle bodies that are coupled to the ones with the master speed screws, there are two adjustment screws in the couplers as shown. These are located on the other end of the two master throttles.

By turning the screw shown in the photo, you can adjust the throttle opening of the throttle body that it is connected to (the one on the right), independently of the "drive" throttle body.

EFI SYNCHRONIZATION PROCEDURE

The following procedure will guide you through the process if your EFI system is brand new and has yet to be synchronized on a running engine.

Each twin-throat throttle body shares a common throttle shaft, and therefore, flow readings are taken **ONLY ON THE FOUR CENTER VELOCITY STACKS**. Proceed as follows:

1. Take a reading with your synchronometer on the left rear throttle body and note the value on the flow meter. Note that there is an adjustment screw on this throttle body. This is an **UPPER** idle adjustment screw.
2. Take your next reading on the left front throttle body and adjust the flow using the adjustment screw located on the linkage coupler. This is a **LOWER** idle adjustment screw. Match the flow of the front throttle body to the rear. If the rpm is too high, back-out each adjustment screw until the rpm is where you like it. Typically, 850 rpm is normal.
3. Moving to the passenger side, do the same thing to match the flow of the right side throttle bodies.
4. Take a reading on the four center velocity stacks and make any final adjustments.
5. **FINAL STEP:** Using only the **UPPER** screws, set the overall engine idle to the desired rpm, going back and forth to balance the two sides.

In the event that you have an EFI that has been disassembled or is completely out of adjustment, use the following procedure to begin from ground zero:

1. Back off all 4 adjustment screws.
2. Starting on the driver side turn the **LOWER** screw on the coupler until it just makes contact with the tab.
3. Do the same on the passenger side.
4. Back to the driver's side, turn the **UPPER** screw until it makes contact with the drive lever and then turn it in by 1/2 turn after contact. Note: watch passenger side for any movement.
5. Now turn passenger side **UPPER** screw the same as in step 3 (if it didn't open in the last step).
6. With a slightly warmed-up engine, take a syncrometer reading on the **driver rear front stack**.
7. Adjust the **LOWER** screw on the driver's side coupler to get these two readings to match. Adjust the **UPPER** and **LOWER** screws until they match.
8. Repeat the process for the passenger side.
9. To get the engine to idle at the preferred rpm, turn the **UPPER** screws up or down, and keep them matched.

Terminator X Handheld Instructions

IMPORTANT: *If you have a battery cutoff switch, the ECU must be wired directly to the battery before the cutoff switch. Your “switched” 12V power source is AFTER the cutoff switch, and this allows the ECU to power-down normally when the ignition is switched off. If power is completely cut off to the ECU, it will lose any changes since the last correct power-down by the switched 12V power source. This is why it is important to power-down the ECU with the switched 12V first, as this allows the ECU to add the changes made in its “volatile” memory to the “non-volatile” memory, so on the next key-up the latest changes are used.*

These specific instructions are to be used only after thoroughly reading the supplied kit instructions, creating a calibration and on a running vehicle.

Section 1: Static Timing Synchronization

This procedure is only for systems that are using the computer controlled timing feature of the ECU.

Start at the “Home” screen of the handheld.

Press: TUNING>SYSTEM>IGNITION SET-UP>STATIC TIMING

Chose the timing value you desire to use such as 30 degrees. (Remember this timing value is for verification purposes only and not actual timing for engine operation).

Press the “Set” button. Verify that the center of the screen reads” STATIC TIMING SET”. Adjust the distributor so the balancer matches the commanded timing value in the static timing feature.

WARNING: If for some reason the ECU is powered down before completion of the Static Timing Synchronization procedure, the Static Timing feature will need to be reactivated.

Section 2: Idle Speed and IAC calibration

The engine should be at normal operating temperature before starting this procedure.

Start at the “Home” screen of the handheld.

Press: TUNING>BASIC>BASIC IDLE

Tap “Hot Engine Idle Speed”, set desired idle speed of engine. Press Save.

Press: HOME>MONITER>MONITERS>IDLE

Start the engine, adjust the throttle stop screw until the IAC position is between 10-18%. When complete, recalibrate the TPS sensor.

Terminator X Laptop Programming Instructions

1. Laptop communication set-up
2. Injector values and off times
3. Static timing synchronization and inductive delay parameters
4. Idle Speed and IAC calibration

1. Optional Laptop communication set-up

Before connecting a laptop to the Terminator X ECU, we suggest creating a calibration with the included handheld. Modifications to this file will be accomplished via laptop.

For connecting the laptop, a Holley USB/ Can interface cable, part number **558-443**, will be needed. This is not included as part of the Terminator X ECU kit.

Terminator X software is available under the support tab at Holley.com under this link: https://www.holley.com/support/resources/#Fuel_Injection. For your convenience, you can access this as a live link on the www.jiminglese.com website: Go the 8-stack Systems drop-down menu, click on 8-stack EFI, and scroll to the very bottom of the page. The Holley support link is there.

Once on the Holley link, scroll down to the Terminator X platform and click on "software" (second line down) allowing the program to make any changes to the laptop as prompted. *This same information is on my website...just got to www.jiminglese.com and go to the EFI page, scroll to the bottom, and you'll find the live Holley link shown above.*

Open the Terminator X software and close the "Choose Opening Option" window. Make sure the USB to Can interface cable is plugged into the main harness and laptop. Power up the ECU and navigate to the top header of the software which will read: **File Save Toolbox USBLink**

Click on "USBLink" and allow the file in the ECU to download into the laptop. If there is no "USBLink" but "Offline" instead, allow another minute or two for the driver to download or switch USB ports.

Once you have download the file from the ECU to the laptop, USBLink will transition to "ONLINE" accessing live data. Depending on the operation selected below, it will be necessary to toggle between "USBLink" and ONLINE"

2. Injector values and off times

1. Toggle to "USBLink".
2. Click on the System ICF icon 
3. Identify the "Fuel Injector Information" field and change the following:

Injectors: Custom

Rated Flow Per Injector: Supplied by injector manufacture

Rated Injector Pressure: Supplied by injector manufacture

Minimum Injector Opening Time: 1.00 msec is acceptable for most

Injector Off Time: Fill in the appropriate off time values in the cells above the graph for the corresponding voltage.



Once you have updated your injector information, click on "USBLink" The System ICF will fail and produce a red light. Click the "Send to ECU" tab and the System light will change to green. Power down the ECU to lock these changes into memory before starting engine.

3. Static Timing Synchronization and Inductive Delay Parameters

Timing Synchronization:

With the engine running, establish communication by clicking on "USBLink". On the bottom left of the screen is a "Sensors" monitor. Using the blue arrow, toggle right to the "Idle Tuning" monitor and identify the "Ignition Timing" line.

Next, in the icon row find the "Sync" icon (shown left) Click on the small down arrow directly next to the icon. Click on the "Enable Static Timing Check" option. Input the desired timing you would like to use to check static timing such as 30 degrees. Click "Set". Verify that the timing value in the "Idle Tuning Monitor" is the same as the one entered in the Static Timing window. Adjust the distributor or crank trigger to sync the balancer so it shows the same timing value as in the "Idle Tuning Monitor".

Warning: when the ECU is powered down, the static timing check will automatically be disengaged. The static timing procedure will need to be followed every time the ECU is cycled off.

Inductive Delay:

Once the timing is synced, verify the timing is still locked out and rev the engine to approximately 3500rpm. The timing should not retard or advance at this RPM. If it does, you will need to change the value in the Inductive Delay field. Click on "OnLine" so it returns to "USBLink" Click on the System icon and in the Systems Parameter window click on "Ignition Parameters". Under Ignition type, click on "Configure" and then change the Inductive delay either up or down to eliminate the timing change with RPM. Once you've changed the number in the Inductive Delay field, click on "USBLink". The "System" ICF will fail. Click "Send to ECU". Power down the ECU to lock change. Start engine and lock out the timing again by following the above instructions under Timing Synchronization and verify that the timing does not move with RPM. It may take multiple attempts to resolve this conflict.

Rotor Phasing:

This process is NOT needed if using any Holley EFI distributor.

Once the timing has been synchronized we will need to rotor phase the distributor. Turn off the engine and rotate the engine by hand to the timing mark used at peak torque on cylinder #1. (Naturally aspirated applications can use a value between 25 to 30 degrees.) Then make a mark on

the body of the distributor that coincides with the #1 terminal of the cap. Remove the cap. The rotor should be pointing at the #1 mark on the body of the distributor. If it does not and you are NOT using a crank trigger, install a MSD 84211 adjustable and adjust accordingly. If you are using a crank trigger, spin the distributor so the rotor lines up with the mark on the distributor.

4. Idle speed and IAC calibration

For this process, the engine needs to be at operating temperature.

The process starts by setting the target idle speed. While online with the ECU, click the Idle ICF icon. (shown left) Click on the "Idle Speed" tab that opens in the top left corner. Change the table at the warm coolant temperature for preferred idle speed.

Identify the "Sensors" monitor bottom left. Arrow over to the right to the "Idle Tuning" monitor. In this monitor you will find the "IAC Position" line. Start the engine, verify you are online with the ECU and adjust the throttle stop screw until the IAC position is between 10-18%. When complete, recalibrate the TPS sensor.

Fuel injector data for Bosche EV6 injectors

This is a non-sequential EFI system. The charts below show the “off” times for the various injectors. Setting the off-time moderates the injector pulses for a smoother fuel flow, but it is not mandatory.

With the Holley Terminator X ECU, you have the option of selecting Untimed Sequential firing of the injectors, but the hand-held device does not have a drop-down menu for you to insert this data.

A convenient feature of the Terminator X controller is that it allows you to plug-in a laptop if you wish to insert this information. Below is a chart of the off-times.

The data sheet in your instruction packet will tell you which injectors are installed in your EFI system.

43 PSI: Flow: 43.1 lb/hr

8.0	8.8	9.6	10.4	11.2	12.0	12.8	13.6	14.4	15.2	16.0	16.8	17.6	18.4	19.2	20
1.76	1.51	1.29	1.10	0.96	0.84	0.74	0.64	0.56	0.48	0.43	0.37	0.31	0.27	0.22	0.17
7577	4766	1978	8188	5712	785	2279	543	2514	9395	3252	5273	8807	0452	1298	8001

60 PSI: Flow: 49.9 lb/hr

8.0	8.8	9.6	10.4	11.2	12.0	12.8	13.6	14.4	15.2	16.0	16.8	17.6	18.4	19.2	20
1.99	1.70	1.45	1.25	1.08	0.94	0.83	0.73	0.64	0.56	0.49	0.43	0.37	0.32	0.27	0.22
7433	6253	9089	4257	6145	714	5627	6807	3772	7196	505	0145	3999	524	3059	8436

SYSTEM PARAM

ECU Configuration

Engine Parameters

Ignition Parameters

Dwell Time

Sensor Scaling/Warnings

Basic I/O

Closed Loop/Learn

DI Target Fuel Pressure

Injector Phasing

Individual Cylinder

Inputs/Outputs

Colors have been altered so as not to bleed all your black ink from your printer. This will usually have an entirely black background.

E

Sensors

RPM 0

TPS 0%

MAP 0 kPa

MAT 0°F

CTS 0°F

Baro 0.0 kPa

Battery 0.0 Volts

Oil Pressure 0 psi

Fuel Pressure 0 psi

IAC Position 0%

Fuel Pump Prime 5.0 sec

Actual System Pressure 60.0 psi

Total System Fuel Flow 399.2 lb/hr

Enable Injector End Angle Table

Injector End Angle -90.0°

FUEL INJECTOR INFORMATION

Injectors Custom

Rated Flow per Injector 49.9 lb/hr

Rated Injector Pressure 60.0 psi

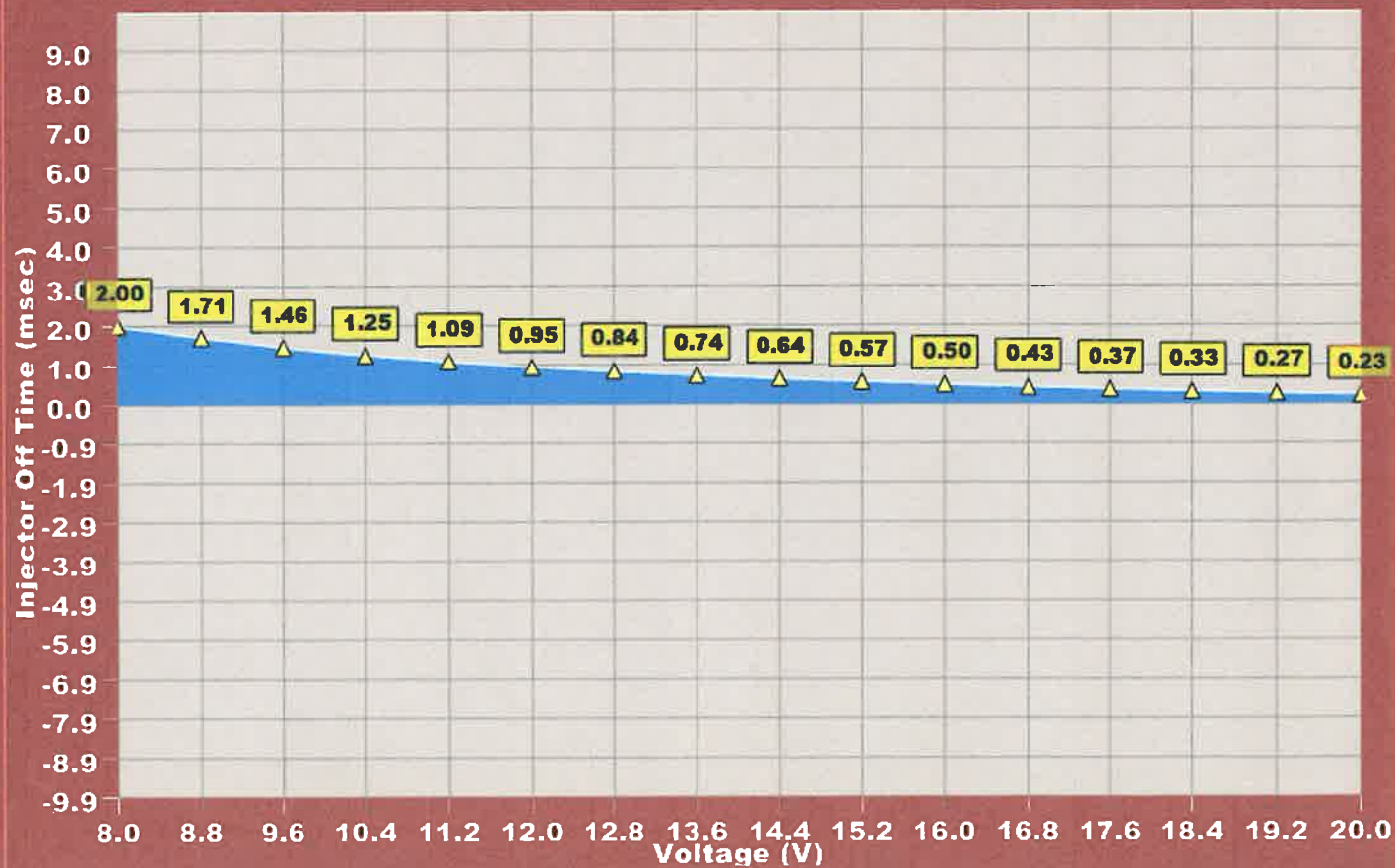
Injection Strategy

Min Injector Opening Time 1.00 msec

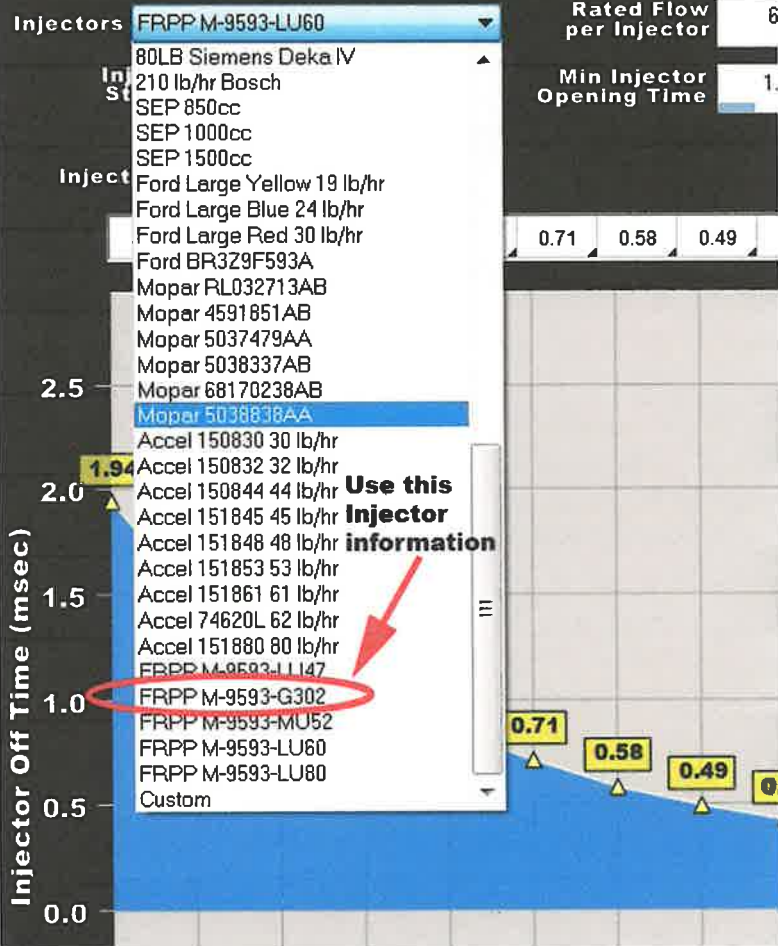
Total Injector Flow 49.9 lb/hr

Injector Off Time

2.00 1.71 1.46 1.25 1.09 0.95 0.84 0.74 0.64 0.57 0.50 0.43 0.37 0.33 0.27 0.23



FUEL INJECTOR INFORMATION



Part numbers and applications for intake sensors

In the event you need a replacement part or require the following information for any other reason, these are the sensors installed in your intake manifold:

TPS – Weber type throttle body: Walker #200-91062

TPS – Conventional-style throttle body: ACDELCO #213-912.

The Idle Air Control is used in two versions. One is a direct-mount, and the other is a “remote” type mounted on a threaded base:

Direct mount IAC (mounted with two screws) - We purchase these from a number of sources made by various manufacturers but they are all variants of the Holley 543-105. You can use that as value.

“Remote” type IAC: Typically fixed to the manifold with a 3/8NPT pipe nipple; sometimes it sits horizontally, and sometimes vertically. If you have a K&N breather on your manifold, then you have this type of IAC. Use AC Delco part number #25527077

GM / 1-bar MAP sensor direct-fit OE replacement: Delphi #PS10000

Applications:

2006 6.0L Corvette LS2

2011-1995 Buick, Cadillac, Chevrolet, GMC, Hummer, Isuzu, Oldsmobile, Pontiac, Saab, Saturn;
88(3.8L), 9-7x(5.3L, 6.0L), 98(3.8L), Ascender(5.3L), Astro(4.3L), Aurora(3.5L, 4.0L), Avalanche
1500(5.3L),
Avalanche2500(8.1L), Avalanche(5.3L, 6.0L), Blazer(4.3L), Bonneville(3.8L, 4.6L), Bravada(4.3L), C150
0 Suburban(5.7L), C1500(4.3L, 5.0L, 5.7L), C2500
Suburban(5.7L, 7.4L), C2500(5.0L, 5.7L, 7.4L), C3500(5.7L, 7.4L), C3500HD(8.1L), Camaro(3.8L), Cavali
er(2.2L), Cobalt(2.0L), Cutlass Supreme(3.4L), DeVille (4.6L), DTS(4.6L), Eldorado(4.6L), Envoy
XL(5.3L), Envoy XUV(5.3L), Envoy(5.3L), Escalade ESV(6.0L, 6.2L),
Escalade EXT(6.0L, 6.2L), Escalade(5.3L, 5.7L, 6.0L, 6.2L), Express 1500(4.3L, 5.0L, 5.3L, 5.7L), Express
2500(4.3L, 4.8L, 5.0L, 5.3L, 5.7L, 6.0L), Express 3500(4.8L, 5.7L, 6.0L, 7.4L, 8.1L), Firebird(3.8L), Grand
Prix(3.4L, 3.8L), H2(6.0L, 6.2L), H3(5.3L), Hombre(4.3L), Impala(3.8L), Intrigue(3.5L, 3.8L), Ion(2.0L), Jim
my(4.3L), K1500 Suburban(5.7L), K1500(4.3L, 5.0L, 5.7L), K2500
Suburban(5.7L, 7.4L), K2500(5.0L, 5.7L, 7.4L), K3500(5.7L, 7.4L), LaCrosse(3.8L), LeSabre(3.8L), LSS(3
.8L), Lucerne(3.8L, 4.6L), Lumina(3.4L, 3.8L), Monte
Carlo(3.4L, 3.8L), P30(4.3L, 5.7L, 7.4L), P3500(4.3L, 5.7L, 7.4L), Park
Avenue(3.8L), Rainier(5.3L), Regal(3.8L), Regency(3.8L), Riviera(3.8L), S10(4.3L), Safari(4.3L), Savana
1500(4.3L, 5.0L, 5.3L, 5.7L), Savana 2500(4.3L, 4.8L, 5.0L, 5.3L, 5.7L, 6.0L), Savana
3500(4.8L, 5.7L, 6.0L, 7.4L, 8.1L), Seville(4.6L), Sierra 1500 Classic(4.3L, 4.8L, 5.3L, 6.0L), Sierra 1500
HD Classic(6.0L), Sierra 1500 HD(6.0L), Sierra 1500(4.3L, 4.8L, 5.3L, 6.0L, 6.2L), Sierra 2500 HD

Classic(6.0L,8.1L),Sierra 2500 HD(6.0L,6.6L,8.1L),Sierra 2500(5.3L,6.0L),Sierra 3500
Classic(6.0L,8.1L),Sierra 3500 HD(6.0L),Sierra 3500(6.0L,6.6L,8.1L),Silverado 1500
Classic(4.3L,4.8L,5.3L,6.0L),Silverado 1500 HD Classic(6.0L),Silverado 1500 HD(6.0L),Silverado

MAP applications, cont'd.

1500(4.3L,4.8L,5.3L,6.0L),Silverado 2500 HD Classic(6.0L,8.1L),Silverado 2500
HD(6.0L,6.6L,8.1L),Silverado 2500(5.3L,6.0L),Silverado 3500 Classic(6.0L,8.1L),Silverado 3500
HD(6.0L),Silverado 3500(6.0L,6.6L,8.1L),Sonoma(4.3L),SRX(4.6L),SSR(5.3L,6.0L),STS(4.

GM "Direct-mount" type IAC motor OE replacement:

Cadillac Fleetwood 1994, Chevrolet C1500 1993-1990, C2500 1991, C2500 Suburban 1994-1992,
C3500 1994-1988, Camaro 1994, Caprice 1994, Corvette 1994, G30 1994-1988, Impala 1994,
K3500 1994-1992, P30 1994-1990, GMC K2500 1994-1991, K3500 1994-1988, Pontiac Firebird
1994

Informative videos

It's a little cumbersome to hand-type these videos into your computer, but you may find these videos (produced by Holley and MSD) to be informative and useful if they apply to your installation.

If you email me, I will send this page to you by email so you can click on the live links on your computer. –Jim

How to download Holley's Firmware update for the Terminator X:

https://www.youtube.com/results?search_query=download+holley+efi+firmware+update

HOLLEY VIDEO:

How to Install a Holley Terminator X Max ECU on a Ford Coyote Engine

<https://www.youtube.com/watch?v=XfJP7TgDQUs>

MSD VIDEO:

How to Use MSD's Ignition Tester

<https://www.youtube.com/watch?v=l7Ale6zkJ9M>

MSD VIDEO:

How Ignition Timing Works: Vacuum and Mechanical Advance Explained

<https://www.youtube.com/watch?v=msHlcjrnjV0>

