



MVAS MKIII User Manual

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Document Control

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CONTENT

1	Introduction.....	5
2	Description.....	6
2.1	Chassis.....	6
2.2	Microwave Radar	7
2.3	Radar Breakout Module	7
2.3.1	Battery Backup	7
2.3.2	Engineers Terminal	7
2.3.3	Sign Drivers.....	8
2.3.4	Photocell.....	8
2.3.5	Remote Access (option)	8
2.4	DC DC Inverter	8
2.5	Battery Power	9
2.6	LED Emitters	9
3	Installation.....	10
3.1	Mounting the Sign	10
3.2	Radar Alignment.....	10
3.3	Battery Charging	10
3.4	Configuration	11
3.4.1	10 / 20 / 30 mph	11
3.4.2	20 / 30 / 40 mph	11
3.5	Testing	12
4	Connecting to the MVAS	13
4.1	SmartPhone Android Connection via Bluetooth.....	16
4.1.1	How to Download the App.....	16
4.1.2	How to Connect to the Radar	17
4.1.3	How to Set a Meaningful Name for Your Connection	18
4.1.4	How to Download the Data Using One-Tap Operations	19
4.1.5	Play One-Tap Operations	20
4.1.6	Individual Operations.....	23
4.1.7	How to Disconnect After Connecting	24
5	Data Logging & Retrieval	25
5.1	Data Processing	25
6	Radar Software Configuration	26
6.1.1	Data logging	29
6.1.2	Hardware & IO Config	30
6.1.3	Data Output	30
6.1.4	Detection and Units	31
6.1.5	Detection Limits Setup	32
6.1.6	Data Logging & Retrieval	33
7	Remote GPRS Connection to PGS In-station (Option)	34

8	Analysis of Sign Data Logging	35
8.1	Downloading data from The Radar	35
8.2	Analysing Data and Generating Reports	39
8.2.1	Generating Monthly, Weekly and Daily Counts and Speed Reports	39
8.2.2	Interpreting the Analysis Report	40
8.2.3	Exporting Summary Report Data	45
8.2.4	Generating Interactive Charts	47
9	Specification	50

1 Introduction

The Mobile Vehicle Activated Sign (MVAS), unlike conventional Vehicle Activated Signs, is able to operate without any mains electricity supply or solar electrical supplies. The sign uses internal lightweight batteries that can be recharged and then deployed in the sign.

The sign utilises a low power radar detector which provides extended operational lifespan when coupled with the lithium ion batteries. The optical solution utilises the traditional Swarco lens design providing high intensity operation together with excellent performance in sunlight.

The sign is able to detect oncoming vehicles using its integrated radar detector and the speed of the approaching vehicle is displayed to the driver. Preset speed thresholds then warn the driver to slow down by displaying the sign message when above the speed threshold. The warning display consists of LED elements combined to display warning messages.

Depending on the required configuration of the sign when ordering, the sign can be supplied able to store up to 6 months of data locally or a mobile data connection can be added to the sign allowing data to be accessed remotely via the SWARCO in-station software system PGS.

2 Description

The MVAS consists of the following primary components:

2.1 Chassis

The MVAS chassis is constructed from 3mm aluminium which is powder coated (normally black although other colours are available on request). The example below shows a switchable 20, 30 or 40mph warning sign to TSRGD diagram 670 with a supplementary LED text legend which is displayed when a detection is above the set speed threshold. The front face is hinged to allow maintenance access.



The chassis is IP55 rated and all cable gland entry points are protected to maintain this rating. Locks are fitted at multiple points to secure the front face of the sign once closed and also to ensure the seal rating is maintained in use.

2.2 Microwave Radar

The radar is the vehicle detector which is integrated within the sign front face. The radar is a 24.2GHz module Doppler detector which detects Doppler shift. As a target approaches the radar some of the signal is reflected back at a shifted frequency and the measured difference between the transmitted and received frequency is proportional to the speed of the approaching vehicle. To save energy the radar module powers up and activates every 200ms to assess the reflected readings and a tracking algorithm then compares these readings to track vehicles in the path of the radar, thus improving accuracy of speed readings.

The normal detection range of the radar is 100m although this is conditional on the radar reflection so a larger vehicle such as a truck may be detected further than 100m away whilst a motorbike or similar small vehicle may be detected at a shorter range.

The radar module is supplied in two variants, standard and data logging. Where data logging is provided the radar stores traffic data within its own FLASH memory. The data is stored and collected in data bins every 15 minutes and stored as a count in 5 mph speed data bins. Each time a vehicle is detected approaching the radar its speed is recorded and sorted into these data bins.

Using this approach allows the sign to store data for up to 6 months, although the data packet storage is finite so if the time period is adjusted in the configuration to (for example) 10mins then the data storage period would be reduced by a third. Care should be taken to not make the time periods too large; while this will lengthen the storage period beyond six months the count can go above the maximum limit and this means some vehicles will not be counted.

2.3 Radar Breakout Module

The breakout module provides a termination point for connection to the radar plus some additional facilities.

2.3.1 Battery Backup

When the radar is being used for data logging it maintains a real time clock to timestamp all of the traffic data. In the event of a power failure the battery backup uses two CR2477 3V 1Ah Coin Cell batteries to maintain the real time clock for a period of up to 6 months until power is restored. If the real time clock should fail during power failure then the batteries should be replaced. During normal operation when the sign is powered the batteries are unused.

2.3.2 Engineers Terminal

The breakout module provides an RS232 connection to communicate with the radar. The connection can be used to configure the radar, set the real time clock or to download traffic data. Alternatively a Bluetooth module can be fitted to provide a roadside wireless connection at a maximum of 30m distance from the sign. When using a remote solution to access the sign such as a modem to wirelessly connect to the SWARCO in station, on-site engineer access will require the sign to be opened and the modem disconnected before the engineer can connect to the radar.

2.3.3 Sign Drivers

The radar produces two driver outputs; these are combined in the breakout board to provide the following outputs:

Name	Pin	Comment
FLASH1	CONN10 Pin 1	Activates during sign operation at a flash rate of 60-90 flashes per minute
FLASH2	CONN10 Pin 2	Activates during sign operation but inverted to FLASH1
RING	CONN10 Pin 3	Activates during sign operation
SPEED	CONN10 Pin 4	Activates during sign operation
MESSAGE	CONN10 Pin 5	Activates during sign operation
GND	CONN10 Pin 7,8,9,10	0V Return

Each output is rated at 24/48VDC at a maximum load of 6W. Although the module is powered from 12V the LED supply is connected on the STL003 at CONN3 pin 1, so if this is connected to 48V all LED drivers will supply 48VDC.

2.3.4 Photocell

A photocell is connected to the breakout module STL003 on CONN2 between pins 1 and 2 to allow the sign display to dim the sign drivers using PWM. Dimming is used to ensure the sign is efficiently powered to suit the ambient conditions.

2.3.5 Remote Access (option)

To assist remote access when connected to a mobile data modem, outputs are provided to confirm sign operation and to provide an alert when the maintenance door is opened. These connections are provided as follows:

Function	Connection	Operation
12VDC	CONN4 Pin 1	12VDC
ACTIVE	CONN4 Pin 2	Output will go active high to 12V when sign triggered
DOOR OPEN	CONN4 Pin 3	Output will go inactive to 0V when door is opened
GND	CONN4 Pin 4	GND

Where the door monitor is used a 'push to make' door switch will need to be connected between CONN2 pins 1 and 2.

2.4 DC DC Inverter

Operating from a single 12VDC supply it is necessary to provide 24VDC for the LED signal emitters. The STL024 converts 10-16VDC to a regulated 48 ± 0.5 VDC at a maximum loading of 48W. The inverter provides reverse polarity and overload protection in case of mishandling or faults. Connections to the module are as follows:

Connection	Function
CONN P1 Pin 1	12VDC Supply input
CONN P1 Pin 2	0VDC
CONN P2 Pin 1	0VDC
CONN P2 Pin 2	48VDC Output

2.5 Battery Power

The sign is powered from one / two of Lithium Ion 12VDC batteries. Further details of batteries operation are provided in section 3.3.

2.6 LED Emitters

When the sign face is triggered it illuminates to display a warning message with or without flashing ambers. Each pixel of the display is formed from an LED and lens. The combination of LED and lens provides optical contrast for the sign and allows the signs to meet standards for optical uniformity and distribution of the light across the road surface.

The LED emitters provide a sign display certified to EN12966 with the following characteristics:

Beam Width	B3
Luminance Ratio	R3
Colour	C2
Luminance	L3

Depending on the ambient light conditions the LED emitters need to be more or less bright, therefore a photo-cell measures the ambient light conditions on the front face of the sign. The radar module then uses PWM to control the intensity of the LEDs to 6 different light levels. Using this approach also avoids users seeing excessively bright sign displays in low ambient light as well as saving energy where possible.

3 Installation

3.1 Mounting the Sign

When installing the sign on the recommended hinged posts:

Remove the padlock, nut and bolt at the pivot point and lower the top half of the post.

Mount the sign onto the post bracket and lower onto the locating lugs. Ensure the sign is lowered completely and attach padlock through the post bracket and sign bracket ensuring the sign is secure.

Raise the post back to the vertical position, re-attach the padlock, nut and bolt ensuring the post is secure.

Ensure the sign is facing the centre of the approaching lane at 80-90m.

When installing on an existing post:

Attach the post bracket using provided clamps ensuring 2.1m mounting height is maintained (2.4m for cycle paths).

Mount the sign onto the post bracket and lower onto the locating lugs (This will require ladders or alternative climbing aid). Attach padlock through the post bracket and sign bracket ensuring the sign is secure.

Ensure the sign is facing the centre of the approaching lane at 80-90m.

3.2 Radar Alignment

When positioning the sign on the mounting pole it is important to realise that the radar unit is mounted parallel to the front surface of the sign. The sign should be targeted to ensure the radar is aligned to the centre of the approaching traffic at 60-90m along the carriageway. It should be noted that the road from the sign to the 60-90m point needs to be straight. It should be noted that any metallic obstructions in the field of view of the radar may affect the range and accuracy of detection.

3.3 Battery Charging

The MVAS is fitted with one to two lithium ion battery packs, each battery pack is fitted with a charge level indicator. Press and hold the charge level indicator button on each battery pack to confirm the battery state. 3 green LED's indicates fully charged and red indicates the battery is discharged and requires charging. It is important for safety reasons that lithium ion batteries are not over discharged: the battery output will be switched off at 9V battery level for this reason.

The battery is rated for discharge over the temperature range rating of the sign -20C to +60C however the battery can only be charged over the temperature range 0 to +45C, therefore do not attempt to charge the battery outside this temperature range. Do not attempt to charge the battery while the sign is in use.

The batteries are rated for 300 charge / discharge cycles if the sign is operating for a maximum of one month then the sign has a maximum battery life of 25 years.

When charging it is important that the batteries are removed from the sign, a mains 230V charger is supplied with the sign as well as a 12V cigar lighter charger. It is important to only use the chargers supplied with the sign to avoid damage to the batteries and avoid any risk of damage to the battery.

The battery fuel gauge can be used to identify the charge remaining in the battery. Once the battery is off load for 2 minutes or more press the fuel gauge button and read the LED pattern as follows:

- | | | |
|-------------------|--------------|---|
| • No Lights | Empty | Recharge within 12 hours |
| • 1 Red Light | <10% Full | Battery will switch off to prevent over discharge |
| • 2 Red Lights | 10-20% Full | Recharge ASAP |
| • 1 Green & 2 Red | 20%-50% Full | |
| • 2 Green & 2 Red | 50-75% Full | |
| • 3 Green & 2 Red | 75-100% Full | |

WARNING: ONCE THE BATTERY IS FULLY CHARGED DISCONNECT FROM THE CHARGER DISCONNECT THE CHARGER FROM THE MAINS SUPPLY. DO NOT LEAVE THE BATTERY CONNECTED TO THE CHARGER FOR LONG PERIODS

NOTE: ENSURE WHEN THE SIGN IS FIRST SUPPLIED THE BATTERIES ARE FULLY CHARGED FROM THE MAINS SUPPLY USING THE CHARGER PROVIDED.

The batteries are rated for 300 charge / discharge cycles if the sign rated to operate for a maximum of one month then the sign has a maximum battery life of 25 years.

3.4 Configuration

The MVAS can be purchased in two pre-built configurations:

3.4.1 10 / 20 / 30 mph

The MVAS display is capable of flashing a speed warning for vehicles exceeding speed limits of 10, 20 and 30 mph speed limits. The sign has been pre-configured to support all of these speed limits.

To convert the sign to operate in each mode open the enclosure and move the rotary switch to the 10, 20 or 30 position, then close and lock the enclosure. The radar trigger speed will be set accordingly:

Mode	Sign Trigger Speed
10	11 mph
20	22 mph
30	33 mph

As an example if the sign is set to 20 mode when vehicles are detected approaching the sign above 22mph the sign will be triggered. These trigger thresholds can be adjusted in the radar software configuration.

3.4.2 20 / 30 / 40 mph

The MVAS display is capable of flashing a speed warning for vehicles exceeding speed limits of 20, 30 and 40 mph speed limits. The sign has been pre-configured to support all of these speed limits.

To convert the sign to operate in each mode open the enclosure and move the rotary switch to the 20, 30 or 40 position, then close and lock the enclosure. The radar trigger speed will be set accordingly:

Mode	Sign Trigger Speed
20	22 mph
30	33 mph
40	44 mph

As an example if the sign is set to 30 mode when vehicles are detected approaching the sign above 33mph the sign will be triggered. These trigger thresholds can be adjusted in the radar software configuration.

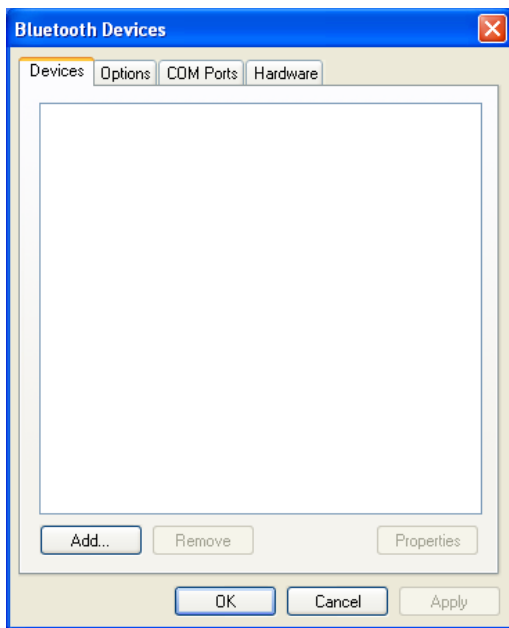
3.5 Testing

Once the sign is installed and configured its operation needs to be verified. Look for vehicles travelling away from the radar with no oncoming traffic and confirm the radar is not triggered. Now with oncoming only traffic confirm the vehicles (cars only) are detected at 70m+ triggering the sign. Please note larger vehicles such as Lorries will be detected at greater distances and motorcycles at shorter distances due to the relative size of the radar reflection. Up-hill and down-hill locations will also affect the detection range.

4 Connecting to the MVAS

The MVAS is fitted with a Bluetooth adapter to provide remote configuration and monitoring of the radar. The device is capable of a data connection speed of 115,200 baud with a maximum range of 40m. Please note to meet this range will require a laptop or personal computer fitted with a class 1 Bluetooth adapter.

Before accessing the radar ensure the Bluetooth on the PC is paired to the Houston Radar Dongle. Double clicking on Bluetooth icon on the taskbar will bring up the display below:

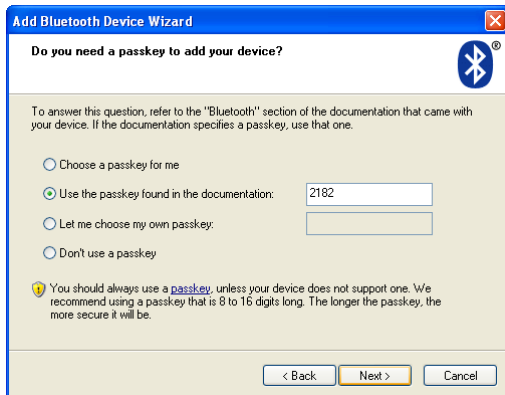


Click Add to add a new device and you should get screen similar to below:



Ensure the `My device is set up and ready to be found` Checkbox is selected, power is applied to the MVAS and select Next>

The Radar HR dongle should be displayed in a window, select the device and then select next, this should bring up the following window:



Select the `Use the passkey found in the documentation` option and enter the passkey **1234**.

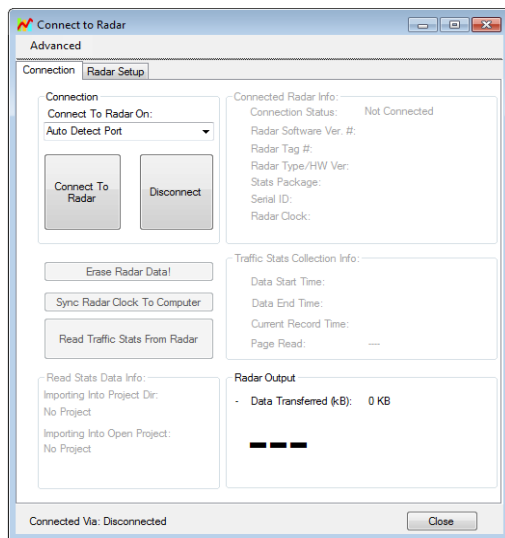
Select Next>

The device should be assigned serial ports by Windows, as illustrated below:



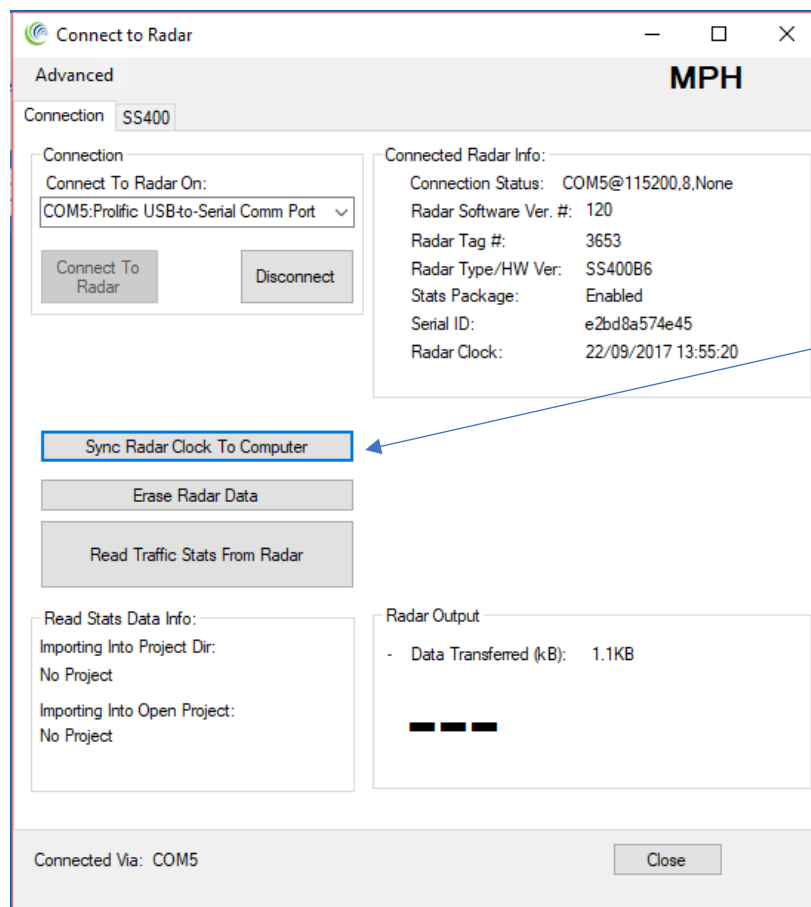
At the Radar stats Analyser software go to the file menu and select Connect to Radar>

The following window will now be displayed:



Now select the Connect to Radar button and the application will make a communications connection to the radar.

Once complete at the main menu Connection ensure Sync Radar Clock to Computer is used to ensure the radar on board clock is at the correct time.



Use to set radar clock to computer clock

Once the clock is synchronised the radar will use the clock to time stamp all traffic data held within the radar. A battery backup facility maintains the clock for up to 3 months when the

main supply batteries are removed. If traffic data is later retrieved without the correct timestamp it means the clock has not been set.

4.1 SmartPhone Android Connection via Bluetooth

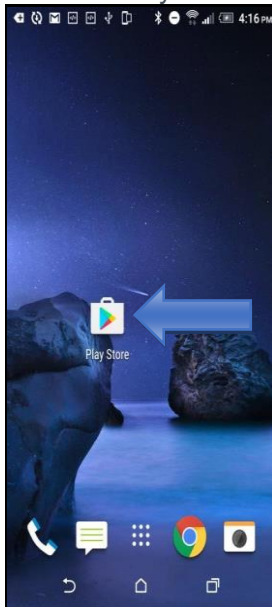
The Houston Radar app is only available for the Android devices.

The Houston Radar app is compatible with Android OS 4.0.3 (Ice Cream Sandwich) to 6.0+ (Marshmallow).

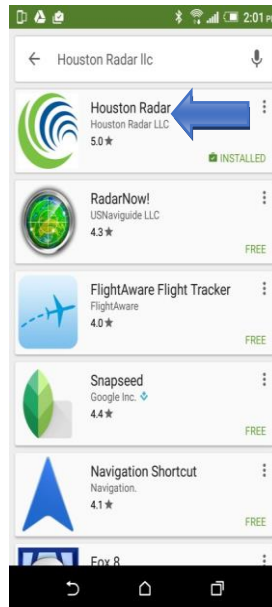
The app will work on smartphones and tablets.

4.1.1 How to Download the App

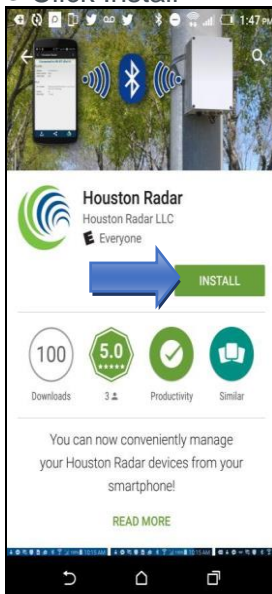
1. Go to Play Store



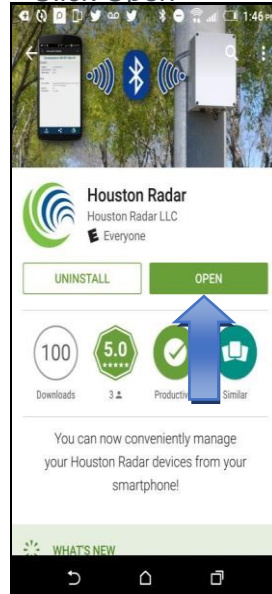
2. Search: Houston Radar LLC



3 Click Install

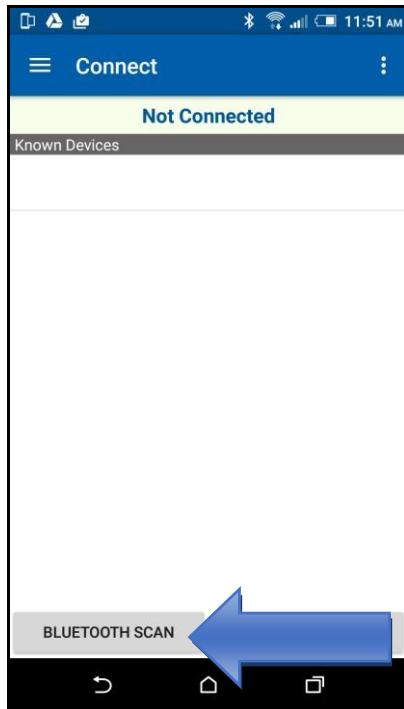


4 Click Open



4.1.2 How to Connect to the Radar

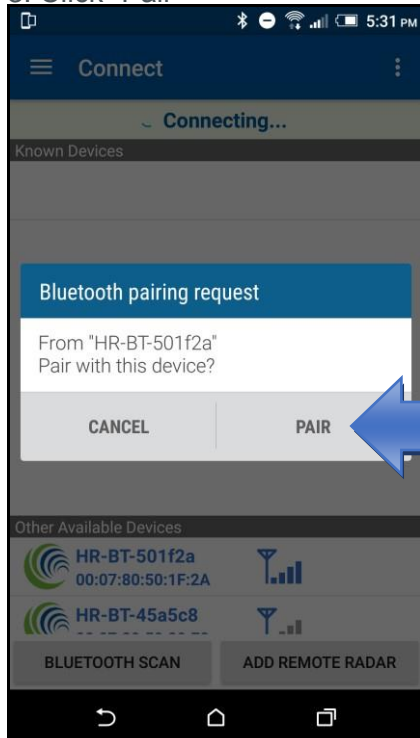
1. Click "Bluetooth Scan"



2. Pick your radar



3. Click "Pair"

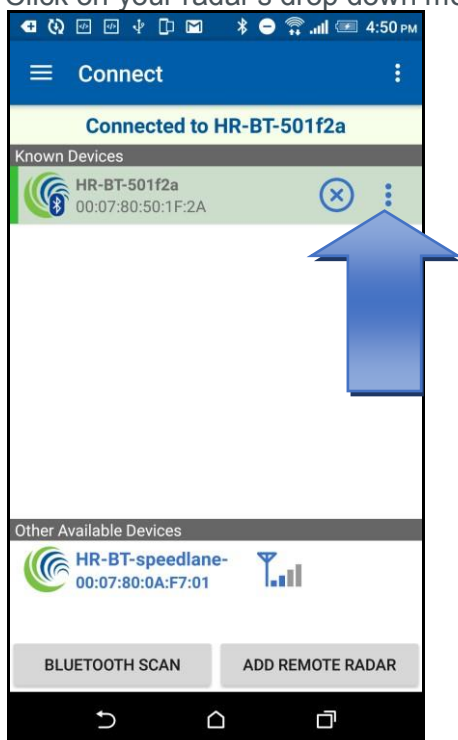


Please Note:

- The scan and connection are required to be done only once per radar.
- The ID shown is listed on a sticker on the device (Bluetooth Dongle).
- The "Remote Radar" is for making connections over the Internet if the device is on the Internet (with either an internal modem or an external modem on the serial port).

4.1.3 How to Set a Meaningful Name for Your Connection

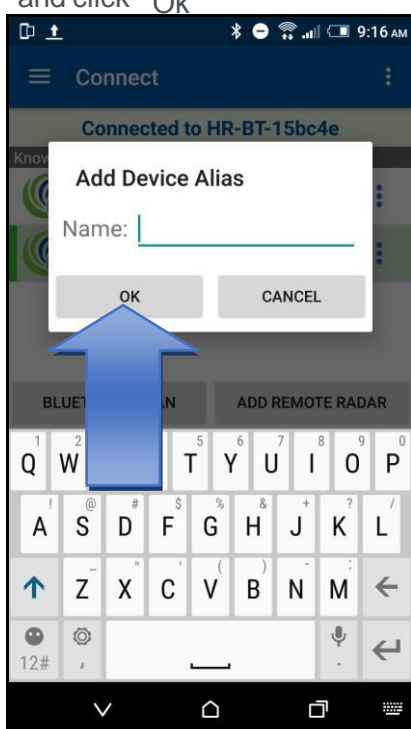
1. Click on your radar's drop down menu



2. Click "Settings"



3. Type in your meaningful name and click "OK"



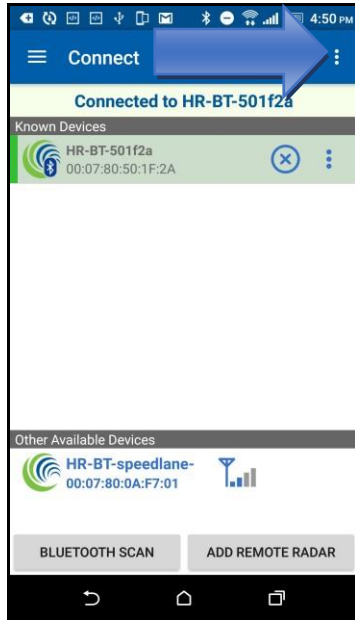
4. The name will appear for that unit



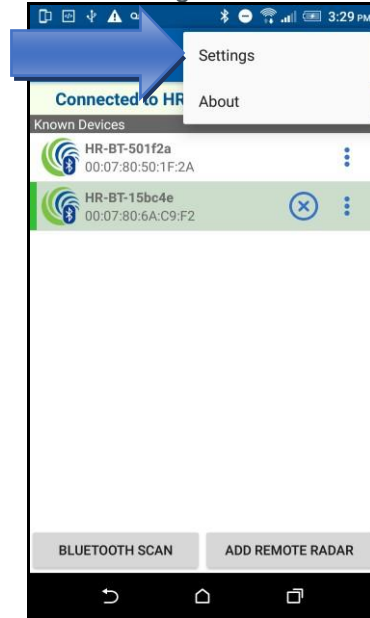
4.1.4 How to Download the Data Using One-Tap Operations

Setting up Play One-Tap Operations: You can set up one tap operation to achieve multiple actions. This includes making the connection, downloading data, syncing clock, erasing data and sharing the downloaded file. One time configuration is required as described below.

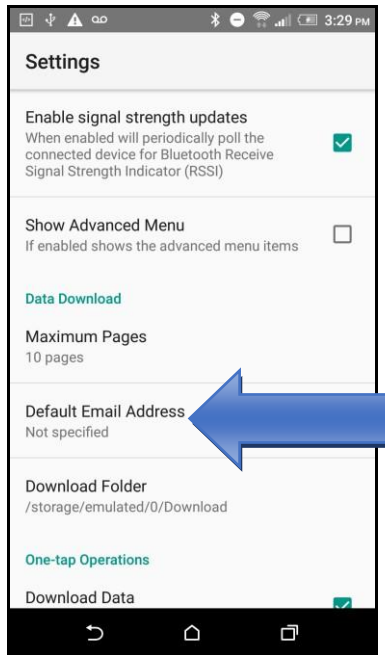
1. Click on the drop down menu



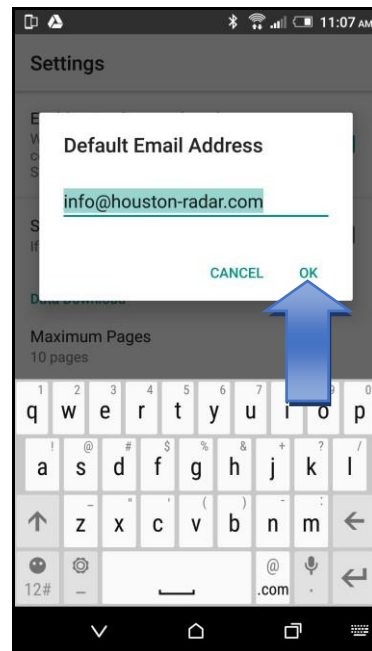
2. Click settings



3. Setting up your default email:
Click on "Default Email Address"

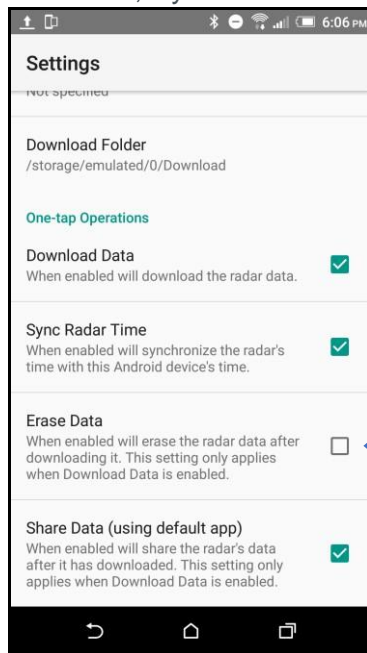


4. Type in your email address and click "Ok"



5. Scroll down and check: Download

6. Data, Sync Radar Time and Share Data

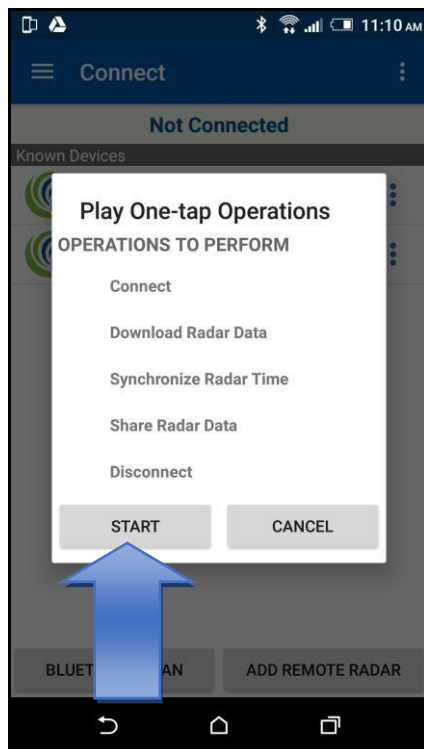


We recommend you select Erase Data so that you don't save old data each time.

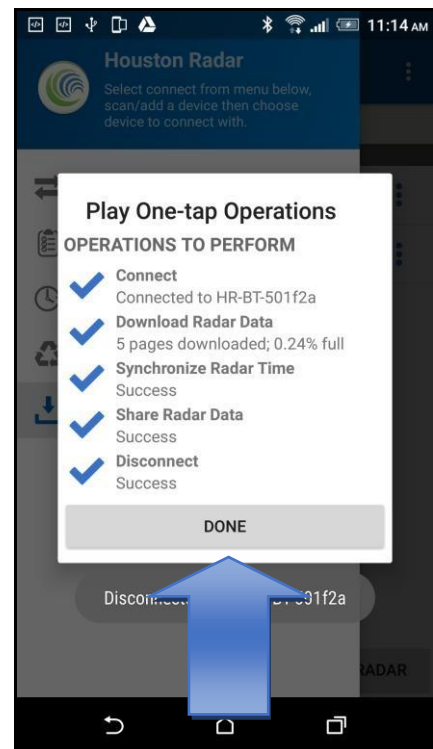
4.1.5 Play One-Tap Operations

Operations to perform: Connect, Download Radar Data, Synchronize Radar Time, Share Radar Data and Disconnect





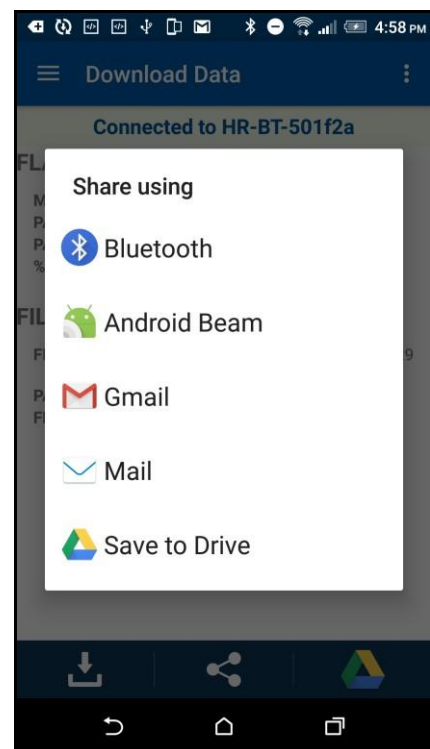
6. The first time you download data this screen will come up asking how you want to share



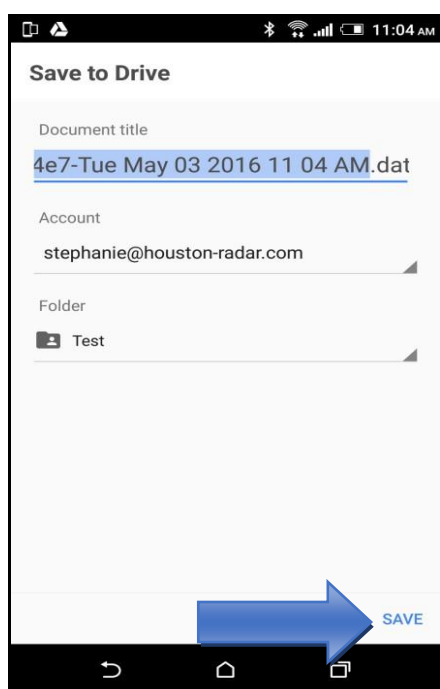
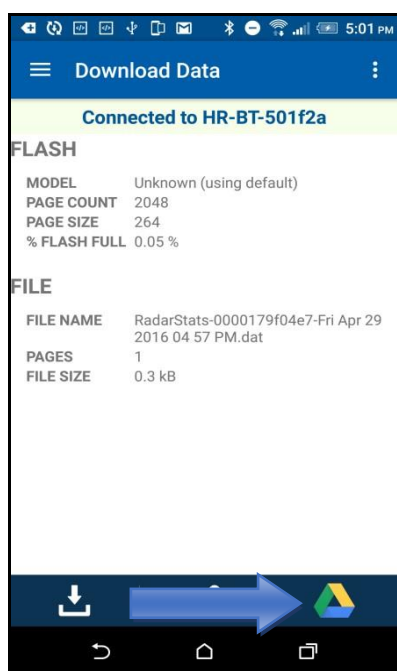
8. Installed and available options are shown in a pop-up



9. After you Save to Google Drive, Google the app will make an icon that you come up for future can easily click and save Operations. Click "Save"



10. After you have Saved to Drive, this will One-Tap



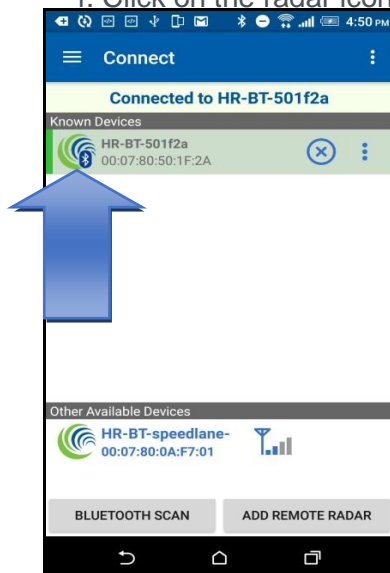
Please Note:

The available sharing options depend on the application installed on your phone or tablet and may be different than shown in the guide.

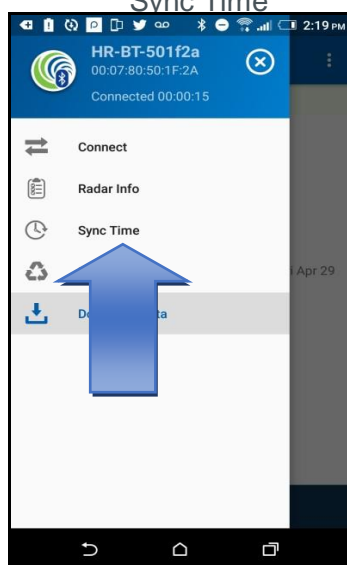
4.1.6 Individual Operations

Can individually Sync Time, Erase Data, and Download Data after you run the One-Tap Operations by:

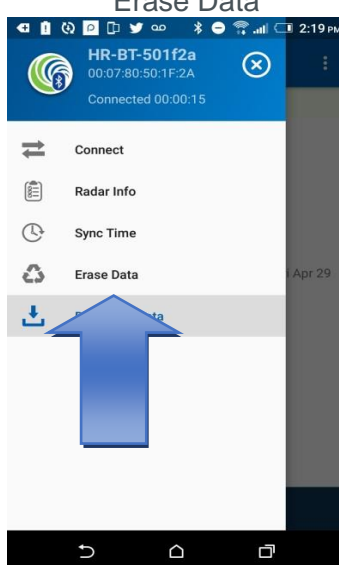
1. Click on the radar icon



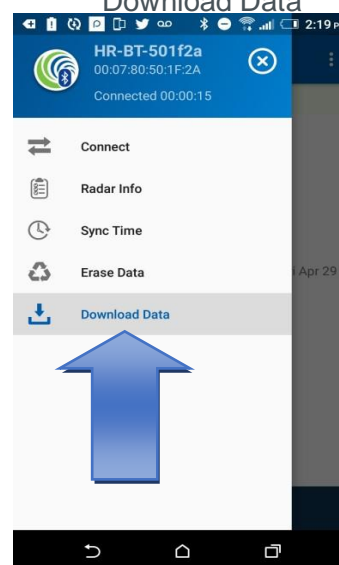
Sync Time



Erase Data



Download Data



4.1.7 How to Disconnect After Connecting

1. Click on the "X"



5 Data Logging & Retrieval

Traffic data is logged in the MVAS radar, where the data is stored and collected in data bins every 15 minutes and 5 mph. Each time a vehicle is detected approaching the radar whether it is above or below the speed limit its speed is recorded and sorted into these data bins. Using this approach allows the sign to store data for up to 6 months.

As an example vehicles approach the radar as follows and are sorted into their data bins.

Vehicle detected at 16:21:05 at 32.3mph

This will be stored in the time bin 16:15:00-16:29:59 speed bin 30-35 mph

Vehicle detected at 16:29:45 at 29.9mph

This will be stored in the time bin 16:15:00-16:24:59 speed bin 25-30 mph

It should be noted where a speed bin is 15-20 mph it is collecting data for vehicles travelling in the range 15.0-19.9 mph.

To retrieve data after the signs has been recording data for some time reconnect the PC with Analytical software to the radar unit and then:

- 1) Open an existing project from the File menu or create a new project. Project names are usually based on the site name or location. Once the project is selected.
- 2) Click 'File' then 'Connect To Radar.'
- 3) 'Connect to Radar.'
- 4) Ensure you see "Radar found on COM (x)" message. The COM port number will depend on the PC setup.
- 5) Click on OK and the radar is ready.
- 6) Click 'Read Traffic Stats From Radar' select 'OK'
- 7) Data will now be uploaded into the project together with the timestamps for the beginning and end of the data.
- 8) A confirmation box will appear, click 'OK'
- 9) Once the import is complete a new data entry will be shown in the project file
- 10) If applicable select 'Erase Radar Data' (if you do not erase the data will be left in the radar)
- 11) Select 'OK'. A confirmation box will appear, select 'OK.'

The data has now been uploaded on to your laptop and can be checked when back in the office away from the sign for processing.

5.1 Data Processing

The MVAS radar analysis software allows data collected from the radar to be processed and analysed.

At the "File" menu select Open Existing Stats Project, then select the project name.

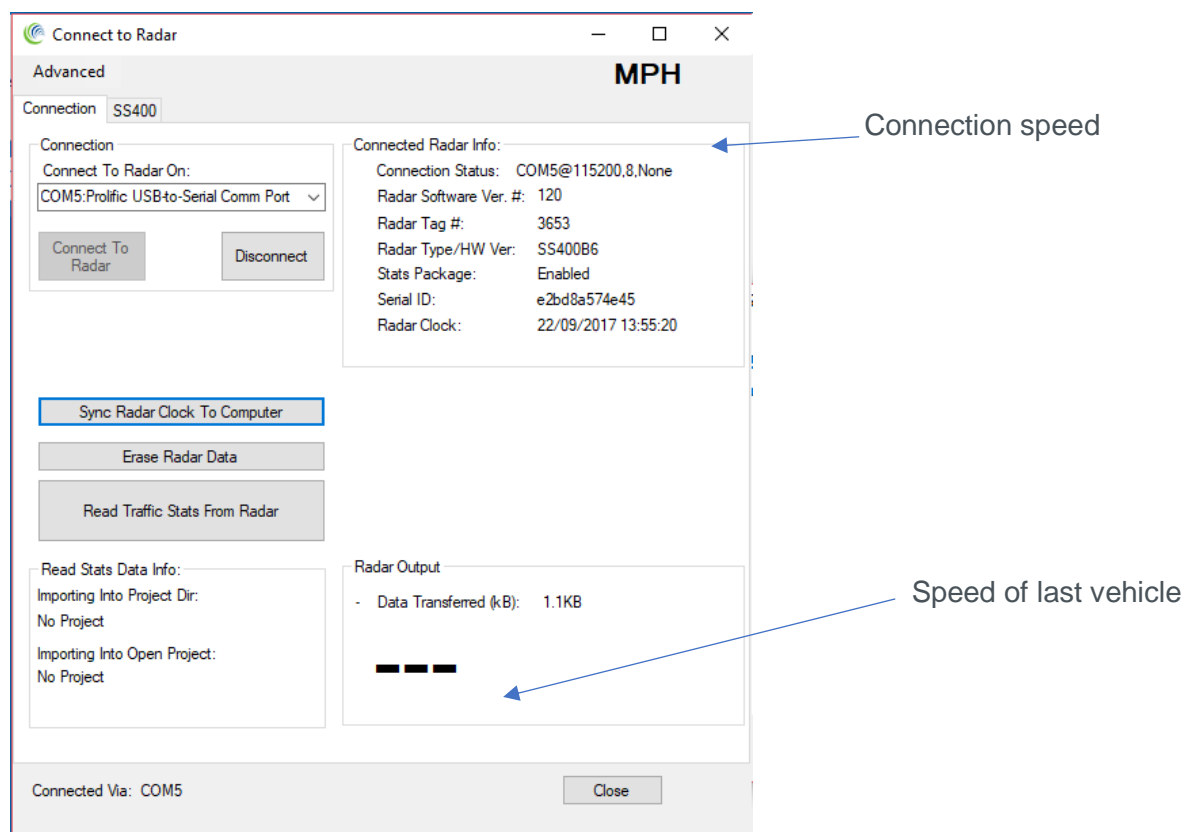
6 Radar Software Configuration

The sign is delivered pre-configured however you may need to make adjustments to the radar configuration parameters if a different setup of the sign is required.

The sign is configured using the Windows Programming Stats Analyser software. Ensure the software is installed on your Windows XP, Vista or Windows 7 PC, then connect through to the radar using the in-built Bluetooth adapter. Ensure the radar Bluetooth adapter is paired with your computer prior to making a connection.

Now start the Radar Stats Analyser software click on

- 1) File -> Connect to Radar..
- 2) Now select the "Connect To Radar." button
- 3) Ensure you see "Radar found on COM (x)" message the COM port number will depend on the PC setup.
- 4) Click on OK and the radar is ready for configuration.



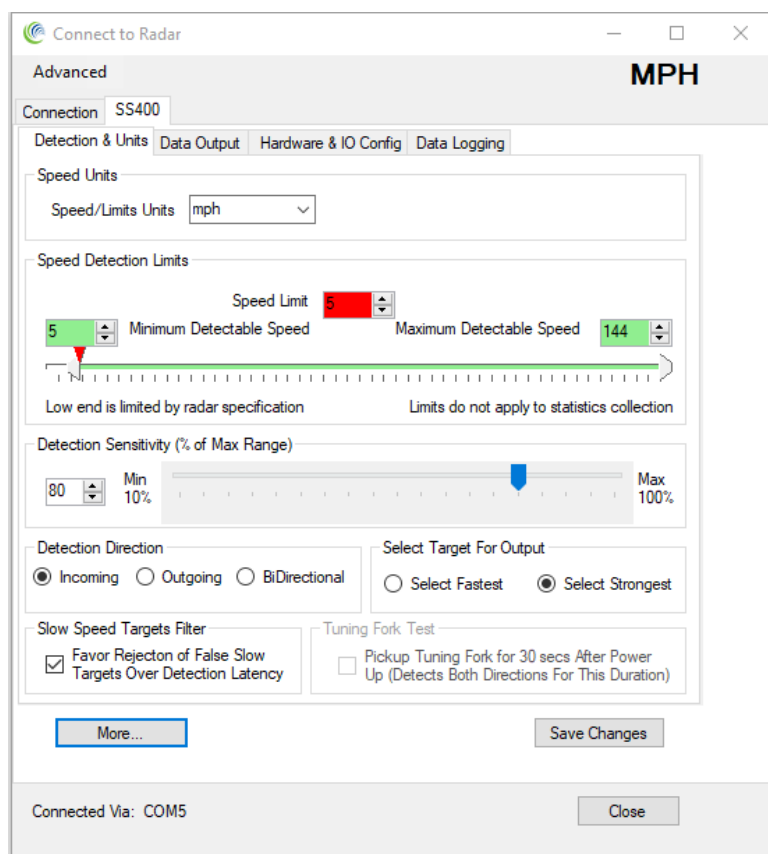
Once connected the screen will identify the radar firmware the connection speed and the speed of the vehicles passing the sign.

The sign will have been pre-configured before leaving the factory there are 3 default configurations used:

001-196	10/20/30 mph warning sign
001-190	20/30/40 mph warning sign

Within the MVAS a single rotary switch allows changing both the displayed speed limit and the radar speed thresholds. The speed threshold is the speed above which the sign will flash a warning message to approaching drivers. Adjust the switch positions to the desired speed threshold. Refer to Sections 2.4.1 and 2.4.2 for the speeds thresholds configuration respectively for the 10/20/30 and 20/30/40 standard builds.

If a configuration is changed and you want to return to the default configuration then from the radar setup screen select More.

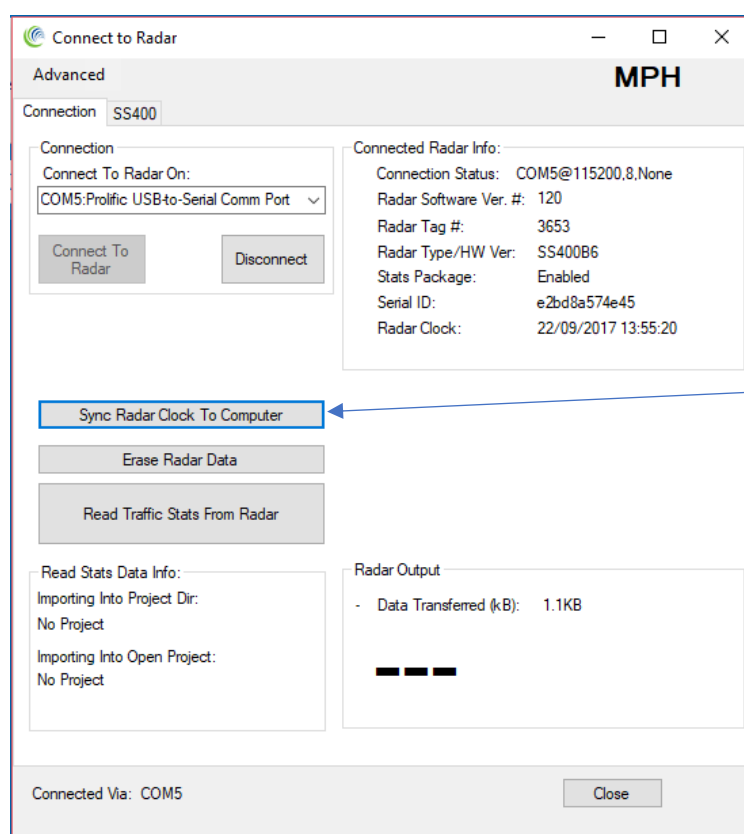


Now select the Load Config from File into GUI. At the file menu select one of the default configurations:

001-196	10/20/30 mph warning sign
001-190	20/30/40 mph warning sign

Then select Write to Radar to download the configuration into the radar unit.

Once complete at the main menu Connection ensure Sync Radar Clock to Computer is used to ensure the radar on board clock is at the correct time.

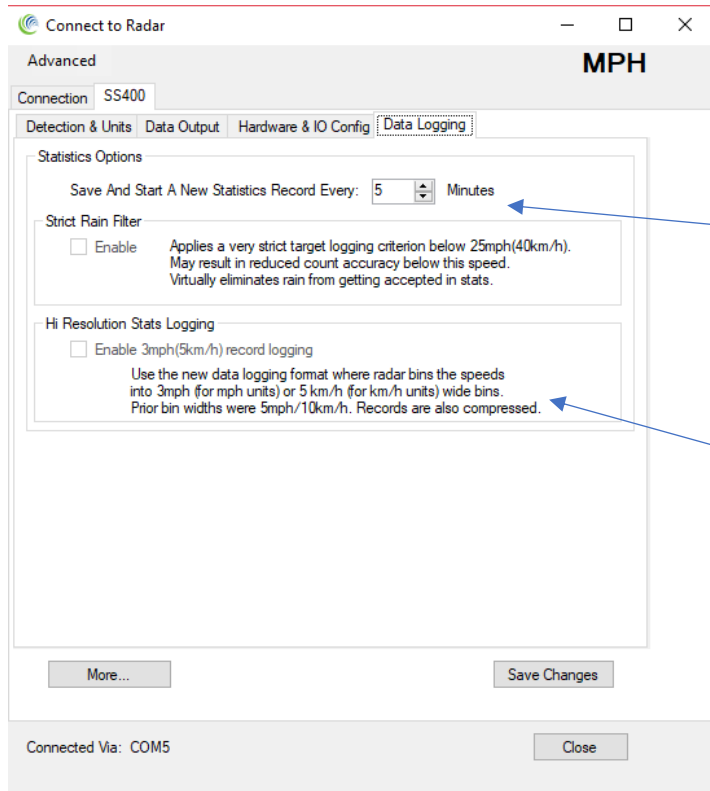


Use to set radar clock to
computer clock

Outside the standard radar configurations further changes can be made as required.

6.1.1 Data logging

If provided data logging can be configured at the Data Logging tab.

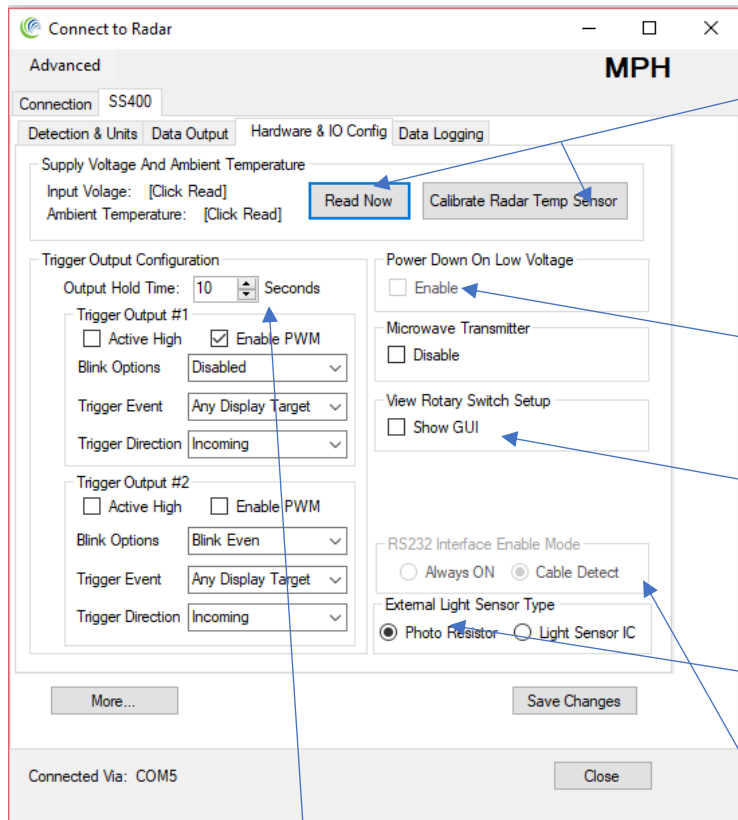


Sample Time Records. Counts of vehicles in each speed bin are recorded over 15 minute periods as a default. This can be reduced to 1 minute sampling or increased to 30 minutes. Reducing the time period increases memory used in storage. 15 minutes intervals will allow 6 months of data to be stored (default) while 30 minute periods increases data storage to 12 months

Vehicle data counts are normally stored in 5 mph bins i.e. 25-30, 30-35 etc. this can be changed to 3mph bins if required.

6.1.2 Hardware & IO Config

This tab allows the hardware operation of the radar and signs to be configured.



Diagnostic facility to check supply voltage and temperature. IF temperature is not accurate Calibration button can be used to improve accuracy.

When the supply voltage drops to below 9V the radar will go into standby mode reducing power consumption. Waiting for the voltage to return to normal. The on board clock status is maintained.

Ensure the rotary switch setup is available on the detection tab.

Default LDR is the photo sensor used to control dimming. IF a PCB mount version is used this should be set to Light sensor chip

Configuration of display outputs. Hold time ensures display persists for default 2 seconds after vehicle has passed detection zone. Increasing time will reduce battery life. Outputs going active low trigger the display activity, active high will invert operation. PWM is normally enabled this means the display is dimmed at night to avoid bright light for drivers. Blinking will cause the output of the sign to flash. A split trigger allows outputs 1 and output 2 to operate at different speed thresholds.

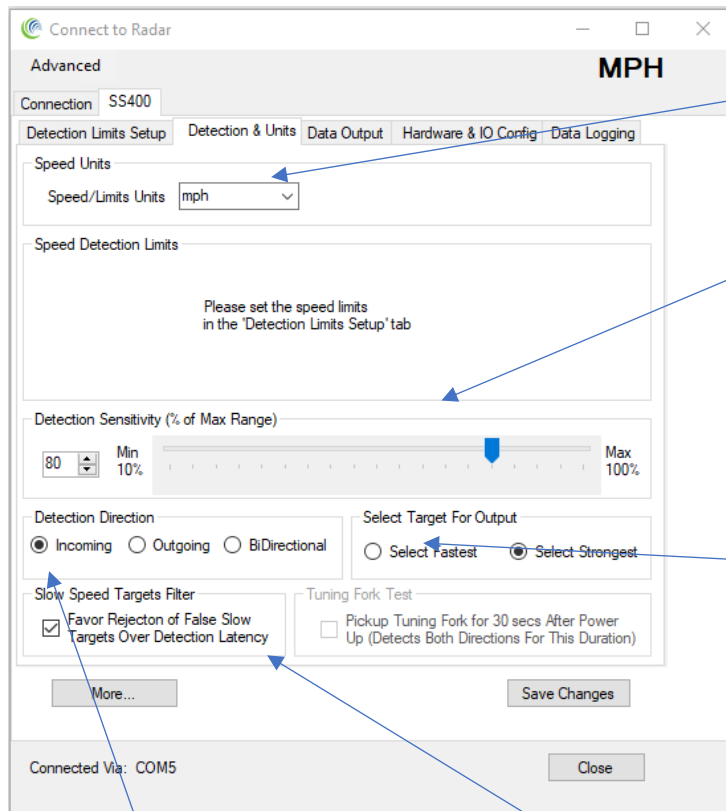
The RS232 interface is normally powered down to save power. Using cable detect it will power up when connected only. Always ON will increase power consumption.

6.1.3 Data Output

The data output facility is used when a GPRS modem is connected to the sign and vehicle detected by the radar are streamed through the serial interface. This facility is not currently supported on MVAS.

6.1.4 Detection and Units

The detection and units tabs allow the radar range and detection settings to be adjusted.



Units selection for the radar default mph but can also be set to kph, ft per sec and meter per sec.

The maximum detection range of the radar is 100m the normal setting is 90% of maximum which provides good balance between range coverage and detection accuracy. Increasing the range to greater than 90% reduces accuracy of detection.

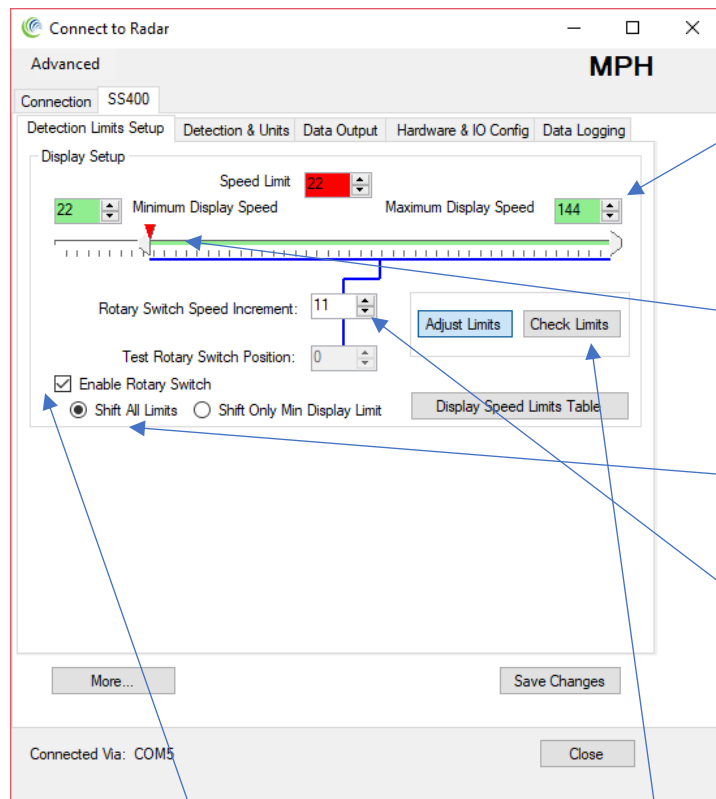
Default to fastest is set to pick the fastest vehicle in a group to trigger the sign rather than the largest. In this case in a platoon of vehicles the fast car will be detected over a slower but stronger signal from a lorry.

Direction is set to incoming to detect only vehicles approaching the sign only.

Default is set to help reduce spurious data from water droplets reflecting radar signal at low speeds on branches or when snowing.

6.1.5 Detection Limits Setup

This tab provides the settings for the speed thresholds used within the sign.



Maximum speeds of a vehicle which will trigger the sign to operate.

The minimum display speed and speed limit are normally set to the speed at which the sign is required to trigger. If display output 2 is required to operate at a different speed threshold or flash a message then they would be set to different speeds.

As the minimum and speed limit thresholds are set to the same value it is important both are updated by the rotary switch so use Shift all limits.

When using the rotary switch each position steps the speed settings up or down by this speed increment i.e. 1mph increments in this example..

Enable if the rotary switch on the radar is being used to set different speed thresholds.

To change the speed limits ensure Adjust Limits is selected and then change the Minimum Display Speed, Speed Limit and Maximum Display Speed to suit. To ensure limits are correct use Check Limits and then use the Test Rotary switch position to simulate operation of the rotary switch and the adjustments it makes to the radar. In addition Display Speed Limits Table will display a summary of all the switch positions.

N.B: Always remember to Write to Radar after making any changes in the configuration to ensure changes take effect.

N.B: When using a dual faced sign, remember if switching between 33mph / 44mph to also change the power switch from '30' to '40' for the relevant message to be displayed.

6.1.6 Data Logging & Retrieval

At the radar configuration menu select:

- 1) Click File then "connect to Radar"
- 2) Connect to Radar
- 3) Ensure you see "Radar found on COM (x)" message. The COM port number will depend on the PC setup.
- 4) Click on OK and the radar is ready.
- 5) Click 'Sync Radar Clock To Computer' Time and date will adjust to your PC (so ensure the PC date and time are correct)
- 6) Now select the tab "Data Logging"
- 7) Ensure data logging is set to record in 15 min time slots.
- 8) Save and Start A New Statistics Record Every (15) Minutes.
- 9) Strict rain Filter (Disabled)
- 10) Hi Resolution Stats Logging (Disabled)

To retrieve data after the signs has been recording data for some time reconnect the PC with Analytical software to the radar unit and then:

- 12) Click 'File' then 'Connect To Radar.'
- 13) 'Connect to Radar.'
- 14) Ensure you see "Radar found on COM (x)" message. The COM port number will depend on the PC setup.
- 15) Click on OK and the radar is ready.
- 16) Click 'Read Traffic Stats From Radar' select 'OK'
(The default save location is 'C:/My Documents/My Radar Stats/No Project).
- 17) You can change the file name as you please. Select 'Save.'
- 18) A confirmation box will appear, click 'OK'
- 19) If applicable select 'Erase Radar Data'
- 20) Select 'OK'. A confirmation box will appear, select 'OK.'

7 Remote GPRS Connection to PGS In-station (Option)

A GPRS modem (RM6000) can be optionally fitted into the MVAS sign, this provides a remote connection from the Swarco Parking Guidance System (PGS) in station. Using this connection the in-station can be used to remotely change the speed threshold of the radar and collect vehicle data logged in the MVAS radar.

Please refer to the SWARCO RM6000 User Manual for setup details.

8 Analysis of Sign Data Logging

8.1 Downloading data from The Radar

All data that needs to be analysed must be first downloaded into a project. A project is simply a place to organize different sets of data together.

The user is the best judge of how they want to organize their data. Some possibilities are:

1. Fixed location sign or data taken at various times from the same location.

If the sign is in a fixed location, or you return to the same location over different periods of time of the month or year, you may create a project for that location. Then you can import data at different times from the same location into the same project. This will allow you to analyse different sets of data from that location together and even run comparison over time to see how traffic patterns are changing.

2. Speed studies at various locations.

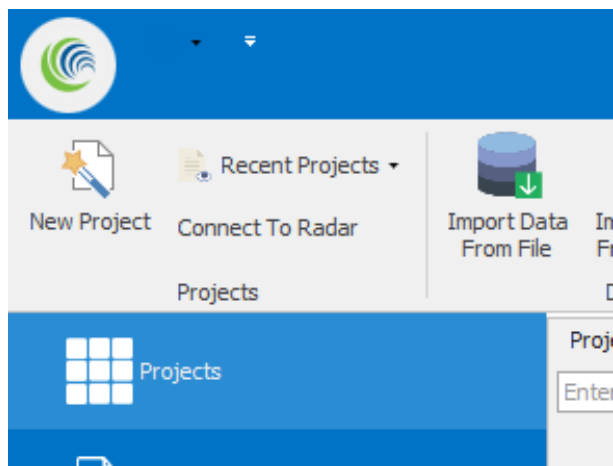
In this case, you may want to create a project per speed study, or by date. There are pros and cons to each approach.

Project Per Speed Study: In this case, you may end up with a lot of projects. There is no inherent limitation to the number of projects allowed, but projects are created and displayed in a single level view and a lot of projects may get difficult to navigate after many studies.

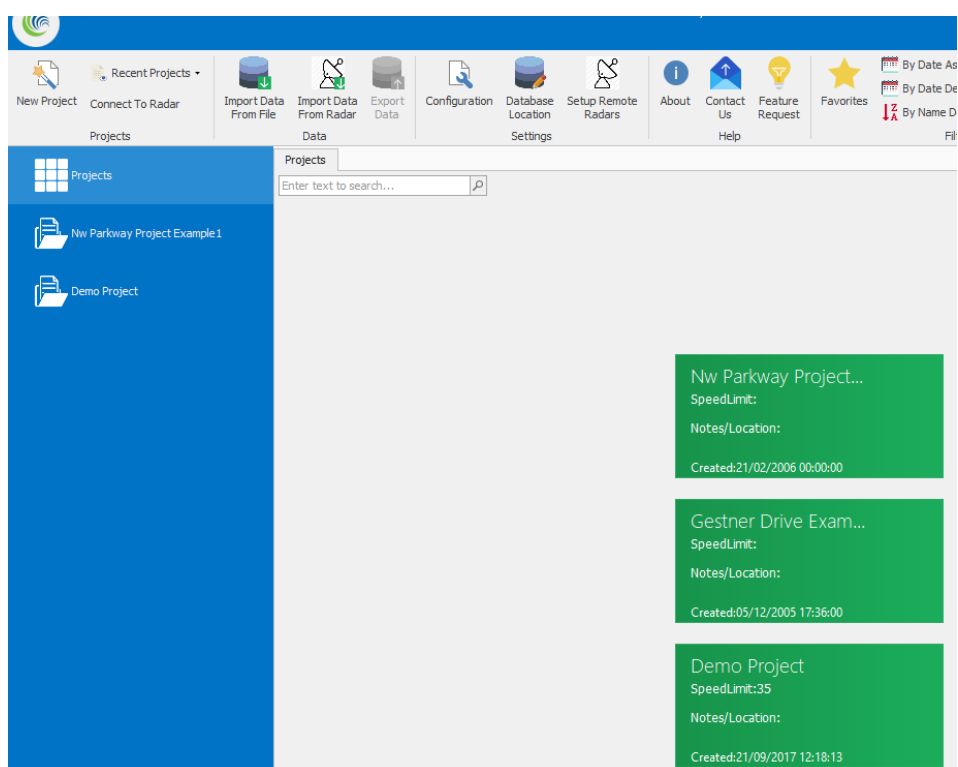
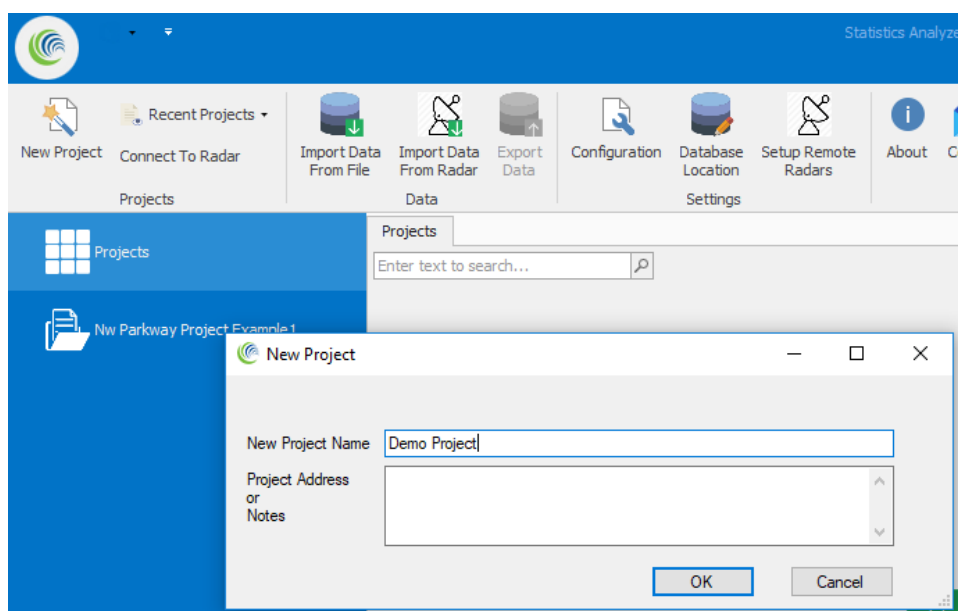
Project per date: You may create a project date named by “year-month”. This will allow easy navigation if you track your speed studies by date.

The software allows you to label each individual import of data from the radar. The project name and import label is printed on each report and chart. Thus, even if you collect your data by “Year-Month” format, you can easily have multiple speed studies in the same project even if they are from different sites.

STEP 1: Create (or Open) a project to import your data into

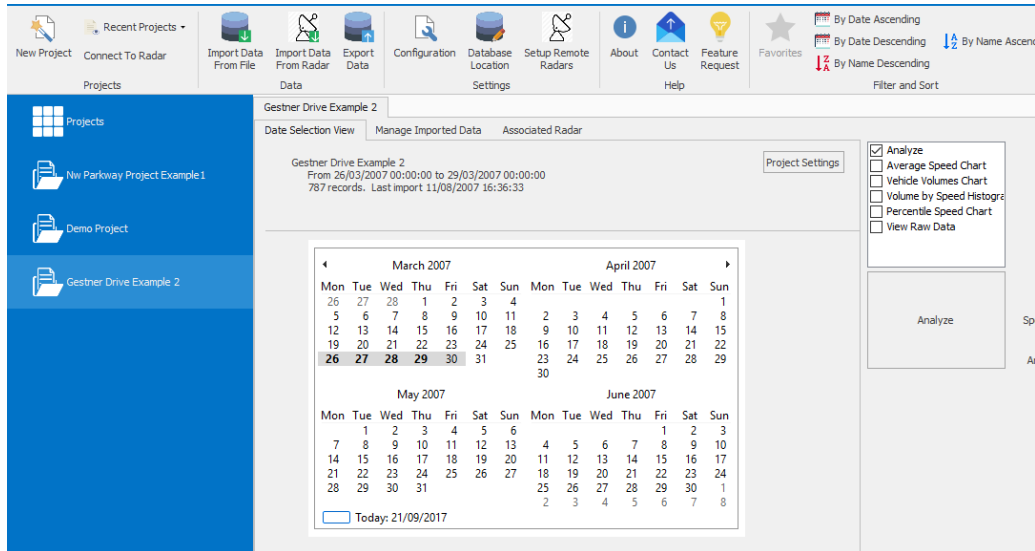


STEP 2: Name your project or Open Existing Project



Step 3: Import Data From Your Connected Radar. Ensure the project you wish to import is selected. Data will be imported into this project.

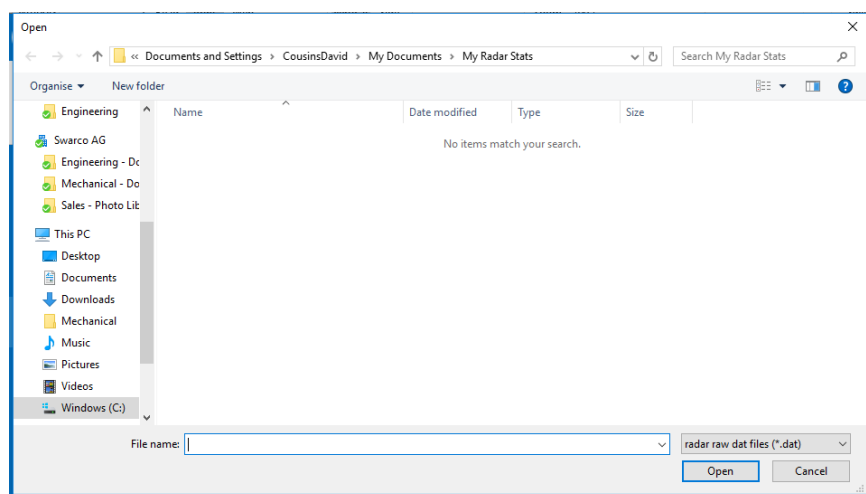
If this is an existing project, previously imported data will be shown here and the new data will be imported separately and a summary shown as another line in the table as shown below.



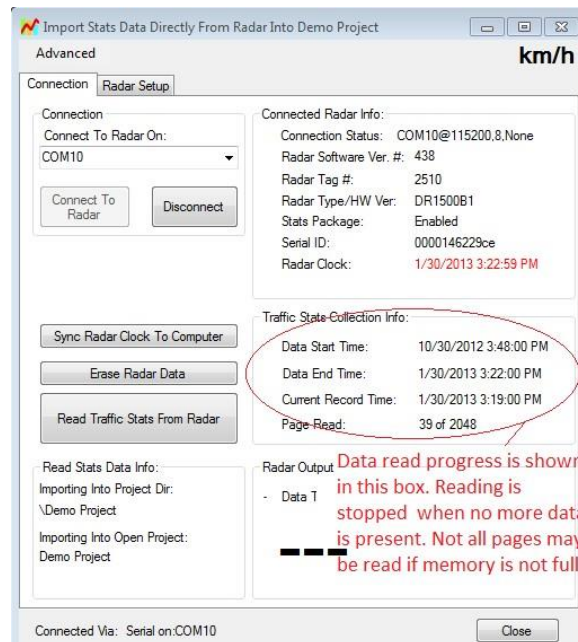
Select Data then Import Stats Data From Radar...

If you connected to the radar in the section “Connecting to a local radar to retrieve data” or “Connecting to a remote radar to retrieve data”, you will now be prompted to save a “.dat” file. We suggest that you accept the default path and file name and simply click on “Save” button.

All imported data is saved in the .dat file on your computer in addition to being imported into the project database. This file may then be emailed to a colleague and/or imported into a project. We suggest that you simply accept the suggested filename and click “Save”. The .dat file will be placed in a folder with the same name as the project in the “My Documents\My Radar Stats” directory. This allows you to find .dat files later.



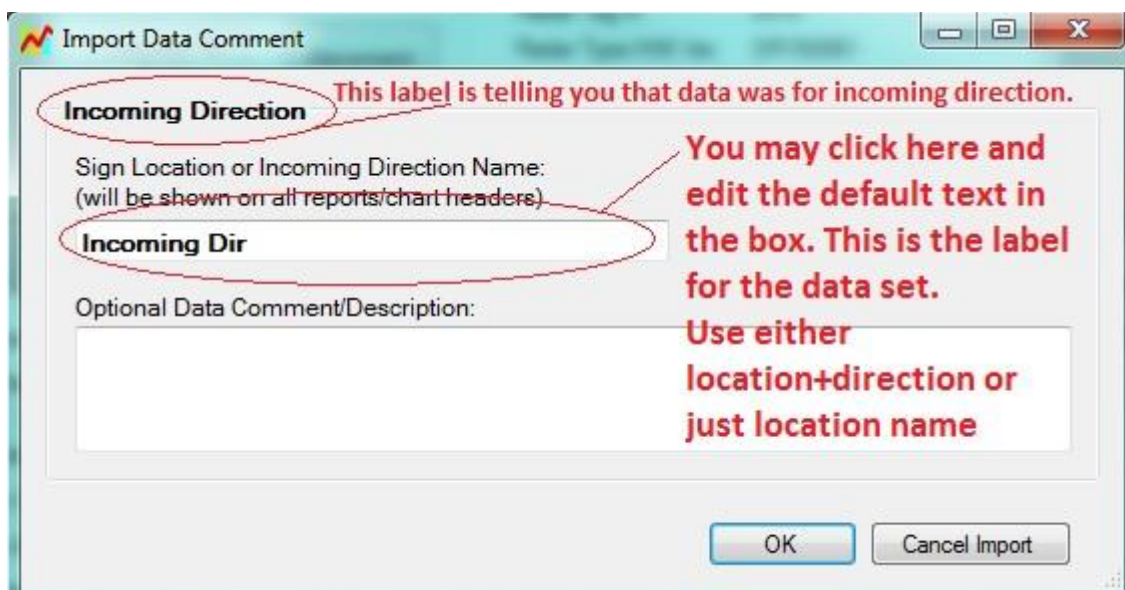
Once you click Save, the program will download the data from the radar. You will see the download progress in the following box.



Once all data has been read from the radar and stored into the .dat file, you will be presented with "Import Comment" box. This is the opportunity to label this data import. The label will show up in the project data window and will be printed on all reports and graphs.

If you are organizing the data into projects created by year-month, we suggest that you label your import by location name and traffic direction (e.g. *main and dartmouth-NB*). If you are organizing your projects by location name, we suggest you simply use the traffic direction as the import label (e.g. *incoming or north bound or NB* etc.).

You may also insert a comment to be attached to this import. Both the label and comment are easily editable later via the project data window.



Click on OK button when you are done with your label and comment. At this point you will see a progress bar as the data is being imported into the SQL server.

Once the import is complete, a new entry summary will be shown in the project window.

You have now successfully imported data from the radar into the database project.

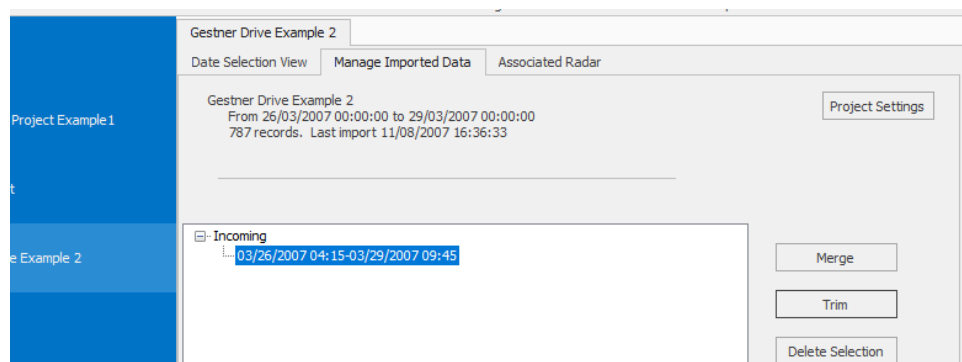
8.2 Analysing Data and Generating Reports

8.2.1 Generating Monthly, Weekly and Daily Counts and Speed Reports

STEP 1: Open the project and select the data set you want to analyse
Refer to the section 8.1, [Step 3: Import Data From Your Connected Radar](#) to create and import data into a project. Once your project is open you have two choices to select your data set.

Option 1: Run report over one complete data set (import)

You would choose this option if this is the only data set you have from this one study or the time period of your interest lies completely within this data set and the dataset is from the same location. The start/end times of records in a dataset are listed in the summary window as shown below.

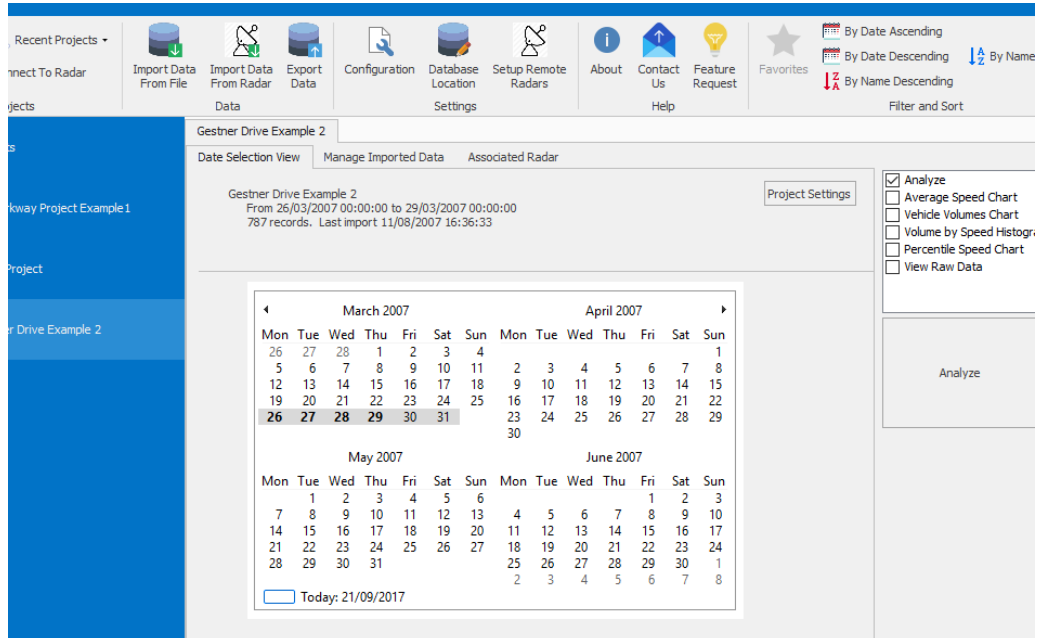


You should not proceed with this option if this data set contains data from different locations or for some reason you do not wish to run a combined report over all this data.

If your dataset contains data from more than one location, and you know the start/end date for your data from your different locations, you should import the same file multiple times and trim the data for each import to correspond to the different traffic studies.

Once you have selected the data set to analyse, simply ensure the *Generate Analysis Report* checkbox is selected and then click on the *Analyse* button.

Option 2: Run report over a specified period of time including multiple data sets



The software allows you to specify start/end period to run the analysis. Using this option automatically includes all data in all import sets in **this** project that are within the specified timeframe.

You may not want to use this option if you have data from different locations in this project. This is a great way to run a complete analysis that gets filled out as more and more data is available. In this case import all available data (as and when available) into the same project and run a user defined date range study across the entire time frame as shown below:

Ensure the *User Defined Date Analysis* tab is selected before you proceed.

After you have selected the filter you want (default or created your own), click the “Analyse User Range” button and the reports window will pop up. We will next discuss the report and the type of analysis it performs.

8.2.2 Interpreting the Analysis Report

Once you click the *Analyse* or *Analyse User Range* button, the program selects the data you need analysed, runs an analysis and returns the results in the following window. *Interpreting the Monthly Counts/Speed Avgs tab:*

Incoming										
Analysis Report: Monthly Counts/Speed Avgs Weekly Counts/Speed Averages Charts: Average Weekly Speeds Charts: Average Weekly Volumes Charts: Daily Volumes										
Project: Gestner Drive Example 2										
Location: Incoming Direction										
Project Notes:										
Select Display Data										
<input checked="" type="radio"/> Show Counts <input type="radio"/> Show Avg. Speeds <input type="radio"/> Show 85pct Speeds										
Select Month: March										
Hour	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Week Day Avg	Weekend Avg	Week Day 85% Avg Speed
0 - 1	18	16	22					18.7	0	33.6
1 - 2	16	13	18					15.7	0	31.4
2 - 3	6	8	13					9	0	30
3 - 4	5	8	9					7.3	0	29.2
4 - 5	3	3	2					2.7	0	35
5 - 6	13	10	13					12	0	30.6
6 - 7	44	30	37					37	0	30.1
7 - 8	140	171	154					155	0	32.2
8 - 9	184	191	210					195	0	32.3
9 - 10	140	129	120					129.7	0	33.1
10 - 11	126	137						131.5	0	33.7
11 - 12	185	159						172	0	34.3
12 - 13	185	210						197.5	0	34
13 - 14	168	175						171.5	0	33.4
14 - 15	187	189						188	0	33.2
15 - 16	258	223						240.5	0	32.9
16 - 17	205	410	236					283.7	0	32.4
17 - 18	317	291	312					306.7	0	32.7
18 - 19	198	224	193					205	0	32.3
19 - 20	138	149	139					142	0	33.1
20 - 21	119	119	121					119.7	0	31.3
21 - 22	92	92	117					100.3	0	31.7
22 - 23	46	45	64					51.7	0	32.1
23 - 24	36	32	49					39	0	31.3
Totals	1151	3040	2903	598	0	0	0			
% of Total	15%	39.5%	37.7%	7.8%	0%	0%	0%			

As you can see, the report title bar contains the project name and location and this information is also repeated within the report window as well.

All analysis is done on an hourly basis and reported by the day of the week.

For example, if you select the *Monthly Counts/Speed Avgs* tab, you are presented with an option to view the average hourly speeds by hour of day for each day of week.

If you selected 85th percentile speeds for the month of June on this tab, the value in the 1st cell (hour = 0-1, Day = Monday) is the average of the 85th percentile speeds from the midnight hour to 1am on all Mondays in June (where there is data). And so on and so forth for all the cells.

The *Week Day 85th % Avg Speed* (last) column contains the average of that row excluding the weekends. So the 1st cell in the last column is the average 85th percentile speed during the weekday in June for the midnight to 1am time slot.

Similarly, the average speed and counts selector on this tab shows the average of the average speeds and average counts for the specified hour for the specified day of the week in June.

If data for more than 1 month is available, you can select it on the top right.

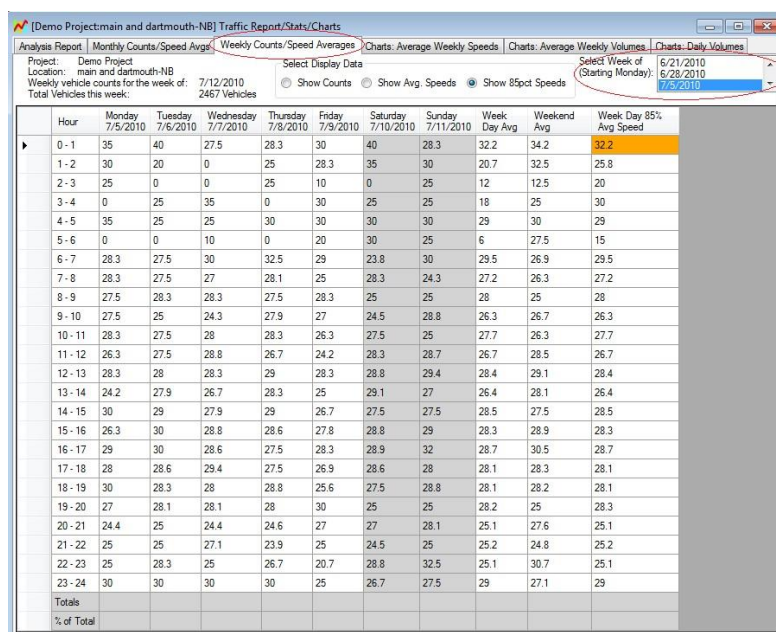
Interpreting the Weekly Counts/Speed Averages tab

Click on the Weekly Counts/Speed Averages tab to show the data by actual week.

When viewing counts, the cells in this tab contain actual count data for the selected week by hour of the day.

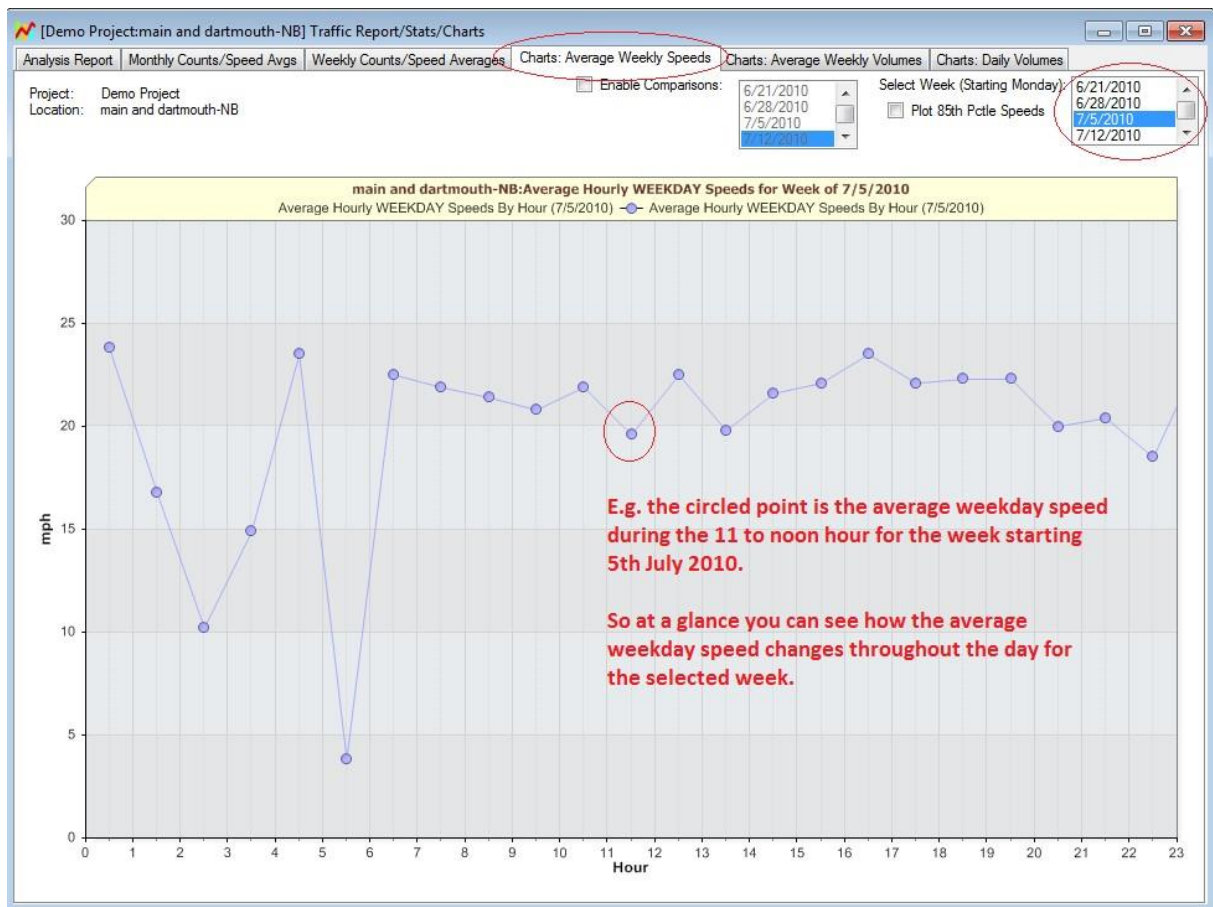
When viewing average or 85th percentile speeds, the cells contain the average or 85th percentile speed data for the selected week by hour of day.

If the analysis has more than one week of data available, you may select it on the top right as shown below.



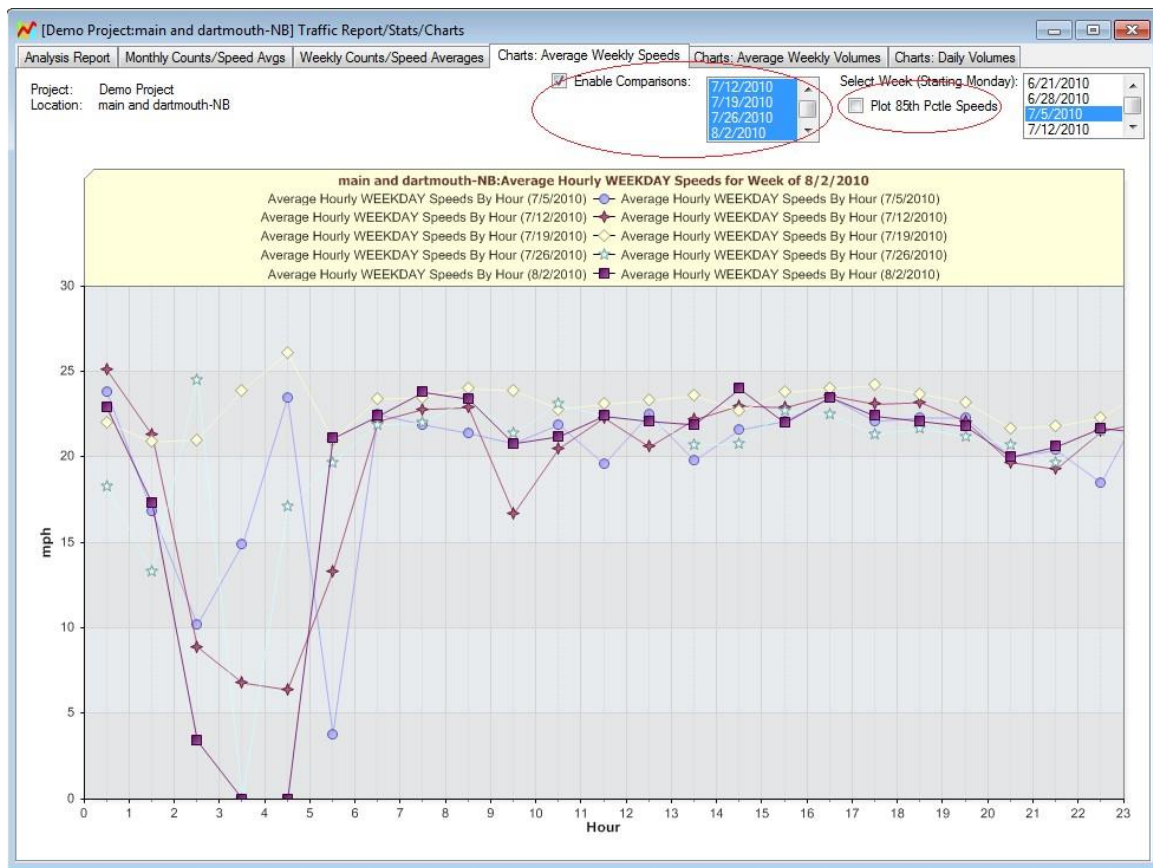
Interpreting the Charts:Average Weekly Speeds tab

Click the Charts:Average Weekly Speeds tab to show a hourly graph of the average Weekday speeds by hour for the week selected as shown below.



When you select a week on any of the weekly tabs, the selection is maintained when you click over to another tab. This way, you can simply select a week (say) on the **Weekly Counts/Speed Averages** tab and then click over to the **Charts: Average Weekly Speeds** or **Charts: Average Weekly Volumes** tab to examine the data in different views for the same week.

The charts also allow you to compare data from multiple weeks to see if traffic patterns are changing over time. Click the “Enable Comparison” checkbox and select more or more weeks to compare to. To select more than one week, hold down the CTRL key while clicking to make your selection.



You may also plot the 85th percentile speeds by checking the “Plot 85th Percentile Speeds” checkbox found next to the week selector box as shown by the red circle in the image above.

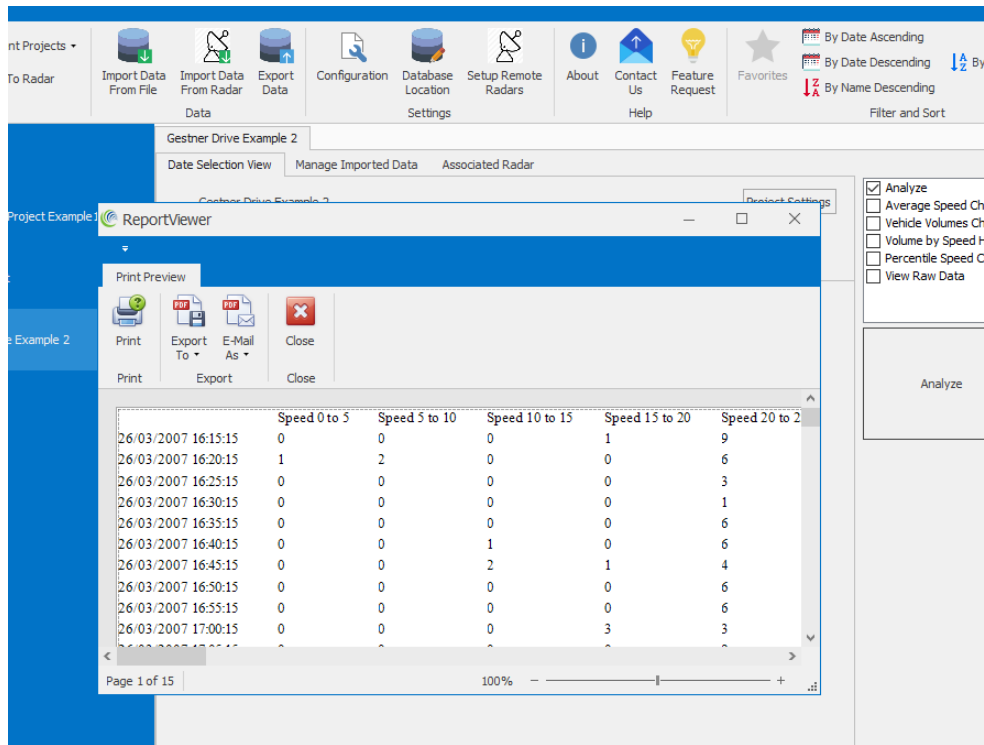
Printing and exporting tables or charts

All tables or charts may be printed or copied to the “Windows Clipboard” for pasting into another document. Select the tab page you wish to print or copy. To print it, click File->Print... and to copy click Edit->Copy Graph/Spreadsheet to Clipboard...

Once you copy a graph or a spreadsheet to the Windows clipboard, you may then open another application (e.g. Word) and paste it into a document. Graphs are pasted as images whereas tables (spreadsheets) are pasted as text data in a Word document and numbers in Excel.

8.2.3 Exporting Summary Report Data

The software also allows you to export 15, 30 or 60 minute and daily summaries. For this to work. Select the Export Data menu. On the menu select the data output required whether PDF, Excel or Image file:



You may specify a summary time interval of 15, 30 or 60 minutes and pace speed interval to be used during the summary export.

To change these settings please go to the Configuration Menu item.

You will be presented the following window where you may make your selections. These settings are applicable to all projects and may be changed at any time and another analysis run with the new settings.

Settings

Web proxy

☐ Enable HTTP proxy

Address: Port:

Excel Summary Export Settings

☒ Enable Speed Rebinning for Excel Exports

Rebin Settings

These settings apply only to Amadillo Traffic Data.

Speed Bin Width (Mph or Km/h):

Min Speed Bin (Mph or Km/h):

Max Speed Bin (Mph or Km/h):

Pace Speed Interval (Mph or Km/h)

Export Interval

☐ 1 Minute ☐ 5 Minutes ☐ 10 Minutes
☐ 15 Minutes ☐ 30 Minutes ☒ 60 Minutes

☐ Include Raw Data in Excel Export

☐ Include Tally Report in Excel Export

Min Speed Bin In Tally Max Speed Bin is Determined From Min

Export Summary template (the default template is in the installation folder.)

Traffic Analysis Report Settings

Peak Time Hour Start Interval

☒ 60 Minutes ☐ 30 Minutes ☐ 15 Minutes

Default Data Save/Export File Directory:

C:\Documents and Settings\CousinsDavid\My Documents\My Radar Stats

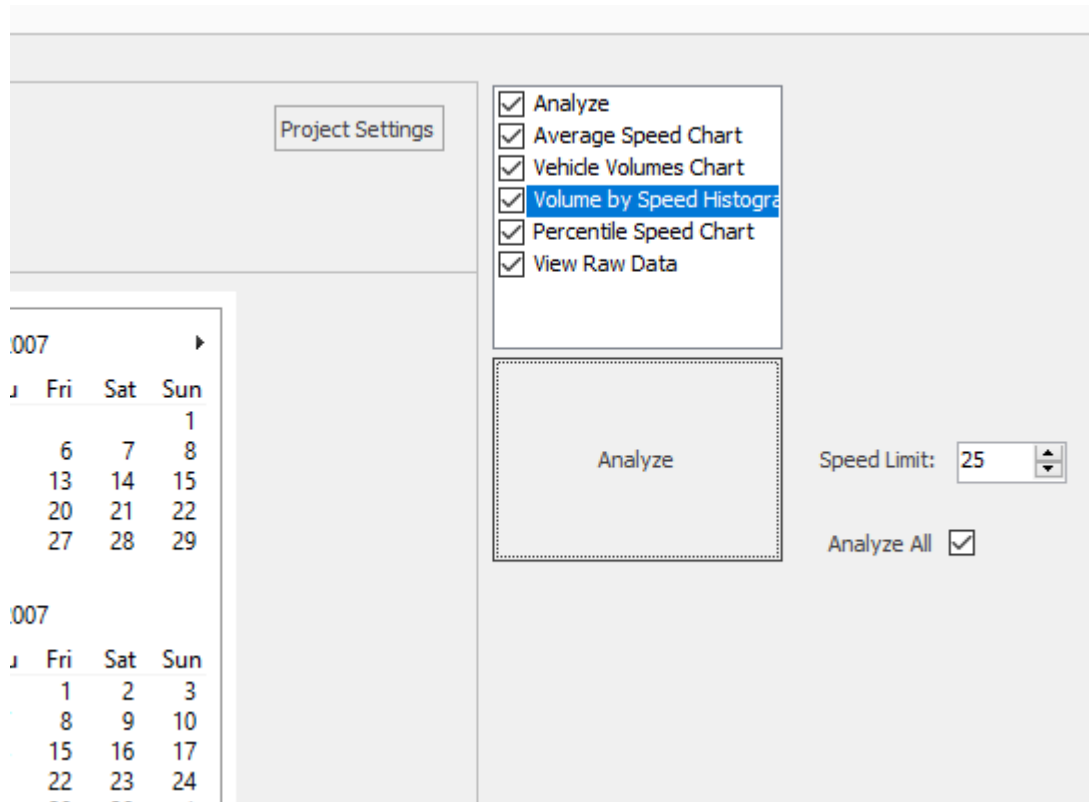
Language Selection

Language:

8.2.4 Generating Interactive Charts

The stats analyser software has a powerful feature where the user may generate interactive charts of raw data and navigate through the entire dataset easily and quickly. This feature provides a bird's eye graphical view of the entire data set.

You may generate interactive graphs via the individual checkboxes circled below.



The screenshot shows the 'Project Settings' window. On the left, there are two calendar views for the month of October. The top calendar shows dates 1 through 29, with the 1st highlighted. The bottom calendar shows dates 1 through 24, with the 1st highlighted. In the center, there is a large rectangular area labeled 'Analyze'. To the right of this area, there is a 'Speed Limit' dropdown menu set to '25' and an 'Analyze All' checkbox which is checked. Above the 'Analyze' area, there is a list of checkboxes, all of which are checked:

- ☒ Analyze
- ☒ Average Speed Chart
- ☒ Vehicle Volumes Chart
- ☒ Volume by Speed Histogram
- ☒ Percentile Speed Chart
- ☒ View Raw Data

Average Speed Interactive Chart

The average speed interactive chart plots all the vehicle speeds vs. time. Depending on the amount of data being plotted in the selected dataset, the data is automatically aggregated in optimal time bins.

For example, in the chart shown above, the entire data contains over four months of data for 58012 vehicles. This is so much data, that the software has automatically re-aggregated it in 4 hour intervals. Aggregation level is shown on the left side via selected "4 Hr" radio box as well as printed on the y axis.

The above selection means that the count values (shown as gold circles) and the average speeds (shown as blue circles) are count totals and average speeds over 4 hours.

Also from the bird's eye view it becomes apparent that there is a large gap in the data from around the 16th of October through the 7th of November.

There are a few ways to navigate around this data. To examine a smaller time period, click the left mount button at the start date you want to examine and then click the left mouse button again at the end date. The graph will automatically zoom to this range.

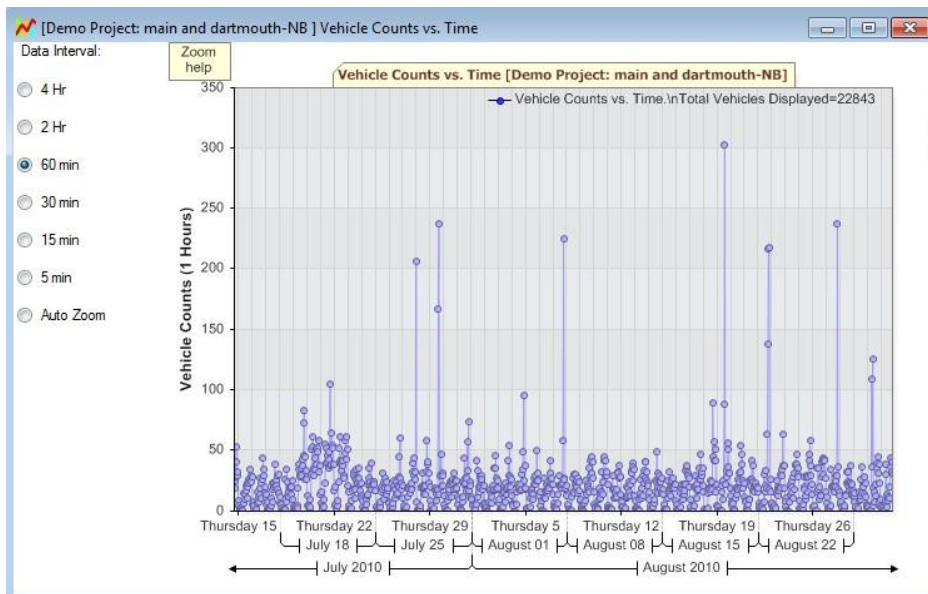
Once you zoom in, you can easily click another aggregation period on the left pane and the data will redraw with higher resolution (e.g. 30 minute or 15 minute as you choose).

If you want the software to automatically pick the best resolution automatically, select “Auto Zoom” on the left pane. Now the software will automatically determine the optimal aggregation period based on how much data can be displayed on the screen without too much clutter.

As you zoom around in the data, the total number of vehicles in the view is automatically recalculated and displayed on the top in the legend area. This is a great way to get vehicle totals across different or non-standard time periods.

Total Counts (Volume) Interactive Chart

Check the *Generate Vehicle Volume Chart* checkbox to get an interactive chart of vehicle counts (volumes) vs. time. An example is shown below:

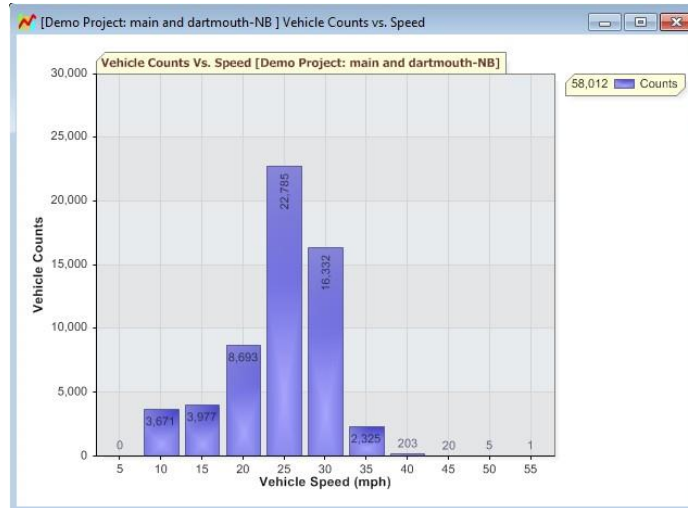


Selecting the 60 minute aggregation option is a great way to get a bird's eye view of the hourly volume of traffic throughout the dataset. Just as with the average speed chart, this chart is completely interactive and you can navigate around in it by mouse clicks, mouse scroll wheel and arrow keys. Click on the “Zoom Help” button in the chart area for instant help.

Histogram Chart

Click on the Generate Volume by Speed Histogram Chart to generate the following chart.

This chart plots the number of vehicles in the data set vs. the speed bin they were recorded in.

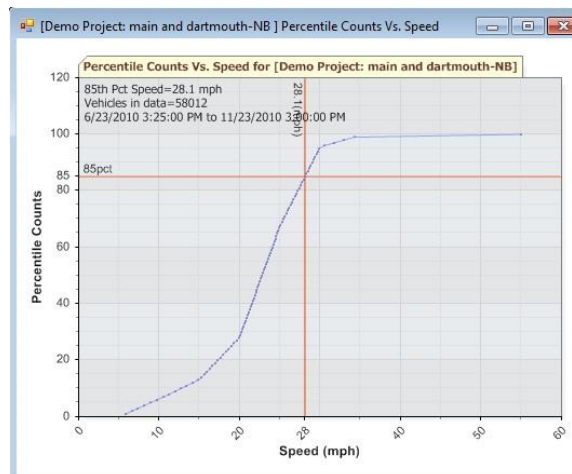


Percentile Vs. Speed Interactive Chart

Determining the 85th percentile speed of traffic on the road is an important requirement for a speed study.

The software allows you to automatically calculate the 85th percentile speed on the road. Additionally, it also calculates the speed associated with all percentiles of vehicles from 0 to 100. This information is plotted as a well known "S" chart.

Check the *Generate Percentile Vs. Speed Chart* checkbox and click the *Analyse* button to generate the following chart. This chart plots the total percentile counts of vehicles on the road traveling at every speed up to the maximum speed in the dataset. The 85th percentile speed is also automatically marked by the red crosshairs. For example, in this data set, the 85th percentile speed is 28mph. You may also click anywhere on the chart and obtain the percentile value and speed at that point.



9 Specification

Operating conditions:

Temperature -15 to +60C

IP Rating: IP55

Charging Voltage 230VAC / 12VDC

Radar:

Fundamental Frequency 24.2GHz (K Band)

Beam Angle 38° * 45°

Beam Polarisation Linear

RF Power 5mW

Maximum Detection Range 100m

Power:

Standby 0.1W

Maximum Power build specific see sign labelling.

2* 22 Ahr Lithium Ion Battery

Alternative builds 14Ahr, 14Ahr, 22Ahr providing alternative life between charges.

CE Certification

EN12966 Road Vertical Signs – Variable Message Signs

Uniformity: Pass

Requirement	White	Red	Yellow	Blue	Green
Colour	C2	C2	C2	C2	C2
Luminance	L3	L3	L3	L3	L3
Luminance Ratio	R3	R3	R3	R3	R3
Beam Width	B3	B3	B3	B3	B3

Protection: P2

Temperature: T1

Dynamic Snow Pressure: DSL4

Point Load: PL3

Wind Loading: WL7

Temporary Deflection Bending: TDB5

Partial Action Factor: PAF1

EN50293 Electromagnetic Compatibility

EN50556 Road Traffic Signal Systems - Electrical Safety

