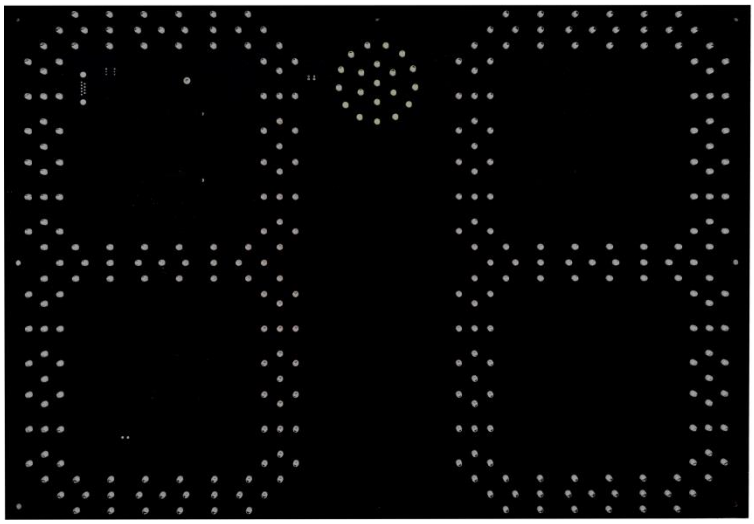
PNL18

OEM Radar Speed Sign Kit

Installation and User Manual

K-Band Doppler Speed Measurement and Display Kit
Rev 1 December 20, 2021



702 Julie Rivers Drive, Sugar Land, TX 77478
http://www.houston-radar.com
Toll Free: 1-888-602-3111

This device conforms to the CE mark and conforms to the requirements of the applicable European Directives as follows:

EN 60950-1
ETSI EN 300 440-1 V1.4.1
ETSI EN 300 440-2 V1.2.1
ETSI EN 301 489-1 V1.7.1
EN 55022 Class B
EN 61000-4-2 8 kV/4 kV
EN 61000-4-3 3 V/m

FCC ID: TIADR600

This device meets the FCC requirements for RF exposure in public or uncontrolled environments.

This device complies with FCC part 15 Rules. Operation is subject to the following two conditions: 1. This device may not cause harmful interference and 2. This device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not approved by Houston Radar could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

IC ID: 21838-DR600

This device meets the IC requirements for RF exposure in public or uncontrolled environments.

Cet appareil est conforme aux conditions de la IC en matière de RF dans des environnements publics ou incontrôlée.

IC Warning

This device complies with Industry Canada license exempt RSS standard(s). Operation is subject to the following two conditions: 1. this device may not cause interference, and 2. this device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil est conforme avec Industrie Canada RSS standard exempts de licence (s). Son utilisation est soumise à Les deux conditions suivantes: 1. cet appareil ne peut pas provoquer d'interférences et 2. cet appareil doit accepter Toute interférence, y compris les interférences qui peuvent causer un mauvais fonctionnement du dispositive.

Warning: DR600-OFD radar is supplied in an open frame format with exposed antenna and electronics and thus is a static sensitive device. Please use static precautions when handling. Warranty does not cover damage caused by inadequate ESD procedures and practices.

Note: Specifications may change without notice.
Note: Not liable for typographical errors or omissions.

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INTRODUCTION

Congratulations on your purchase of the Houston Radar directional Doppler Speed Radar sign kit PNL18. This state of the art two-digit speed display with integrated ultra-low power 24GHz K-band microwave Doppler radar is specifically designed for the license free solar power or battery operated speed sign and traffic calming sign market.

Utilizing high performance, ultra low power DSP (Digital Signal Processing) technology and microwave components based on a planar patch array antenna with integrated low power MMIC, you will find that this high quality product meets your exacting standards for performance and reliability.

Some of the highlights of this product include:

- Zero cables highly integrated design assembles into your enclosure in minutes
- 18" (46cm) digit height with 30% inter-character separation is matched to 2000+ ft (600+ m) detection range of the radar for optimal display legibility
- Best in class power efficiency achieved by:
  - Low power DR600 radar directly drives display thus eliminating display controller
  - Built-in ambient light sensing and automatic brightness control
  - Ambient temperature compensation of the LED drive voltage
  - High efficiency boost regulator for LED drive voltage
- When no traffic is present, the radar automatically powers down display further reducing power consumption
- Wide input supply voltage operation allows flexible power supply options ranging from 3, 4 or 5 cell Lithium Ion packs to 8.5V or 12V Lead Acid batteries without sacrificing sign efficiency
- Built-in rotary switch allows user to set cutoff and violator speed alerts in the field without connecting to a computer
- White LED strobe light and display flashing can be optionally activated to draw attention to speeding
- An expansion connector allows addition of a third digit or a fixed custom external message, e.g "SLOW DOWN" when speed violation is detected
- Built-in radar is FCC approved with CE mark and available in 24.125GHz and 24.200GHz versions for worldwide deployment
- Advanced In-Radar Traffic Statistics collection option available

INSTALLATION

The PNL18 is supplied in an "open frame" format. It requires a weatherproof enclosure before it may be operated outdoors.

Direction Pointing:

The DR600 radar used in the PNL18 is directional in nature. It may be configured to detect and measure the speed of incoming, outgoing, or bi-directional traffic. It then rejects traffic moving in the opposite direction (unless set to bi-directional). Direction of detection is configured via the bits in the radar's MO and MD variables, or preferably, via the GUI. In the usual "speed sign" configuration the radar is set to measure and display speeds of incoming vehicles and is the default shipped from the factory.

Statistics are only gathered for incoming traffic when placed in incoming or bi-directional mode. No statistics will be collected in outgoing mode.

To achieve optimal performance please follow a few simple rules:

- ✓ PNL18 should be pointed into the direction of the oncoming traffic.
- ✓ PNL18 should be placed along the size of the road to minimize the angle of the oncoming traffic to the sign.
    - If it cannot be placed right along the side of the road, it should be pointed at least 100-150 feet up the road into oncoming traffic.
- ✓ The radar in the unit may pick up rotating fans, compressor blades, etc. Avoid pointing it at any machinery containing moving parts.
- ✓ PNL18 should be mounted at least 3 feet high from the ground for proper operation and at least 6 feet high for maximum pickup distance
- ✓ PNL18 utilizes 15° viewing angle LEDs. For maximum visibility of the digits the sign should be pointed at the incoming traffic with better than 10° accuracy. Alternatively, the sign may be oriented towards traffic to maximize the LED brightness from the desired viewing location on the road. We suggest providing an adjustable mounting bracket for your enclosure that will allow at least a ±15° horizontal rotation to allow the user to make an adjustment during installation.

Recommended Enclosure for the PNL18:

The PNL18 display kit must be protected by a weatherproof enclosure for outside use. The following needs to be observed for optimal performance:

1. Any plastic cover or window in front of the unit may be mounted as close to the LEDs as desired. However, please consider any potential damage from flexing due to an external impact on the sign face (vandalism, etc.) being transferred to

the PNL18. For maximum field reliability we recommend that you test the proposed enclosure design to ensure the front face does not flex sufficiently to transfer an impact to the PNL18.

2. The optimum material for the front window/face is Lexan (Polycarbonate) plastic.
3. The optimum thickness of polycarbonate window/sign face is half wavelength at 24.125Ghz or about 137mils to 146mils (3.5 to 3.7mm) thick.
    a. Commonly available ¼" or 3/8" thick Lexan is not optimal and will reduce pickup range. 3/16" thick Lexan is a better choice if the recommended thickness is not available. For metric sizes, 4mm thick Lexan is a reasonably good choice.
    b. Frosted (anti-glare) plastic have been successfully used as well. It does not matter which side (into the sign or into the traffic) the frosting faces and is left to your discretion.
4. Other plastic materials may be used as a front window, but the optimum thickness will wary with the material's dielectric constant. Please contact Houston Radar for details.
5. If you want to make a metal mask with holes for the LEDs to pass through, you must provide a plastic window for the radar microwave beam to pass through. The location and size of this window is shown in Appendix A.
   A dxf drawing to use as a template for the metal mask is available. Please contact Houston Radar for the drawing.

We strongly recommend that you prototype and test your enclosure on the road to verify that the radar detection range is not affected by your choice of plastic and mechanical design prior committing to full production.

Hookup:

Power Input:

The PNL18 may be powered from a DC supply with output voltage between 8.5 and 18VDC. This allows great flexibility in power options including 12V (nominal) lead acid batteries (SLA), 3, 4, or 5 cell Lithium Ion (LiOn) or Lithium Iron Phosphate (LiFePO4) cells. In all cases, a highly efficient input power regulation system in the PNL18 adjusts the LED drive voltage to the optimum level required by the sign based on ambient temperature. This ultra low operational power translates directly into a longer battery life or gives you an option to power the unit from smaller batteries and smaller solar panels.

Data/PC Connection:

The PNL18 features a standard RS232 interface that is used to configure the sign as explained later in this document. It also sends out the measured speed over this interface when a vehicle is detected which may be used by an external controller board to monitor the speed measured by the radar in the PNL18 kit or display on a connected PC running Houston Radar Stats Analyzer.

Measured Speed Output:

In addition to showing the measured speed on the LED digits, the PNL18 will also send out the speed via the ASCII interface as a 3-digit speed with an optional direction indicator in standard resolution mode. Extended resolution mode adds up to 3 digits after the decimal point. The format is:
[?,+]nnn[\r,\n] or in extended resolution mode [?,+]nnn[.n[n[n]]][\r,\n]
The format of the speed output can be adjusted to any combination of:
"?": Optional prefix sent when 000 selected to be sent when no vehicles are detected
"+": Optional prefix sent when nnn speed is sent for incoming vehicles
"nnn": Three digit ascii speed in the units selected via the UN variable
"[.n[n[n]]]": Optional decimal point with up to 3 digits of extended resolution selected via UN variable.
"\r": Carriage Return character, optional line ending
"\n": Line Feed character, optional line ending
Please see serial port configuration section for details on how to select the above format.

The radar used in the PNL18 is the Houston Radar DR600. Please see the DR600 user manual for more details on setting the output format and decimal point options. The LED digits on the PNL18 will only display the whole integer speed even when the decimal point is enabled.

IO Connector Signal Descriptions:

J1 - DB9 RS232 Female Connector:

Connector Pin #	Signal Name	Direction (wrt Radar)	Description
1	VIN Note 1	PWR	Connected to input supply voltage +
2	RS232 TX	OUT	RS232 Serial port TX pin from sign
3	RS232 RX	IN	RS232 Serial port RX pin into sign
4	N/C	-	Do not connect
5	GND	PWR	Signal/PWR Ground
6	N/C	-	Do not connect
7	N/C	-	Do not connect
8	N/C	-	Do not connect
9	N/C	-	Do not connect

Note 1: Pin 1 optionally connected to +VCC (supply +) if PCB pad labeled "DB9 PWR" near DB9 connector is bridged. This may be bridged by the OEM or by us if you require this feature.

J8 - AUX Connectors:

You may optionally connect an off board speed selection switch, DB9 serial connection port, or ambient light sensor.

Connector Pin #	Signal Name	Direction (wrt Radar)	Description
1	Light Note 1	IN	External Light Sensor Input
2	B1 Note2	IN	External BCD speed switch B1 pin
3	B4 Note2	IN	External BCD speed switch B4 pin
4	GND	PWR	Signal/PWR Ground
5	GND	PWR	Signal/PWR Ground
6	B2 Note2	IN	External BCD speed switch B2 pin
7	RS232 TX	OUT	RS232 Serial port TX from radar
8	RS232 RX	IN	RS232 Serial port RX pin into sign
9	VIN	PWR	Connected to input supply voltage +
10	+3.3V Note3	OUT	3.3V output from Radar

Note 1: Contact us for the part number and hookup schematic for the light sensor. Two different types of sensors may be used, passive LDR or active IC (recommended). Internal light sensor must be disabled by removing R26 on the back of the PCB in order to use an external light sensor.
Note 2: You may also connect an external BCD rotary switch or thumbwheel switch to use in place of the on-board rotary switch. In this case the on-board switch must be set to the "0" position or removed at the factory
Note 3: To use 3.3V output on pin 13, JMP2 must be shorted

J9 - IO Connectors:

Connector Pin #	Signal Name	Direction (wrt Radar)	Description
1	OD2	OUT	Open Drain 2 output
2	DA0	IN/OUT	Digital input/output 0 (future expansion)
3	OD1	OUT	Open Drain 1 output
4	DA1	IN/OUT	Digital input/output 1 (future expansion)
5	PB	IN	Push button input
6	DA2	IN/OUT	Digital input/output 2 (future expansion)
7	GND	PWR	Signal/PWR Ground
8	DA3	IN/OUT	Digital input/output 3 (future expansion)
9	VIN	PWR	Connected to input supply voltage +
10	AI1	IN	Analog input 1 (future expansion)
11	Unused	Unused	Unused pin
12	AI2	IN	Analog input 2 (future expansion)
13	+3.3V	OUT	3.3V output from Radar [Note 1]
14	AI3	IN	Analog input 3 (future expansion)
15	GND	PWR	Signal/PWR Ground
16	GND	PWR	Signal/PWR Ground

Note 1: To use 3.3V output on pin 13, JMP3 must be shorted

J5 - 100's Digit board

Connector Pin #	Signal Name	Direction (wrt Radar)	Description
1	GND	PWR	Signal/PWR Ground
2	S0	OUT	String 0 output
3	S1	OUT	String 1 output
4	S2	OUT	String 2 output
5	S3	OUT	String 3 output
6	S4	OUT	String 4 output
7	S5	OUT	String 5 output
8	VLED	OUT	VLED output voltage

J6 - Pwr In (Molex Micro-Fit)

Connector Pin #	Signal Name	Direction (wrt Radar)	Description
1	GND	PWR	Signal/PWR Ground
2	VIN	OUT	Connected to input supply voltage +

J7 - Pwr In (Terminal Block)

Connector Pin #	Signal Name	Direction (wrt Radar)	Description
1	GND	PWR	Signal/PWR Ground
2	VIN	OUT	Connected to input supply voltage +

J10 – Slow Down

Connector Pin #	Signal Name	Direction (wrt Radar)	Description
1	SFDRV	OUT	LED driver output, “THANK YOU” activate
2	SLDRV	OUT	LED driver output, “SLOW DOWN” activate
3	VIN	OUT	Connected to input supply voltage +
4	GND	PWR	Signal/PWR Ground

USE

Turn on the power to the PNL18 to make it operational. The display will count up to from 1 to 10 and then blank out. The sign is now fully operational.

If the rotary speed switch is enabled (see later section on configuration), turn the speed switch to the desired position (0 through 7) determined by the speed limits on the road to set the low-speed display cutoff, violator display flashing speed, and the high-speed display cutoff.

Typically, users set the violator flashing speed at or just above the speed limit on the road and the high-speed display cutoff at a speed sufficiently above the speed limit to capture most of the speeding traffic but not high enough to encourage “racing against the radar”. For example, for a 25mph speed limit road, the violator limit may be set to 26 mph and the low and high cutoffs will be set 15 mph below and above this value respectively. The exact values are of course left to the judgment of the user.

No other action is required. The PNL18 will display the measured speed when an incoming vehicle is detected between the low-speed and high-speed limits. The display will blink at about 1.4Hz rate if the measured speed is above violator speed. This indicates to the driver that they are driving above the speed limit.

If the white LED cluster is populated (this is the default, but you may choose to have it removed), and enabled through the software configuration - it will strobe at a 10Hz rate. The strobe can also be configured to blink at 1.4 Hz rate when activated.

Finally, if the vehicle speed is above the high-speed display cutoff, the display will be blanked. This prevents drivers from “racing against the sign” (trying to see how high a speed they can display). The strobe may be configured to stay active or go blank above this speed.

As long as the radar is tracking a target between the low-speed cutoff and the high-speed cutoff, the radar will transmit the speed in user selected ASCII format over the serial interface. This may be observed via our PC based configuration tool or captured by an external user provided controller board. Monitoring or capturing this speed is not required for normal operation of the speed sign.

Serial output is affected by low, high, and violator speed configuration in the same way as the display panel.

Force Activating Display

In order to test integrity of the LED digits, to convert PNL18 into a slave display unit or , or for any other custom purposes, the user may activate PNL18 display by using the following procedures:

Option 1:

1. Make sure that PNL18 is connected to a computer or a controller with a standard RS232 cable. PNL18 provides DB9 connector on the back for this purpose. Optionally, a Bluetooth wire replacement may be utilized.
2. Set RS232 parameters (baud rate, parity, etc.) to match that of the PNL18. For PNL18 these parameters are configured via RS variable in DR600 radar non-volatile memory as described in the DR600 manual.
3. Provide power to the PNL18.
4. After the initial count-up is completed, issue "bcd" command. This command supports one or two parameters, must be terminated by a carriage return or line feed and has the following format:
   bcd:speed [flags]
   where *bcd* is the command, *speed* is the value to be displayed and *flags* is an optional parameter that can be used to activate or de-activate the white strobe or an optional external message board. For example:
   "*bcd:20"* will activate PNL18 and display the number 20
   "bcd:55 1" will change the number to 55 and activate the strobe
   "bcd:55 0" or *"bcd:55"* will turn the strobe off and continue to display 55
   "bcd:0" will deactivate display and turns off the digits. Speed value of 0 cannot be displayed since it has a special meaning.

Note 1: bcd command overrides speed output from the detected targets but all other PNL18 features such as brightness control and statistics collection remain operational.

Option 2:

1. Press the button located on the back of the PNL18 to display value "88" and activate the strobe for 60 seconds.
2. Press the button a second time to cancel the PNL18 60 second "88" plus strobe test output.

Triggering an External Custom Message:

LED Driver External Strobe (Slow Down) Output:

The PNL18 makes it very easy for OEM's to connect an external custom LED string message like the Houston Radar "SLOW DOWN" sign (or any string of LEDs arranged in a local language). This message can be activated whenever the strobe is active and will also blink if the strobe is configured to blink. This output will also be PWM controlled according to the configuration applied to the PNL18. A second "THANK YOU" message can also be activated by the PNL18 when the digits are turned on but the vehicle is below the limit at which the strobe will be activated.

This configuration allows you to make a full functionality speed sign with a "SLOW DOWN" type message that is activated if the measured speed is above the speed limit or above the high-speed display cutoff and a "THANK YOU" type message activated below the speed limit. Please refer to Appendix B for a schematic of this simple external message board. Alternatively contact us to purchase this message board.

DR600 Open Drain Outputs:
In addition to the external "Slow Down" output option, the standard DR600 open drain outputs can still be utilized on the auxiliary connector. Please refer to the DR600 user manual for information regarding these outputs.

Collecting and Analyzing In-Radar Traffic Statistics

The PNL18 supports optional "In-Radar" advanced traffic statistics collection. This feature is sold separately. If this feature is enabled you may collect the stored statistics by using the provided Houston Radar Advanced Statistics Analyzer Windows program.

This program must be installed on a MS Windows (32 bit and 64 bit versions) computer and allows the retrieval of stored statistics from the radar by using a PC serial port. It also has features to generate traffic reports, plot interactive graphs and export the raw data to a MS Excel file.

Please refer to the on line help functionality of the program after you install it on your computer for detailed instructions on how to use its functionality.

Real Time Traffic Statistics In the Radar:

The PNL18 In-Radar stats software features "real time" histogram statistics. These are updated as soon as a vehicle is detected and may be read out as a speed bin count "histogram". Thus no historical records need be read out and parsed to read statistics. This feature requires a host program to be on-line to read the live statistics. Please contact Houston Radar for more information if you are interested in acquiring live statistics from the radar.

Internal Clock:
The PNL18/DR600 has a built in clock/calendar function. This is used to keep the time to date/time stamp the historical archive records saved by the Advanced In-Radar traffic statistics collection feature that is available as an option in the radar.

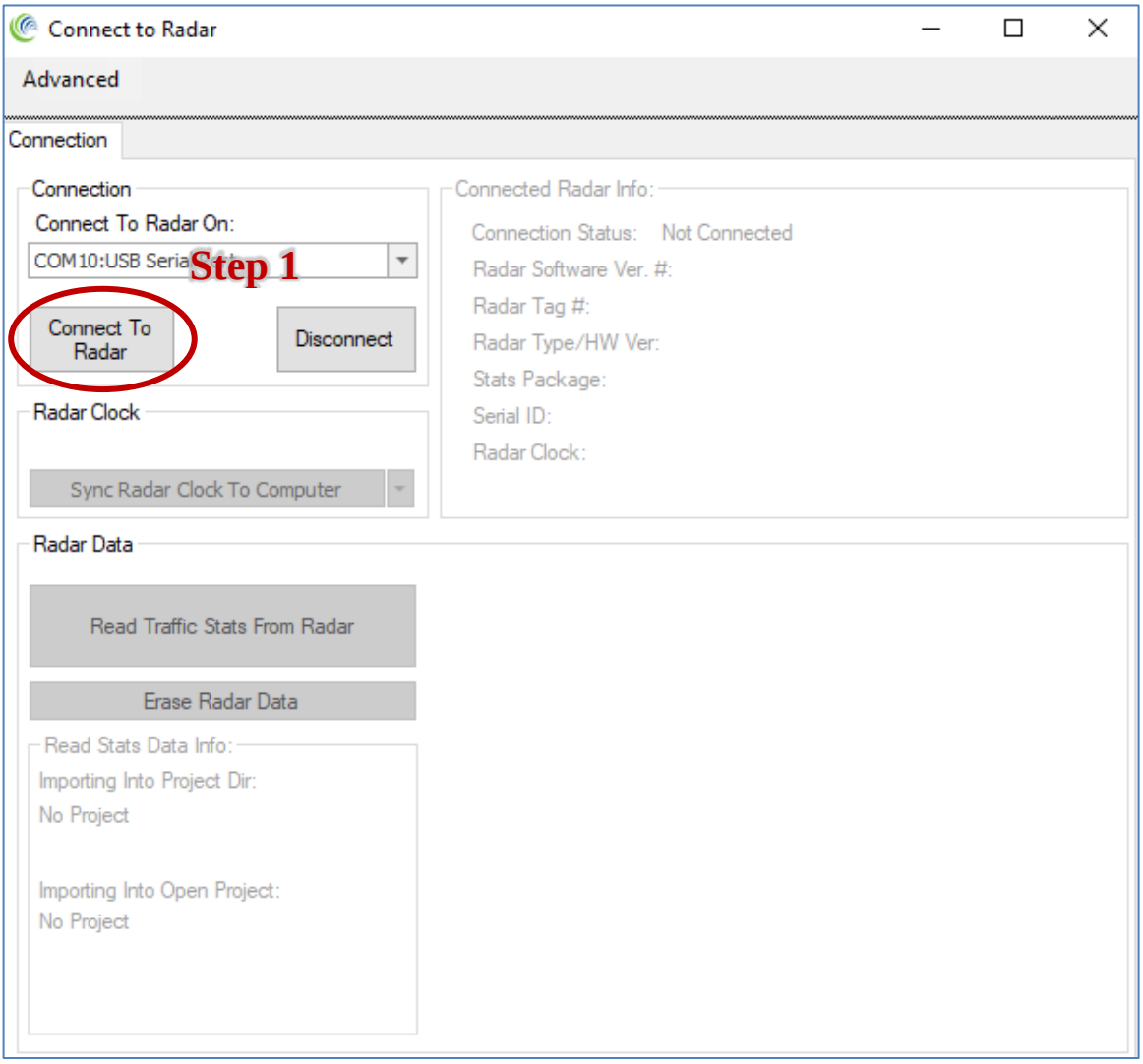
The DR600 radar features a built in clock backup battery that will keep the clock time in the case of power failure for over 10 years.

Configuring the PNL18:

The PNL18 supports many user options and configurations that make it a very versatile device. A user-friendly MS Windows PC based graphical user interface (GUI) software is provided to make this configuration a snap for the end user.

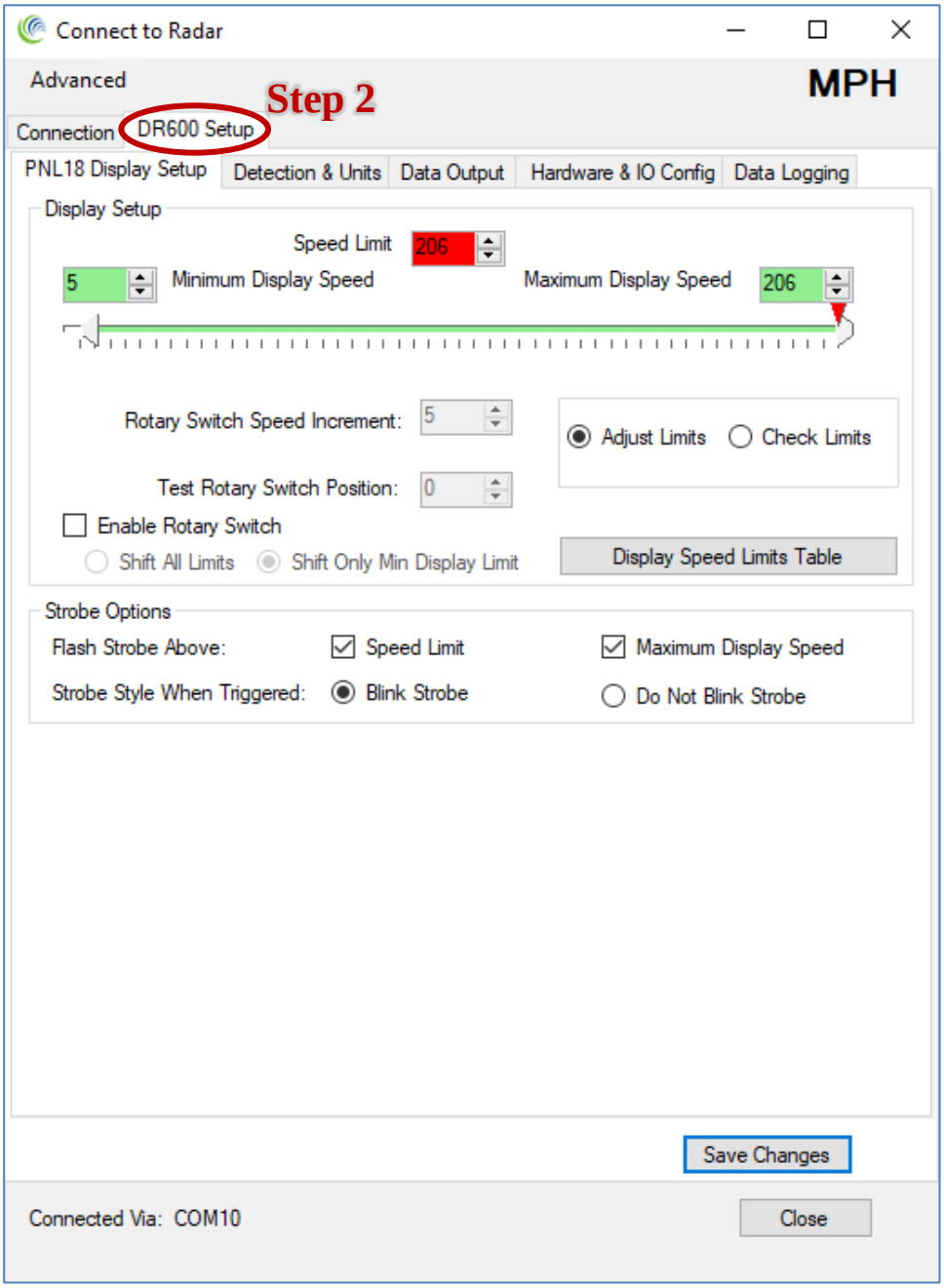
Install the Houston Radar Stats Analyzer software provided with the sign on your MS Windows PC. After starting the installed program, click on "Connect To Radar" in the top ribbon.

Connect To The Unit:
Step 1: Connect to the PNL18 in the "Connection" tab by clicking the "Connect To Radar" button. Ensure you get "Radar Found" message and another window with radar details. Click past these messages.



Read The Radar Configuration:

Step 2: Click on the "DR600 Setup" tab. The software will read the radar configuration and you should see this screen (actual values will depend on your setup).



Setup The Display Limits (Permanent Location, Rotary Switch Disabled):

Step 3: Setup the display limits for your permanent location.

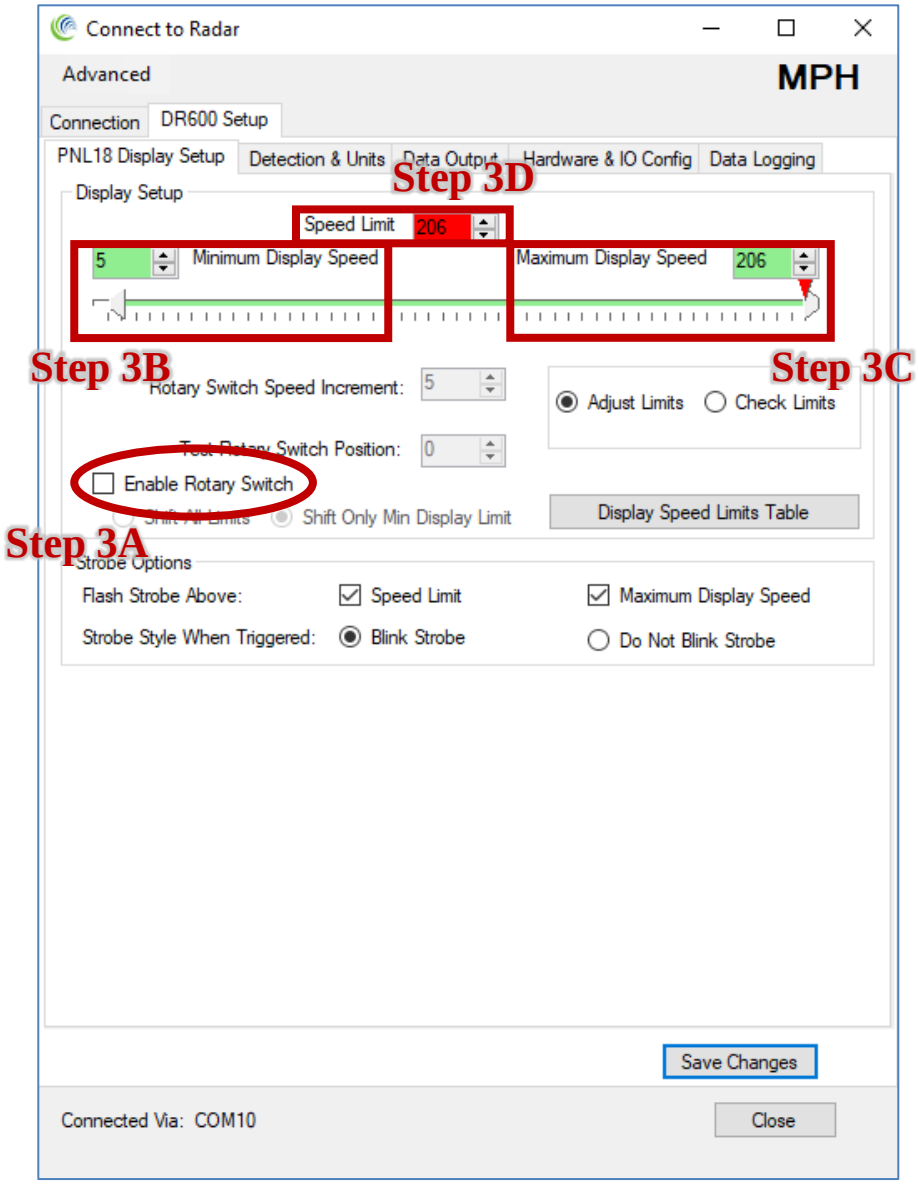
The following screen shows the simplest option with the rotary switch disabled. We will discuss the rotary switch in the next section.

Step 3A: Disable the rotary switch if the sign will be in a permanent location and the display limits will be fixed (skip to next section if sign will be portable unit).

Step 3B: Set the Minimum display speed. Display will be blank below this speed.

Step 3C: Set the Maximum display speed. Display will be blank above this speed.

Step 3D: Set the Speed Limit. Display will flash above this speed to attract further attention. Users may choose to set this slightly above the actual speed limit on the road to prevent excessive flashing if traffic is moving just above the posted speed limit. However, the end user is the best judge of this value.



Setup The Display Limits (Portable Sign, Rotary Switch Enabled):

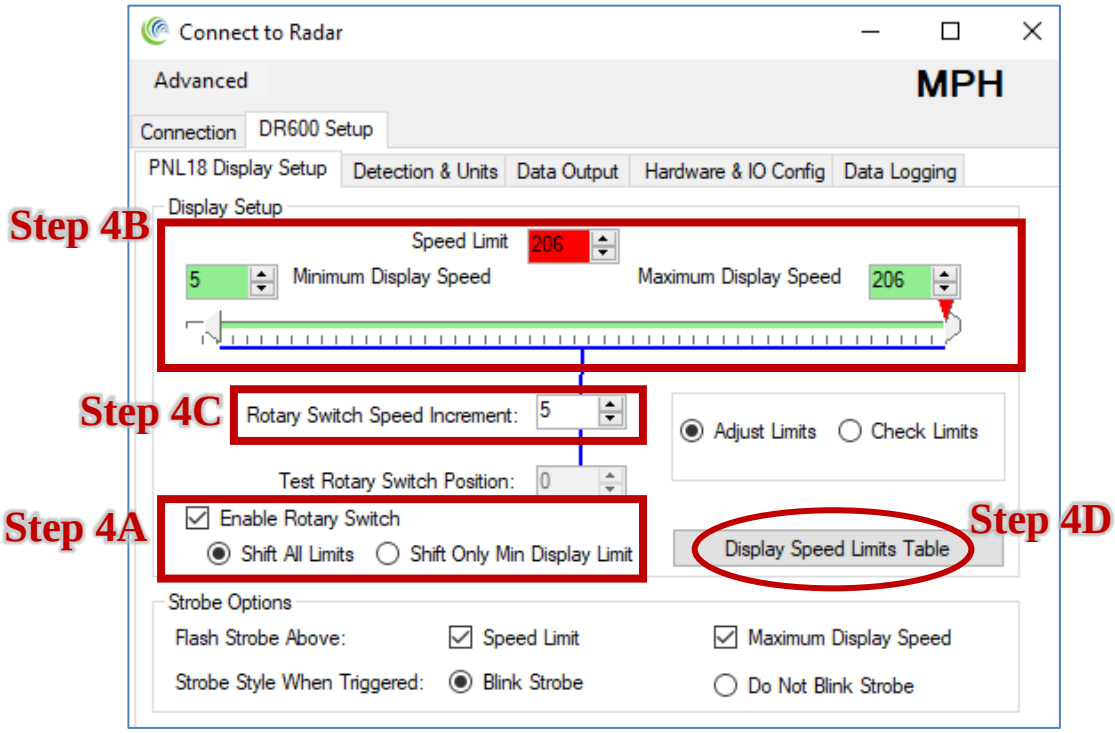
Step 4: Alternatively set the display limits for your portable sign where you may turn the rotary switch (or thumbwheel switch) provided with the PNL18 to conveniently change the display limits for different locations without using a computer.

Step 4A: Enable the Rotary switch and choose if you wish to shift all limits together (as shown in the image) or just the minimum display limit. The blue underline will change to reflect your choice.

Step 4B: Set the Minimum Display Speed, Speed Limit and Maximum display speed to the desired value *for position 0 of the switch (important!)*.

Step 4C: Now set the rotary switch increment. This increment will apply to all display limits **or** just to your minimum display speed depending on the rotary switch mode you picked in *Step 4A* above.

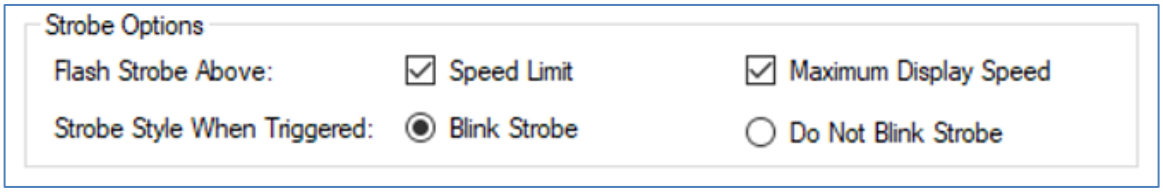
Step 4D: Check your setup. Click the "Display Speed Limits Table" to see the display limit values for the other positions or click on "Check Limits" button and spin the "Test Rotary Switch Position" box. The slider will move to show you the effective values.



Please note that spinning this "virtual" rotary switch on the GUI does not affect the actual sign. To change the speed limits in the sign, the actual rotary switch on the back of PNL18 needs to be adjusted. The simulated values are provided as a tool to check what actual speed settings you will get when your configuration is saved to the sign.

Setup White Strobe Configuration:

Step 5: Set the White Strobe cluster option and blink style to your preference.
If you do not wish the strobe to be activated, simply uncheck both checkboxes.



The PNL18 has a white LED cluster (strobe light) arranged in a circle in between the two digits (this option may not be present in your display). The cluster strobes at a fast 10Hz rate to attract attention and may be selected to activate above the flashing speed limit as well as above the maximum display speed.

Note that if enabled above the flashing speed limit, the cluster will also illuminate above the maximum display speed.

Strobe light is typically used to draw attention of the driver to the display and the fact that their current vehicle speed is above the posted speed limit or that they are driving at an unsafe speed.

The 10Hz modulation can be disabled via software on the PNL18. This is discussed in a later step.

Additionally, this strobe can be configured from this screen to blink on/off at a 1.4Hz rate together with the speed display.

If you connect an external message as described in Appendix B, then that message is activated along with the strobe. Thus the strobe configuration options become the external message options as well. Note that the 10Hz strobing effect does affect the external message. However, the 1.4Hz blinking effect is propagated to the external message.

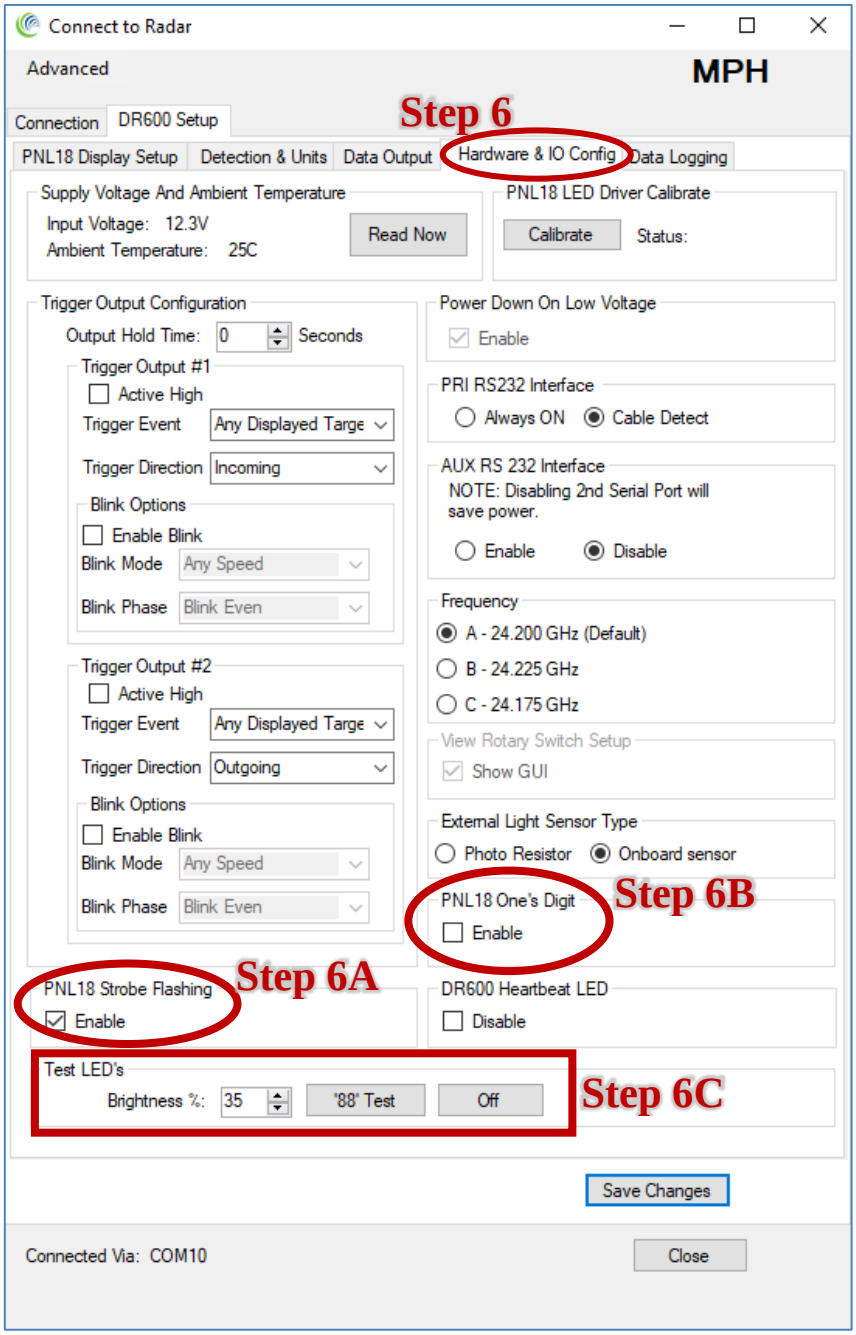
Additional PNL18 Configuration Option:

Step 6: Click on the "Hardware & IO Config" tab.

Step 6A: Enable or disable strobe flashing based on your requirements.

Step 6B: Enable the One's digit option if you have purchased and attached the Houston Radar One's digit panel.

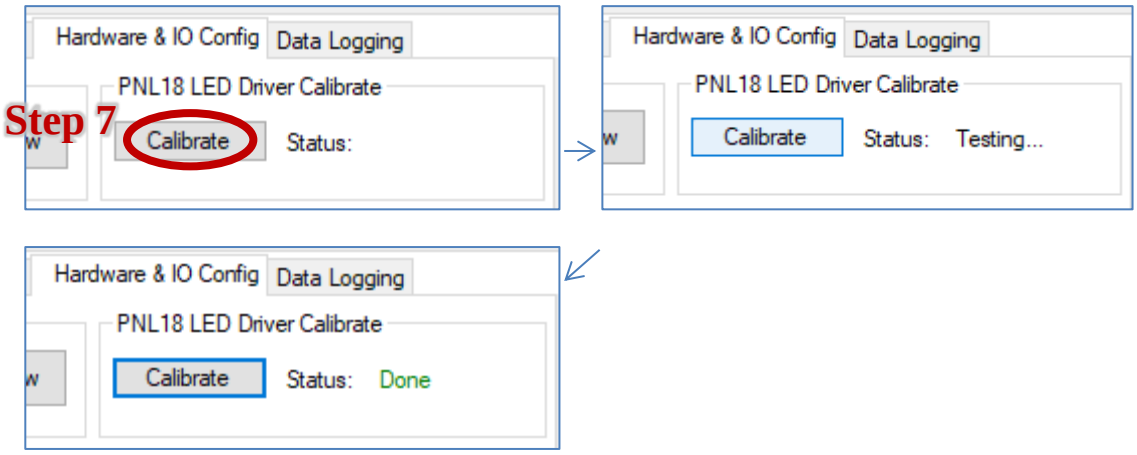
Step 6C: Click the "88 Test" button to enable value 88 test pattern. You may also test custom PWM brightness values.



PNL18 LED Driver Calibrate:

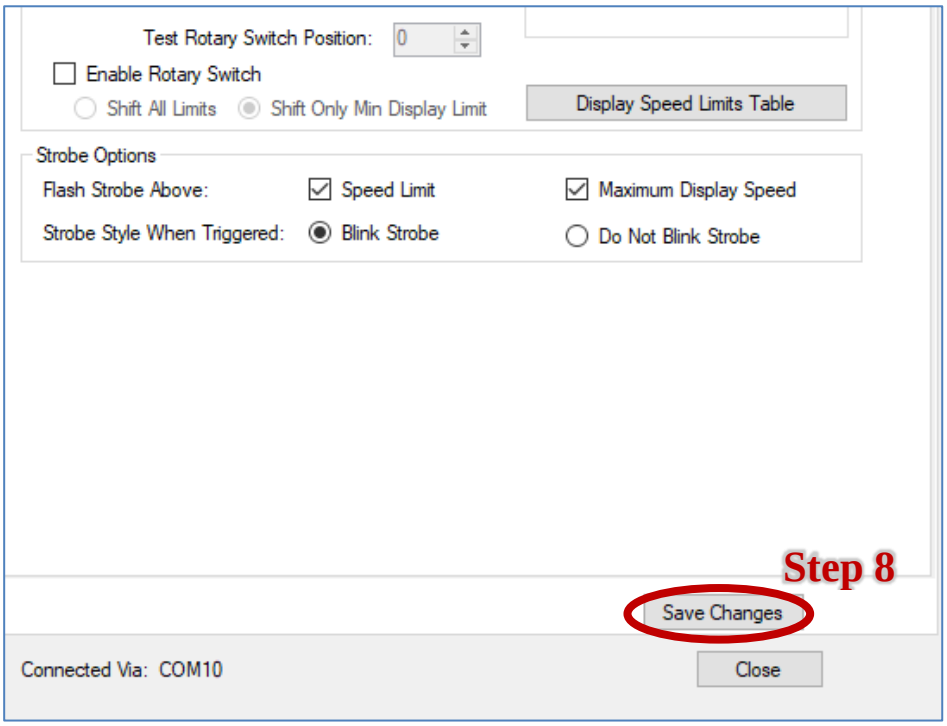
If you install a new one's digit panel, uninstall a one's digit panel, or change the DR600 radar on a PNL18, it is recommended to recalibrate the LED driver controller. This is to ensure optimal performance and power consumption.

Step 7: Click the "Calibrate" button to initiate this process. The "Status" will show "Done" upon the completion of a successful calibration.



Write the Configuration to the PNL18:

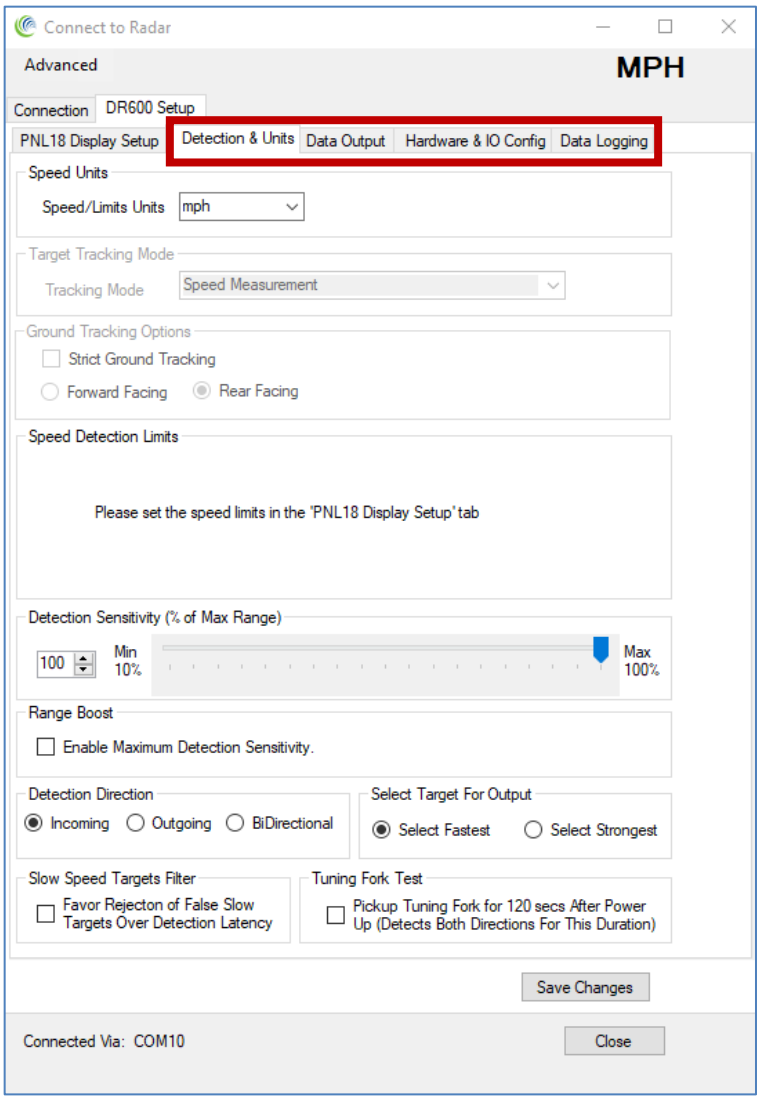
Step 8: Write the Configuration to the PNL18 by clicking on the "Save Changes" button.



Setup Additional Radar Configuration Options:

The radar utilized in the PNL18 is the Houston Radar model DR600. It supports numerous other options like detection sensitivity, programmable serial port baud rate, different measurement units (mph, kph, fps, mps) and fractional high precision speed output over the serial port.

If you wish to configure these options, click the "Detection and Units", "Data Output", "Hardware and IO", and "Data Logging" tabs to make changes to these other infrequently adjusted settings.



The DR600 user manual is also freely available on our website and we recommend that you read the DR600 user manual for more details.

PNL18 SPECIFICATIONS

General

Operating Band	K-Band
Frequency	24.125 GHz ±50Mhz (US) or 24.200 GHz (UK, Australia)
Power Output	5mW
Antenna Beam Pattern	9° x 18°
Polarization	Linear
Supply Voltage	8.5V DC to 16V DC (18VDC Maximum)
Reverse Battery	Protected
Nominal Current Draw (@12VDC including radar)	Display blank: 20 mA typical Display at night: 72 mA typical Display at max brightness: 600 mA typical
Operating Temp.	-40°F to +185°F (-40°C to +85°C).
Weatherproof	No. User supplied enclosure required.
IR Remote Programmable	No

Approvals

Approvals	FCC Part 15 (US Version)
FCC ID	TIADR600
CE	Approved
IC	21838-DR600

Data Interfaces

Serial Communication	RS232
Data Rate	1200 to 115200 baud
Data Connector	DB9 Female with RS232 levels wired as a DCD. Use 3 wires straight through cable to PC RS232 port.
Power	Screw terminal or 2 pin Molex Micro-fit.
AUX	10 pin Molex Micro-fit

Optical

LED Color	ITE Amber (592nm ±4nm) for digits. White for strobe cluster.
Brightness	11,000 nits (cdm) maximum, controlled automatically via onboard light sensor 550nits at night minimum
Viewing Angle	15° cone off normal

Mechanical

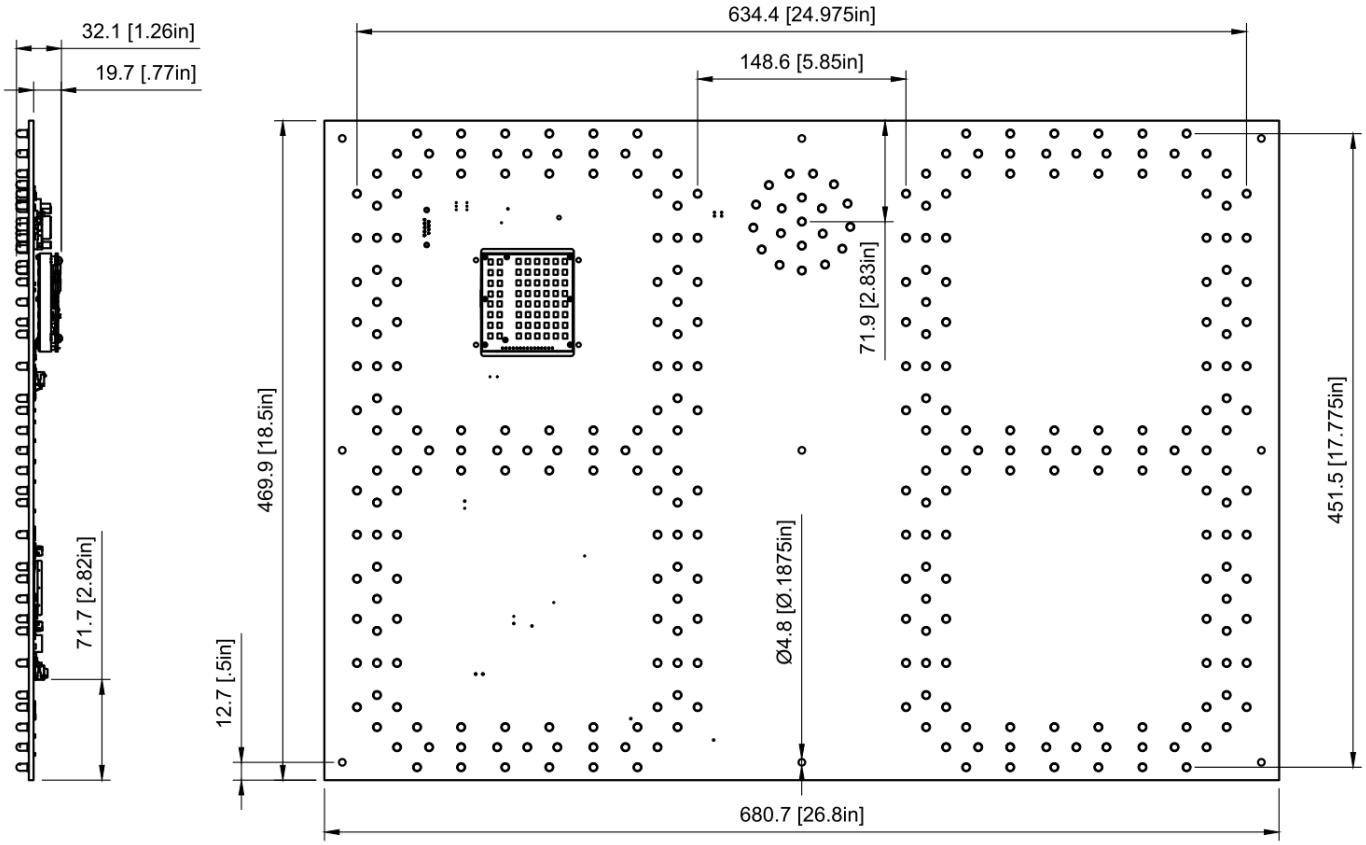
Weight	approx 2.1 kg (4.6 lbs)
Dimensions	26.8”x18.5”1.3” (68 x 47 x 3.2 cm)
Mounting	9x #8 screw mounting through holes.

Performance

Speed Measurement Range	0.6mph to 206 mph (0.97km/h to 331 km/h).

Resolution	±0.003 mph
Accuracy	±0.5% of reading + 0.1mph
Detection Range	In non-range boost mode, typically 450+ m (1500+ feet) for compact vehicles on open and level road with radar mounted 1.5 m (5 feet) high and pointed straight into oncoming traffic. 760+ m (2500+ feet) for larger trucks and vehicles with inherently large radar cross-sections. In range boost mode (or full range mode), these values increase to 790+m (2600+ feet) for compact vehicles and 940+m (3100+ feet) for large vehicles. These values will vary with installation and road conditions. Detection range specified is typical for speeds between 12km/h and 300km/h (8 to 186 mph). Range will taper off below and above this speed range.

Mechanical Outline Dimensions:



Rev 1.0 PCB. Dimensions in mm [Inches]

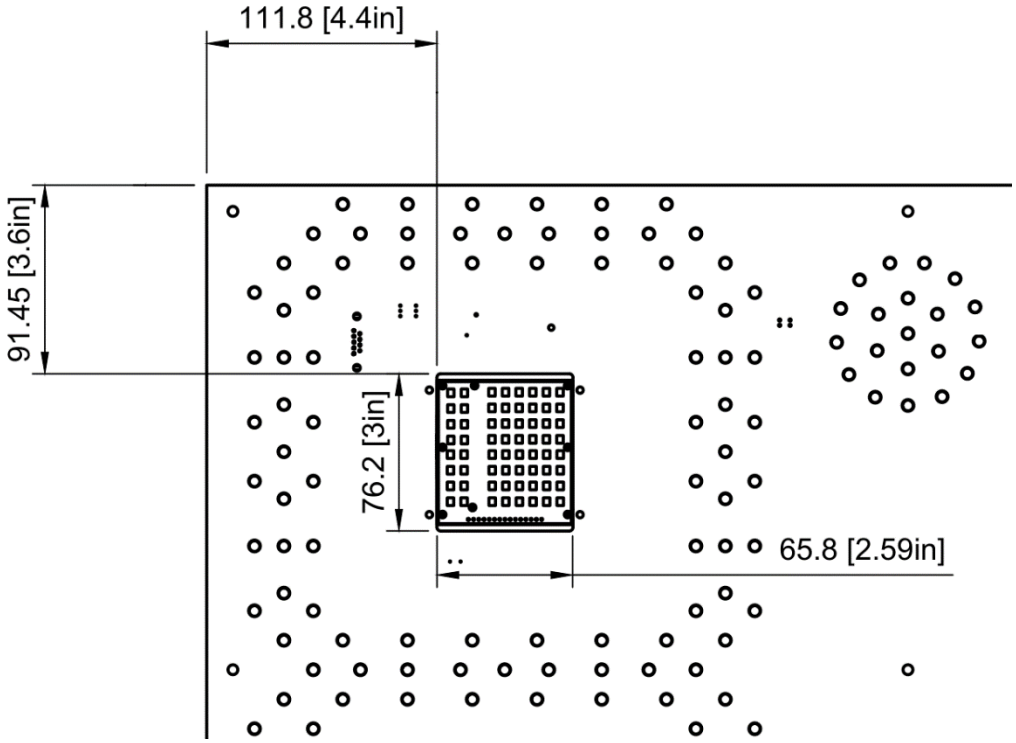
Appendix A: Plastic Window Location and Size When Using Front Metal Mask

If you chose to use a metal front mask (with holes in the LED locations to allow the LED's to show through), you must provide a plastic window for the radar beam to pass through. Use the drawing below for the recommended location and size for the plastic window in your metal mask.

The cutout in the PCB in the center of the figure is the actual size and location of the integrated DR600 radar. The dotted and dashed larger rectangle is the suggested window size.

The suggested window is larger than the actual radar because the radar waves diverge at a 9x18° angle from the face of the radar. The recommended window size is for a metal mask within a few mm from the top of the LED's. If the window is materially further away from this position a larger size window may be required.

Note: the cone cutout is an on-board light sensor. The light sensor is used to adjust the brightness of the LEDs based on ambient light conditions. You must allow ambient light to reach this sensor. Alternatively you may provide an external light sensor wired to the AUX connector on the front of PNL18. Contact Houston Radar for more details.

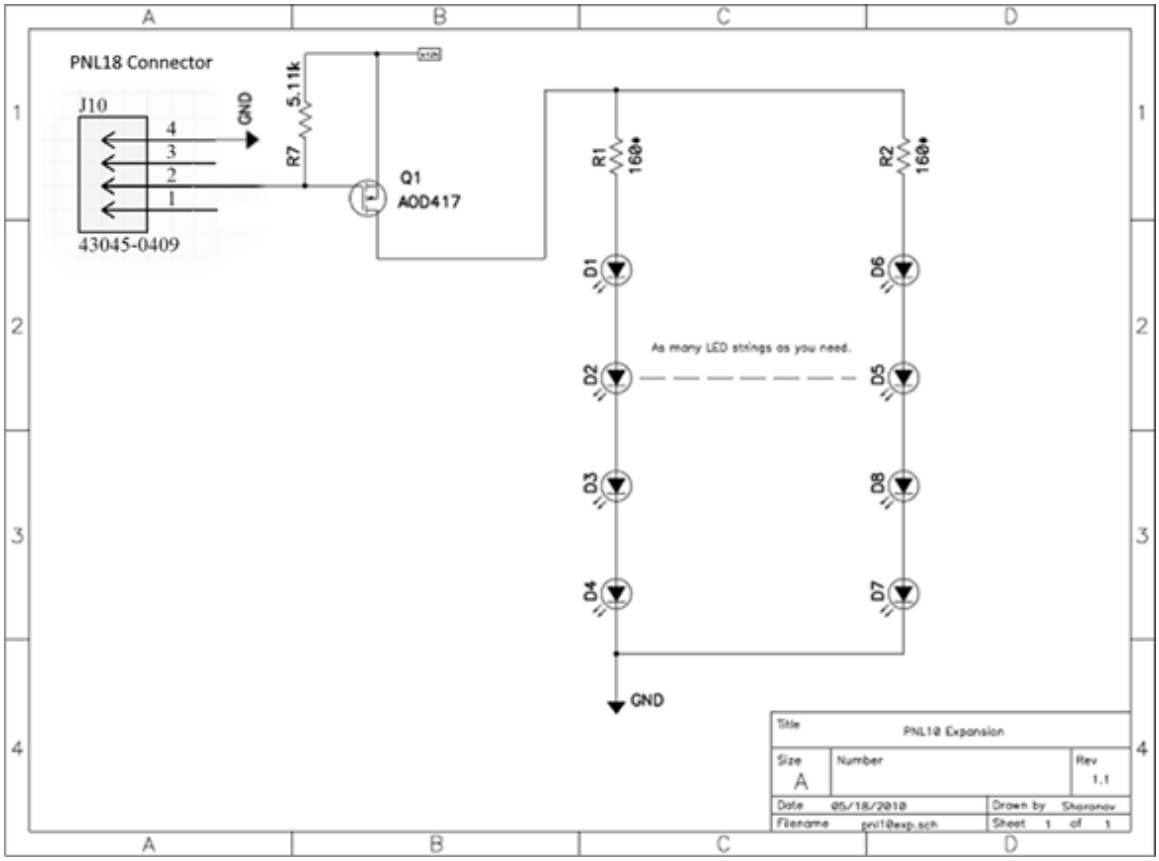


Dimensions in mm [Inches]

Appendix B: Activate An External LED Message Above a Preset Speed

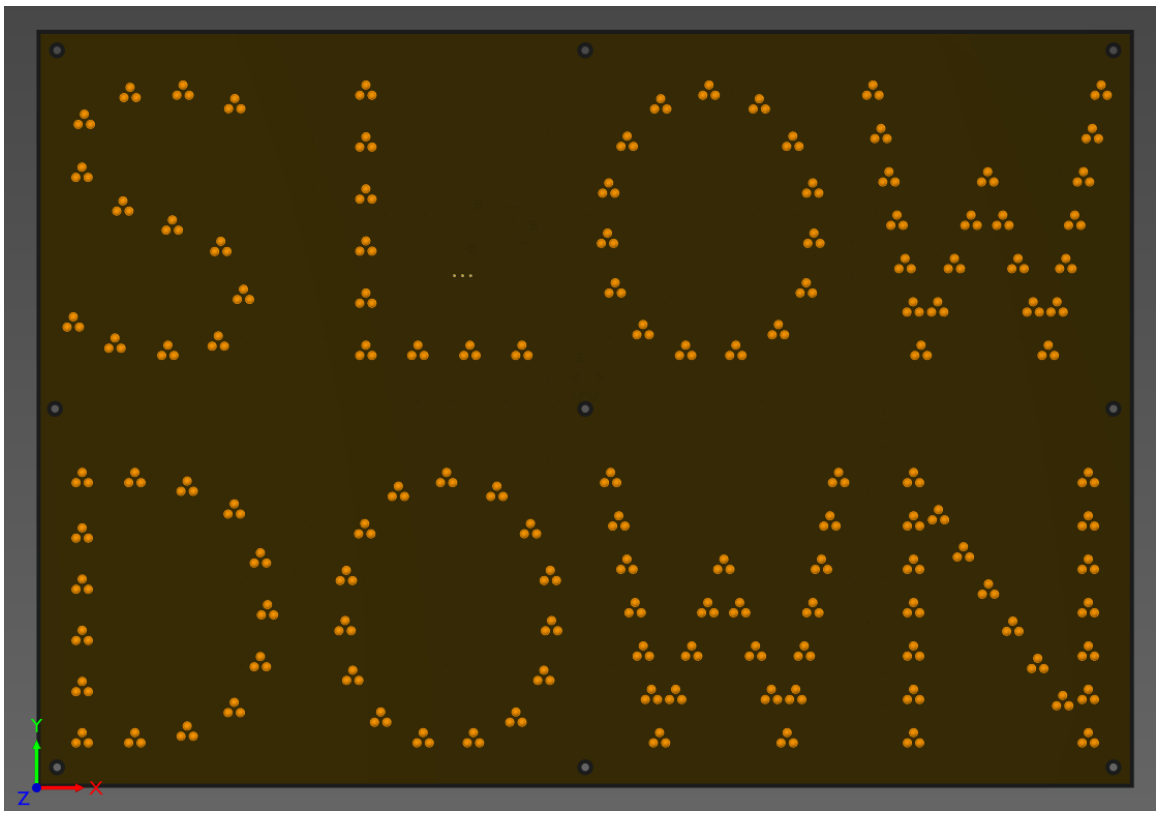
Many speed signs have an external VMS type message that gets activated above a preset speed. This message may spell out text like “SLOW DOWN” or any other message in a local language. Emoticons like a “sad face” are also commonly used in certain countries. The schematic below shows how to connect a string of LEDs that can be triggered by the PNL18 above a user set speed limit. Additionally this message will blink if the user chooses.

Connect as many strings of LEDs as required to form a message. For simplification only two strings are shown on the schematic. Then physically arrange the LED’s in the form of the message or emoticon you desire. The message can be programmed to activate above any user-selected speed. Furthermore this speed can be adjusted in the field through the rotary switch located on the back of PNL18. For most configuration purposes this eliminates the need to connect a computer in the field. If you wish to use a “SLOW DOWN” message we have an LED only board available for purchase. A second “THANK YOU” message (or a “happy face” emoticon) can be activated below the user-selected speed when connected to pin #1 of J10. Thus you can build a “SLOW DOWN”/”THANK YOU” type of display easily. Please contact us for details if you wish to utilize this feature



Appendix C: Houston Radar "SLOW DOWN" panel

Houston Radar also offers a "SLOW DOWN" panel that can simply be plugged into the PNL18 to start operation. This panel operates similarly to the LED Message board described in Appendix B.



Appendix D: Expanding to an Optional 3rd Digit to Make a 3 Digit Speed Sign

You may easily expand the PNL18 to a 3rd digit (to show the 100's place value) via the optional Houston Radar PNL18 One's digit panel.