

Power-Up Calibration (PUC) Options

GENERAL

The drive system uses quadrature motor encoders to report motor shaft position to the drive cards. This provides the precise feedback of shaft position required for smooth motor commutation. Quadrature encoders are incremental encoders – they report change in shaft position rather than absolute shaft position.

On card power-up therefore the system does not know the absolute positions of the motor shafts and is unable to properly commutate the motors until it does so. A power-up calibration procedure is used to achieve this. It is undertaken each time the cards are powered-up.

The default power-up calibration method is MANUAL (see below). This is the only method available for cards with early firmware (ie those supplied before Sept 2017).

For cards with more recent firmware two additional automatic calibration methods are now available. These are also described below.

Automatic calibration options (APUC) are available for cards with 28X2 (CL_SPU) firmware R35 Build 29 or later, AND dsPIC (BLDRV2) firmware R42 Build 43 or later.

APUC is not available for older BLDRV-12/24 cards.

CALIBRATION OPTIONS

1. MANUAL:

This is the default as-delivered setting for ALL cards, and the ONLY method available for pre-Sept 2017 cards. It should be used until full and proper function of the system has been confirmed. The operational sequence is....

Start the CL or Driver Test App software.

Power-up the CL_SPU + BLDRV2-24 cards.

Manually cycle each control axis over its full range of movement (end stop to end stop) at a steady pace until the flashing Yellow LED for the axis driver card goes out and finally the CL_SPU yellow LED goes out.

Click Ping on the software to confirm the calibration is complete and the software is reading the card status.

2. AUTOMATIC - WITH WAIT FOR GO-AHEAD:

Available on post-Sept 2017 CL_SPU + BLDRV2 cards. The operational sequence is...

Start the CL or Driver Test App software.

Power-up the CL_SPU + BLDRV2-24 cards.

The CL software will then display a pop-up window indicating cards are awaiting APUC Go-Ahead. (When using the Driver Test App click Ping to initiate the pop-up window).

When you are ready click Go-Ahead – the cards will then proceed with automatic position and range finding movements. The card Yellow LED's will go out once the procedure is complete.

Click Ping on the software to confirm the calibration is complete and the software is reading the card status.

3. AUTOMATIC – WITHOUT GO-AHEAD:

Available on post-Sept 2017 CL_SPU + BLDRV2 cards. The operational sequence is...

Start the CL or Driver Test App software.

Power-up the CL_SPU + BLDRV2-24 cards.

The cards will then proceed IMMEDIATELY with automatic position and range finding movements. The card Yellow LED's will go out once the procedure is complete.

Click Ping on the software to confirm the calibration is complete and the software is reading the card status.

PREQUISITES

It is strongly recommended that the automatic power-up calibration (APUC) options are NOT used until the system has first been set up and commissioned using the default MANUAL power-up calibration method.

The APUC options require the good function of the mechanical transmissions, and this should be confirmed through the standard setup and commissioning of the system.

The specific prerequisites for successful APUC are:

SOFTWARE:

- CL Software V1.322 with CL_Background process V1.550 or later
- Driver Test Application V51 or later

MECHANICAL:

- Solid mechanical end stops must be in place – the motors will be driven against the end stops to detect working range. If the end stops are missing or are soft the range detection will not complete properly. Approx 30% motor torque output is used for end stop detection, although this is adjustable in EEPROM settings.
- The mechanical transmissions should be stiff – ie no soft/sloppy belt stages or components that bend or slip under load.
- The controls should not have any significant unbalanced loads built-in. The motors

should be free to take up position during APUC as demanded by the cards. This will normally be the case unless the controls require significant force from the motors to move them.

- Related to the above – the controls' movements should be smooth and low friction over their full range. If they are sticky or stiff in places the range finding may not work properly.
- The correct EEPROM voltage scaler settings must be active. This will not usually be an issue unless you have altered the EEPROM settings for the cards.

The cards will briefly apply maximum current to the motors during APUC and if the wrong voltage settings are active for the motor in EEPROM this may result in over-current of the card and motor.

SETTINGS

The PUC settings are held in the BLDRV2.ini settings file in the Config Mngr folder.

The settings are changed manually in the ini file, and the Driver Test Application is then used to write the new settings to the CL_SPU EEPROM.

The relevant settings are in the [Shared] parameters section of the ini file:

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; Power-up calibration (PUC) method
; 1= standard manual movement calibration
; 2= reserved
; 3= automatic movement - starts immediately on power-up
; 4= automatic movement - awaits go-ahead from user
; 5= automatic movement - test mode - sets working range = 8 x encoder rollover edge counts = 2 shaft revs for
MB082 with 360ppr encoder
; NOTE: DO NOT use 3 or 4 until your build is operating normally with manual power-up calibration.
```

Calib_Method=4

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; Automatic power up calibration force level in % of maximum. Too low a value may prevent smooth movement
; during APUC, higher values may enable smoother movements. 30% is normally sufficient.
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APUC_Force=30

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; Automatic power up calibration rate – increase setting to slow the APUC speed of movement, decrease the
setting to speed-up the movement. Typical range 20 to 50.
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APUC_Delay=20

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Note: the new settings can be saved to a renamed BLDRV2.ini file if required.

To change the settings....

1. Open the BLDRV2.ini file in Notepad or similar text editor.

2. In the [Shared] settings area adjust the Calib_Method, APUC_Force and APUC_Delay parameters as required.
3. Save the file.
4. With the cards powered-up and Driver Test Application V51 (or later) running click **Ping**, then click **Update_EEPROM** and follow the prompts.

(Note the cards do not have to be power-up calibrated first – but do wait until the power-up LED sequences have stabilised.)

5. Power-cycle the cards to enable the new PUC setting. Note if Calib_Method=3 has been set the system will immediately go into its auto-movement sequence on restart.

The settings are written to the CL_SPU EEPROM and so will persist until next changed using the same procedure.