Purpose of this Document

There is very limited documentation available for a Marlin based IDEX setup, and number of the key settings are quite difficult to work out without lots of trial and error.

The purpose of this document is to describe the main Marlin changes required for an IDEX set up, and to explain what these settings do where necessary.

The document assumes that the reader is familiar with editing Marlin source code, and is able to determine the correct values for the remainder of the configuration required for their particular 3d printer.

Basic hardware requirements for IDEX setup

Stepper Motors

The selected motherboard needs to support a minimum of 6 stepper motors. These are broken down as follows, but the total number will depend on the setup of your particular printer:

- X Axis. 2 identical stepper motors are required, each motor will be responsible for moving 1 of the 2 extruders.
- Y axis. 1 stepper motor
- Z axis. 1 stepper motor (minimum, but 3 independent steppers recommended as best in class solution (note this requires BL touch of equivalent))
- Extruders. 2 identical stepper motors are required, one for each of the two extruders.

For stepper motor selection, regular 42-34 stepper motors with 1.8 degree step angle are recommended. Whatever stepper motor is chosen, it is critical that the correct Vref / current values are configured to ensure correct printer operation.

End stop switches

If you are using a conventional endstop setup (rather than sensorless homing) you will require 1 additional end stop switch on the X Axis.

Note that with an IDEX setup, "Extruder 1" is the left hand extruder and homes to the left hand side of the print bed (the X Min direction), whilst "Extruder 2" is the right hand extruder and homes to the right hand side of the print bed (the X Max direction). This is why 2 end stop switches are required, and later in the Marlin configuration you will see that both XMin and XMax have to be setup correctly.

Choice of Hotend

It is critical with a dual extrusion setup that both nozzles can be adjusted to the same height, which ensures consistent filament extrusion. As a result, it is vital that at least one of the hotends selected has an adjustable height nozzle to match that of the other extruder.

The recommended setup is to use 2 x Copperhead hotends, and a custom mount has been designed to work with the popular EVA2 modular assembly (https://main.eva-3d.page/)

EVA2 is a great choice for an IDEX setup due to its range of supported hardware, and very compact design – ensuring that there is minimal loss of printing real estate on the bed in the X direction due to the IDEX assemblies getting in the way of each other.

Bed Probe
A bed probe such as a BLTouch is optional to this setup. If a bed probe is in use, Marlin expects the probe to be attached to Extruder 1 (the left hand IDEX assembly). This is not configurable without major code changes.

List of Marlin Changes to get IDEX working

configuration.h

Configuration Key	Configuration Value	Notes
#define EXTRUDERS	2	Change the default value from 1 to 2. This tells Marlin that you have a dual extrusion setup.
#define HOTEND_OFFSET_X	0	Leave this at the default value of zero. The settings later will deal with the relative positions of the two extruders.
#define USE_XMIN_PLUG	Enable by removing the "//"	As mentioned earlier, the two extruders home at opposite ends of the X axis. The XMin endstop is used for extruder 1.
#define TEMP_SENSOR_0 #define TEMP_SENSOR_1	Enable by removing the "//" for "TEMP_SENSOR_1".	Each hotend will have its own thermistor, and the second extruder needs enabling to support this. Ender the appropriate value for your thermistors
#define X_DRIVER_TYPE #define X2_DRIVER_TYPE	Enable "#define X2_DRIVER_TYPE" by removing the "//".	Configure the correct stepper drivers for each X axis motor. Note that there may be other dependent values required for X2 depending on the stepper drivers, e.g. trinamic driver current in advanced configuration.
#define E0_DRIVER_TYPE #define E1_DRIVER_TYPE	Enable "#define E1_DRIVER_TYPE" by removing the "//".	Configure the correct stepper drivers for each extruder motor. Note that there may be other dependent values required for E1 depending on the stepper drivers, e.g. trinamic driver current in advanced configuration.
INVERT_E0_DIR INVERT_E1_DIR	Set INVERT_E1_DIR to same value as INVERT_E0_DIR	This is a software setting that determines which way the

		stepper motors move (can be adjusted by changing cable wiring layout too).
#define X_BED_SIZE #define Y_BED_SIZE	Example for Ender 5 Plus: 377 350	The normal printable area may be different from the physical bed size. IDEX complicates this further as each extruder may not be able to reach part of the bed at each extreme of the X Axis. It is recommended you configure the X_BED_SIZE value to the physical dimensions of the bed. This value is used to determine the relative extruder position, and using the full size also means you lose the lowest possible amount of printing space.
#define X_MIN_POS	Example for Ender 5 Plus: -36	When the left hand extruder homes, it will be parked off the left hand side of the bed. The default Marlin behaviour is to treat this as X=0. This needs to be adjusted so that X=0 is the left hand edge of the printer bed. The exact value used here will depend on your printer setup, but for an IDEX setup on a Ender 5+, this is a guide.
#define X_MAX_POS	Example for Ender 5 Plus: 412	Similarly to above, when the right hand extruder is homed, it will move to the X axis maximum end stop. The default Marlin behaviour would be to assume this is equal to the maximum configured X axis bed size (e.g. 377). As at the maximum end stop position, extruder 2 is parked off the right hand edge of the bed, this is a value >377.

		412 is the required approximate value for a IDEX setup on a Ender 5+.

Configuration_adv.h

define X_CURRENT define X2_CURRENT define E0_CURRENT define E1_CURRENT	Values suitable for your stepper motors.	If you are using Trinamic stepper drivers, you need to configure the correct current values for your motors. Choosing too low a value will cause your motors to skip steps, and too high will cause overheating and shorten their life. A good rule of thumb: Take the manufacturers current specification for the motor, e.g. 1.5amps. Divide this by the RMS (root mean square) value of 1.4. e.g. 1.5amps / 1.4 = 1.071 amps. Take 80% of this value = 857 (rounded to 850).
#define DUAL_X_CARRIAGE	Enable by removing the "//"	Tells Marling you have an IDEX dual extrusion setup.
#define X1_MIN_POS	X_MIN_POS	Ensures that the IDEX minimum X value is the same as previously configured
//#define X1_MAX_POS X_BED_SIZE	Disable by putting in the "//"	Not required
#define X1_MAX_POS	342	This is used in conjunction with X_MIN_POS to determine the maximum position that the left extruder can move to. Adjust X_MIN_POS first to get X=0 position equal to where the L/H extruder nozzle is just on the bed at the left edge, then adjust this value and increase to the maximum possible value

		before the extruders touch when right hand extruder is parked, and left hand extruder has been moved to maximum value.
#define X2_MIN_POS	35	This controls how far left the right hand extruder can move. It should be set to the lowest value possible before the extruders touch when the left hand extruder is parked, and the right hand extruder is moved as far left as possible.
#define X2_MAX_POS	412	Should be the same as X_MAX_POS. It is the X value when the right hand extruder is parked.
#define X2_HOME_DIR	1	Ensures the right hand extruder homes towards the maximum endstop position.
#define X2_HOME_POS	X2_MAX_POS	Controls the parking position of the right hand extruder
DEFAULT_DUPLICATION_X_OFFSET	188	If you enable duplication mode on the printer, this controls the distance from which the two parts are printed from eachother.
#define PID_PARAMS_PER_HOTEND	Enable by removing the "//"	Even with 2 identical hotends / heater cartridges / thermistors, the PID values to get consistent temperatures will be different. Enable this to allow each hotend to have its own PID tuning.