Getting started with VSD-E & VSD-XE 160

Evolution

1. Introduction

Thank you for choosing Granite Devices VSD-E / XE drive!

This practical guide will introduce to quick deployment of VSD-E/XE drives. In this guide drives are configured for a typical position mode PC CNC application. However similar approaches can be used for other uses/modes as well.

Before proceeding with this guide, make sure you have read and understood the following manuals:

● VSD-E/XE 160 manual

● GDtool 2.5 manual

All manuals and program & configuration files are available from our web site (see product page side box).
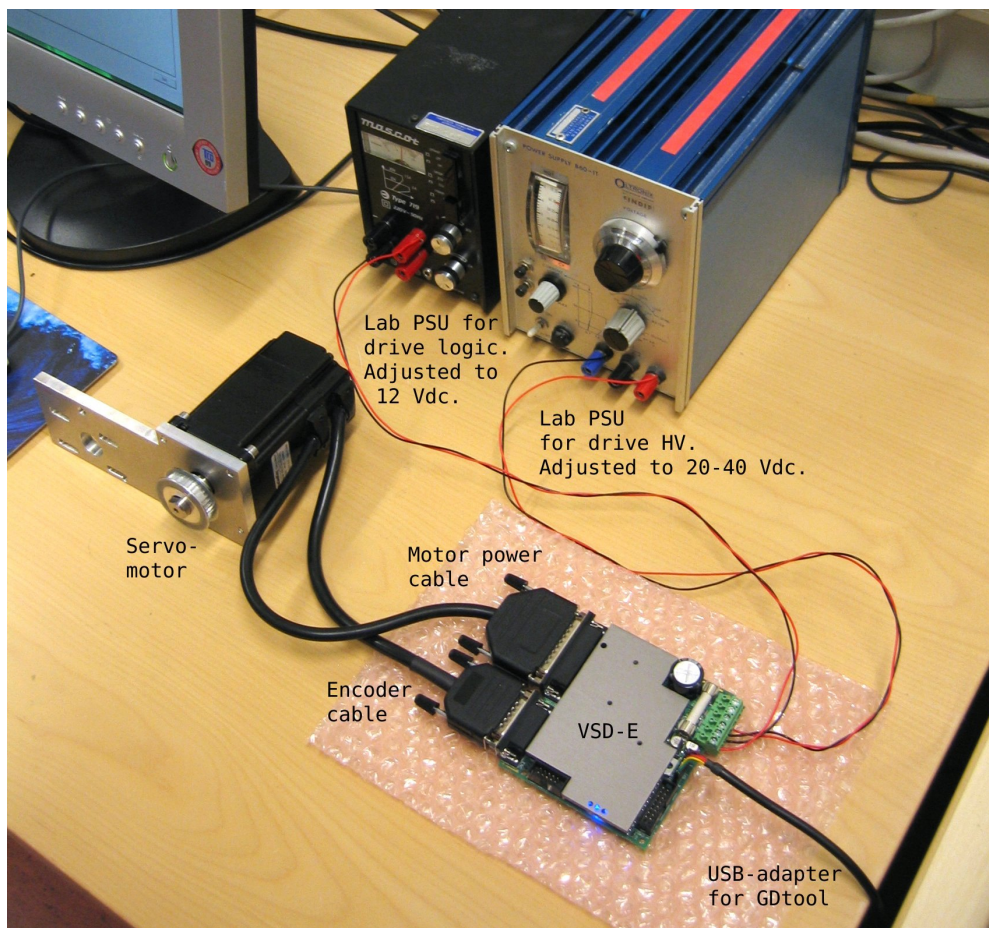

Figure 1: Test setup for GDtool tuning (we'll return to this in the next chapter). Note: it is recommended to mechanically fix larger motors to be safe from unexpected motor "jumping". Also higher than 40VDC supply may be used, but it is recommended to use reduced voltage for first tests.

Warning! Never operate this drive with non-isolated power supply (I.e. rectified AC mains voltage or with autotransformer). Doing so may be **lethal** especially due to non-isolated logic circuity and very high earth currents of this product.

VSD-E/XE has been designed only for electrically isolated power supply.

Granite Devices can't be held responsible for possible damages caused by unsafe use of our products or literature. See VSD-E manual for more information.

2. Building a test setup for drive tuning

Wiring

Begin wiring by making motor & encoder connections to D-Sub connectors. **Use motor/encoder data sheet & VSD-E manual to match wires to pins.**
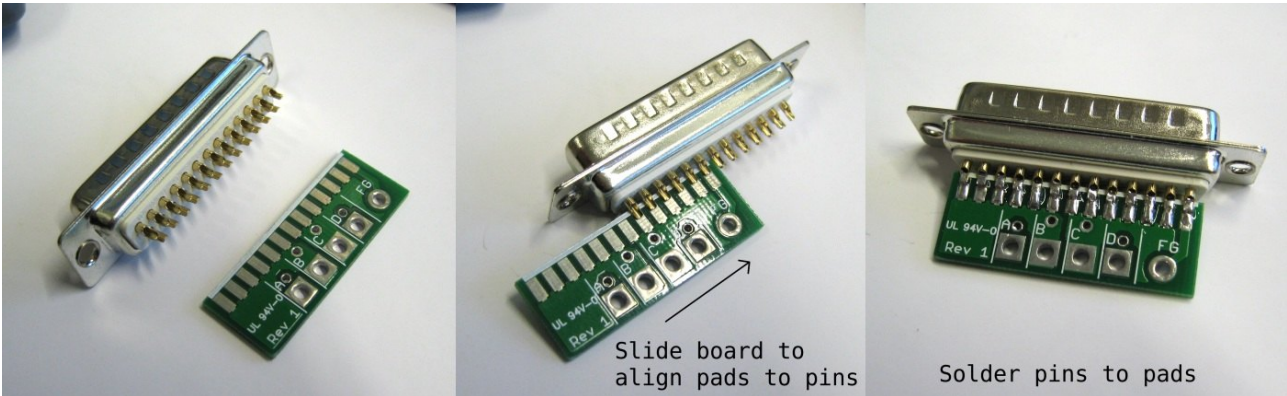

Figure 2: Using the motor connection PCB to ease D-Sub wiring (supplied with every VSD-E/XE).

Figure 3: Wired encoder & motor D-sub connectors (covers opened)

Before powering up anything, double or triple **check all connections**, especially encoder voltage supply wires. Ensure that there is no short circuits wiring.

Connecting parts

Build a test setup that resembles **Figure 1** (see page 1)**.**

Unless you are experienced VSD-E/XE user, use limited current power supplies (such as adjustable lab power supplies) to do initial motor configuration and testing.

Once everything is connected & powered, connect USB adapter to drive and proceed to next chapter.

3. Setting drive parameters

Follow **GDtool manual** for making connection to drive and choose one of the cases below.

Tip: if you are getting led blinking sequences #9 or #11 (see VSD-E manual), the HV power supply probably has too low power capability. In such case try increasing voltage and/or current limits of PSU.

Case A: you have GDtool motor configuration file from supplier

The easiest way to get motor operational is to **load motor configuration file supplied by motor seller** (if available) to GDtool and drive. See figure below for doing so.

Note that the settings in typical **pre-configured files have quite loose position control parameters** (making motor not stiff) and those need to be tuned after motor is mounted on actual machine. We'll return in position tuning in the last chapter.
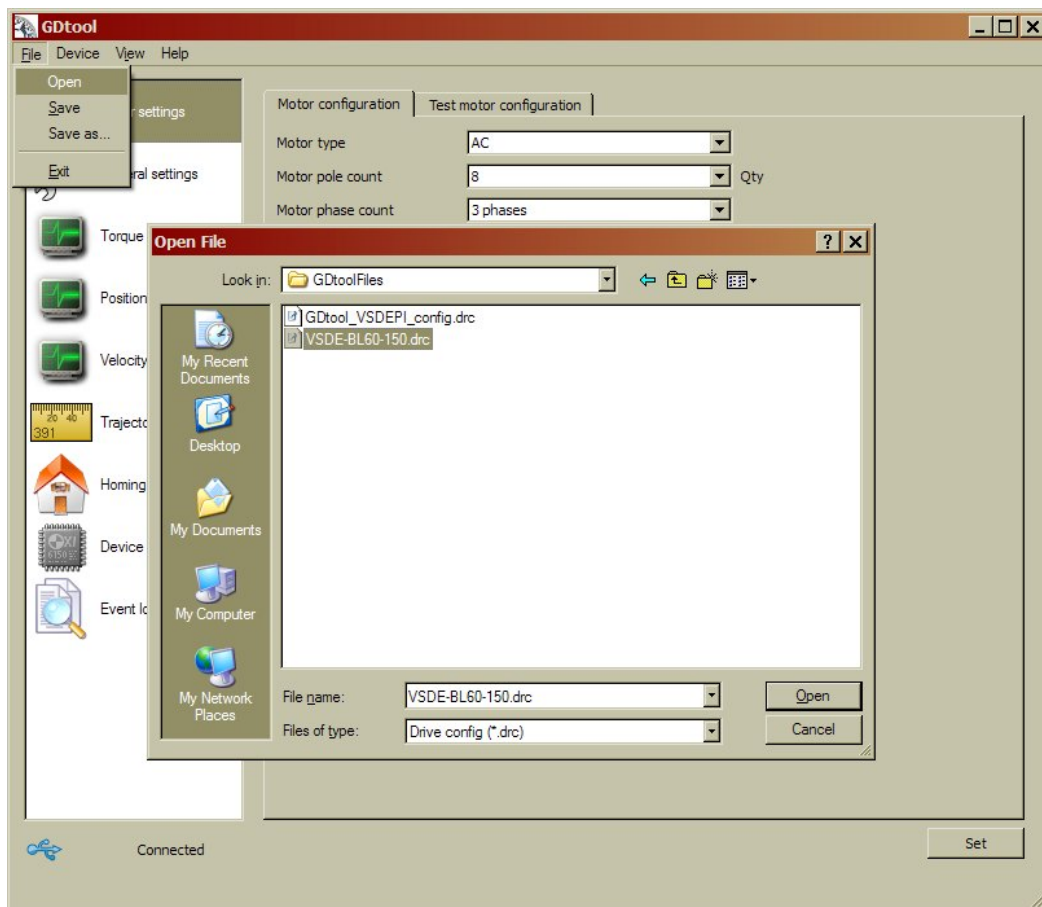

Figure 4: Loading motor configuration to drive after connection to drive has been established.

Case B: no pre-configured motor settings file available

If ready configuration file for your motor was not available, follow **GDtool manual** and your **motor datasheet** for motor parameter setting. In case of uncertainty, feel free to contact us for assistance.

After motor parameters are set, you may proceed to drive tuning. Follow the instructions of **Tuning manual**. Note that it is not necessary to tune position controller very well at this point because position mode tuning has to be re-done after motor is mounted on actual machine. This is because load on motor will have significant effect in position response. We'll return in position tuning in the last chapter.

4. Connecting to VSDEPI

VSDEPI is a parallel interface for PC CNC applications in step/dir mode. VSDEPI connects to drives with straight ribbon cables to minimize cable mess.

Before going beyond this point, **you should have properly working motor configuration in drive** (in position mode).

Configurations for VSDEPI

To make VSD-E and VSDEPI understand each other, It is necessary to **load VSDEPI specific settings file to drive**. Read **VSDEPI manual** for step by step instructions. Loading VSDEPI settings file is done much like in Figure 4.

Also **configure your CNC software** for VSDEPI. Instructions for Mach3 & SmoothStepper are available in VSDEPI manual.

Wiring for VSDEPI

Flat ribbon cables can be easily assembled from the parts of **VSD-E installation kit**.
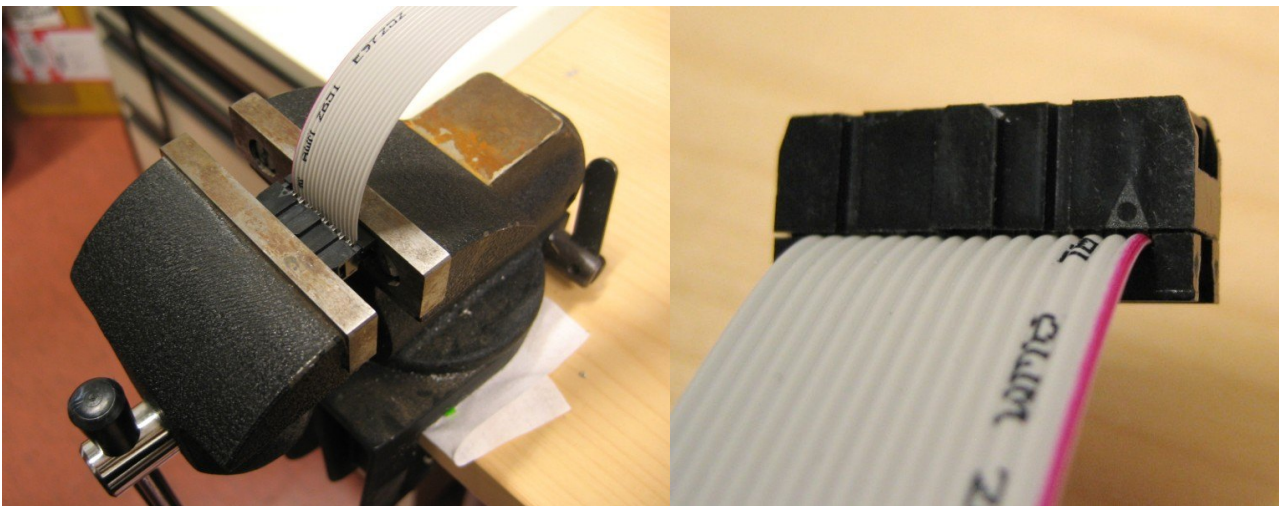

Figure 5: Attaching IDC connector to bare flat ribbon cable by pressing it in a vise. Ensure that polarity is correct in both ends of cable (colored stripe aligned to arrow).

To make a new test setup with VSDEPI, **Switch off** power supplies, **remove USB adapter** and **connect VSDEPI** like in the figure below
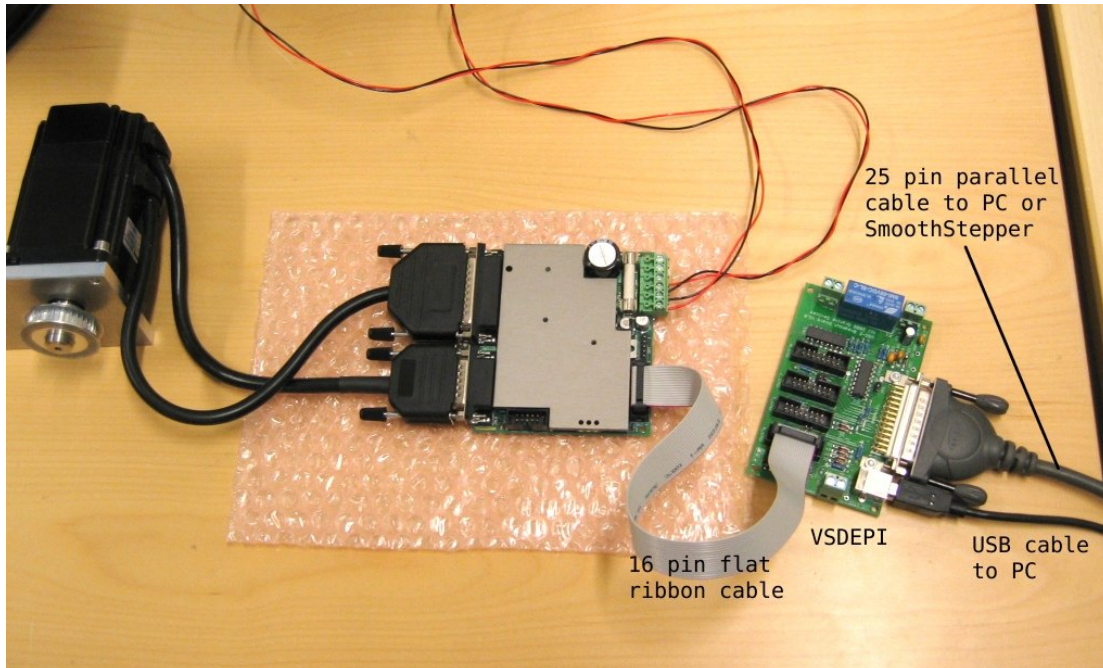

Figure 6: VSDEPI connected to a VSD-E drive and ready for use. Additional drives can be connected to free VSDEPI ports.

After powering up again, you should be able to operate and move motor through CNC software. **Test that everything is working as expected**. Verify that:

- Motors are moving by CNC software command

- E-Stop **and/or** drive fault (i.e. switched off HV supply) stops CNC-software and disables all drives

- Hitting E-stop from CNC software disables all drives

5. Finishing touches

After everything is working nicely on the test setup, you may:

- Install motors to actual machine

- Install drives in their final enclosure (if not already done)

- Use fixed voltage high power supplies

Drive **position control parameters need to be tuned** after motors are mounted on actual machine because motor load will have significant effect on positioning performance. To tune position controller, follow the step-by-step instructions of **Tuning manual**. Notice that optimal position control gains are lowest possible values that produce good enough response.

After positioning tuning, you're done! Configurations for your new high performance servo setup!

Problems?

For fastest troubleshooting, read the troubleshooting chapters of all mentioned manuals and use analytical approach to solve the problem (measurements, experimenting, different tests etc). If solution couldn't be found, feel free to contact our support at support@granitedevices.fi!

6. Frequently Asked Questions

1. Do I need to connect regenerative resistor?

You may try drives & machine without regenerative resistors since VSD drives will protect them selves from regenerative over voltage. If you get over voltage faults during deceleration, then install regenerative resistor to at least one drive in HV DC bus.

2. How to configure axis homing / home switch?

There are generally two ways, choose one:

1. Use homing function of controlling software (Mach3 for example). Wire mechanical home switch to VSD-E/XE encoder connector pins. Home switch signal will be routed through VSDEPI to PC (D-Sub 25 pins, see VSDEPI manual).

2. Use VSD-E/XE internal homing function, which does not need intervention of PC. Use GDtool to configure homing sequence. In this method you may also use *hard-stop homing* which doesn't require mechanical switch. Also motor index pulse can be used for precise homing.

3. How to use VSD-E/XE drives with third party breakout board (BOB) or controller?

Use *GDtool* to configure VSD-E/XE's CMD connector pins to match your needs. I/O pin functions can be configured from *General Settings->User I/O* page.

For quick start, you may follow VSDEPI manual instructions to load *VSDE-General_Interface.drc* configuration file (available from VSDEPI page) to drive. By doing so, CMD connector pins can be wired the following way to BOB or controller:

1 Not connected	**5** Direction out [2]	**9** Disable/clear faults out [2]	**13** Not connected
2 Not connected	**6** GND or 0V	**10** Start homing out [1][2]	**14** Not connected
3 Step out [2]	**7** 3.3V to 5V supply	**11** Drive fault input [3]	**15** Not connected
4 GND or 0V	**8** GND or 0V	**12** Servo ready input [1][3]	**16** Not connected

Note 1: functions of pins 10 and 12 are not usually needed in PC CNC application.

Note 2: These need to be TTL or CMOS outputs (must be capable of driving logic level voltage, i.e. not open collector outputs).

Note 3: pins 11-12 are the only input to BOB, all other signals are outputs. Breakout needs to supply voltage to pin 7 to make pins 11 and 12 operational.

4. How to install optical fibers to LEDs?

Optical fibers can be used to route led signals to enclosure front panel:

1. Cut fibers fibers to suitable length (3 pcs per drive).

2. Insert fiber end to VSD-E/XE holes above LEDs. Due to fiber diameter tolerances, fitting may be loose or tight. If fiber don't fit in hole, reduce fiber diameter by grinding it little bit with sand paper.

3. Drill holes to enclosure panel where you want fiber lights to appear. By stripping black insulator of fiber, only 1 mm holes are needed. You may use adhesive to secure fiber in position.

5. How to use analog (velocity mode) input with potentiometer?

Wire a **1.0 to 3.3 kOhm potentiometer** to CMD connector: middle pin to CMD pin 15, edge pins to CMD pins 13 and 14 and connect CMD pin 16 to CMD pin 13.

Configuring drive for 0-5V analog input (potentiometer) instead of +/-10V: set *PWM/Analog offset* to 25% and *Total input scaling ratio* ratio to 4:1. Also make sure drive is configured for Analog input and for Velocity mode.

For single direction operation, set offset to 0% and scaling ratio to 2:1. To reverse direction, switch wires of CMD pins 15 and 16.

7. More information

For useful **tuning & performance related web links** and **support**, please, please check the following link:

http://granitedevices.fi/index.php?q=manuals