

Product:	ESC Velocity
Currawong part number:	CE1101
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Serial numbers range:	n/a

From August 2018, the CE1101 ESC Velocity -03 variant will supersede the previous -01 PWM input and -02 CAN variant ESCs. The new variant represents a unification and improvement of the legacy designs. This document describes the changes introduced by the new variant.

1 Power hardware and motor control

No changes have been made to the power hardware and the ESC retains its tested 80V/80A continuous rating. Motor control firmware and behaviour is identical to the -02 variant. The design is currently undergoing further characterisation to increase the tested limit.

2 Communications interface

The new -03 variant is intended to require minimal interface changes to be a drop in replacement for the -02 variant.

Pin	-02 variant	-03 variant
10	CAN H	CAN H
9	CAN L	CAN L
8	CAN H	CAN H
7	CAN L	CAN L
6	Ground	Ground
5	Not connected	Hardware enable
4	Used for USB programming of motor control firmware. Must not be connected externally in flight.	Ground
3		PWM input
2		Ground
1		Factory use only

2.1 CAN interface

The CAN interface is pin compatible with the -02 variant. The auxiliary processor firmware and CAN packet protocol are compatible and will be maintained between the two variants. New features in the protocol that cannot be implemented in the legacy hardware will be documented in the ICD.

The CAN transceiver has been changed from the ADM3053 to the TJA1051. Isolation is now provided by the ADuM5403.

2.2 Hardware enable

The -03 variant adds a hardware enable line to the communication connector. This directly enables or disables the gate drive signals to provide true hardware interlock independent of the state of the processor. Note that when the ESC is hardware disabled, no status beeps will be emitted by the motor.

The enable line is a nominal 5V logic level input, active above 4V and inactive below 1V, relative to the isolated communications ground. Input filtering and hysteresis reduce sensitivity to noise.

The state of the hardware enable line is available over CAN telemetry (refer to the CE1101.d02 ICD). On a falling edge of the enable signal, the gate drivers will immediately turn off and the ESC will additionally assert a software disable. On a rising edge the gate drivers will be enabled again, however the ESC will remain in software disable until a standby command is asserted via CAN. Note that the start-up software enable behaviour of the ESC is configurable, such that if the hardware line remains asserted during an unintentional power cycle the ESC can immediately resume function.

2.3 PWM input

The -03 variant adds provision for a PWM command input compatible with the signal requirements for the -01 PWM variant. The PWM input can be operated simultaneously with the CAN interface with configurable command source priority, providing a migration path for customers using the legacy -01 or other vendors' ESCs.

2.4 RPM output

The -03 variant removes the commutation output signal present on the -01 PWM input variant. However the motor speed is available over CAN telemetry and the ESC has an integrated speed control loop, removing the need for external governors.

2.5 Electrical specifications

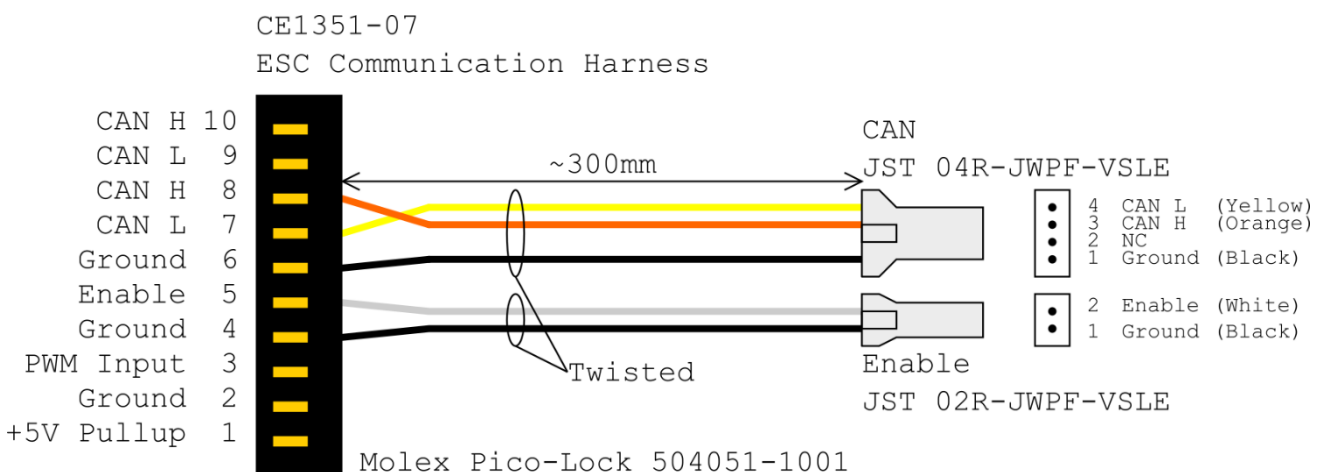
The communications interfaces (both signal and ground) are galvanically isolated from the battery inputs for improved noise immunity. The input pins (pins 3, 5, 7 – 10) are ESD protected and tolerant of a continuous +-30V fault with respect to communications ground.

For users migrating from the -01 variant there is no longer a need to provide external logic power, as the ESC generates its own isolated 5V supply.

To ensure correct operation of the ESC, communications interfaces should be referenced to the provided ground pins on the connector, not the battery ground terminal of the ESC.

2.6 Harnessing

The CE1351-07 harness brings out CAN and hardware enable to JST JWPF connectors. It replaces the CE1351-01 as the standard harness included with each ESC. Custom harnesses are available on request for an additional fee.



3 Motor temperature sense

The -03 variant adds provision for an external connection to a KTY83 or PTC1000 element for sensing of motor temperature. While this connection was available on some units of the -02 variant, the -03 variant now uses a JST LEA series connector (housing PN LEAR-02V-S) with improved crimp terminals for higher reliability.

This connector is fitted at the phase terminal end of the ESC. An additional strain relief tab has been added to the enclosure for strain relief of the cable.

Motor temperature is available over CAN telemetry (refer to the CE1101.d02 ICD).

4 Bus current sense

The DC bus current sense circuit has been improved from the -02 variant. All units are factory calibrated, however nonlinearities in the current sense element degrade accuracy at high currents and duty cycles. Future firmware releases will improve the accuracy of current sensing over the full operating range of the ESC.

5 Programming and configuration interface

For users migrating from the -01 variant, settings previously configured over USB are now configured over CAN via the cEQUIP software. The CAN bootloader provides facility for updating the auxiliary processor firmware over CAN without physical access to the ESC internals.

Motor control firmware updates are still performed over USB, which has been moved to a dedicated programming connector. Users should consider purchasing a CE1441-02 ESC USB programming harness if motor control firmware updates are desired.

Approved by: James Newlands – Product Engineer

Document Revision History

v1.1 (9 August 2018)

- Fixed incorrect wiring in CE1351 figure (pinout in table is unchanged).

v1.0 (1 August 2018)

- Document created.