



Attitude



71013003-RHKR (1 valve) 71013001-RHKR (2 valves) Universal Exhaust Valve & Controller Installation and User Manual

The *Attitude* exhaust valve controller (EVC) was designed to be a fully programmable exhaust valve control system. Designed to be universal in application and adaptable to just about any vehicle. The 71013001-RHKR/71013003-RHKR universal exhaust valve control kits allow the user to transform the vehicle's one dimensional exhaust system in to a fully programmable Multi-Mode Exhaust System capable of much more than making your exhaust louder. The *Attitude* EVC is capable of fully load based active valve positioning, making it possible to have the street ability of a quiet exhaust to a Race Ready fully open exhaust and every position in between without ever touching a switch or FOB. No other exhaust valve system can come close to the adaptability of functionality of the *Attitude* EVC.

Introduction & System Requirements

Congratulations on your purchase of the ~~Atitade~~ Exhaust Valve and Controller kit. This kit is intended to provide the user with a fully programmable and dynamically active exhaust control system that will enable the vehicle's exhaust system to be transformed from an antiquated one dimensional experience to an active exhaust management system that will allow the exhaust to become an integrated part of the vehicle's engine management system. This system allows the user to tune the exhaust to not just change the sound, but to continuously manage the exhaust velocity at any RPM, throttle position, or load. Active exhaust management can help create an exhaust profile unique to your engine combination that will help produce power and torque that a straight through one dimensional exhaust simply can't.

This manual is intended to provide the user with a basic understanding of the ~~Atitade~~ exhaust valve controller kit and the intended uses for this system. If the guidelines of this manual are followed, you will find this system is very easy to install and will provide you with a wide range of tuning options for your vehicle's exhaust system and enhance your driving experience. Please read through the entire manual before attempting to install this system, failure to follow the instructions or attempting to use this product for purposes other than it was intended will result in wasted time and damaged parts.

VEHICLE REQUIREMENTS

- 12 Volt DC electrical system
- 1-12 cylinders
- TPS Signal – Throttle Position Sensor (0-5 or 5-0 volt output signal)
- RPM signal (OBDII connection, coil -, MSD BOX tach out, HEI tach out, etc.)
- Manifold vacuum source
- Full Exhaust System (60" from a header collector or catalytic converter to the valve location recommended)

WELDING AND FABRICATION REQUIRED!

This is "NOT" a bolt-on installation and requires the fabrication and welding of exhaust system components. Please refer to the valve installation instructions for detailed information.

Tools Required	
Tape Measure	1" Step Drill
#2 Phillips Screw Driver	Welder
Medium Blade Screw Driver	Cut Off Saw
Wire Cutters	Vehicle Electrical Schematic
Wire Strippers	Electric Drill and assorted bits
Wire Connector Crimpers	Electrical Tape
Socket Set	Volt Meter

Before You Start

Take inventory of the parts and accessory pack contents, report any damaged or missing parts to Holley customer service / Technical Support 1-866-464-6553

Parts List			Accessory Pack Contents:		
Qty	P/N	Description	Qty	P/N	Description
2	504R20A	Valve Assembly	1	199R11241	User Manual
1	200R630A	EVC Controller	1	599R116	Tool Box Sticker
1	200R631A	3.5" LCD	6	217R4	Cable Ties
1	271R1161A	Wiring Harness Assembly	2	204R679	3/8" Ring Terminal
1	271R1163A	OBDII Cable	2	204R680	1/4" Ring Terminal
			2	204R681	Butt Splice
			2	204R682	Heat Shrink Sleeve
			2	53R290	1" Grommet

Installation of your *Attitude* Exhaust Valves and Controller Kit

EXHAUST VALVE INSTALLATION

Proper placement and installation of the exhaust valves is critical to the performance of the entire system and also to prevent damage to the exhaust valves and the vehicle's engine or exhaust system. Use these simple guidelines and reference pictures to help with the installation process.

CAUTION: REMOVE THE ACTUATOR FROM THE VALVE BODY WHILE FABRICATION OF THE EXHAUST SYSTEM IS BEING COMPLETED AND NO ADDITIONAL WELDING OPERATIONS ARE NEEDED. Refer to exhaust valve precautions and assembly.

Selecting the Best Location for the Valve Assemblies

In order for the system to work correctly, there has to be 2 exhaust paths through the muffler and the valve has to be able to control the direction the exhaust passes through those path ways. If a dual path Muffler is not practical or available, then a bypass tube can be fabricated around the muffler and controlled by the exhaust valve. See the photos provided for examples of dual path muffler installations with the valves installed in the primary exhaust flow path. The valve should control the unrestricted and un-muffled (if desired) flow path. The secondary flow path should be the restricted and muffled flow path in most cases. This configuration will provide the most noticeable change in sound level differential from valve open to valve closed and the highest possible flow rate and tuning options when the valve is in active mode.

Important: The valve should never be installed in the primary flow path with no bypass around the valve when closed. This could result in extreme exhaust pressures and possible heat damaging the exhaust valves, engine, or exhaust system.

NOTE: For exhaust valve durability and overall system performance, the valve should be placed as far to the rear of the exhaust as possible.

Dual Path Mufflers Explained

Figures 1, 2, & 3 show typical exhaust valve installation methods using Dual Path mufflers.

A Dual Path muffler is simply a Muffler with 2 separate pathways through the muffler for the exhaust to travel, the primary pathway will be unrestricted and in most cases un-muffled and become progressively louder as the valve opens, the valve assembly will be installed at the outlet of this pathway to allow control of the exhaust flow direction when the valve is active (**Figures 1, 2, & 3**). The secondary flow path is typically the smaller and more restrictive muffled pathway through the system, when the valve is closed the exhaust is forced to travel the secondary pathway and will become progressively quieter as the valve closes. **Figure 1** shows an external feed for the secondary pathway. **Figures 2 & 3** show an internal feed for the secondary pathway and re-enters the tailpipe externally. Both accomplish the same result. **Figure 4** shows a simple side exit "Cut Out" installation where the secondary flow path is controlled by the valve.

CAUTION: NEVER ALLOW THE EXHAUST SYSTEM TO EXIT UNDER THE VEHICLE. ALWAYS EXIT THE EXHAUST TO THE SIDE OR REAR OF THE VEHICLE WITH A TAILPIPE.

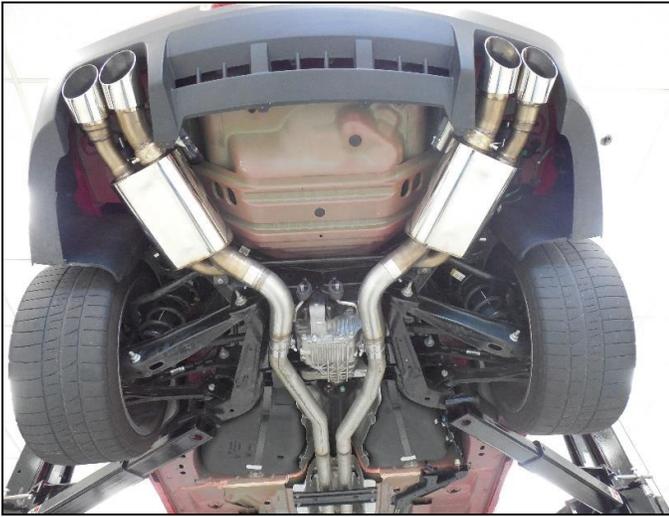


Figure 1 – Quad tip rear mount installation



Figure 2 – Dual tip rear mount installation



Figure 3 – Mid mount install w/ tailpipes



Figure 4 – Side exit secondary cut out

EXHAUST VALVE ACTUATOR DISASSEMBLY

- Remove the (x3) 8mm nuts securing the actuator to the valve body flange.
- Remove the actuator from the flange.
- Do not lose the drive spring coupler.

Important: Do not use the valve assembly as a ground path when welding – the bushings and shaft can be damaged.

Installing the Actuator AFTER Welding is Complete

- Return the valve blade to the open position.
- Install the spring coupler on to the actuator drive as shown in **Figure 5**.
- Align the spring coupler with the receiver groove in the drive hub of the valve assembly (**Figures 6 & 7**).
- Place the actuator over the studs on the mounting plate.
- Be sure the wire seats into the groove on the hub and install the 8mm nuts (**Figure 8**).



Figure 5



Figure 6

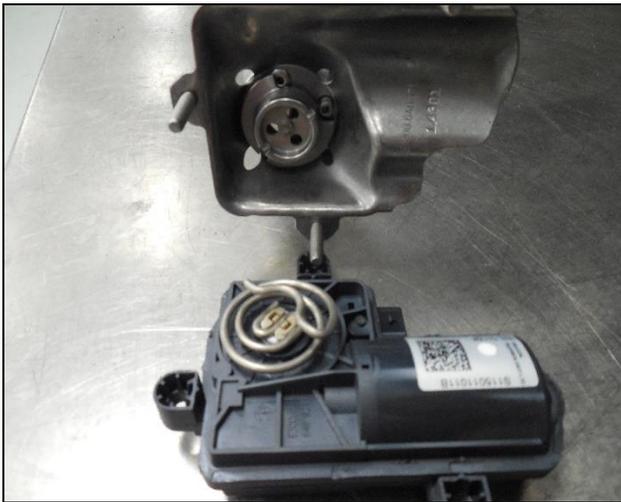


Figure 7



Figure 8

INSTALLATION OF THE CONTROLLER

The installation of the controller and wiring harness is not complicated or difficult, but does require a basic understanding of the vehicle's electrical system and a few specific tools to do the job correctly. If you are not comfortable with splicing wires or lack the tools to complete the job correctly, please allow a professional to install your Attitude exhaust valve controller.

Getting Started

Identify the type of inputs you will need to allow the **P/N 71013001-RHKR/71013003-RHKR** EVC Controller to operate correctly. Holley's engineers have designed the EVC controller to accept a variety of inputs that will allow the controller to function properly with a wide range of vehicles. Best results and ease of tuning are achieved with the EVC controller set up to use RPM and Throttle Position (TPS) as the load inputs. Understanding that not all vehicles use a throttle position sensor (carbureted engines for example). The EVC Controller has been equipped with a MAP sensor (Manifold Air Pressure) that can be used as an option to throttle position.

Supported inputs

- OBDII – RPM and TPS (1996-2017 MY Vehicles)
- Analogue RPM (Coil (-), C/D box -Tach output, HEI distributor-Tach output, Standalone EFI Tach output)
- Analogue TPS signal (0-5 volt or 5-0 Volt signal from sensor)
- MAP (Manifold vacuum signal from engine directly to MAP sensor on EVC controller)
- Holley EFI or Sniper CAN Bus (aux inputs harness P/N 71013005-RHKR required)

OBDII

Most 1996 and newer vehicles produced for the USA have a 16 pin OBDII diagnostic connector that will supply an RPM signal (engine speed) and a TPS signal (Throttle Position) to the EVC controller. This connector is located under the driver's side dash on most vehicles (**Figure 9**). Refer to your owner's manual for exact location. If your vehicle is pre 1996 and does not have an OBDII diagnostic port, it will be necessary to use the analog inputs and accessory harness **P/N 71013002-RHKR available at www.holley.com or calling technical support @ 1-866-464-6553.**

NOTE: Some OBDII protocols up to 2008 may be unable to provide adequate RPM and TPS sample rates for the EVC controller to accurately control the valve position. If the valve action seems to hesitate or fall behind the mapping table, it may be necessary to use analog inputs for RPM and TPS signals.



Figure 9 – OBDII Connector

FUSED POWER HARNESS – CONNECTOR CN12 /CN14

It will be necessary to locate clean power and ground sources that meet the following requirements for use later in the installation

12 Volt Switched Power - CN12/CN14

- Locate an uninterrupted switched power source that has power with the key in the Run and Start positions.
- Taken from a minimum 15 amp fused source
- Do not use the ignition coil or starter solenoid.

Clean Ground – CN12

- Directly to the negative terminal of the battery is recommended
- Optional - Bolted to the chassis with a dedicated threaded stud (only if chassis has a clean battery ground) and is free of paint, grease, or dirt.

Plan Your Wiring Layout

The EVC wire harness is a universal harness intended to accommodate a wide range of applications. It is good practice to mock install the controller and harnesses to be sure the intended routing does not have any unexpected issues. Plan the placement of the 3.5" LCD, so it can be easily accessed and not interfere with the safe operation of the vehicle.

NOTE: The 3.5" LCD fits nicely into a standard Cell Phone windshield mount.

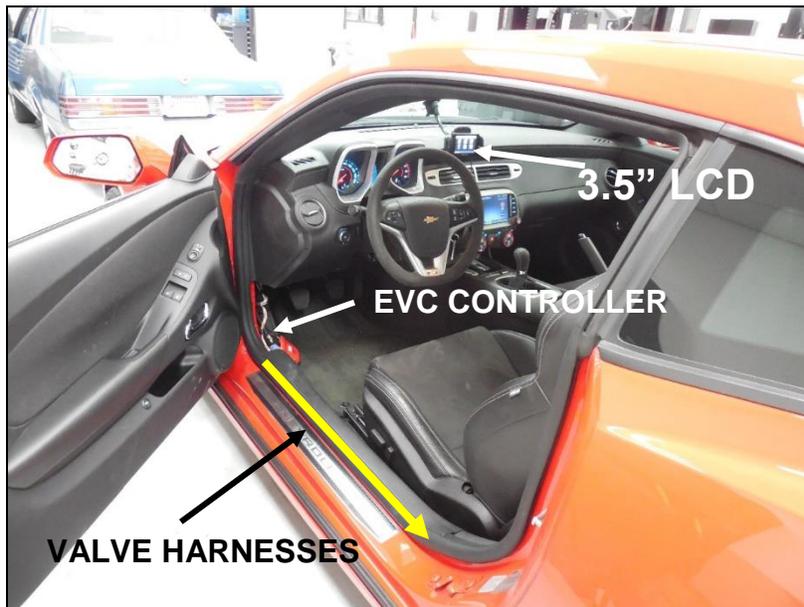


Figure 10 – Basic EVC Component layout

Beginning the Installation of the Control System

Mount the Control Unit

- Mount the Control unit in the location you selected during the mockup layout.

Important: Be sure the controller and harnesses are secure and out of the way of controls and moving parts that could interfere with the safe operation of the vehicle or rub through the harness and create short circuit.

Install the Harness

Note: Refer to *Attach* wiring harness overview for wire harness connector identification

- Plug the main wiring harness connector CN1 into the 18 pin connector on the EVC control unit (**Fig. 11**).
- Plug the (x2) 4 pin valve harnesses connectors CN5/CN8 into the main wire harness connectors CN4/CN7.
- Route the valve harness to the valve location under the carpet and away from moving parts and pinch points.
- Use existing pass through holes (if available) in the rear of the car to run the harnesses through the floor to the valves (**Fig. 12**). If no holes are available you will have to drill a hole and use a filler grommet to protect the harness. **NOTE:** Check the area under the floor where the drill will come through to be sure there is nothing that will be damaged by the drill bit.
- Plug the harness connector CN6/CN9 into the valve actuators
- Route the harness for the 3.5" LCD to the location the LCD will be mounted. Plug in the connector CN2 to the mating connector on the LCD harness (**Fig. 13**).

NOTE: The connector on the LCD Harness is double ended and will accept the CN2 connector and function correctly in either slot.

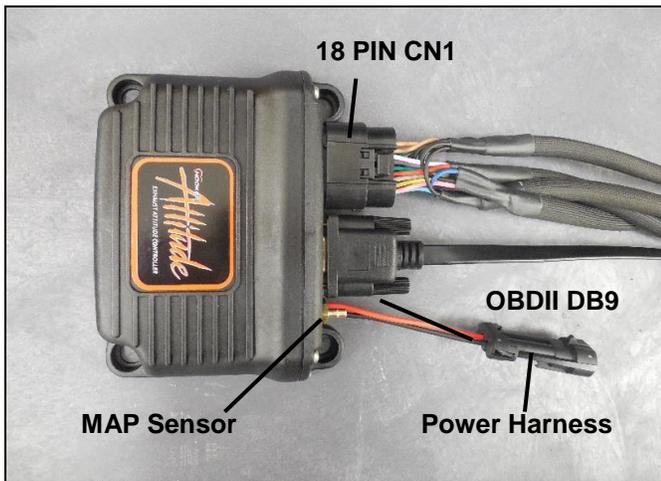


Figure 11



Figure 12

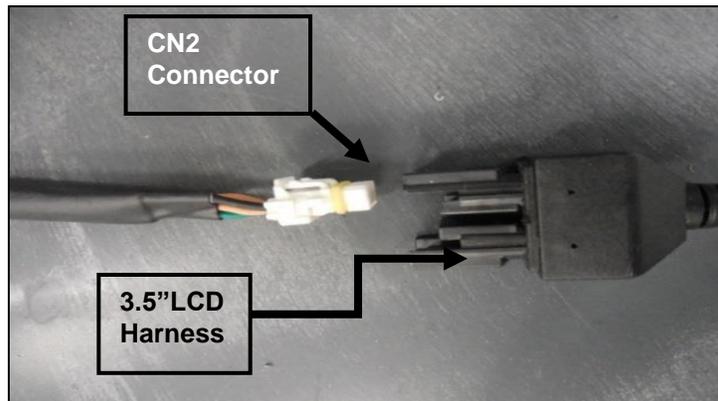


Figure 13

Disconnect battery before making any electrical connections to the vehicle.

- Plug the fused power harness connector CN12 into the short power harness from the controller (Fig. 11).
- Route the harness to the location previously located for 12 Volt switched power.
- Plug the Single red fused power wire connector CN14 into the main wiring harness single connector CN13. Connect to (15 amp minimum) uninterrupted 12V switched power source located earlier.
- Be sure the power source has 12 volts with the key in the run position as well as when in the start position.
- Connect the RED wire from connector CN12/CN14 to the 15 amp fused and switched power source located earlier.
- Connect the BLACK wire from connector CN12 to the negative (-) terminal of the battery using the supplied ring terminal (use the alternate grounding source only if the battery is not a practical option). A clean dedicated ground is critical to problem free operation of any electrical component and this one is no exception.

NOTE: Refer to the wire splicing illustrations page for acceptable splicing techniques (and a few unacceptable).

Load inputs

OBDII – for 1996 -2017 Model Year Vehicles

Analogue Inputs – for pre 1996 vehicles that are not equipped with an OBDII diagnostic system

Auxiliary Inputs – CAN bus from Holley EFI or Sniper (aux input harness P/N 71013005-RHKR)

Using the OBDII Connection

If your vehicle is a 1996 to 2017 model year, you will have a 16 pin OBDII Diagnostic port that can be used for the RPM and Throttle Position Sensor (TPS) signal (Fig. 14-15).

- Plug the DB9 connector of the OBDII harness into the controller as shown in Fig. 11.
- Plug the 16 pin male OBDII connector (HOOKER Logo) into the 16 pin OBD port on the vehicle (Fig. 14-15).

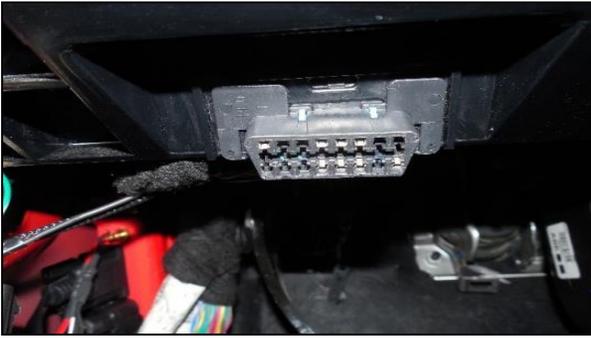


Figure 14



Figure 15

Using analogue inputs for RPM and TPS signals

If your vehicle was manufactured prior to 1996, it is not equipped with an OBDII Diagnostic port or you have chosen to use analogue inputs for another reason. Please follow the steps listed below for proper connection through the accessory harness (P/N 71013002-RHKR).

Accessory Harness Connector CN 11

Tach signal input

Tach IN (engine rpm) – Yellow wire Pin H Figure 16

Choose the Tach signal source best suited to your application

- COIL (-) Connection (Fig. 17)
- GM style HEI Distributor – Tach output connection (Fig. 18)
- C/D Ignition Box Tach output (MSD 6AL shown - Fig. 19)
- Tach Output on most aftermarket standalone EFI systems

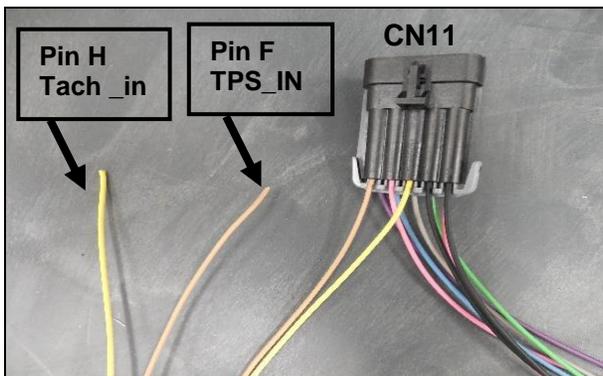


Figure 16

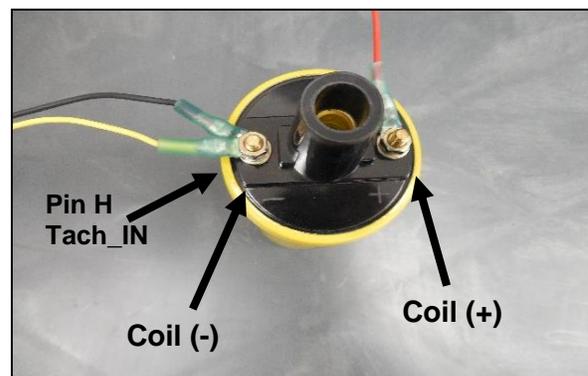


Figure 17 – Conventional 12v Coil

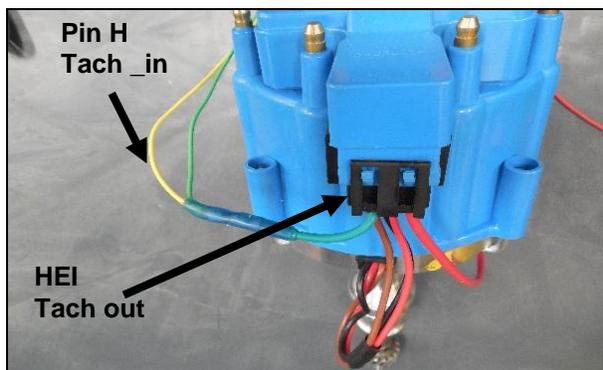


Figure 18 – GM HEI Style distributor

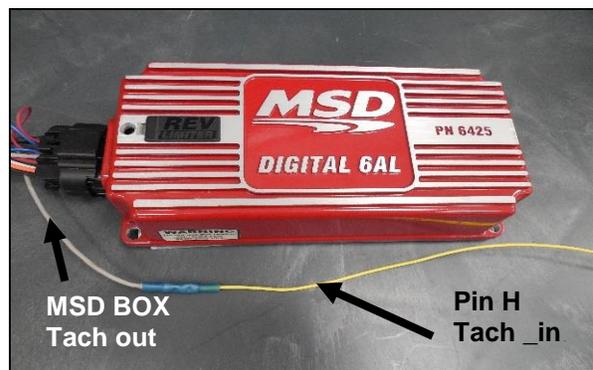


Figure 19 – C/D BOX (MSD 6AL Shown)

TPS Signal Input (Throttle Position Sensor)

The ~~Attitude~~ EVC controller will accept either 0-5 volt or 5-0 volt TPS signal input, the Controller is pre configured for the more commonly used 0-5 Volt TPS sensors. If your vehicle uses a 5-0 volt type sensor you will have to select 5-0 Volt in the TPS set up screen after installation is complete, This will be covered during the initial set up phase of the installation.

TPS_IN (throttle position sensor) - Tan wire Pin F Figure 16

- **0-5 volt**
- **5-0 volt**

Locate the TPS sensor on the side of the throttle body. It is usually located on the opposite side of the throttle body as the throttle cable on the primary throttle shaft. See **Fig. 20**. Follow the steps below to verify the TPS signal wire using a digital volt meter.

- Consult your service manual to locate the TPS signal wire in the sensor harness.
- Turn the ignition to the ON position (DO NOT START THE ENGINE).
- Connect the Positive lead of the volt meter to the wire at the TPS connector (the connector must be plugged in to the sensor).
- The voltage will increase from 0-5 volts or decrease from 5-0 volts (depending on the sensor type) when the throttle pedal is depressed from closed to wide open position (**key on /engine off**).

Connect the TAN wire from the accessory harness connector CN11 to the TPS signal out wire (**Fig. 20**).

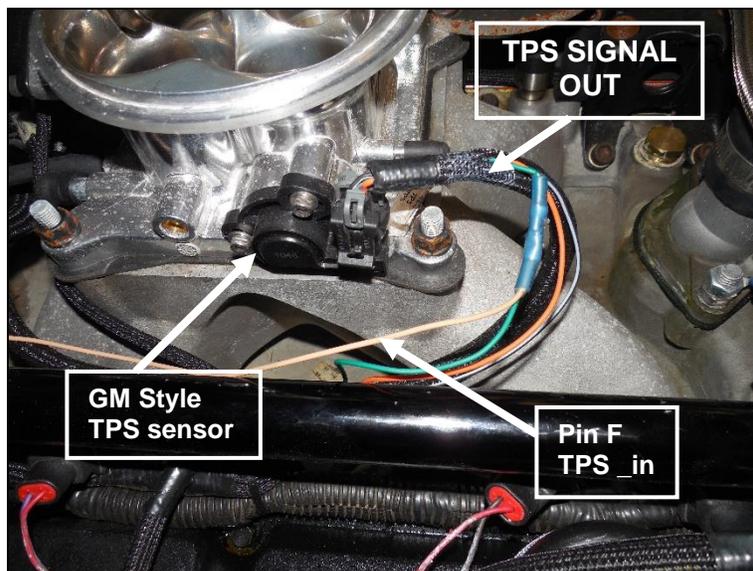


Figure 20

Using Holley EFI OR Sniper CAN Bus for RPM and TPS inputs

RPM and TPS signals can be found at the CAN harness from the Holley EFI or SNIPER standalone fuel management systems. This is the small 4 pin connector used to connect the 3.5" LCD screen used with the Holley Dominator or SNIPER EFI. Using the Auxiliary inputs harness P/N 71013005-RHKR RPM and TPS signals can be sent to the Attitude EVC Controller directly through the DB9 port on the EVC Controller.

Connecting the Auxiliary inputs harness

- Locate the 4 pin CAN connector from Holley EFI or SNIPER harness
- Connect the Auxiliary inputs harness P/N 71013005-RHKR into the CAN harness and the 3.5" LCD into the mating connector on the Auxiliary harness (if used)
- Connect the female DB9 connector from the Auxiliary harness to the OBDII DB9 connector on the EVC Controller.

Setting up the Controller for Auxiliary input harness

- Select System from the home screen
- Select Local Setup
- Select Setup Options
- Choose Holley EFI type **HP/Dominator** or **SNIPER**
- Verify TPS and RPM Activity on the gauge screen

ATTENTION! Choosing HP/Dominator or Sniper when using the OEM OBDII connection may result in vehicle not starting!

MAP Sensor Input (Manifold Air Pressure)

The ~~Attitude~~ EVC controller is equipped with a 0-1bar MAP sensor and can be used for the primary load input if the vehicle does not have a Throttle Position Sensor. If you are using the MAP sensor, then you are most likely also using the analogue RPM signal input through the accessory harness as well. Accessory harness kit P/N 71013002-RHKKR includes a vacuum tee and 8 ft. of vacuum hose to make the connection from the engine's manifold vacuum source to the MAP sensor on the EVC Controller. Follow the steps below for the installation of the vacuum line to the EVC controller.

NOTE: It will be necessary to configure the EVC controller for MAP input. This will be covered in the initial set up instructions.

Installing the MAP Sensor Vacuum Line

The MAP sensor requires a direct vacuum source from the intake manifold that is not controlled by the throttle blades. Most throttle bodies or carburetor base plates will have vacuum fittings that can be used for the MAP sensor vacuum source.

NOTE: Do not tap into the brake booster vacuum line.

- Locate a direct manifold vacuum source.
- Connect the 1/8th inch vacuum hose directly (or using the reducer tee provided) to the vacuum source (**Fig. 21**).
- Route the vacuum line away from moving parts or potential heat sources to the EVC controller.
- Trim off any excess vacuum line that is not needed and connect the vacuum line to the brass hose barb on the EVC controller (**Fig. 11**).

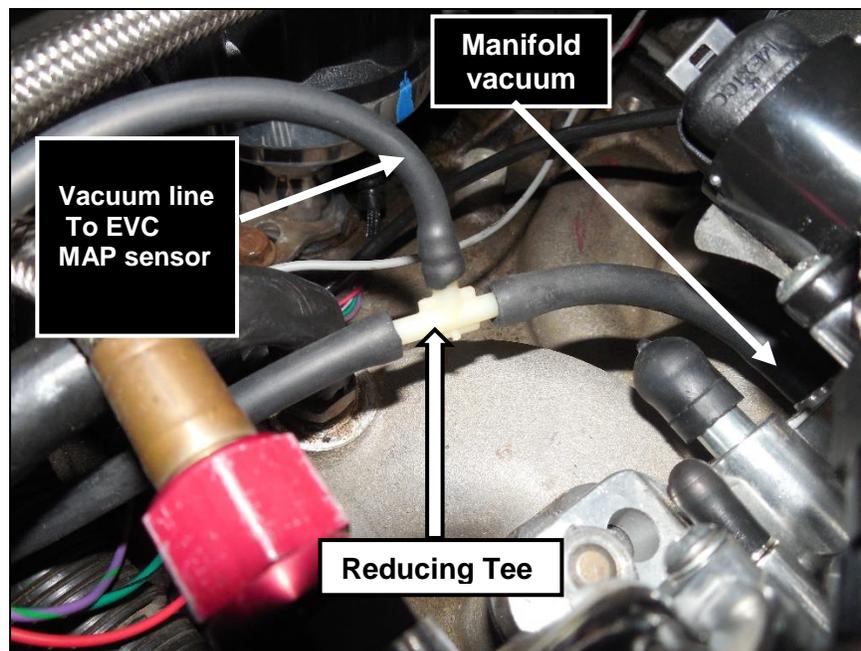


Figure 21

Initial set up of the *Attitude* ECV Control unit

Quick check list

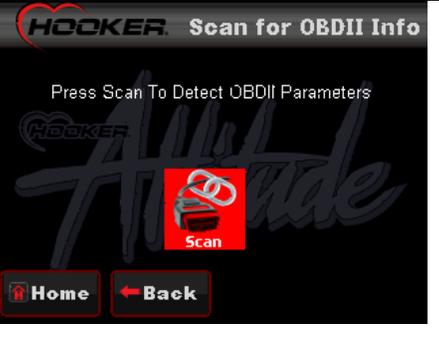
- Main harness CN1 plugged in to controller
- Power harness CN12 plugged in to controller and connected to switched power and grounded to the battery
- CN13 plugged into CN14 and connected to 12V switched power source
- Valve harness CN6/CN9 connected to valves
- 3.5" LCD harness plugged in to EVC harness connector CN2
- OBDII cable plugged in (if used)
- Accessory harness CN11 plugged into main harness CN10 (if used)
- CAN to DB9 auxiliary harness plugged in (if used) – HP/Dominator or Sniper selected in setup options
- MAP vacuum line connected to engine vacuum and the EVC MAP sensor (if used)
- Reconnect the battery

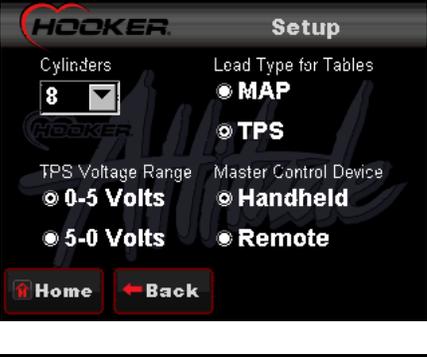
Powering up the Controller

- **Turn the Ignition to the “run” position (do not start the engine)**

The START UP screen on the LCD will illuminate and display the WARNING message

- Read and understand the WARNING message. Then, press AGREE (using your finger or the provided stylist) and the home screen will appear.

<p>STEP 1</p>		<p>Select <u>SETUP</u></p>
<p>STEP 2</p>		<p>Select <u>OBDII</u></p> <p>If this option is being used for RPM and TPS inputs (96-2017 MY vehicles only)</p> <p>Skip to <u>Startup</u> if using analogue inputs through the accessory harness</p>
<p>STEP 3</p>		<p>Select <u>SCAN</u></p> <p>A green status bar will appear and display a <u>Scan Complete</u> or <u>Scan Failed</u> message</p> <p>If <u>scan complete</u> press BACK</p> <p>If <u>Scan Failed</u> REPEAT SCAN x2</p> <p>If <u>Scan Failed</u> refer to trouble shooting page</p>

<p>STEP 4</p>		<p>Select <u>Startup</u></p> <p>Startup screen will appear</p>
<p>STEP 5</p>		<p>Press Valve % at startup bar and use the slider to set the valve position to 0 %</p> <p>Press the time bar and set to 10 seconds</p> <p>When complete press <u>BACK</u></p>
<p>STEP 6</p>		<p>Select <u>Initial</u></p> <p>Setup screen will appear</p>
<p>STEP 7</p>		<p>Select number of cylinders</p> <p>Select MAP or TPS Load input type</p> <p>Select TPS Voltage range if used</p> <p>Remote- is reserved for analog controls that can be created to work through the accessory harness as an alternative to the LCD touch screen</p> <p>When complete press HOME</p>
<p>STEP 8</p>		<p>Select <u>Active</u></p> <p>The Active Control Screen will appear</p>

STEP 9



Select Touring

The Touring Icon will highlight red

When complete press HOME

Initial set up complete!

System Checks and Basic *Attitude* Adjustment

System Checks

Congratulations! You have successfully installed your *Attitude* exhaust valves and controller. Follow a few basic steps to make sure the system is functioning properly and all the correct load inputs are selected and active.

- **Turn the Ignition to the “run” position (do not start the engine)**

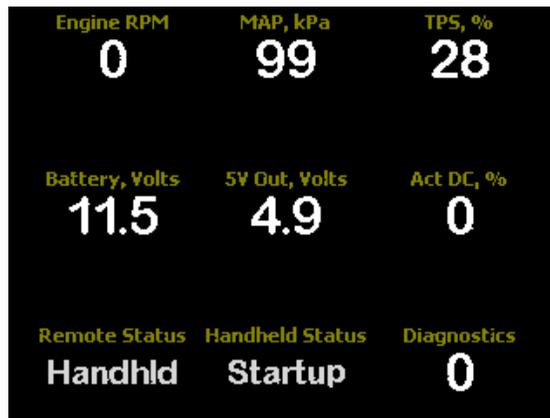
The START UP screen on the LCD will illuminate and display the WARNING message, press AGREE to continue

- When the home screen appears press Gauges –The Gauge screen will appear and display the current setup and sensor values with the **KEY ON and ENGINE OFF**

Note: TPS, MAP, and Battery values will vary depending on throttle type, altitude, and battery condition.

MAP, KPa (can be as low as 70 for very high altitude locations.)

TPS, % (can be as high as 30 for vehicles with electronic throttle bodies)



Checking Load Inputs

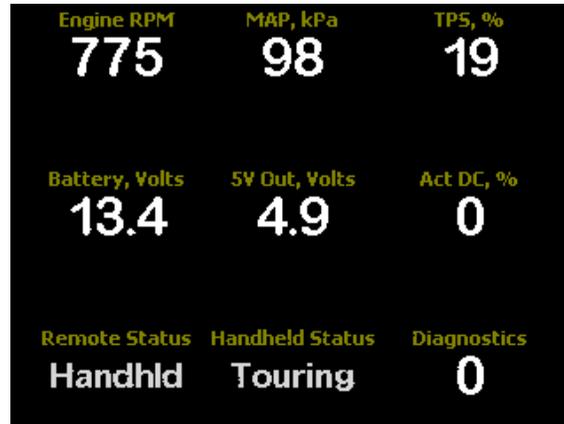
TPS - Depress the throttle slowly and release. The TPS % gauge value will rise and fall if TPS is being used as a load input and TPS is selected in the set up screen. Key ON Engine OFF

RPM - Will be at 0 with the engine off and follow engine RPM when the engine is running

MAP - MAP value with the engine off will be 70-100 KPa and follow the manifold vacuum pressure when the engine is running. The MAP value at Idol will vary with engine configuration, typical unmodified V8 engines will have values of 30-40 KPa at 750 RPM with no load (transmission in Park or Neutral). The load value will increase as the throttle is opened and the load on the engine increases. Manifold vacuum must be connected to the EVC controller MAP sensor and MAP selected as the load type in the set up screen

Checking Controller Activity

When the engine is started, the valves will be commanded to the startup position by the Controller. Handheld status will display **Startup** on the gauge screen for 10 seconds after engine startup and the valve position will be 0% (Initial set up values). After 10 seconds the startup feature will expire and the handheld status will change to **Touring** (mode selected during initial setup). The controller is now monitoring engine speed and load and will command the valve follow one of 5 modes when **Active** is selected from home screen. The valves can also be controlled manually when **Manual** is selected from the Home screen.



Checking Valve Control

Manual Valve Control

- Turn the Ignition to the “run” position (do not start the engine).

The START UP screen on the LCD will illuminate and display the WARNING message, press AGREE to continue

- Select Manual from the home screen. The Manual Control slider bar will appear.
- Slide the bar or tap the scale (using a finger or the supplied stylus) to move the valves to the desired position. Listen for the valves to change position as the slider bar moves from 0-100 %.
- Monitor the valve’s position on the gauge screen (**Act DC, %**) after each position change. The value will correspond with the scale on the slider bar.

Active Valve Control

Turn the Ignition to the “run” position and start the engine.

The START UP screen on the LCD will illuminate and display the WARNING message, press AGREE to continue

The LCD will display the Home screen and you will be able to select from any of the options displayed by touching the Icon.

- The controller will command the valves to the startup position selected in the startup menu. (0% for 10 seconds)
- Select ACTIVE, then select from one of the 5 options from the Active control screen
- **Touring** – Quietest and least aggressive valve mapping
- **Sport** – More aggressive Idol and low speed mapping with aggressive mid and high speed mapping.
- **Race** – Aggressive Idol with very aggressive mid and high speed mapping
- **Custom** – Create your own mapping strategy using the **Custom** Selection from the home screen (see tuning page).
- **Quick Mute** – Quickly closes the valves for “Quiet” operation if needed

Drive the Vehicle

Take the vehicle for a test drive. It is highly recommended to have a passenger ride along as the operator of the LCD while the vehicle is being driven. If a passenger is not available, pull over in a safe location to make changes to the system before continuing the test drive.

Have the passenger change selections and listen to the changes in sound as the valves follow the programmed mapping. Pay attention to how the valves react to a variety of different load and speed conditions in each driving mode. The design of your exhaust system will have a significant impact on the overall volume and sound quality of the exhaust system as a whole. Explore all the options – Active, Manual, and Quick Mute. You can also create your own custom mapping strategy that allows the user to tailor the valve mapping to individual taste and vehicle requirements. See **Custom Settings and Creating Mapping Tables** for details on creating custom settings and mapping strategies.

Custom Settings and Creating Mapping Tables

The  has been configured to allow the user to tailor the functionality of the system to your specific vehicle and personal taste.

You can customize the following settings:

- LCD back lighting
-  Ghost Image
- Startup Settings
- Custom 8x8 Map tables
- Custom RPM axis tables
- Custom LOAD Axis tables

Customize your

LCD backlighting

- Select the System folder from the Home screen
- Select Screen Backlighting
- Adjust slider bar to desired back light
- Exit

Ghost Image

- Select the System folder from the Home screen
- Select Local Setup
- Select Setup Options
- Choose background image option
- Exit

Startup settings

The  has a Startup function that adjusts the valve position and the duration the valves stay in that position when the engine is started. You can adjust the valve position from 0-100%, also adjust the duration (in seconds) the valves stay in that position before the start up feature expires, the valves return to the mapping position the controller was in when the engine was shut down.

Example: You prefer to drive your car in the Active Track Mode, but you want to be able to leave the house in the morning and not wake the family. If it takes you 2 minutes to get down the road to a point you want the controller to return to Active Track Mode, adjust the Startup tables to 0% and 120 seconds.

Startup Table Adjustment

- Select Setup from the Home screen
- Select Startup
- Press the Valve % at startup bar
- Use the slider to adjust from 0-100% then press Save
- Press the Length of Time bar
- Use the slider to select the length of time the valves remain at the selected position after startup then press Save
- EXIT
- On the next start up, select the gauges screen. The Act DC % Gauge will read the valve position selected and the handheld status will read Startup for the length of time selected. When the Startup time expires, the controller will return to normal operation. The handheld status will read the mode selected and the Act DC % Gauge will read the Active valve position in real time.

Creating a Custom 8X8 Mapping Table

The ~~Atwood~~ is a very adaptable product and has been preprogrammed with a range of valve mapping selections that will be acceptable for most applications. Holley engineers understand that canned options are not going to satisfy everyone. A custom mapping table was created to allow the user to create a valve mapping table that is specific to the user's vehicle and driving habits. These tables can be set up to accommodate a wide range of vehicle configurations that will require custom tuning options not available in the pre-programmed mode selections.

If you are using MAP (manifold vacuum) as your load input, you will find the custom tables particularly useful to achieve smooth valve transitions. Each vehicle's Manifold Vacuum pressure profile is unique to that vehicle for any number of reasons: engine size, camshaft, carburetor, gearing, and so on. You will be able create custom configurations using the 8x8 tables and also custom scale the RPM and load axis tables to further fine tune the table to match your vehicle's requirements.

Follow the steps below to create a custom 8x8 valve mapping table. Have fun with it! It is not complicated. Just follow the step by step instructions and guidelines and you will be enjoying a new and interactive driving experience before you know it.

Custom Mapping Tables

What type of load inputs are you using? The mapping configurations for TPS and MAP load inputs are going to be different. There are examples of both TPS tables and MAP tables provided to illustrate the difference in tuning requirements and give you a baseline to get started. The controller is pre-loaded with a typical TPS Custom MAP Table, RPM and LOAD axis tables. The best way to understand how a particular adjustment will affect the valve action is to make adjustments and drive the vehicle to evaluate the change.

NOTE: Before attempting to create or adjust any parameters in the custom tuning options, be sure the system is configured and working properly in all the pre-set Active and Manual Modes and there are no Diagnostic codes present in the gauge screen.

Caution: Monitoring the gauge screen or making adjustments to the system while driving the vehicle is dangerous and not recommended. Have a passenger monitor the 3.5" LCD and make any tuning changes to the system. Pull the vehicle over to a safe location and make changes if a passenger is not available.

Building a Mapping TABLE

The map table is divided into two Axis Plains

- X Axis = LOAD (left to right) left side of scale is low load or TPS position – right side of the scale is high load or TPS position
- Y Axis = RPM (up and down) low rpm at the top of the scale – High RPM at the bottom of the scale

The 8x8 table is 64 individual cells that represent a valve position from 0-100%. The table works as an intersection of the X and Y Axis (RPM and Load). The valve position will follow the table as the engine RPM and Load intersect at each cell continually when you drive.

MAP Table Tuning

- Select Custom From the home screen and the custom menu screen will appear (**Figure 22**)
- Select Advanced Table - RPM vs Load, the 8X8 table will appear (**Figure 23**).
- Select one of the Cells within the table and the slider bar will appear (**Figure 24**).
- Adjust the slider bar to the valve position desired and press OK, the table screen will appear with the value highlighted. Press Save to lock the value into the table (**Figure 25**).
- Continue this process until all the table cells are populated with the values you are targeting

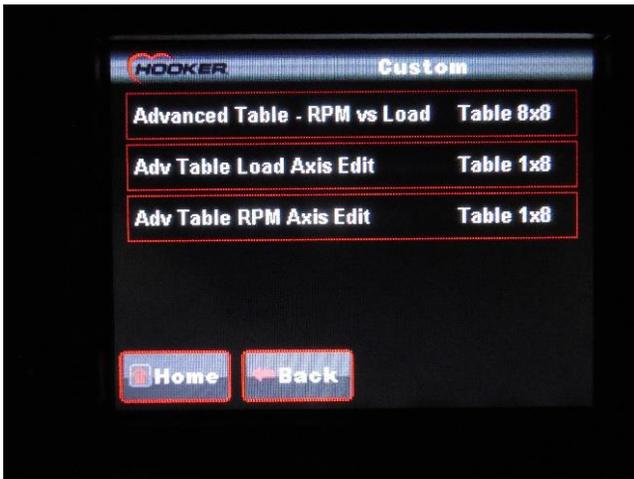


Figure 22

(Valve Position) Custom (%)

	60	67	70	73	76	79	83	90
0	0	0	0	2	4	6	8	8
1017	0	1	3	5	7	9	13	16
1928	0	2	4	11	15	14	18	31
2285	0	3	10	15	16	18	31	47
2857	3	10	13	17	22	28	36	56
3714	5	11	15	25	28	40	62	88
4071	12	14	19	29	35	56	93	100
4571	19	36	45	50	56	71	94	100

Cancel Save LOAD

Figure 23

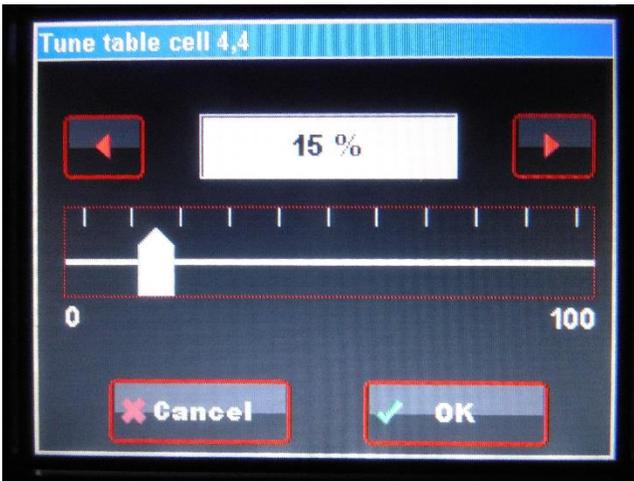


Figure 24

(Valve Position) Custom (%)

	60	67	70	73	76	79	83	90
0	0	0	0	2	4	6	8	8
1017	0	1	3	5	7	9	13	16
1928	0	2	4	11	15	14	18	31
2285	0	3	10	15	16	18	31	47
2857	3	10	13	17	22	28	36	56
3714	5	11	15	25	28	40	62	88
4071	12	14	19	29	35	56	93	100
4571	19	36	45	50	56	71	94	100

Cancel Save LOAD

Figure 25

Advanced RPM and Load Axis tuning

Advanced Axis tuning is designed to allow the user to custom scale the Load Axis and RPM Axis curves independently of one another. This is helpful when the valve mapping table needs to be configured to allow for specific engine or driving characteristics that are outside the pre-set scaling. The pre-set scaling is best suited for use when TPS is being used as the load input and the intended RPM range is 0-6000 rpm.

See the figures below for a quick reference to see the difference in Load and RPM Axis scaling when using TPS as the load input vs. MAP (Manifold Vacuum) as the load input.

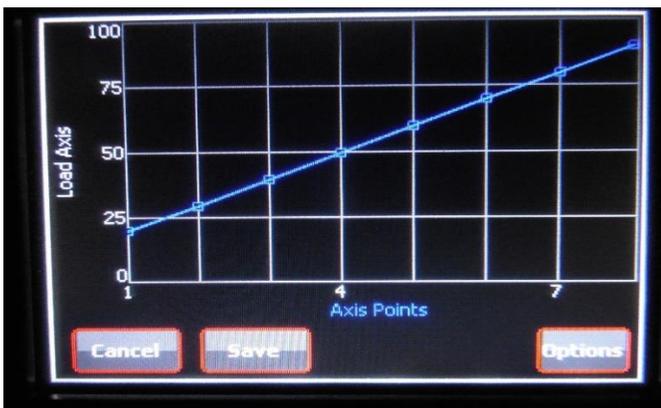


Figure 26 – TPS Load Axis Table

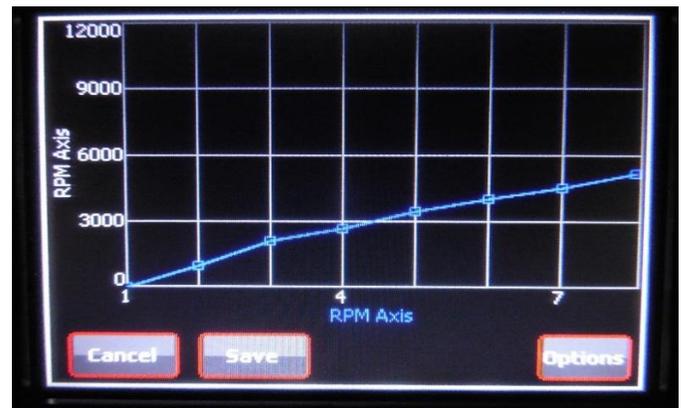


Figure 27 – TPS RPM Axis Table

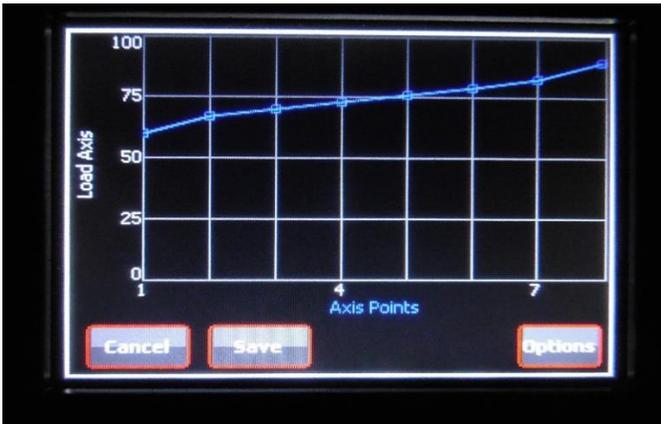


Figure 28 – MAP Load Axis Table



Figure 29 – MAP RPM Axis Table

(Valve Position) Custom (%)

	20	30	40	50	60	70	80	90
0	0	8	16	26	37	56	66	82
1000	0	12	25	34	45	64	71	82
2142	14	23	30	39	55	68	77	86
2732	20	22	31	40	59	73	85	94
3535	23	27	37	49	63	85	89	97
4071	25	29	40	56	67	84	100	100
4553	27	30	45	60	81	100	100	100
5196	30	30	51	70	90	100	100	100

LOAD

Figure 29 – TPS 8x8 Table

(Valve Position) Custom (%)

	60	67	70	73	76	79	83	90
0	0	0	0	2	4	6	8	8
1017	0	1	3	5	7	9	13	16
1928	0	2	4	11	15	14	18	31
2285	0	3	10	15	16	18	31	47
2857	3	10	13	17	22	28	36	56
3714	5	11	15	25	28	40	62	88
4071	12	14	19	29	35	56	93	100
4571	19	36	45	50	56	71	94	100

LOAD

Figure 30 – MAP 8x8 Table

Adjusting the Load axis Table

- Select -Adv Table Load Axis Edit - from the custom tuning menu, the Load Axis screen will appear (Fig. 26-28).
- Use your finger or the stylist to adjust the load axis points to the desired graph location.
- Press save to return to the menu, then press the - Advanced table – RPM vs. Load - bar to view the changes to the Table

NOTES:

- **TPS** Load scaling will generally be a wide range 20-90% when using TPS as the Load input. The scaling range is represented and should be read in % of throttle position when using TPS. This will provide a very smooth and progressive valve action (Figure 29).
- **MAP** Load Scaling will be a narrower and higher range (50-90 KPa). The Scaling range is represented and should be read as KPa (manifold pressure) when using MAP as the load input. Manifold Vacuum Reference changes very quickly and will require the load targets to be set to the higher ranges of the scale as seen in Figure 30, keeping the valve action smooth and progressive.

Adjusting the RPM axis Table

- Select - Adv Table RPM Axis Edit- from the custom tuning menu, the RPM Axis screen will appear (Fig. 29-30).
- Use your finger or the stylist to adjust the load axis points to the desired graph location.
- Press save to return to the menu, then press the - Advanced table – RPM vs. Load - bar to view the changes to the Table

NOTE:

- Keep the RPM scale within the normal operating range of the engine. If the RPM scale is too tight (1000-2000 RPM), the valves will operate full scale within that range with very little resolution. If the RPM scale is set too wide (0-12000 RPM) and the engine will only operate to 6000 RPM, the table will effectively be cut in half limiting the valve open % to the 6000 rpm intersection of the table.

Use the gauges screen to monitor TPS %, MAP KPa, RPM, and **Act DC %** (valve position) to help with the tuning process. You will be able to see the valves react to table changes and evaluate how those changes affect the exhaust performance. Use the tuning tips listed to help make the process go smoothly.

Tuning Tips

- Work in small 4 cell blocks to get started.
- Build a Rough table and then make small blending changes to fine tune the overall performance.
- Table cell changes effect the valves % of open position at a particular intersection of the table.
- Load and RPM Axis adjustments do not change the values in the table cells. They move the cells to different load or RPM ranges.
- Tune the Load and RPM Axis tables individually in small steps after the mapping tables are created.
- Save the changes as you go, any changes made will be lost if the Cancel button is selected.

Using the Load Scale at the top of the mapping table 0-90

- Read as TPS % when using TPS as the load input - corresponds to the gauge screen **TPS %**
- Read as KPa (manifold pressure) when using MAP as the load input - corresponds to the gauge screen **MAP, KPa**

Diagnostic Trouble Codes and Troubleshooting

Diagnostic Trouble Codes – displayed at bottom right corner of gauges screen

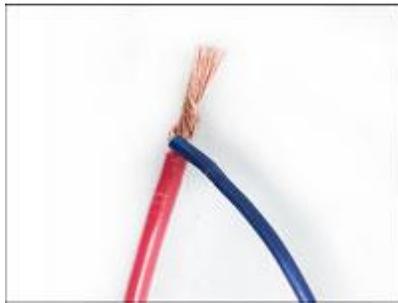
- **0** = No diagnostic trouble codes reported
- **1-4** = **System Error Reported** Contact Holley Technical Support **1-866-464-6553**

Troubleshooting

This is a quick reference for most common issues that may be encountered during the installation and tuning process

Problem	Possible Cause/Solution
3.5" LCD will not power up	<ul style="list-style-type: none"> • Main harness connector CN1 not plugged in to the Controller • No switched 12v power <ul style="list-style-type: none"> Verify switched 12volt power source Check connector CN12 Check fuse at CN12 • No ground or poor ground connection • Harness connector CN1 not connected to 3.5" LCD power harness (Figure13)
3.5" LCD powers up but the valves are not responding	<ul style="list-style-type: none"> • No 12 volt battery power <ul style="list-style-type: none"> Verify 12volt battery power source Check connector CN13 Check Fuse at connector CN13 • Valve harness connection CN6/CN9 not connected to valves • NO RPM input • Check manual operation of valves after key off /key on cycle • Check for diagnostic codes in Gauge screen
Valves cycle open then closed after the engine starts	<ul style="list-style-type: none"> • Switched 12 volt power cuts off during cranking and returns after engine starts • 12v battery power connection CN13 is connected to switched 12 volt power source
Valves open with a 0% TPS reading and closed with 100% TPS reading	<ul style="list-style-type: none"> • TPS voltage range incorrect in the setup menu
Valves not following the load mapping tables with TPS load input	<ul style="list-style-type: none"> • No TPS signal input • MAP selected as load input in set up menu
Valves not following the load mapping tables with MAP load input	<ul style="list-style-type: none"> • No MAP signal input • TPS selected as load input in set up menu
MAP vacuum signal lost with closed throttle (70-100 KPa at idol)	<ul style="list-style-type: none"> • Vacuum source is not connected to direct manifold vacuum
Valve is open on startup then closes to follow Startup Table - System functions normal after Startup Table expires.	<ul style="list-style-type: none"> • Valve position was open when the engine was shutdown. • Vehicle has delayed switched power activation • Allow 3.5"LCD to power up before engine start.
Manual valve position returns to zero at start up	<ul style="list-style-type: none"> • Normal operation
Very slow or erratic valve response when using OBDII inputs	<ul style="list-style-type: none"> • Early OBDII with slow data transfer rate Change to analog inputs with accessory harness
OBDII scan failed	<ul style="list-style-type: none"> • OBDII cable not connected • OBDII protocol not supported (use analog inputs) • Data rate too slow (use analog inputs)
Vehicle will not start (crank) when the EVC controller is connected to the OBDII connector	<ul style="list-style-type: none"> • OEM ECU is not selected in the setup options screen. <ul style="list-style-type: none"> Select system folder from the home screen. Select local setup. Select setup options. Choose OEM ECU.

ATTENTION! VERY IMPORTANT!
DO NOT resort to any of these “wiring” methods!



Twisted Together Wires



Wire Nuts



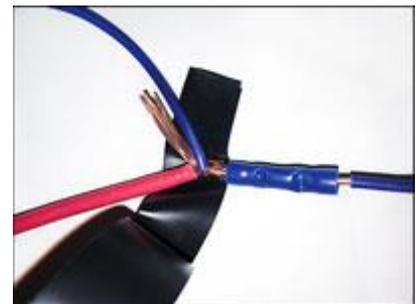
T-Taps!



Wire Jammed Into a Fuse



This!



Electrical Taping Bare Wires

You'll Thank Us Later!

These are Acceptable!



OEM Quality Connectors (supplied)



Soldered Connection w/ adhesive heat shrink

File Sharing and Calibration updates

Using the SD card slot in the side of the 3.5" LCD, firmware updates can be uploaded when available and your custom calibration files can be Downloaded and saved or shared with other units. Use this feature to save as many as 20 Custom calibration tables. They can be quickly saved as you are building the custom valve mapping and Axis tables, if you decide you want to change your custom settings you will always have a copy to re install later if you change your mind.

EXO Calibration Load and Save

Step 1:

Insert a standard SD card (2GB – 16GB) into the left side of the 3.5" handheld display.

From the main screen select [System].



Step 2:
From the [System] page select [File Load & Save]



Step 3:
To save a calibration file from the ECU, select [Download from ECU]. You will then be prompted to enter a file name. Once you have entered a file name press [OK]. Once selected, the file transfer will begin automatically. You can save over 20 different unique file names. The saved calibration files can now be saved, emailed, shared with your friends, etc. from your PC via an SD card reader.

To upload a calibration file to the ECU, select your target file name listed. Example below would be [my cal file]. Once selected, the file transfer will begin automatically.



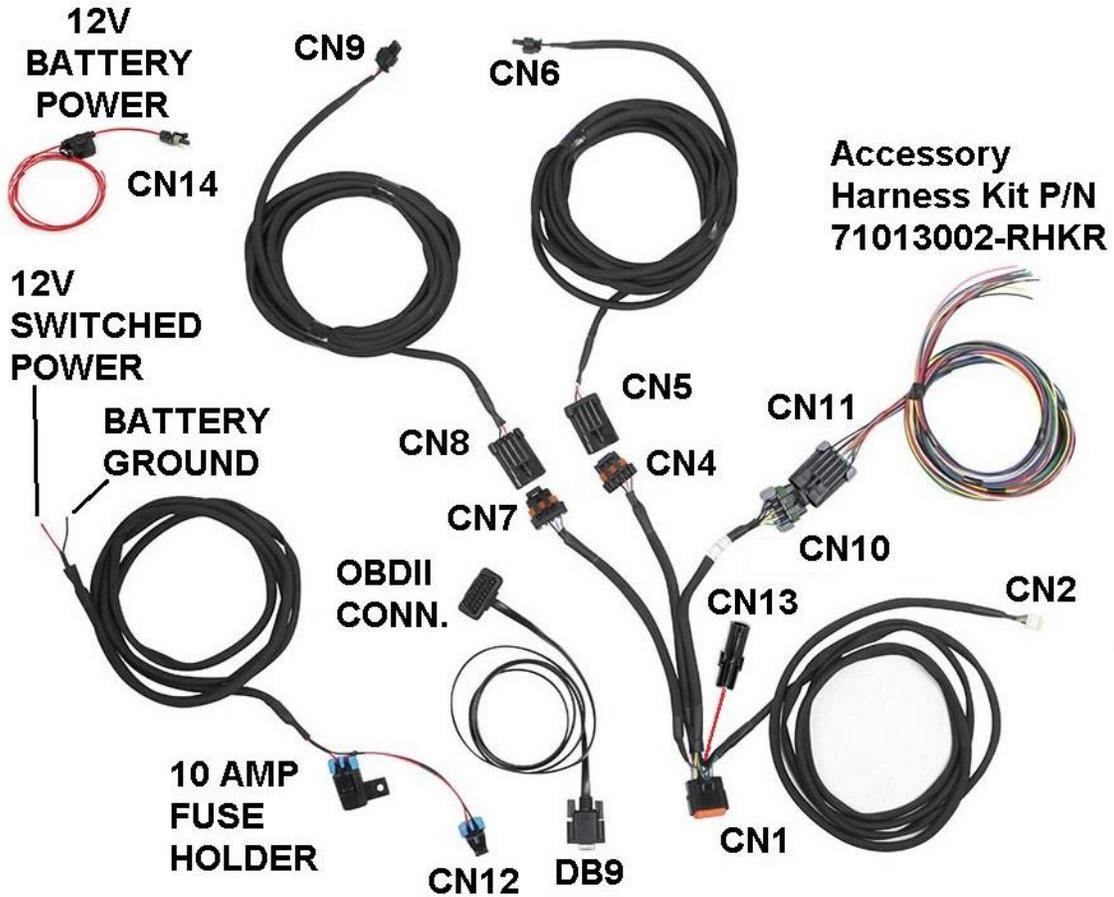
EXO Calibration Delete from SD Card

Step 1:

To delete a file from the SD card, select your target file name listed and press [Delete from SD]. Deletion from the SD card is permanent so use care when deleting files.



EVC WIRING HARNESS OVERVIEW



199R11241

Revision Date: 4-12-17