



G4+ Thunder WireIn ECU Specifications

The Thunder is Link Engine Managements biggest, most advanced ECU yet.

The Thunder is designed for high end applications requiring maximum performance, flexibility and tuning control. The Thunder has more inputs, more outputs and more features than any other Link ECU.

The Thunder has all the features found on other LinkECU's plus onboard 3 axis accelerometer, two EGT thermocouple inputs, two Onboard Lambda Controllers and 2 x E-throttle Controllers.

- Dimensions: 170 x 212 x 44 mm (6.7 x 8.3 x 1.7 in)
- Weight: 1.04 kg (2.29 lb)
- Material: Aluminium Die Cast, Black Powder Coated
- Mounting: Flush mount extruded mounting bracket
- Connectors:
 - o 2 x 34 pin AMP Super Seal
 - o 2 x 26 pin AMP Super Seal
 - o 2 x Link 6 pin
- Indicators: Power / Fault code indicator LED
- IP Rating: 54

Platform

- Electronics: Link G4+ Engine Control Platform
- Processor:
 - o 40 MHz dual processor
 - o Engine control specific MCU and Digital Signal Processor
- Memory: 32 Mbit Data Logging Memory
- Communications
 - o USB - PC Tuning
 - o 2 x CAN 2.0B - User configurable
 - o RS-232
- Firmware: Link G4+ Firmware V5.5.0 or later. In field firmware updatable
- Tuning Software: PCLink G4+

Security

- Password: Password protection can be applied to prevent unintended adjustment
- Lock: Shipped locked (engine control disabled). Must be unlocked by a Link distributor

Max. Ratings

- Power Supply: Reverse Polarity protected. Max Continuous operating voltage 24V. Over voltage protection at 27V. Minimum operating voltage 6.5V.
- Temperature: -40 to + 80 °C (-40 to 185 °F)

Inputs

- Engine Position:
 - o Up to 6 engine position sensor inputs (reluctor, hall or optical)
 - o Engine position tracking to 0.1 degree accuracy
 - o Digital Sampling Oscilloscope on Trigger 1 and 2 Inputs





- Analog:
 - 20 0-5V Analog Inputs
 - 2 have configurable pullup resistor
 - 2 have permanent pullup resistor
- Digital
 - 8 Frequency or switching inputs. All with switchable pullup resistor
 - 6 High frequency differential frequency or switching inputs
 - Suitable for ABS or turbo speed sensor
 - 2 Switching inputs
- Barometric Pressure: Internal factory calibrated barometric pressure sensor (or external sensor option)
- Knock: 2 Knock sensor inputs
- Lambda Sensor Control: 2 Internal wideband Lambda sensor controllers utilising latest Bosch OEM digital signal processing technology
- Thermocouple: 2 Thermocouple amplifiers suitable for K Type thermocouple sensors
- Accelerometer: 3 Axis accelerometer with orientation correction

Outputs

- Injector: 8 Peak and Hold or Saturated injector driver outputs. 10/3A max. Unused injector outputs can be used as general purpose outputs. 0.1 degree, 1.6 us precision
- Ignition: 8 Ignition pre-amplifier drivers (external igniter required). Unused ignition outputs can be used as general purpose outputs. 2.2A max. 0.1 degree precision.
- Auxiliary Outputs
 - 4 Low Side Drivers. 2.2A max
 - 4 Low/High Side Drivers. 2.2A max
 - 6 Half Bridge Drivers 8 A max
 - 6 Low Side Drivers with open circuit detection 1 A max
- Regulated Outputs
 - 8V sensor supply. 200mA max
 - 5V sensor supply. 200mA max

Accessories

- Included:
 - Flush fit clip in mounting bracket
 - USB tuning cable
 - Link stickers
- Optional
 - Wiring Loom (various length and pin kit options available)

The Thunder also has the Link G4+ platform features

- This list gives a basic overview of the Link G4+ ECU platform. For full details of the individual adjustments and settings it is recommended that PCLink G4+ is downloaded and installed.

Configuration

- Engine Types
 - 1 to 12 Cylinder (2 or 4 Stroke)
 - 1 to 4 Rotor





Fuel Control

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- Staged Injection Primary/Secondary Tuning
- Corrections by other control features (eg limits, motorsport features)
 - o Auxiliary Injection:
- Additional injector stage control using unused fuel outputs for additional fuel stages or water/alcohol

Ignition

- Types:
 - Direct Spark
 - Distributor
 - Twin Distributor
 - Wasted Spark
 - Rotary Leading Wasted
 - Rotary Direct Spark
- Signals:
 - Rising or Falling Spark Edge
 - ms or duty cycle dwell mode
- Ignition Control:
 - Ignition Delay Correction
 - Minimum Spark Duration Control
 - Maximum Advance Limit
- Ignition Corrections:
 - Ignition Timing Calculated using:
 - Ignition Table
 - Dual Ignition Table (Overlay, switched or blended)
 - ECT Trim Table
 - IAT Trim Table
 - 4D Ignition Table
 - 5D Ignition Table
 - Other control features (eg limits, motorsport features)
 - Multi Fuel:
 - Blending of ignition timing between fuels supported
 - Other:
 - Transient Ignition Retard Control
 - Idle Speed Ignition Control
 - Individual Cylinder Ignition Correction
 - Memory:
 - 32 Mbit Data Logging Memory

Engine Protection

- Limiting System
- Used for all limits and configurable for each limit type:
- Fuel Cut
- Ignition Cut
- Rotary Specific
- Closed loop RPM limiting based on configurable control range
- 2D/3D Tables





- Basic/Advanced modes
- Throttle position dependent cut control
- Adaptive or Constant cut effects
- Hard Cut
- Ignition / Fuel trim during limit
- Limit exit decay
- Limit Types:
- RPM, MAP, Vehicle Speed, System Voltage
- Two General Purpose Limits with configurable tables (eg oil/fuel pressure or IAT/ECT)

Output Functions

- Types:
 - Variable Valve Timing Control for intake and exhaust cams up to 4 cams
 - Idle Speed Control for two/three wise ISC solenoids or four/six terminal stepper motors
 - Boost Control Solenoid
 - Test On/Off
 - General Purpose Output with up to three switching conditions and logic mode
 - General Purpose PWM with up to three switching conditions and logic mode
 - Fuel Pump Control
 - Fuel Pump Speed Control (switched or PWM)
 - Engine Fan Control
 - Air Conditioning Clutch
 - Intercooler Spray Pump
 - Tacho
 - Check Engine Light
 - Purge Solenoid
 - ECU Hold Power (Keep Alive)
 - Speedo
 - Electronic Throttle
 - Electronic Throttle Safety Relay
 - Oxygen Sensor Heater
 - Cam (switched valve lift / VTEC)
 - Anti-Lag ISC Lift Solenoid
 - Exhaust Power Valve
 - Starter Control Solenoid
 - Shift Light
 - Throttle Blip Solenoid
 - Traction Light
 - Rotary Oil Pump Position Control
 - Closed Loop Stepper Position Control
 - Tumbler Valve Control (Subaru)
 - Virtual Auxiliary:
 - Configurable internal signals that can be used as switching conditions for other ECU functions or to extend output functions number of conditions
 - Timers:
 - Triggerable/resettable timers to be used in sequencing output and internal functions





- Shift Light:
 - Shift Light control function
 - Per gear RPM and control range
 - Configurable light brightness depending on RPM to shift point
- CE Light:
 - Check Engine Lamp functionality to display ECU fault codes on the dash. Various modes for light operation
- Engine Fan:
 - Up to three independent engine fans with temperature, hysteresis and air conditioning options
- Tacho:
 - Correctable tacho output with key on tacho sweep option
- Speedo Out:
 - Correctable speedo output with key on speedo sweep option
- IC Spray:
 - Pulsed intercooler spray pump low frequency PWM with various switching conditions
- ECU Hold Power:
 - Keep Alive function for controlling EFI main relay to keep the ECU powered for a controlled time after key off
- Fuel Pump Control:
 - Prime time, RPM and fuel flow switched and PWM support
- Unused Fuel and Ignition Outputs:
 - Can be used for most outputs function types listed above

Input Functions

- Digital Types:
 - General Purpose Input
 - Frequency
 - Variable Valve Timing Cam Position
 - Wheel Speed
 - Air Conditioning Request
 - Intercooler Spray Request
 - Anti Theft Switch
 - Neutral/Park Switch
 - Power Steer Pressure Switch
 - Ignition Switch (Key on)
 - Speed Limit Request
 - Start Signal
 - Clutch Switch
 - Brake Switch
 - Cruise Control Switches
 - Turbo RPM
 - Ethanol Content Sensor
 - Dual ECU Mode Switch
 - Oil Level Switch
 - Stop (engine kill) Switch
 - Oil Pressure Switch
 - Multi Fuel Select Switch
 - Traction Disable Switch





- Analog Types:
 - General Purpose Input
 - Volt Input
 - MAP Sensor
 - Throttle Position Sensor
 - Accelerator Position Sensors
 - Oil Pressure
 - Fuel Pressure
 - EGT (0-5V)
 - Barometric Pressure Sensor
 - Engine Coolant Temperature
 - Intake Air Temperature
 - Narrow Band Oxygen Sensors
 - Rotary Oil Pump Position
 - Tumbler Valve Position
 - Closed Loop Stepper Position Feedback
 - Exhaust Back Pressure
 - Crankcase Pressure
 - Suspension Position
 - Air Conditioning Pressure
 - Lambda (Internal)
 - Gear Position
 - Fuel Temperature
 - Gear Lever Force
 - Fuel Rail Pressure
 - Reverse Lever Position
- Thermocouple:
 - Internal cold junction compensated thermocouple amplifiers
- Accelerometer:
 - 3 Axis G force sensor
 - Software corrected to allow install in any orientation
- Lambda Sensor Control:
 - Internal OEM level wideband Lambda sensor control using latest Bosch digital signal processing technology.
- Calibrations:
 - Built in calibrations for many industry standard and OEM sensors as well as custom 2 point and tabled calibrations.
- Fault Detection:
 - Configurable fault detection and fault value for all Analog Inputs with fault code generation
- Engine Position
 - Modes:
 - Over 80 built in trigger modes for OEM applications as well as user configurable modes for common configurations
 - Sensors:
 - Supports all OEM Variable Reluctance (VR), Hall or Optical sensors. Aftermarket sensors supported
 - Calibration:





- Configurable filtering, pullup resistors and threshold voltages for VR sensors
- Engine position correction (base timing adjustment) for all trigger modes
 - VVT Cam Position:
- Support for up to two engine position (Crank and Cam) and up to four cam position signals

Engine Control

- Idle Speed Control:
 - Support for most OEM and aftermarket idle control solenoids and stepper motors and electronic throttle
 - Basic open loop idle speed control and advanced closed loop control options
 - Configurable speed, RPM and throttle position lockouts
 - Engine Fan, Power Steer and Air Conditioning correction
- Electronic Throttle:
 - Support for up to two electronic throttle bodies
 - Independent or shared throttle target
 - Full safety functionality for all sensors, drivers and other parts of the electronic throttle system including safety relay
 - Up to three switchable throttle target tables
 - Support for anti-lag idle up using electronic throttle
- Boost Control:
 - Basic open loop or advanced closed loop control options
 - Up to three boost target tables
 - Boost target table blending option for Multi Fuel or dash board adjustment
 - Staged boost control for fastest spool up and stable control
 - ECT, IAT and Gear boost corrections
- Knock Control:
 - Closed loop individual cylinder knock control
 - Uses digital signal processing (DSP) technology for accurate windowed knock level measurement
 - Configurable frequency and individual cylinder gain settings
 - Adjustable knock window
 - Fast timing removal (retard) and slow reintroduction (advance), all configurable
 - Permanent memory of timing removed or reset at key on
 - Per cylinder or grouped knock ignition correction tables
- Variable Valve Timing (VVT):
 - Over 40 built in OEM VVT signal patterns and user defined signal patterns
 - Up to four independently configurable (two inlet, two exhaust) cam control channels
 - Up to three switchable inlet and exhaust position target tables
 - Accurate, fast and stable position control
 - Supports common PWM and most BMW VANOS control types
- Cruise Control:
 - Cruise Control using electronic throttle
 - Allows digital and analog cruise switch input
 - Safety features to disengage cruise on brake and clutch
 - Adaptive driver behaviour recognition for a smooth transition between driver and cruise control
 - Adjustable speed operating range and maximum speed increase rate





- Air Conditioning (AC) Control:
 - Basic and advanced control modes
 - Digital or CAN control options
 - AC clutch control based on AC pressure, evaporator temperature and engine load
 - Engine fan control
- Starter Motor Control:
 - Crank with key, Start/Stop and Touch Start options
 - RPM, anti-theft and park/neutral lockout options
- Transmission:
 - Gear detection using RPM/wheel speed, CAN or gear position sensor
 - Auto calculated or user defined gear ratios
 - Driven and driving wheel selection
 - Slip % calculation
 - Input shaft RPM calculation

Logging

- ECU Logging:
 - 32 Mbit internal flash
 - Log up to 100 ECU parameters. All ECU parameters can be logged
 - Selectable logging rates up to 100 Hz
 - Memory compacting algorithm to ensure maximum memory utilisation and wear leveling
 - Continuous (looping) data recording
 - Download all or any part of logging memory for instant display in PCLink
- PCLink Logging:
 - Log any or all parameters in the ECU while connected to PCLink in real time on the screen at rates in excess of 60Hz
 - Auto history recording to catch an event that happened in the past!
 - Advanced logging analysis and tuning functions
- Statistics:
 - Resettable statistics including Max RPM, Max ECT, Max MAP, Engine Starts, Engine Running Time and many more

Communication

- CAN:
 - Two CAN 2.0B channels available
 - OEM Modes and extremely customisable CAN templates for transmission and reception of ECU parameters
 - CAN bus status and error reporting
- OBD:
 - ISO 15765-4 (CAN) OBD communication to scan tools and displays
- RS-232:
 - RS232 connection
 - Multiple data stream options and baud rates supported





Motorsport

- Anti Lag:
 - Basic and Advanced modes
 - Full anti Lag integration with other ECU systems
 - Activation, ignition retard, fuel addition and ignition cut controls
 - Configurable smooth or "lumpy" cyclic idle control
 - Multiple switchable Anti Lag tables
 - Cool down mode
- Launch Control:
 - Single RPM mode for clutch switch or launch button
 - RPM vs Speed (2D or 3D) for controlled slip
 - Latched launch RPM for rolling start
 - Activation and clutch switch options
 - Ignition retard, fuel correction and cut effect options
- Gear Shift Control:
 - Extremely configurable closed loop gear shift control
 - Can be used from simple clutch switch through to full closed loop control with strain gauge lever and gear position sensor
 - Sequential and H pattern gear boxes supported
 - Per gear cut, ignition trim, fuel trim and torque reintroduction time settings
 - Downshift RPM lockout
 - Downshift throttle blip control
- Traction Control:
 - Closed loop wheel slip control
 - Fuel or ignition control options
 - Speed and throttle position lockouts
 - Multiple per gear slip threshold tables

Tuning

- Real Time:
 - All ECU Parameters available for real time display and logging during tuning
 - Smoothest most configurable tuning and data display interface available (PCLink G4+)
 - Quick view of all ECU runtime information for fast diagnostics
- ECU Controls:
 - Upload, download and compare maps
 - Easily upgrade firmware through PCLink
 - Reset statistics
 - Clear ECU fault codes
 - Unlock (Enable) ECU
 - Restore to factory settings
 - Enable/disable password protection
 - Temporarily disable password protection until next power cycle
 - Auto throttle position sensor calibration
 - MAP sensor calibration
 - Trigger scope





- Tuning:
 - Mixture MAP for fuel tuning correction from logged data
 - QuickTrim for calculated VE table correction while tuning
 - QuickTune for automated fuel tuning
 - Knock audio graphical analysis for determining knock filtering frequencies
- Help:
 - Over 800 pages of context sensitive documentation
 - Help viewer embedded in PCLink for full documentation alongside settings
 - Access to Link technical support and forums

