The two variants of the modern Defender are the 2.4 litre diesel from 2007 produced until 2012. From 2012 to 2014, which marks the final production run of the model range, the Defender is fitted with an improved 2.2 litre diesel for the purpose of meeting ever stricter emissions laws. The 2.2 litre model is also now fitted with a Diesel Particulate Filter as standard.

These modern models of Defender are outfitted with CAN-BUS networking systems. These network types now support the engine management as well as the instrument pack. The newer 2.2 litre model has a Bosch ABS braking system which also connects through the CAN-BUS. The Lucas 10-AS alarm, which is not a part of the CAN-BUS network, is still a standard fitment component on all Defender models.

The ECU's fitted per the 2007 and 2012 models are as follows:

Vehicle model:	System and name:	ECU Type:
Puma 2.4 litre *2007-2012*	*Engine Management: Diesel EMS*	*CAN-BUS*
	Instrument Pack	*CAN-BUS*
	ABS: Wabco D-type	*Legacy*
	Alarm System: Lucas 10-AS	*Legacy*
Puma 2.2 litre *2012-2015*	*Engine Management: Diesel EMS*	*CAN-BUS*
	Instrument Pack	*CAN-BUS*
	ABS: Bosch ABS	*CAN-BUS*
	Alarm System: Lucas 10-AS	*Legacy*

Accessing your Defender Puma from the Nanocom Evolution:

Gaining access to a Defender Puma vehicle through the Nanocom Evolution is simple; from the main menu screen you can follow this menu path:

Defender -> Puma

From this point onwards, the Nanocom will scan the connected vehicle using its intelligent VIN detection, determining from the VIN number whether the Defender is either the 2.4 or the 2.2 model and then displaying a predefined menu of features related to that vehicle. Please note, the menu functions presented for the Puma 2.4 and the 2.2 are slightly different due to the vehicles differences.

Functions for the Defender Puma models:

As explained above, the 2.4 and the 2.2 Defender Pumas have slightly differing Engine Management ECU's as well as a different ABS system too. Because of the slight differences between the two vehicles, their menu options and functions will differ, they will be as follows:

Puma 2.4	*Puma 2.2*
Fault Codes- Reading and Clearing	Fault Codes- Reading and Clearing
ECU Information section	ECU Information
Puma Engine	Puma Engine
Live Instrument Mode	Live Instrument Mode
Instrument Pack Section	Instrument Pack Section
10-AS Alarm Section	10-AS Alarm Section
Wabco ABS Section	Puma 2.2 Live Inputs- 7 sections
	Bosch ABS Section

Fault Code Reading and Clearing:

As with all modern age vehicle diagnostics, vehicles use Fault Codes to help identify and give information regarding faults that can occur in a vehicle. These codes can be read and identified by our Nanocom Evolution and displayed in a clear, concise and accurate manner for the user to observe and record.

Fault codes are typically read and used by professional technicians and mechanics, although the Nanocom gives you the ability to read the fault codes accompanied by a text description of the fault, as well as offering the user the facility to save the fault codes to an SD-Card.

All of the Nanocom Fault Code sections contain an option to Clear Faults.

ECU Information:

The ECU Information section is used to read and display data about the CAN-BUS ECU's that are fitted to the vehicle. As these modern style ECU's feature their own specific software, this information is needed by those who wish to change the software on or perhaps replace, update or modify and ECU.

When entering this section, the Nanocom will display the names of the CAN-BUS ECU's the vehicle has. Please note: Legacy (non CAN-BUS ECU's) do not show up in this list.

The information given varies from ECU to ECU but generally includes the Assembly number, Software numbers, Version numbers, Hardware numbers and all other relevant information.

Puma Engine:

This page contains information about the Puma Engine and details on various engine and ambient condition.

There are 3 sections under this page: Fault Codes, Inputs and Settings.

In the Fault Codes section, the user can read values, configuration settings, and other stored information from the ECU.

To reduce the amount of text on the screen we have put buttons that only show any stored snap shot data for each fault on pressing and to more easily see the difference between Tested and Untested faults we have separated them into two distinct groups.
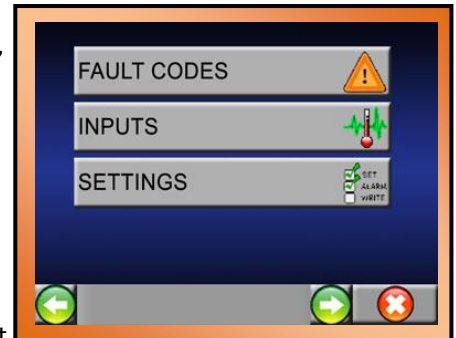
- **Tested fault codes**: This function is like the traditional fault code memory in that any faults shown here have been tested and have failed.

- **Not tested fault codes**: This function lists all the fault codes for the vehicle system that are related to self diagnostic tests which have not yet been ran. Unlike traditional fault code systems, where validating that a particular fault was no longer present in the system meant clearing the fault and then running the system in such a way as to hope that the conditions had been met sufficiently to have caused the system to run the relevant test to re log the fault if it was still present. This function actually lists those fault codes that have not been tested due to the conditions for the system to run the test and asses if that fault code should be logged due to a problem existing or passed and therefore not logging nor remaining on the untested list due to the fact that the fault has ran and the test passed.

In the Inputs section, the user can see the real time live display of the information the electronic control unit of the selected vehicle system is currently deriving from its input sensors.
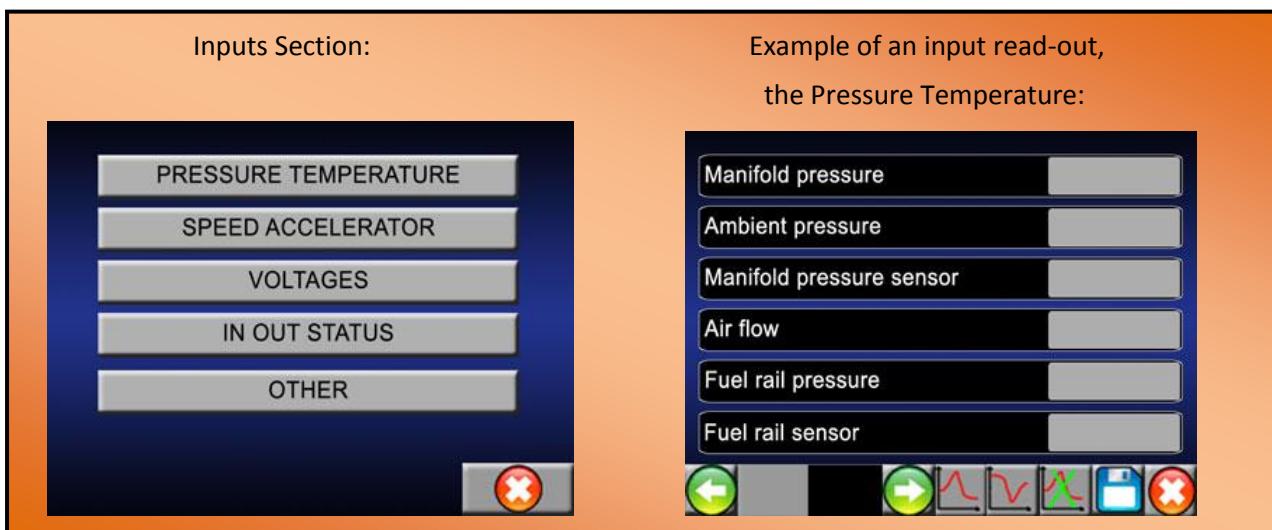
In the Settings section the user can change the speed limit stored in the Engine Control Module.

CAN_BUS Instrument Mode:

This function displays a fixed group of live data pages. Each vehicle has its own predefined live data pages, with a typical 4-6 individual fields of information per page. The live data being displayed is copied from the Engine Management ECU from various sources such as sensors, from all over the vehicle.

Here is a typical example

of a CAN-BUS vehicle Live

"CAN Instrument Mode"
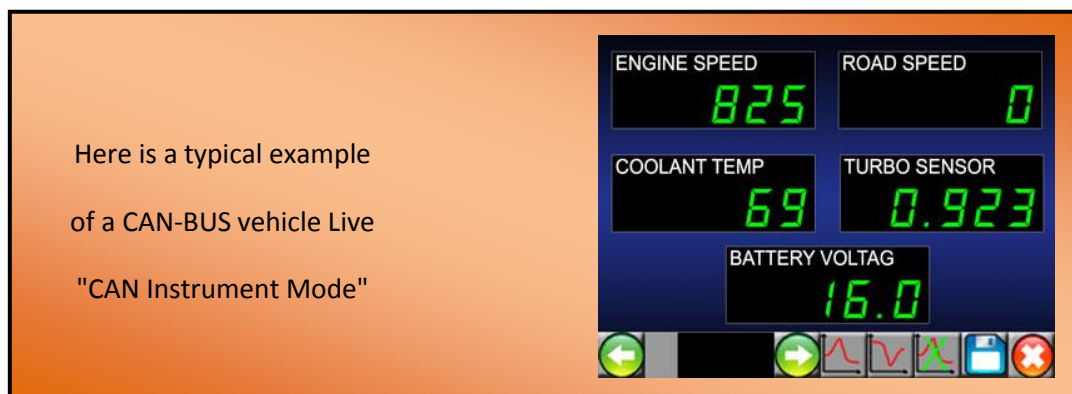
This mode has been created primarily for use while driving the vehicle to observer various data that the vehicle may not display, such as live Mass Air Flow (MAF) into the engine. This can be useful in fault diagnosis or purely as a secondary drivers display.

Lucas 10AS Alarm System:

The Lucas 10-AS Alarm system operates as a perimetric type alarm, handling the vehicle immobilisation and also capable of supporting Remote Central Door Locking. The 10-AS is fitted to both the 2007 and the 2012 Defender models and has been used on the TD5 Defender throughout its production.

The Nanocom Evolution boasts advanced coverage of this alarm system and grants the user an Events Log, Settings, the ability to change the country setting, to view inputs, control outputs and a group of specific utilities such as Key Fob (Plip) Learning.

An "Outputs" page: One of many "Settings" pages:
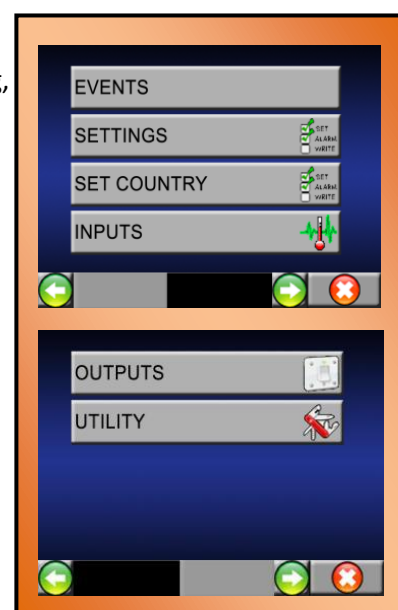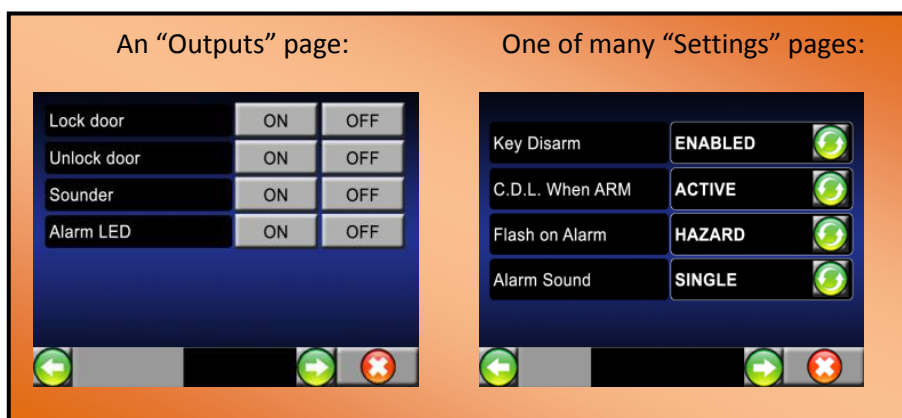
This section also provides the tools necessary to install a new or replacement 10-AS Alarm ECU to the vehicle, by simply saving the settings from the old one to the SD Memory Card and then writing them to the new alarm after fitting it.

You can find the Lucas 10-AS Alarm ECU Guide here, along with many more useful manuals and guides:

http://nanocom-diagnostics.com/downloads

2.2 Puma Defender: Dynamic Inputs Section:

This section is specific only to the 2.2 Puma Defender. It contains 7 grouped sections of live data inputs, they have been grouped according to category and type of input data. The 7 groups and their contents have been listed below:

Pedals and Positions
- Absolute throttle position (%)
- Accelerator pedal position sensor 1 (%)
- Calculated engine torque (Nm)
- Calculated engine load value (%)
- Desired engine speed (RPM)

Engine Components and Status
- Cylinder balancing off-set injector 1
- Cylinder balancing off-set injector 2
- Cylinder balancing off-set injector 3
- Cylinder balancing off-set injector 4
- Cranking state
- Fuel lift pump
- Engine oil level (%)
- Glow plug relay state commanded
- Glow plug relay state feedback
- Starter motor status
- Vehicle awake request

Engine Sensors and Lamps
- Engine coolant temperature sensor (Voltage)
- Low oil pressure switch
- Oil pressure lamp
- Glow plug lamp
- Glow plug relay
- Oil temperature sensor (Voltage)

Air and Manifold
- Demanded manifold pressure (Bar)
- Intake air temperature (C)
- Intake air temperature sensor (Voltage)
- Manifold absolute pressure (Bar)

Turbo and Boost
- Barometric pressure sensor (Voltage)
- Boost absolute pressure sensor (Voltage)
- Boost pressure actuator- controller output (%)
- Boost pressure actuator - measured position (%)
- Commanded boost actuator control (%)
- Turbo bypass valve (%)
- Turbo wastegate position sensor (Voltage)
- Variable turbo nozzle sensor (Voltage)

EGR and DPF
- Commanded EGR (%)
- EGR bank1 commanded (%)
- EGR valve position feedback
- EGR valve position (%)
- EGR valve position sensor (Voltage)
- Exhaust gas Temperature Sensor 1 (Voltage)
- Exhaust gas Temperature Sensor 2 (Voltage)
- Exhaust gas Temperature Sensor 3 (Voltage)

Fuelling
- Engine fuelling control state
- Fuel rail pressure (Bar)
- Fuel rail desired pressure (Bar)
- Fuel rail pressure sensor (Voltage)
- Fuel temperature (C)
- Oxygen Sensor Heater Duty Cycle Sensor (%)
- Differential pressure sensor

Wabco D-Type ABS System: Puma 2.4 only:

This ABS system boasts a similar style of coverage and functions to that of the 10-AS Alarm, providing a Fault Code reading and clearing section, Inputs for monitoring values, Outputs for testing system functions and a Utilities Section containing special service features such as Brake Bleeding and Valve Testing.
The inputs section for this ABS system provides data from sensors as well as inlet and outlet valve voltages, to individual wheel speeds and the major ABS component power supply values. Below are some example images of input pages for this application:
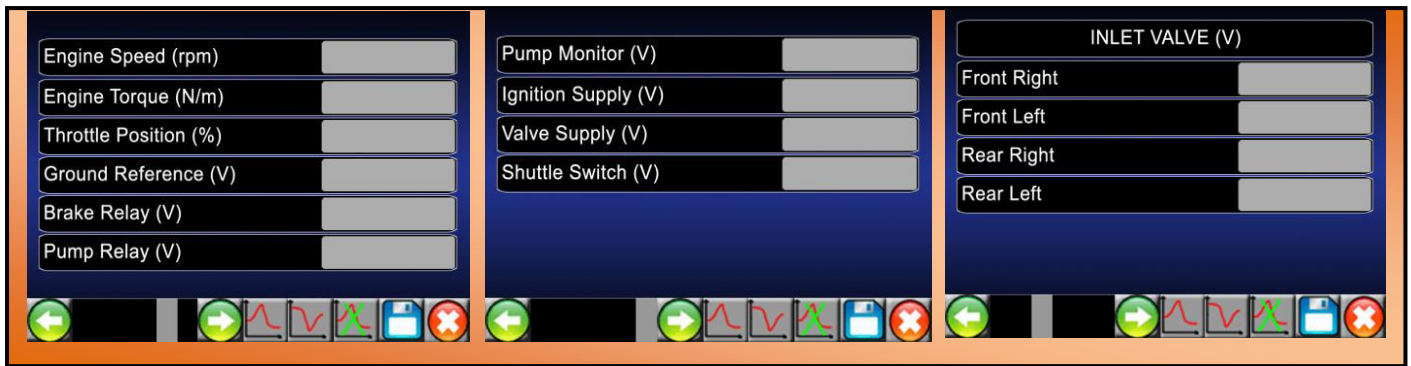
The outputs section of this application offers the user the ability to test certain functions of the ABS system that the ECU has control over, such as directly opening and closing the inlet and outlet valves, running the relay pump and testing all of the LED indicators.

Please see below:

Finally, the utility section provides the user the facilities to perform power brake bleeding, modulator bleeding and a set of four separated corner tests, to test each individual corners ABS assemblies.

Bosch ABS System: Puma 2.2 only:

The Bosch ABS system has been the chosen ABS system for the Defender Puma 2.2 and so, is a relatively new application for the Defender Puma for the Nanocom.
As this application develops further, new functions and coverage will be added to it.

Currently, this application supports full fault code reading and clearing, ECU information as well as an inputs section for monitoring the same live data that the ABS ECU receives.

Here is a list of the inputs provided (from V1.26 onwards):

- Brake Fluid Hydraulic Pressure
- ECU Supply Voltage
- FL Wheel Speed Sensor
- FR Wheel Speed Sensor
- RL Wheel Speed Sensor
- RR Wheel Speed Sensor

- Lateral Accelerometer
- Longitudinal Acceleration Value
- Steering Wheel Angle
- Vehicle Mode
- Vehicle Speed
- Yaw Rate Sensor

Further inputs will be added as the system coverage for the Bosch ABS is being updated.

Injector Grades

Reads and provides editing and writing capabilities for each of the four groups of 16 Hex injector grade characters as stamped on the injectors. Injectors are numbered from front to back, number 1 is at the front and number 4 is at the back end of the engine.

Each injector has its own unique code. This code is used by the engine management as part of the fuelling control and must be entered correctly.

Pilot Correction

Each injector connected to the engine management has different characteristics e.g. opening times, shutting times and these injector characteristics vary with fuel rail pressure. Normal Pilot Correction learning functionality is designed to learn changes to injectors over time, so it only allows incremental changes from previously-learned values. If injectors are changed, or cleaned etc, the difference may be substantial. Pilot correction learning may not be able to immediately access the appropriate values - it may take several engine cycles to reach the correct values. This will adversely affect emissions.

The next time normal learning is done, pilot correction learning will immediately adjust to the appropriate value. The user must start the engine and run at idle while using this function.

Additional information and links:

At Blackbox Solutions, we strive to provide as much documentation about our products as possible, as well as member support forums and video demonstrations for all of our diagnostic equipment.

There is a documentation section available here:

http://nanocom-diagnostics.com/downloads

This page hosts a vast number of support documents from individual ECU guides to Nanocom Firmware upgrade guides through to complete Nanocom user guides.

Also, we have the Nanocom Support Forum which can be accessed here:

http://forum.nanocom-diagnostics.com

The forum contains a huge amount of accumulated knowledge, hints and tips. As well as the constant and powerful support offered by other Nanocom owners and of course, the full BBS support team. This is our most powerful support tool.

You can also find many useful Tutorial and Demonstration Videos on our YouTube Channel, found here:

https://www.youtube.com/user/BBSP38/featured

We hope you enjoy your Nanocom Evolution!!!

v. 1.30