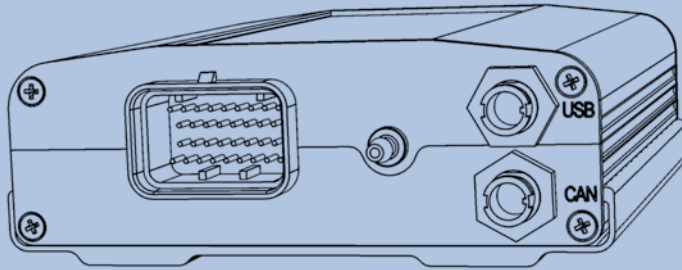# G4

Storm

Link Engine Management

Why G4, when the G3 was so popular?

Link^{G3} ECUs have been a phenomenal success. Feedback from dealers and customers has been tremendous.

We proudly release our all new G4 range of ECUs. The most obvious change is the smart new enclosure with its "clip-on" mounting base, waterproof connectors and the new lightweight, smaller diameter cable.

G4 ECUs feature "QuickTune" automated fuel self tuning. Using an AFR "target map" enables the tuner to precision tune in a minimum of time and aids precision cam and ignition tuning.

All tuning maps are configurable so tuners have absolute flexibility with up to 6D mapping, a level of sophistication unavailable until now.

You will be stunned by the G4's performance, features, and reliability.

The Link Team

Storm Wire-In Engine Management

The G4 Storm delivers performance that rivals any engine management system on the market. This ECU is more than capable of running sequential injection, ignition and variable valve timing on most of today's engines. The Storm offers all of the advanced G4 tuning features at an extremely competitive price.

- four injection drives
- four ignition outputs
- three/four analog inputs*
- two temperature inputs
- three/four digital inputs*
- eight auxiliary outputs
- one, thirty four pin, waterproof connector
- built in, 2.5 bar, MAP sensor
- 5V out
- USB to Link CAN cable
- Link CAN connector
- Spare injection and ignition channels can be auxiliary outputs

* One digital input shares the same pin as one analogue input

Key Features

- Built in 2.5 bar MAP sensor (2.5 bar absolute, 1.5 bar of boost)
- Up to 6D fuel and ignition mapping
- Precision closed loop cam control (four cam, independent control)
- Sequential fuel and ignition delivery
- Digital triggering, all OEM patterns
- Rotary - up to two rotors, fully sequentially staged injection and sequential ignition
- OEM idle hardware supported
- 5D boost control with three switchable tables
- Motorsport features - antilag, launch, flat shift
- Continuous barometric correction (on board)
- CAN port
- QuickTune - automated fuel tuning
- Individual cylinder correction
- Odd-fire engines & two-strokes
- USB tuning cable included
- Knock with "windowing" using additional G4 KnockBlock
- Stats recording into on-board memory
- Gear compensations for spark, boost and fuel
- Real time selectable dual fuel, ignition and boost maps
- Sync and crank sensors can be a combination of Hall effect, variable reluctance or optical
- Boost control referenced to gear, speed or throttle position
- 4Mb internal logging memory
- Staged injection
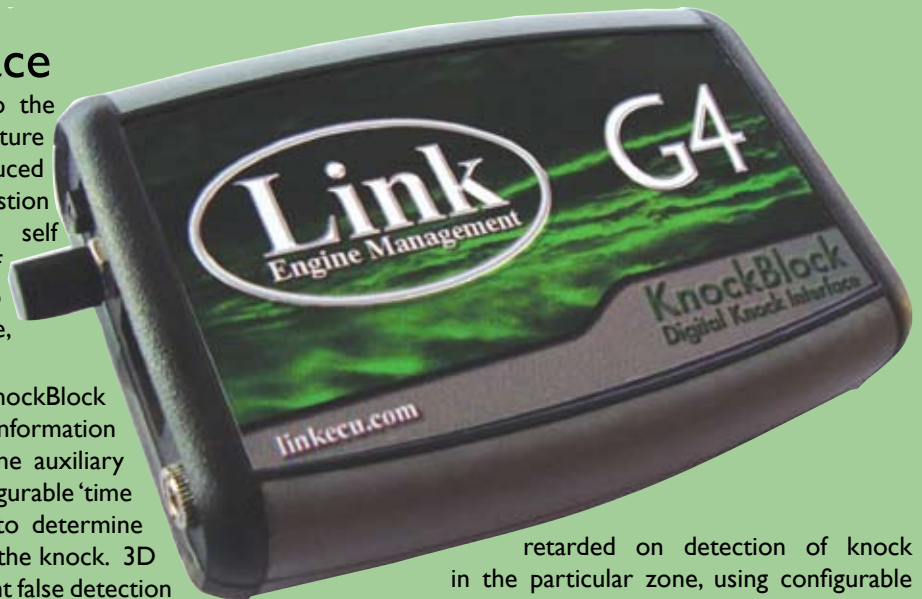- "Firmware" updates via linkecu.com

What's New with the G4 Storm

KnockBlock G4 Interface

Knock, also known as detonation refers to the spontaneous combustion of an air/fuel mixture inside a combustion chamber. Knock is induced by excessive pressure within the combustion chamber causing the air/fuel mixture to self detonate. These pressures can be a result of high engine temperature, inappropriate turbo boost pressure, excessive inlet air temperature, and ignition timing which is over advanced.

The Link G4 Storm with the addition of the KnockBlock G4 as an interface enables knock control. Information is passed between the two devices using one auxiliary channel and one digital input. This allows configurable 'time windowing' techniques enabling the Storm to determine which cylinder has knock, and the severity of the knock. 3D knock level threshold tables are used to prevent false detection caused by mechanical engine noise.

Each individual cylinder can be assigned with a 3D knock ignition trim table. These tables are generally spanned using 'RPM' and 'Load' as their axis, and zones within these tables are modified dynamically by the ECU upon detection of knock. Timing is retarded on detection of knock in the particular zone, using configurable sensitivity and clamping properties. This all happens within the bounds of microseconds.

The G4 Storm can be configured to gradually re-introduce timing advance, at a rate governed by the speed and delay of which the user has specified in the settings when knock is no longer detected..

Up to Six Dimensions of Fuel & Ignition Tuning

Under most circumstances a 3D Fuel Table is sufficient. RPM is typically used for one axis with load (typically represented by MAP or MGP) on another axis. The 3rd axis/dimension is the fuel zone value.

This 3D mapping will be very familiar to the average tuner and a 3D surface representing the fueling can be easily visualised or physically displayed by selecting Surface Graph.

In special cases 3D mapping may not be adequately flexible to cope with all operating parameters.

Multi-throttle turbo charged engines typically show an example of this. With the throttle wide-open at a MAP value of, for example, 200kPa and an engine speed of 5000rpm the engine will have considerably different fueling requirements than with the throttle half open and the same MAP and engine speed. In this case the 4D Fuel Table table may be used. This second table may be spanned using throttle position on the load axis.

When a 4D/5D table is turned on, its Table Activation mode can be selected. This allows the 4D or 5D Fuel Table to become active only under certain conditions. This is useful if an external switch or switching output is required to activate the table (e.g. switching in the 4D Fuel Table when the NOS solenoid becomes active). If the table is required to be always active, set this adjustment to Always ON.

As with all tables, 4D and 5D Fuel Tables can have their X and Y axis parameters selected and their row/column locations adjusted. To do this, click on the table and press X or Y.

QuickTune

Using PCLink, QuickTune is an interactive tuning tool that assists in time efficient fuel tuning. A graphical display of Target AFR (desired AFR) and Actual AFR (measured AFR) is provided. A dual pointer gauge allows the tuner to quickly see how close Actual AFR is to the Target AFR. Quick Tune can be setup to operate over the entire fuel table or just over a particular area. Quick Tune can be used in Manual or Automatic modes. In Manual mode, Quick Tune guides you to cell centering and advises you when is a suitable time to make a fuel table adjustment. With the press of a key a calculated adjustment is made. Often only one or two adjustments are required to tune each cell. In Automatic mode Quick Tune does all the adjustments for you. This leaves the tuner free to operate the Dyno or perform other tuning work such as making ignition or cam angle adjustments.
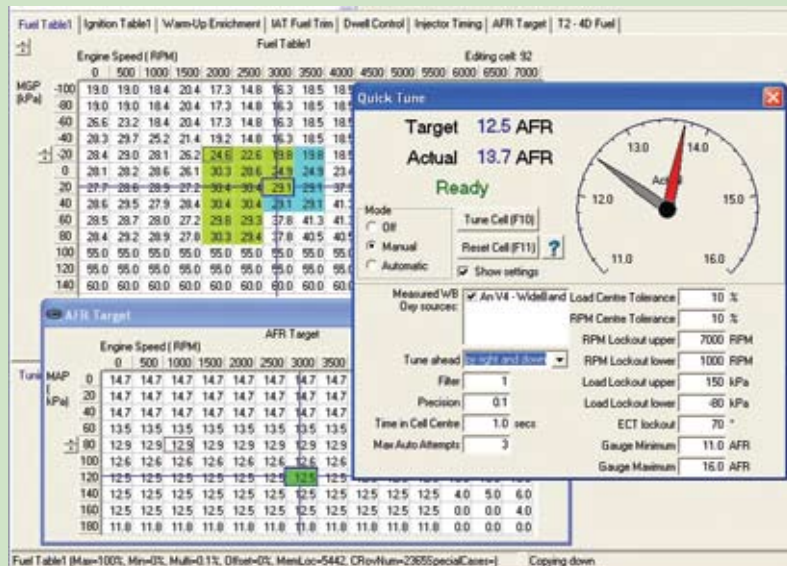
Features

Dynamic Configuration

This means that the tuner can now configure the ECU to meet any requirements they may deem necessary. Previously tuners had to operate within what the Link engineers defined, at the time of writing the firmware. The result of this absolute flexibility is that G4 ECUs can be customised by the tuner to optimise any engine.

Cam Control

Precision closed loop cam control for up to four cams, independently controlled, with feedback so that the ECU knows exactly "where" they are at all times. Precise cam control is the window to performance for modern, high performance engines and G4 ECUs provide precision cam control as a standard feature.

The Storm Firmware (micro software)

When tuning, the twelve major tables are now dynamically allocated. What this means is the tuner can now configure the ECU to meet any requirements they may deem necessary. Previously tuners had to operate within what was defined by the ECUs programmer. The result of this absolute flexibility is that the Storm ECU cam be customised by the tuner to optimise any engine.

QuickKeys

Tuners are delighting in the new PCLink 4. One of the many reasons for this is that all major tuning can be done without using the mouse using QuickKeys. Another powerful feature is the copy/paste function within the various maps.

Diagnostics

G4 ECUs log all information for display at a later date via PCLink. Max/min temperatures, pressures, number of times limits are hit etc. are all recorded.

Compatibility

Engines, triggering and VVT (variable valve timing) is pre-configured and selectable via "drop-down" menus. If your engine is not listed you can configure your own requirements.

Configurability

All inputs and outputs and completely configurable e.g. any analogue input can be used for any input type and as the axis for any table or input switching function.

Sensors

Choose from our list or custom configure the input channels to match your sensor.

Boost control

Select up to three boost tables and configure when they are applied. Gear/TPS/temperature, any condition you want to apply to boost control.

AFR Target Table

The AFR (air, fuel ratio) is a critical part of the G4's fuel calculation. Once the engine is tuned, adjustments to the AFR can be made, just by changing the AFR target table, without the need to retune the fuel table
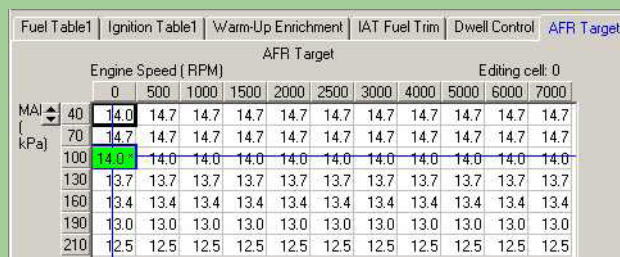
G4 Storm Technical Specifications

Engine Configurations
- 2-12 Cylinder Distributed
- 2-8 Cylinder Wasted Spark
- 2-4 Cylinder Direct Spark
- 2 Rotor Engines
- Odd Fire Engines
- 2-Stroke Engines
- Configurable Firing Order
- Configurable TDC Points (for odd fire)

Fueling Adjustments
- Up to 440 Zone Fuel Table with configurable load and RPM centres. Configurable X and Y Axis Parameters
- Multiple Fuel Tables
- Up to 6D Fuel Mapping
- Injection Rate
- Master Enrichment
- Pre Crank Prime
- Crank Enrichment
- Post Start Enrichment
- Warm Up Enrichment
- Acceleration Enrichment
- IAT Fuel Correction
- Injector Deadtime Compensation
- Overrun Fuel Cut
- Idle Load Trims
- Fuel Temperature Correction

Ignition Adjustments
- Up to 440 Zone Ignition Table with configurable load and RPM centres. Configurable X and Y Axis Parameters
- Closed Loop Knock Control. (Requires External Controller)
- Crank Dwell Extension
- Maximum Advance
- AFR Table Correction
- Spark Duration
- Beginning / End Injection Definable
- Dwell Time Table. Configurable X and Y Axis Parameters
- Individual Cylinder Trim
- Individual Cylinder Tables
- Multiple Ignition Tables
- Up to 6D Ignition Mapping
- Individual Cylinder Ignition Trim
- IAT Trim
- Voltage Correction
- ECT Trim
- OEM Compatibility
- CDI Compatibility

Limits
- Engine Temperature Dependent Soft and Hard RPM Limit
- Engine Temperature Dependent Soft and Hard Boost Limit
- Vehicle Speed Limit
- System Voltage Limit
- User Configurable RPM Limit based on external input

Triggering
- Digital Trigger Decoding
- Reluctor, Optical Proximity or Hall Sensors
- Programmable filtering and arming thresholds
- Configurable trigger patterns or preset triggering options.
- Supports nearly all OEM trigger patterns and custom trigger arrangements

MotorSport Features
- Antilag Group A/Group N
- Launch/Traction Control
- Flat Shifting
- Stats Logging
- Staged Injection

Auxiliary Output Options
- Each Output independently configurable
- Unused ignition and injection outputs available as auxiliary outputs
- General Purpose Output
- General Purpose PWM
- Continuously Variable Valve Timing Control
- Closed Loop Idle Speed Control (Solenoid or Stepper (4 & 6 Terminal))
- Fuel Pump
- Fuel Pump Speed Control
- Engine Fan
- Air Con Clutch
- Air Con Fan
- Intercooler Spray
- Tacho
- Check Engine Light
- Purge Solenoid
- Oxygen Sensor Heater
- Switched Cam Solenoid

Variable Valve Timing
- Up to 4 channel independent
- Precision Closed Loop Control
- 3D Tables with configurable X and Y axis controls
- Preset or Custom Configuration
- Supported Engines - 1UZFE VVTi; Subaru AVCS; EVO 9 VVT; BMW VANOS; Toyota 3SGE, 1ZZ, 1JZ, 2NZ, 2JZ; Honda K20; Nissan VQ35; Ford V8; Holden V6

Processing
- 40 MHz Specialised Engine Management Microprocessor
- Ignition control to 0.1 degree, fuel to 0.01 ms
- 32 Bit Calculation
- 10 Bit ADC Resolution
- 20000+ RPM
- 4Mb Non Volatile Flash

Inputs/Output
- 4 High Current Injector Drives
- 4 Ignition Channels
- 8 Auxiliary Outputs
- 3 / 4 Digital Inputs
- +5V Out
- +8V Out
- 2 Temperature Inputs
- 3/4 0-5V Analog Inputs
- 2 Trigger Inputs (Reluctor, Optical or Hall Sensors)
- On Board Baro Correction (Real Time)
- On Board 2.5 bar MAP Sensor

Communications
- Tuning Port USB Via Adapter
- Serial RS232
- CAN

Analog Inputs
- Each channel independently configurable with preset or custom calibrations
- Wideband O2 (from external controller)
- Boost Adjust Signal
- Configurable Fault Detection Settings
- Voltage (0-5V)
- Pyro (from external controller)
- Throttle Position
- Pressure (general purpose, fuel, oil)
- Air Flow Meter
- MAP
- Temperature (coolant, IAT, general purpose)
- Throttle Position
- Narrow Band O_2

Boost Control
- Engine Temp Correction
- IAT Correction
- Multiple Boost Tables
- External Adjustment

Idle Control
- Reliable and accurate user configurable Closed Loop Control
- Solenoid or Stepper Motor ISC Valve
- Aircon, Engine Fan or Power Steer idle up
- Open Loop Control Mode for diagnostics

Environment
- Internal Temperature Range -10 - 85°C
- Ambient Temperature Range -30 - 90°C
- Voltage 8 - 22V
- Operating Current 200mA
- Electrical protection on all inputs and outputs

PCLink
- Adjust ALL parameters in real time
- Mouse or keyboard operation
- Tuning
- QuickTune - automated fuel self tuning
- Logging Analysis
- Diagnostic Information
- Built In Help
- Definable Screen Layouts
- View over 300 possible runtime parameters

Physical
- Length: 142 mm
- Width: 126 mm
- Height: 42 mm
- Weight: 600 grams
- Connector : 34 Pin Waterproof Automotive

Package Contents
- Storm G4 ECU
- 2.5 Metre Wiring Harness
- Mounting Brackets and Screws
- Wiring and Installation Instructions

Additional Accessories (Purchased Separately)
- Intake Air Temperature Sensor
  - 3/8 NPT
  - Bosch push in
  - 14mm (Aluminium or Steel Mounting Bosses to suit)
- Throttle Position Sensor
- 1,2 or 3 Channel Link Igniter
- Narrowband Oxygen Sensor
- Wideband O2 Controller & Sensor
- Injector Ballast Resistor Packs
  - 1 x 1R (6 x <6R injectors)
  - 2 x 1R (12 x <6R injectors)
  - 1 x 4R7 (1 x <6R injectors)
  - 2 x 4R7 (2 x <6R injectors)
  - 1 x 2R2 (1 x <3R injectors)
  - 2 x 2R2 (2 x <3R injectors)
  - 4 x 4R7 (4 x <6R injectors)
  - 6 x 4R7 (6 x <6R injectors)

Manufacturing Standard
- ISO 13485

DisplayLink
"Full Information at your Fingertips"

Plug in and go, real time driver display. Users love the DisplayLink due to its ease of use, fascinating insight into what is happening with the engine and the fact that they can't "mess up the ECU".

Connect the DisplayLink, it works "out of the box". Select what you need to see, the DisplayLink provides the instrumentation and information desired, both while the engine is running and subsequently from the internal memory.

All settings, menus and information are accessible using the five built-in buttons. Warnings are activated if inputs go out of range, a built in warning light alerts the driver and the condition presented graphically (even in direct sunlight).

Link Engine Management

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For more information, contact your local Link Engine Management dealer

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