NOTES – BFF CL System Wiring

A) IMPORTANT – POWER SUPPLY PROVISION

The BLDRV3 cards operate on a 24V DC power supply The PSU to be used MUST be a smooth, voltage regulated supply capable of sustaining the supply voltage at the demanded current draws – variation of the supply voltage above the data sheet specifications will damage the cards, and any electrical noise on the supply will be felt as roughness in the force feedback at the controls.

A suggested PSU is **Mean Well NES-350-24** or similar. This is a 24V 14.6 Amp power supply suitable for 2/3 axis systems depending on motor choice,

See - https://www.meanwell.com/webapp/product/search.aspx?prod=NES-350

The Mean Well SE-450-24 18.8 Amp is suitable for most 3 axis systems using MB082GA210 motors. However if all three axes are to be used routinely at full output simultaneously then a larger PSU may be required.

Most Mean Well PSUs provide protections such as fast short-circuit cutoff and, if these features are present in the PSU, can avoid the need for fuses in the 24V supply lines.

NOTES:

1. BFF Control Loader software V2+ and FS9/X with FSUIPC or with X-Plane V9.6+ and XPUIPC. For X-Plane a custom XPUIPC offsets file must be installed – see CL Software user guide.

   The CL software can be run on a networked PC via WideFS.

2. Three BLDRV3 brushless motor drivers are shown – one for each control axis. Elevator, aileron or rudder allocation is set using jumper settings on the cards.

   The driver cards are normally connected together and to the CL_SPU_USB card using the on-board inter-pcb header connectors. They are shown separated in the diagram for sake of clarity.

   PC comms is to the CL_SPU_USB card via a standar USB-MiniB cable.

3. Wiring details are shown for the Elevator drive only – the Aileron and Rudder wiring is the same to their respective drivers. All the drivers can be supplied from the same 24V DC power source so long as it has adequate current capacity.

   PLEASE NOTE the grounding requirements for the cards described in the driver card data sheet section 3.L.

   The driver to motor wiring connects the 3 power phases, the quadrature encoder and one hall-effect position sensor to the driver. The hall sensor input is used to calibrate the absolute position for the quadrature encoder during manual power-up

calibration. The quadrature encoder provides the continuous motor shaft position feedback required for the motor commutation.

4. Position feedback to FSX via a joystick card is NOT normally required for the main control axes. The control positions are instead instead derived from the motor encoders and sent to the flight sim via FSUIPC. This can be overridden in the CL software settings to allow potentiometer position feedback to FSX if required.

   However a joystick card WILL be required for trim inputs – either via pots or buttons.

   Joystick card axes or buttons can be assigned to the CL system trim inputs using the Configuration Manager Tab 7.

   Do not enable these trim axis assignments in FS9/X and do not use the FS9/X internal trim adjustments otherwise the sim and CL flight controls zero positions will not match.

5. Low cogging force feedback motors. Brushless Servo or BLDC motors with sinusoidal back EMF characteristics of the type specified. Not all low cost BLDC motors will operate satisfactorily in a CL system – even with the BLDRV3 drivers. Many have trapezoidal back-emf characteristics or excessive cogging behaviour and can not generate smooth enough torque output.

   60ST-M01330 Servo Motors are suggested (fitted with 2500 cpr encoders). For greater torque output 80ST-M02430 motors are suggested (about 2x torque output).

   MB082GA210 motors will provide similar torque output to the 60ST-M01330 and should have 360cpr quadrature encoders fitted.

   The mechanical design of the motor to control drive is another critical area for the overall system performance, as is the mechanical connection of the position pots to the controls. Transmissions must be rigid (not flexible) and precise with low levels of friction and as little backlash as is possible.

6. The Aileron and Rudder axis wiring is the same as is shown for the Aileron. All three drivers can share the same power supply if it has adequate current capacity.

7. A standard USB to USB Mini B cable is required to connect the PC to the CL_SPU_USB.

8. An optional logic power switch can be fitted across jumper “Switch” on the CL_SPU_USB. This can be used to switch the logic power to the card separately from the main 24V power to the BLDRV3's.

   If jumper “Switch” is permanently closed (by default jumper link) then the logic circuits will activate when the 24V power is connected to the BLDRV3 adjacent to the CL_SPU_USB.

   Note the Pilot/Co-Pilot station assignment for the CL_SPU_USB is set via jumper “Station” on the CL_SPU_USB. Co-Pilot assignment should only be used in dual electrically linked set-ups.