MSD Boost Control Module
PN 77631

Parts Included:
1 - Controller, PN 77631
2 - 12v Air Solenoids
2 - 75PSIG Racepak Sensor PN 810-PT-75GVT
Parts Bag

Parts Required But Not Supplied:
Power Grid Control PN 7730
4 Port CAN-Bus Hub PN 7740
CO2 Bottle and Pressure Regulator

FEATURES

- Two programmable boost curves for on the fly boost curve changes.
- Two electronically controlled air solenoids for precise wastegate pressure control.
- Direct plug into MSD's CAN-Bus hub for ease of installation.
- Utilizes the Power Grid data acquisition to help fine tune boost curves.
- Built-in boost timing retard option.
- Two 75 psig sensors to measure manifold and wastegate pressure for high pressure applications.
- Overboost shutdown.
- Spool boost rev-limiter control.

OVERVIEW

The Boost Control Module allows fine tuning control of the engine's manifold pressure (boost) in forced induction engines by managing the pressure on top of the wastegate through a set of electronically controlled air valve solenoids. The Module integrates with the Power Grid Controller seamlessly through the 4 port CAN-Bus connector which minimizes wiring.

All Power Grid Modules work through MSD's CAN-Bus system. The Power Grid Modules are plug and play installations but may require extension harnesses for remote wiring.

Note: Do NOT cut the wires to the CAN-Bus Harness. In the event an extension harness is needed to mount the unit in the desired location MSD offers the following extension harnesses-

    2' CAN-Bus extension PN 7782
    4' CAN-Bus extension PN 7784
    6' CAN-Bus extension PN 7786

The module has several programmable features such as Over Boost Shutdown, Spool/Launch RPM activation once the spool pressure is achieved, Data Acquisition through the Power Grid Control, and allows for two separate Boost Control Curves for "on the fly" switching. The Module utilizes the built in data acquisition function of the Power Grid for fine tuning of the Boost Control Curves and the Boost Retard Curve. The module uses two 75 psig sensors to monitor and data log boost pressure.

INSTALLATION
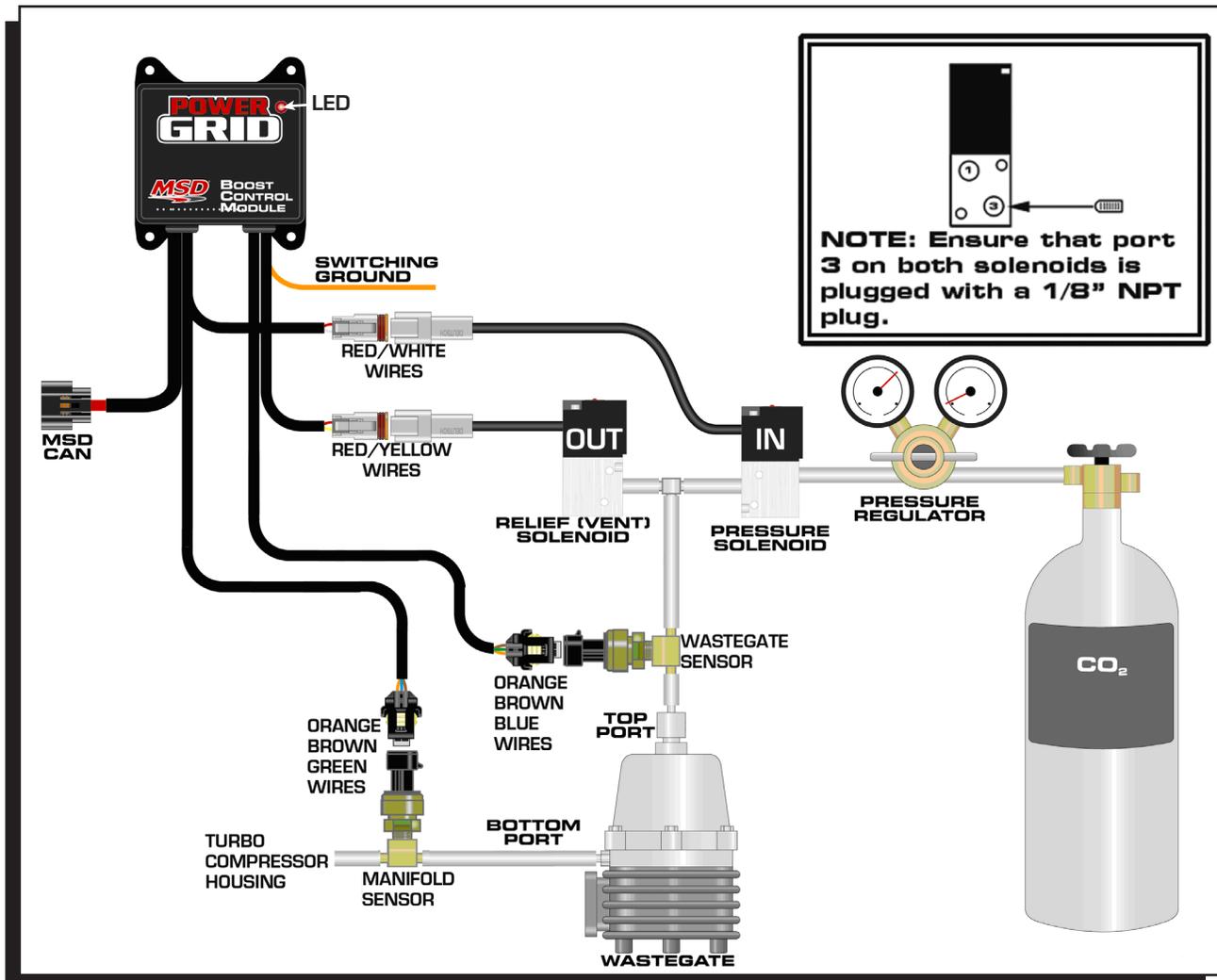
Figure 1 Single Wastegate Plumbing
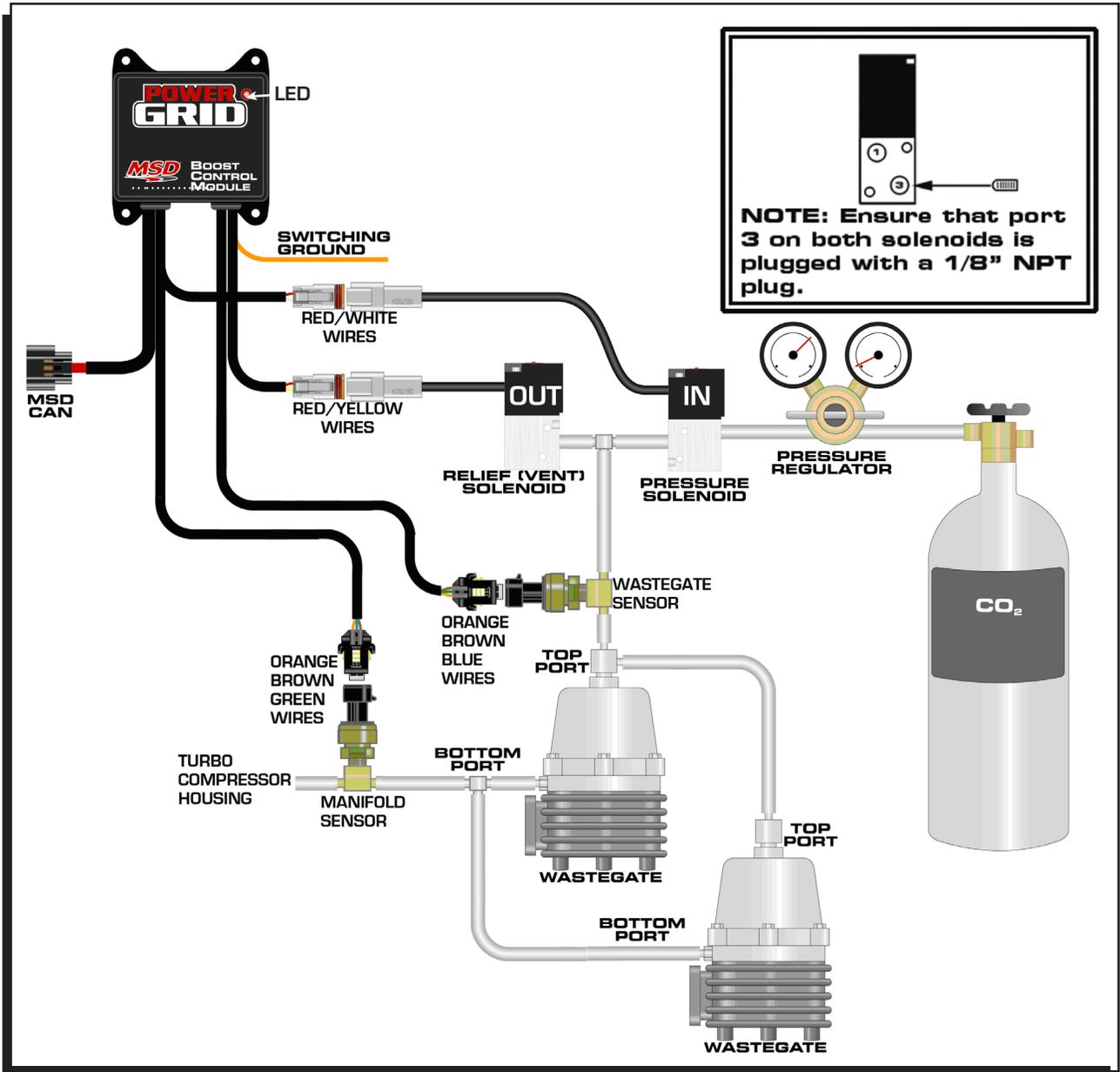
Figure 2 Dual Wastegate Plumbing

Note: Use of a pressure regulator is required. Adjust the CO2 bottle pressure to no more than 20psi above the maximum wastegate target pressure. MSD recommends Camozzi fittings throughout the air pressure system.

WIRING

1. Mount the Boost Control Module with the supplied hardware.
2. Plug the six pin MSD CAN connector from the Boost Control Module into a free port on the MSD CAN-Bus Hub PN 7740.
3. The orange wire switches to ground when active. Use a relay to activate devices that consume more than 2 amps (Figure 3).
4. Route all wires away from heat sources.
5. Assemble the connectors. NOTE: The solenoids are not polarity sensitive.
6. Connect the red and white wires to the Pressure IN solenoid.
7. Connect red and yellow wires to the Pressure OUT (VENT) solenoid.
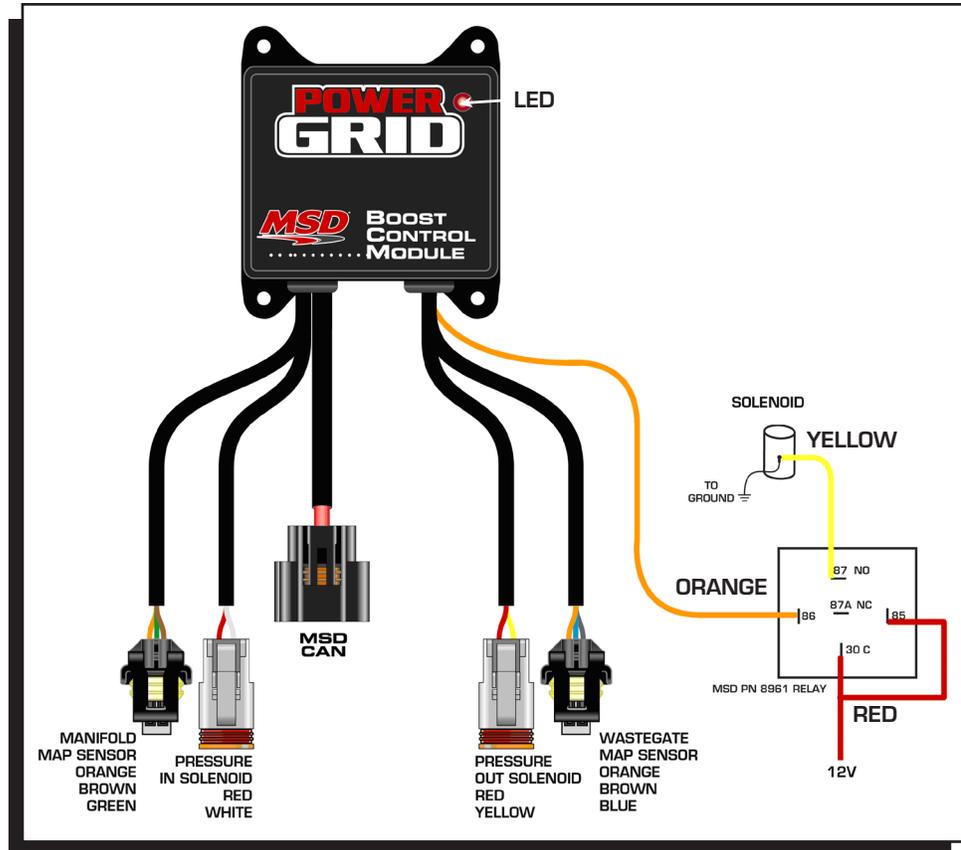
Figure 3 General wiring

MSD 77631 WIRING

Wire Grouping	Wire Color	Function	Description
6 PIN CONN (To CAN-Hub)	RED	MSD CAN HI	Supplies 12v switched power to add on modules on CAN-Hub. Allows communication with the Power Grid System Control. This connector is used only with Modules added to the CAN-Hub System.(Figure 1)
	BROWN	SHIELD	
	RED	POWER	
	BLACK	MSD CAN LO	
	BLACK	MSD CAN GND	
Single Wire	ORANGE	SWITCHED GND	Normally open and will switch to ground once activated (2A max). Use of a relay is required for higher current applications (Figure 3)
Solenoid Connector	RED	12V	Control wires for the Pressure IN Solenoid.
	WHITE	SWITCHED GND	
Solenoid Connector	RED	12V	Control Wires for the Vent OUT Solenoid.
	YELLOW	SWITCHED GND	
MAP Sensor Connector	ORANGE	5V	Plug in for Wastegate MAP Sensor.
	BROWN	GROUND	
	BLUE	SIGNAL	
MAP Sensor Connector	ORANGE	5V	Plug in for Manifold MAP Sensor.
	BROWN	GROUND	
	GREEN	SIGNAL	

PROGRAMMING THE BOOST CONTROL MODULE
MSD VIEW
The MSD View software programs the functionality of the Boost Control Module. While using the program, position the mouse pointer over a function to display its description.

SAVES AND TRANSFERS
With the ignition ON and connected to the Boost Control Module changes are made in real time. You can create and save numerous files on your PC and transfer them as needed.

The MSD View can display pressure in either KPa or PSI. To change the display units, click on "View"=>"Units" and select "Metric (KPa)" or "English (PSI)" (Figure 4)

RED LED
The LED indicates that the module is communicating with MSD View. Without a connection to a PC or Laptop the LED will be "Off".
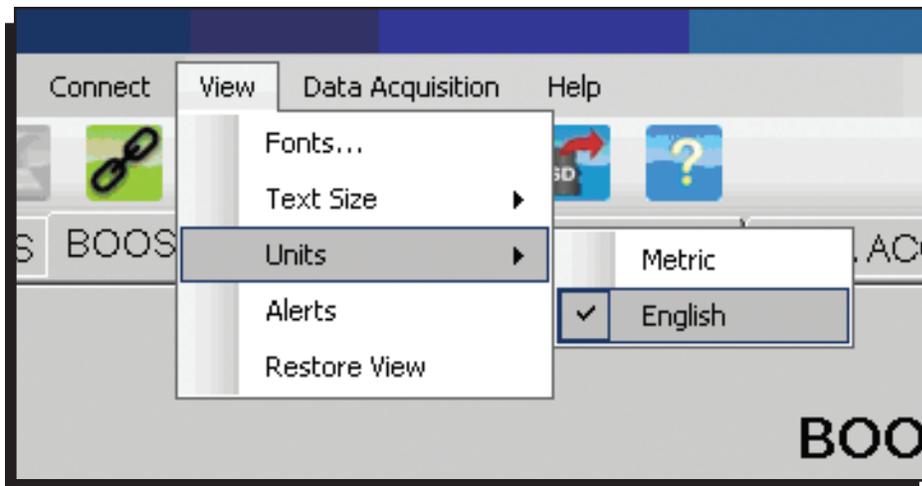
Figure 4 Selecting Display Units

PROGRAMMABLE FEATURES AND SETTINGS

SETTINGS (FIGURE 5)

Over-Boost Shutdown: Allows the user to set an over-boost limit that will disable the ignition as the programmed Manifold boost pressure setting is exceeded. The default setting is 75psi and can be adjusted from 2.9psi to 75psi. Boost pressure must drop at least 1psi below that setting for the ignition firing to resume.

Note: Setting the Over-Boost Shutdown to 75PSI disables the Over-Boost Shutdown.

Note: All references to pressure in the 77631 Boost Control Module refer to Gauge Pressure.

Boost Pressure Switch: The Orange wire switches to ground while the set boost pressure is exceeded. The Orange wire can sink up to 2 amps of current (continuous) to ground(Figure 3). The default setting is 75PSI and can be adjusted from 0psi to 75PSI.

Note: Use a relay for higher current applications.
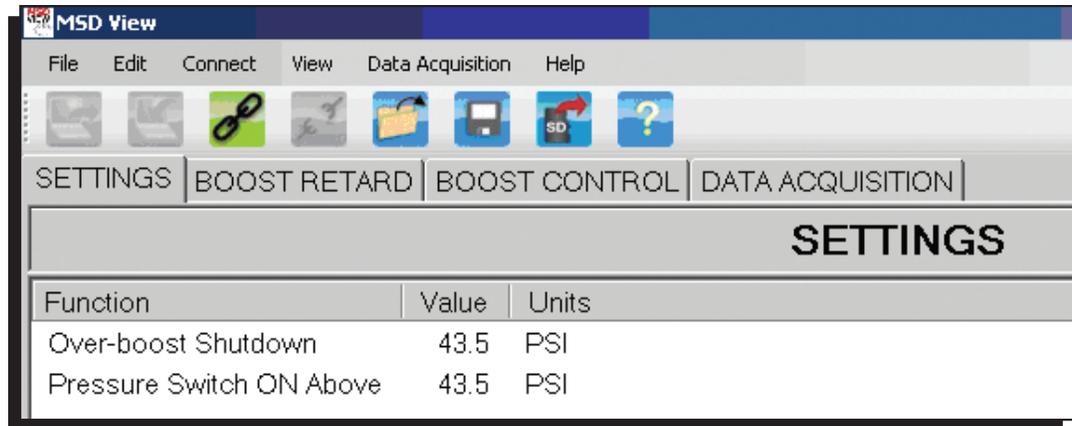
Figure 5 Settings

BOOST RETARD (FIGURE 6)

This window allows for programming a Boost Retard Curve. This curve retards timing as a function of Boost Pressure. The vertical line indicates amount of retard from 0° (top) -20° (bottom). The Horizontal line indicates boost pressure from 0psi (left) to 75psi (right). Plotting a curve is possible through two different methods. Plot points can be entered numerically in the MAP PRESSURE / IGNITION TIMING columns to the left of the Boost Retard Curve. The MSD View software will automatically add the dots to the curve with this method. Another method would be moving the mouse pointer over the desired plot point,

right click => left click "Add Dot." The MSD View software will automatically populate the MAP PRESSURE / IGNITION TIMING columns with this method. Making changes to existing dots or plot points in the columns is possible by clicking on the dot and dragging it to the desired position, or by simply editing the plot points in the columns. The yellow square in the right hand corner of the Boost Retard Curve displays the pressure and retard timing as it follows the mouse pointer (Figure 6).
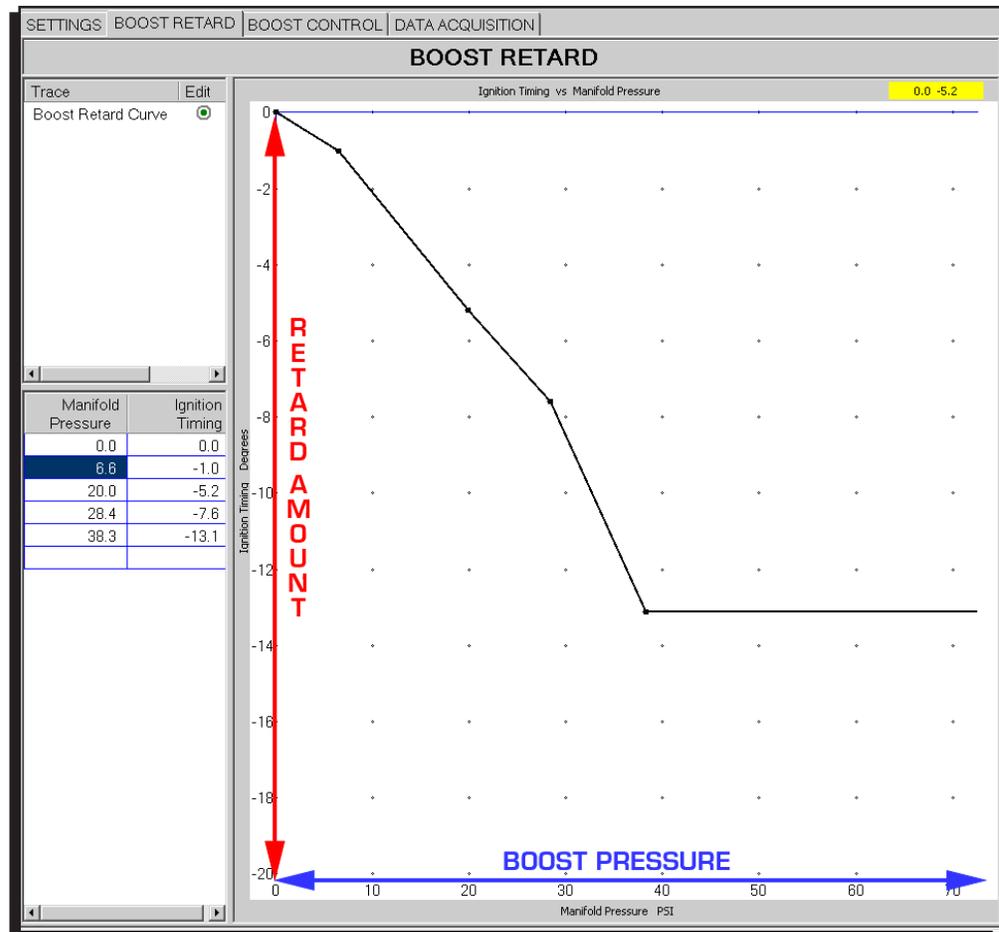
Figure 6 Boost Retard

BOOST CONTROL: SETTINGS & BOOST CURVE

There are three sub tabs under the primary tab BOOST CONTROL. These settings in these tabs control the engine boost pressure..

Note: The Boost Control Module is manipulating Manifold Boost Pressure, by controlling the pressure on top of the wastegate. Changes in the Boost Pressure curve may not directly correspond to wastegate pressure Boost Curve settings. For example: If the wastegate is equipped with a 7psi spring, and 20psi of pressure is added to the top of the wastegate through the Boost Curve, the turbo may not create 27psi of boost, this due in part to physical limitations of the turbocharger and/or engine. During the initial tuning, start applying small amounts of pressure to the top of the wastegate to determine how much boost the turbo will produce without risking engine or turbo damage. 3psi to 5psi on top of the wastegate is a good starting point for most setups. Use of the Over-Boost Shutdown during the initial testing is recommended.
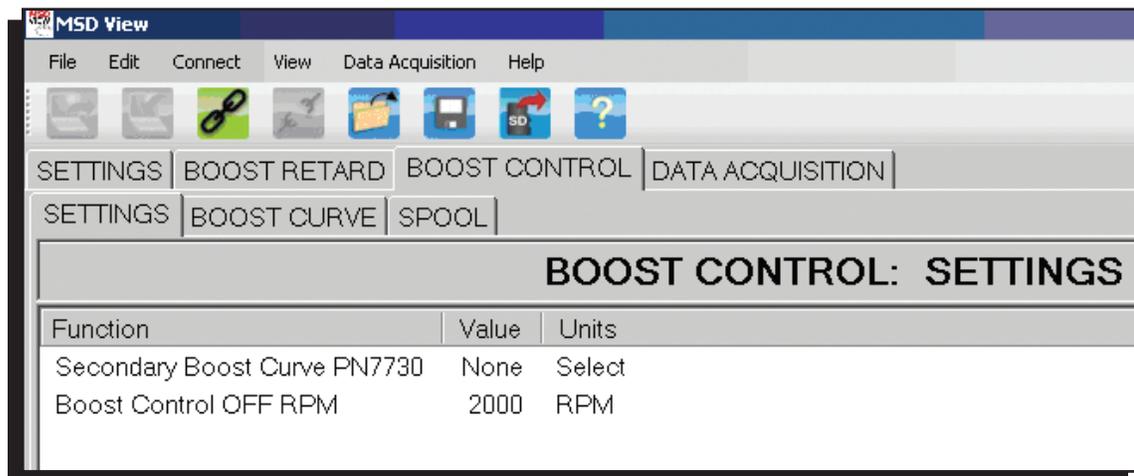
Figure 7 Boost Control: Settings

BOOST CONTROL: SETTINGS

SECONDARY BOOST CURVE: Determines which wire from the Power Grid Controller PN 7730 will enable the secondary Boost Curve. The default setting is "NONE," but the selections can be either "STEP 3" (TAN) or "STEP 4" (LT/GRN), and refers directly to the retard activation wires from the Power Grid Controller PN 7730. (Figure 7)

BOOST CONTROL OFF RPM: The solenoids will NOT activate unless engine RPM is above this setting. The default setting is 2000RPM and can be adjusted from 0RPM to 10000RPM. (Figure 7)

 Note: This feature minimizes CO_2 consumption while the engine is OFF.

 Note: Set the Boost Control OFF RPM to 0 to test the Boost Control while the engine is off which is helpful in determining if the system is functioning correctly, and check for leaks in the air lines.

BOOST CONTROL: BOOST CURVE (FIGURE 8)

This window allows for programming the Boost Curve. This curve will determine the desired pressure that will apply to the top of the wastegate as the time increases after the launch.

Note: The Boost Control Module is controlling pressure on top of the wastegate while also monitoring Manifold Boost pressure. The Boost Control Module, does NOT control Manifold Boost pressure directly.

The vertical line indicates the wastegate target pressure from 0PSI (bottom) to 75PSI (top). The Horizontal line indicates time in seconds after the launch from 0s (left) to 10s (right). Plotting a curve is possible through two different methods. Plot points numerically in the LAUNCH TIME / WASTEGATE TARGET columns to the left of the Boost Curve. The MSD View software will automatically add the dots to the curve with this method. Another method would be moving the mouse pointer over the desired plot point, right click => left click "Add Dot." The MSD View software will automatically populate the LAUNCH TIME / WASTEGATE TARGET columns with this method. Making changes to existing dots or plot points in the columns is possible by clicking on the dot and dragging it to the desired position, or by simply editing the plot points in the columns. The yellow square in the right hand corner of the Boost Curve displays the wastegate pressure and time in seconds as it follows the mouse pointer (Figure 8).
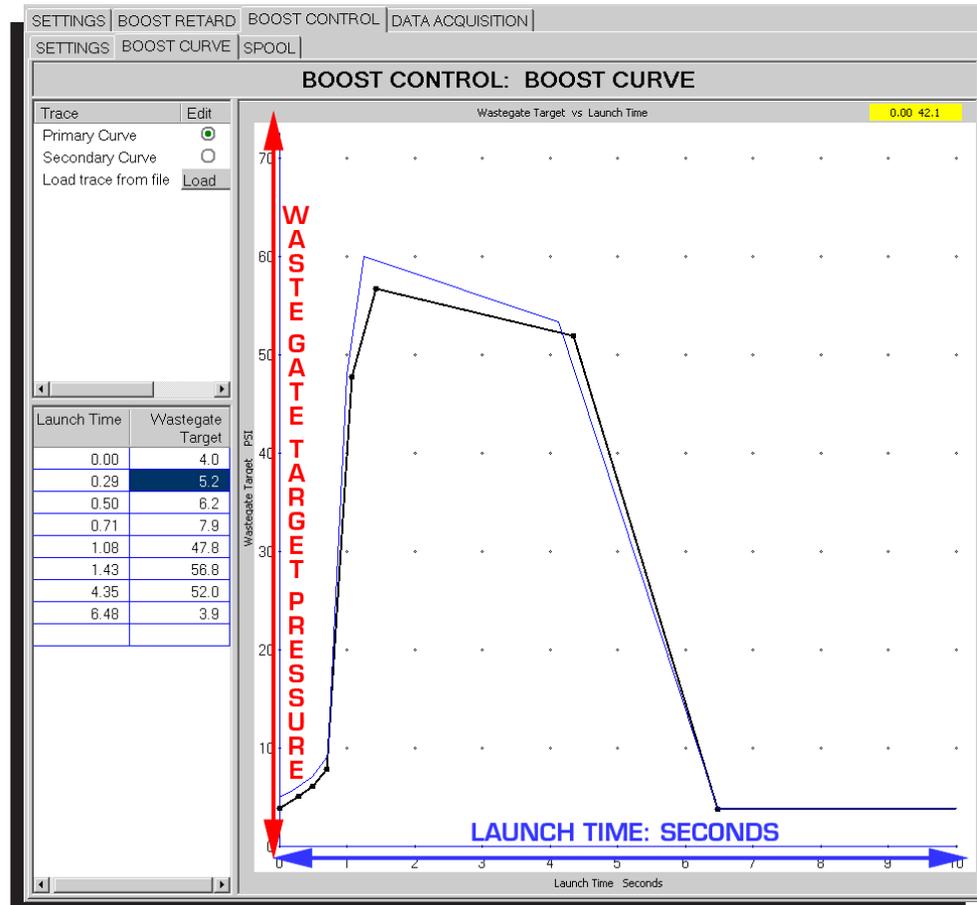
Figure 8 Boost Control: Boost Curve

For initial testing with no previous use of the turbo motor, MSD recommends setting the Boost Curve low. A good starting point would be to plot one dot at 2-3psi @ 0 seconds. If there is a 6-7psi spring in the wastegate, this should theoretically make 8-10psi. This number will skew as boost pressure increases. In other words, 20psi on the top of the wastegate coupled with a 7psi spring in the wastegate

will not make 27psi of boost pressure. It wouldn't be uncommon to see 18-20psi of boost pressure in that scenario. The way to determine how much boost the turbo will make in relation to pressure increases on the wastegate is through testing. There are physical limitations in the turbo charger system, wastegate size and placement, pressure drop, and engine limitations that will affect how much boost pressure the turbo will actually make.

BOOST CONTROL: SPOOL (FIGURE 9)
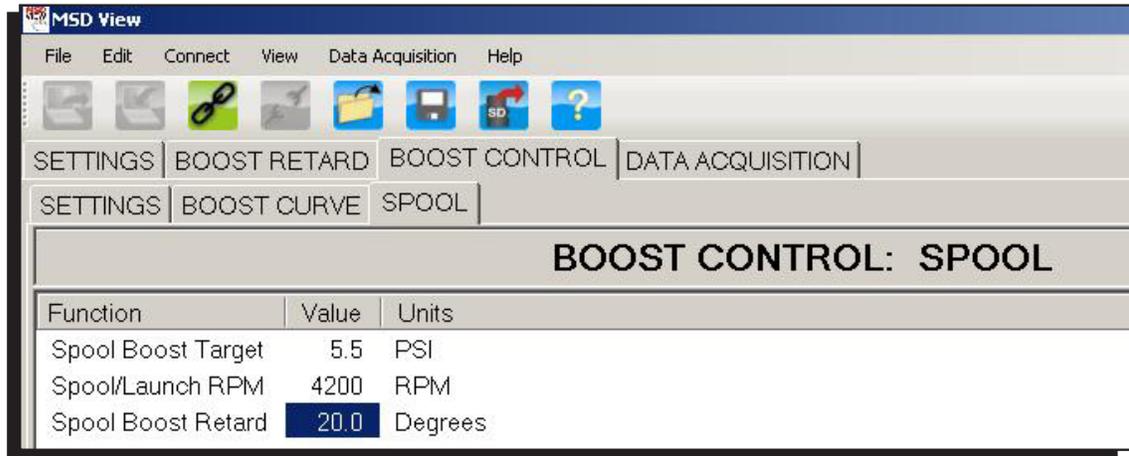
Figure 9 Boost Control: Boost Curve

The next settings function as a spool rev-limiter or retard without wiring up the 5th step retard wire as a spool limiter.

Spool Boost Target: Used to set the target spool pressure. The range of adjustment is 2.9 psi to 75 psi.

Launch RPM above Target: Sets the launch RPM once the Spool Boost Target is reached. The setting can be adjusted from 0RPM to 12000RPM.

> **Note:** This setting will function only if set below the launch rev limiter within the PN 7730.

Spool Boost Retard: A retard used to help spool the turbo during staging. Adjustable from 0-30*

The Boost Control Module has two different methods which aid in spooling the turbo. These methods work seamlessly without the need for additional wiring of the step retard wires to active the spool rev-limiter in the PowerGrid.

Note: Only one method for spool boost rev-limiting/retarding will work at any given time. The two methods cannot be used together at the same time.

Method 1: Lower the launch RPM. Start by setting the Spool Boost Retard to 0. Set the Spool Boost Target to the desired MAP pressure at launch. Set the Spool/Launch RPM to the desired launch RPM. This will work as the launch limiter once the boost pressure is at the desired level. Set the Launch Rev Limiter in the Power Grid 7730 Rev-limiter to a higher limit to act as the Spool Rev-Limiter. For example, if the desired manifold pressure was 12psi, and the car typically launched at 4400RPM; The Launch Rev Limiter could be set to 4800RPM to aid in turbo spool. The Spool/Launch RPM could be set at 4400RPM. Once the turbo spooled and built more than 12psi of boost, the Boost Control Module would automatically switch from the 4800RPM rev-limit to the 4400RPM rev-limit.

Method 2: Set the Spool Boost Retard to the desired retard amount. Set the Spool Boost Target to the desired MAP pressure at launch. Set the Spool/Launch RPM to the minimum RPM that the retard will activate at.

Note: Once the Spool Boost Target is achieved, the Spool/Launch RPM (Method 1) or Spool Boost Retard (Method 2) will clamp down launch value, even if the pressure drops below the Spool Boost Target. This is to prevent the limiter/timing from "hunting."

DATA ACQUISITION
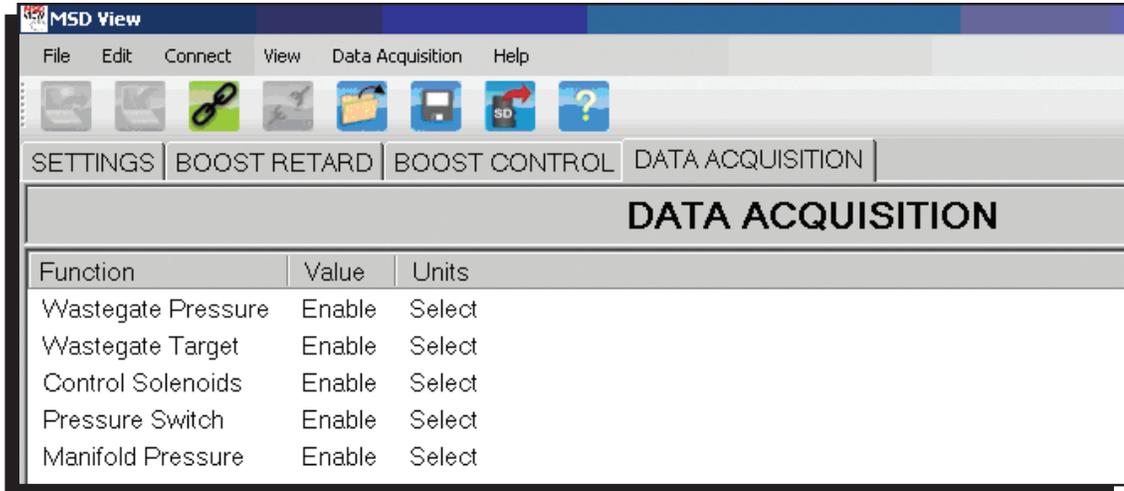
Figure 10 Data Acquisition Tab

The Data Acquisition tab allows for the channels from the Boost Control Module to either be enabled or disabled in the Power Grid data acquisition. The default setting is enabled.

Note: These channels are recorded through the Power Grid Data Acquisition only and are NOT recorded through the Racepak VNET connection.

INTERPRETING THE POWER GRID DATA ACQUISITION
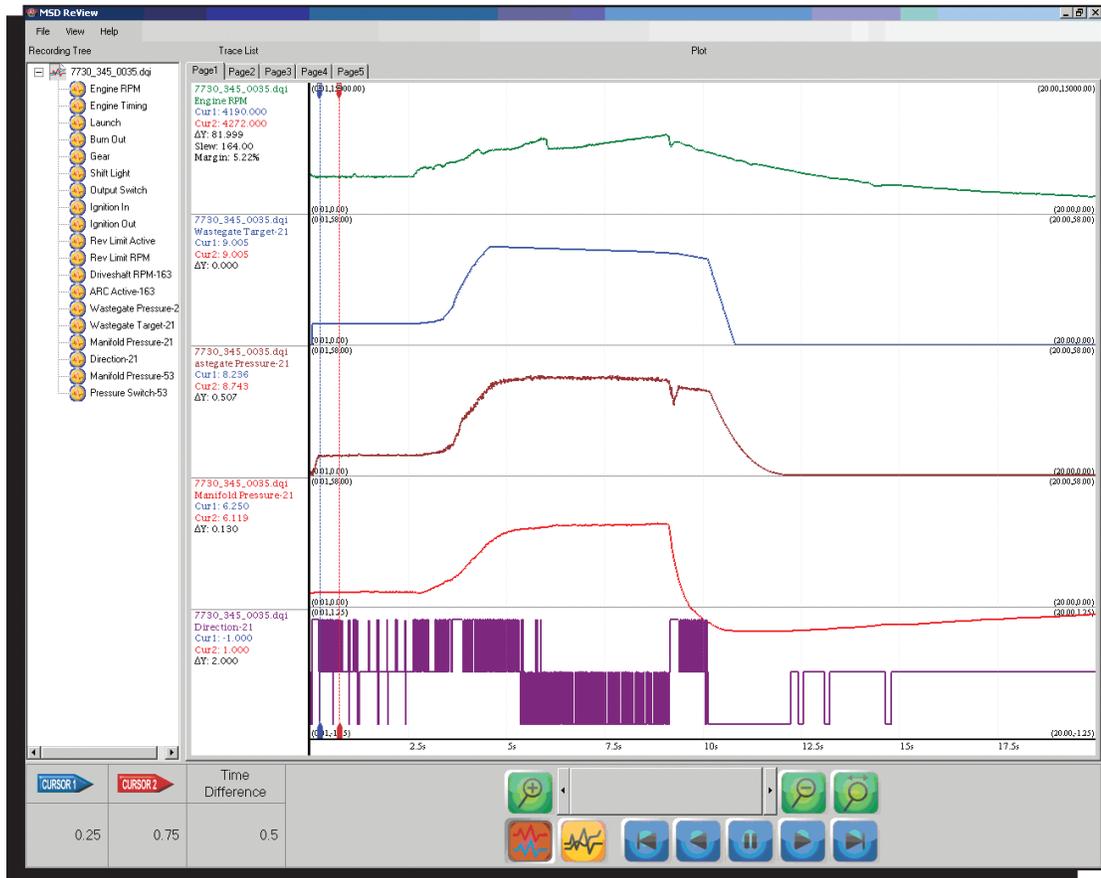
Figure 11 Power Grid Data Acquisition

DATA ACQUISITION

Wastegate Pressure: This trace displays the wastegate pressure during the run.

Wastegate Target: This trace displays the active programmed boost curve during the run.

Manifold Pressure: This trace displays the actual boost pressure in the manifold during the run.

Direction: This trace displays whether the solenoids are building pressure or relieving pressure on the wastegate in order to achieve the target wastegate pressure during the run. Upswings in this trace represent the solenoids building pressure, Downswings represent the solenoids relieving pressure.

Pressure Switch: This trace displays the pressure switch status during the run. 0 represents the switch is in the OFF position. 1 represents the switch is in the ON position.
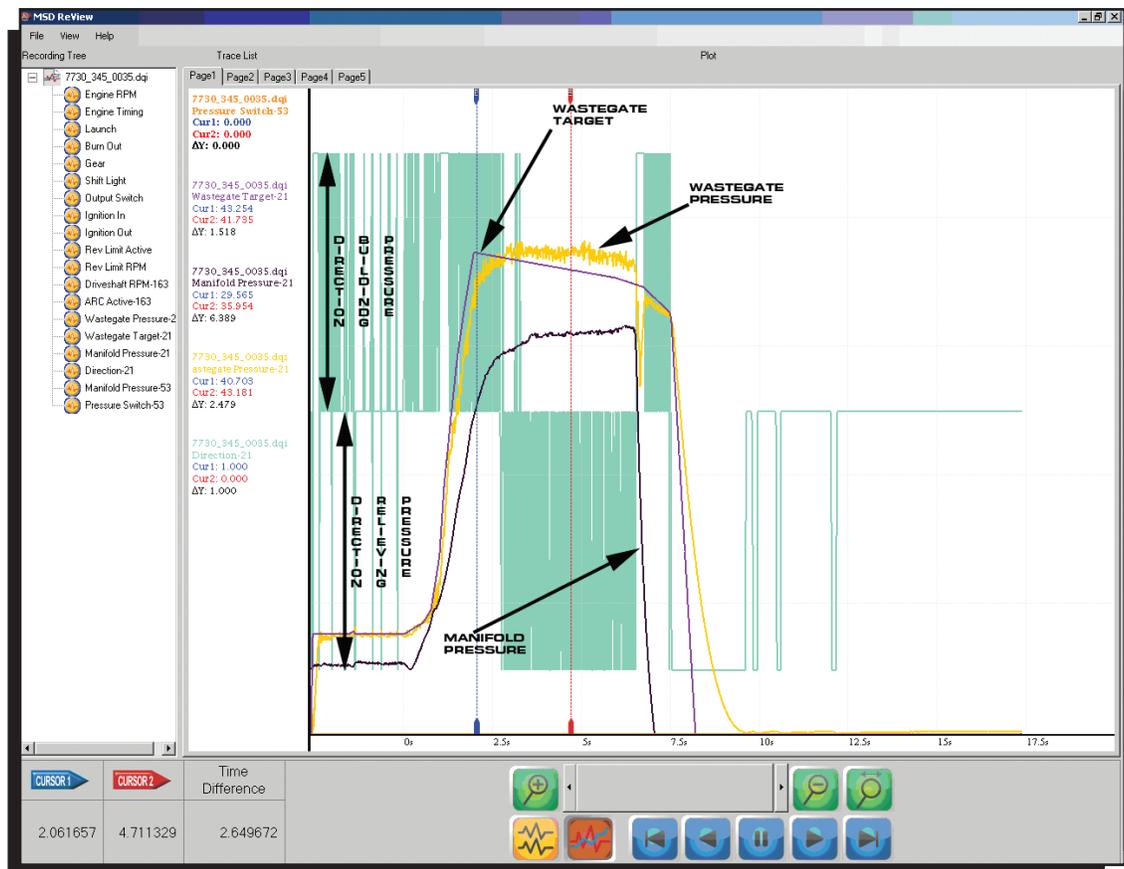
Figure 12 Power Grid Data Acquisition File

DATA ACQUISITION TRACES

Pressure Switch: The example in Figure 12 demonstrates the Pressure switch in the OFF position as it is a flat line along the bottom. In this example the pressure switch is not programmed to activate.

Wastegate Target: This is the programmed boost curve that was active during the run. Ideally the Wastegate Pressure will closely follow this curve.

Wastegate Pressure: This is the actual pressure on the top port of the wastegate.

> **Note:** In Figure 12 the wastegate pressure over shot the Wastegate target curve that was active during the run. The Direction trace shows the solenoids relieving pressure to bring the wastegate pressure down. Even with a pressure difference on the gate of several PSI, the manifold pressure is largely unaffected as these pressure variances rarely relate to huge pressure swings on the manifold.

Direction: There are two arrows that describe how the solenoids are either building pressure or relieving pressure in Figure 12.

Plot Reading	IN Solenoid	OUT Solenoid
1	ON	OFF
0	OFF	OFF
-1	OFF	ON

Manifold Pressure: The manifold pressure trace represents the actual boost pressure in the manifold during the run.

Note: From Figure 12 adding 43psi to the top of the wastegate with a 7PSI spring produces approximately 35-36psi of boost on this combination.