4 OPERATING INSTRUCTIONS

4.1 DESCRIPTION OF CONTROLS
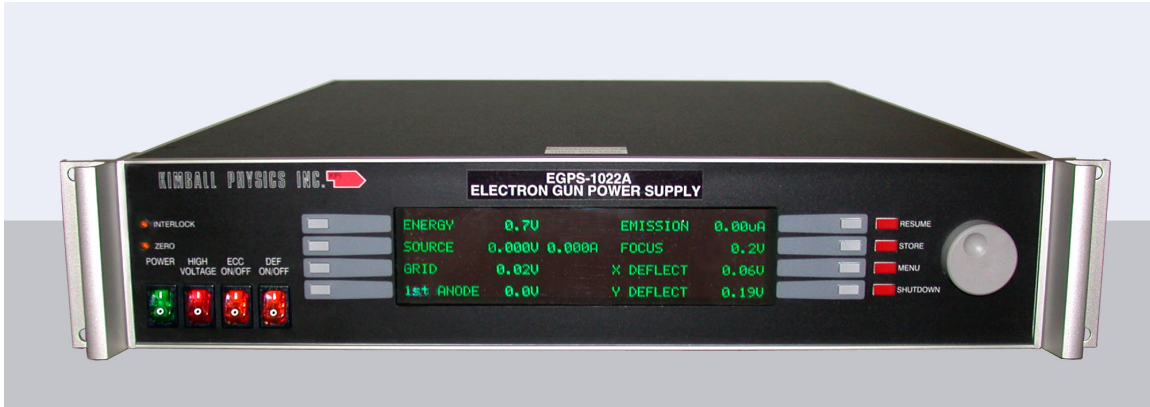

Fig. 4.1-1 Front panel of EGPS-1022 Electron Gun Power Supply with FlexPanel controls

4.1.1 EGPS-1022 POWER SUPPLY

The following is a description of the function of each control in the EGPS-1022 Power Supply.

Front Panel Controls

Power Switch: A green rocker switch labeled **POWER (I / O)** that enables or disenables the entire unit. The **O** position is OFF, and the **I** position is ON.

Interlock LED: An amber LED labeled **INTERLOCK**. When lighted, it indicates an open interlock switch due to an incorrect set-up of the electron gun system. To clear the light, turn off the power switch and correct the fault.

High Voltage Switch: A red rocker switch labeled **HIGH VOLTAGE (I / O)** that enables or disenables the High Voltage power supplies. The **O** position is OFF, and the **I** position is ON.

Zero LED: An amber LED labeled **ZERO**. When lighted, it indicates that a power supply is already turned up when the **HIGH VOLTAGE** switch is turned on initially. This indicates a problem with the circuitry or programming and should be reported to Kimball Physics.

ECC Switch: An amber rocker switch labeled **ECC ON/OFF (I / O)**. The **O** position is SOURCE, and the **I** position is ECC, emission current control. The SOURCE mode allows the user to set the desired Source voltage directly with the encoder wheel. ECC mode allows the user to set the desired emission current which will then be maintained by feedback circuitry controlling the Source power supply.

Deflection Switch: An amber rocker switch labeled **DEF ON/OFF (I / O)** that enables or disenables the power supplies in the deflection unit. The **O** position is OFF, and the **I** position is ON. When off, outputs are grounded, so the deflection plates are grounded.

Display Screen: A digital vacuum fluorescent panel that displays the voltages / currents of the various internal power supplies applied to the electron gun, as well as programming instructions / menus.

Selector Buttons: Eight gray pushbuttons that select the menu item or supply listed on the display screen adjacent to the button. The pushbutton on the bottom right is used for **START** and for **Done** which enters the menu items selected. Clicking a selector button a second time sets and stores the power supply voltage currently displayed, and then deselects the supply so it is not further adjustable by the encoder wheel.

Encoder Wheel: A large gray rotary switch (unlabeled) that adjusts the programming signal of the individual power supply currently selected on the display with its gray pushbutton. Clockwise rotation increases the signal, and counterclockwise decreases it. The rate of increase/ decrease varies with the speed that the knob is rotated to allow for quick rough adjustment or slow fine adjustment. The encoder wheel is also used to adjust values for menu items, such as screen brightness.

4.1 DESCRIPTION OF CONTROLS cont.

Front Panel Controls cont.

Function Buttons: Four red pushbuttons labeled **RESUME**, **STORE**, **MENU**, and **SHUTDOWN** that control the program to run the power supply.

RESUME resets the power supply program voltage to the value stored previously. For high voltage or critical supplies the voltages are gradually ramped up. Resume may be used initially, after power is on, to set all control values, or used when an individual supply is selected to reset a single value.

STORE sets the power supply program voltage to the value currently shown on the display, as adjusted by the encoder wheel, and stores the value in memory. The value may be further adjusted with the encoder wheel for fine tuning.

MENU brings up a list of programming options on the display screen.

SHUTDOWN sets all the individual power supply voltages to zero. Supplies are shut down in an appropriate order and high voltage or critical supplies are ramped down gradually. **H.V. WARNING:** This button does not shut down the entire unit; the supplies will still be energized until the unit is turned off with the **POWER** and **HIGH VOLTAGE** switches.

Menu Items on Display Screen:
Set proportional outputs sets the output of one supply (slave output) to vary proportionally with the output of another supply (source output), so that the slave will be changed automatically when the other is adjusted. To cancel, the slave is reset to its full range.
Set brightness sets the screen brightness on a scale of 1 to 4.
Set screensaver sets the display's screensaver type and delay time.
Display system info displays the power supply model, software revision, power supply serial number and other information.

Power Supply Controls and Meters on Display Screen:
For each control/meter label, the value displayed next to it is the actual power supply output.

ENERGY voltage programs the Energy power supply that provides the electron acceleration energy.

SOURCE voltage programs the Source power supply that heats the cathode, and so controls the beam current. In ECC mode, it sets the emission current.
Both Source Voltage (the cathode filament voltage) and Source Current (the cathode filament current) are monitored.

EMISSION remotely monitors the emitted current from the cathode.

GRID voltage programs the Grid (G-1or Wehnelt) power supply, controls the beam current, uniformity and spot size, can cut off beam.

1st ANODE voltage programs the variable Anode (or multistaging grid, G-2) power supply, extracts beam current.

FOCUS voltage programs the Focus power supply, controls the spot size.

X DEFLECT voltage programs the X power supply for deflection in the X direction, operable when the DEF rocker switch is on, controls spot position.

Y DEFLECT voltage programs the Y power supply for deflection in the Y direction, operable when the DEF rocker switch is on, controls spot position.

Table 4.1-1 ELG-2 / EGPS-1022 Power Supply Ranges

Power Supply	Range
Energy	0 to -2 kV
Source Voltage controlled and metered, Current metered only	0 to 2.0 V (Zener limit approx 1.5 V for Ta disc or Thoria or 0.9 V for BaO) 0 to 2.0 A
Emission Current (Metered, not a separate power supply)	0 to 20 μA
Grid	0 to -50 V
1st Anode	0 to +200 V
Focus	0 to +2 kV
X Deflection	-150 V to +150 V
Y-Deflection	-150 V to +150 V
Optional Fixed Grid (for Dual Grid Pulsing)	-50 V, fixed

4.1 DESCRIPTION OF CONTROLS cont.

Back Panel Controls

Fig. 4.1-2 Back panel of standard EGPS-1022

Local / Remote Control Switches: Two-position slide switches labeled **PROGRAMMING** that set the control of each individual power supply in the **LOCAL** or **REMOTE** mode. (Metering of the supplies is not affected by these switches.)
LOCAL allows control by the manual, front panel controls, FlexPanel Controls or by computer via the Serial Communicator (RS-232, RS-422 or RS-485).
REMOTE allows control only by input via the 50-pin **EXTERNAL INTERFACE** connector below (or optional National Instruments connector).

Remote Control Connector: A 50-pin D-sub connector labeled **EXTERNAL INTERFACE** that allows both analog input to voltage program individual power supplies for remote control and analog output for metering.
(signal inputs: 0 to +10 V, or -10 V to +10 V for deflection, TTL 0 or +5 V)
(signal outputs: 0 to +2 V, or -2 V to +2 V for deflection).

Serial Communicator: A 9-pin D-sub connector labeled **RS-232** or **COMM PORT** that connects to the FlexPanel board to allow programming input from a computer, control of individual power supplies and output for computer metering. On some units, the connector can be set for either RS-232 or RS422 / RS-485, as indicated by the amber LEDs. (The type is specified at time of ordering).

Pulsing Input BNC (optional): A BNC labeled **TTL IN** to receive signals from a user-supplied TTL pulse generator for optional Dual Grid Pulsing systems only. A +5 V signal will cut off the electron beam.

Power Indicator Light: A green light labeled **POWER ON** that indicates that the power for the entire unit is on, as controlled by the front panel POWER switch.

High Voltage Indicator Light : A red light labeled **HV ON** that indicates that the power for High Voltage Energy supply is on, as controlled by the front panel HIGH VOLTAGE switch.

Interlock Terminal Block: A 2-screw terminal block labeled **J2 SPARE INTERLOCK** that disables the power supply when it is an open circuit, shipped jumpered.

Ground: A screw post labeled **E1 GND** for connection to Earth ground.

Main Fuse: Two 250 V, 2 A slow-blow fuses labeled **F1 250V 2A TYPE T** that are the main fuse for the entire unit. (Individual boards have additional fuses.) To replace a fuse or to change the input AC line voltage (115 V or 230 V), pry open the small fuse holder panel.

AC Indicator: A window in the fuse holder that shows the selected input line AC voltage, either 115 V or 230 V.

Power Line Input: A three-prong connector labeled **J1 ~250VA MAX** for input of the AC line voltage (115 V or 230 V, 50 / 60 Hz).
= alternating current

Optional Back Panel Controls for National Instruments LabVIEW™ Computer Interface

Metering Output Connector (optional): A 68-pin D-sub connector labeled **METERING** for monitoring individual power supply outputs by computer, DAQ board NI 6034.
(signal outputs: 0 to +2 V, or -2 V to +2 V).

Programming Input Connector (optional): A 68-pin D-sub connector labeled **PROGRAMMING** for voltage programming the individual power supplies by computer, DAQ board NI 6703. (signal inputs: 0 to +10 V, or -10 V to +10 V, TTL 0 or +5 V)

4 OPERATION

4.1 DESCRIPTION OF CONTROLS cont.

4.1.2 OPERATION OF FLEXPANEL CONTROLS

Display screen

Encoder wheel with
finger depression

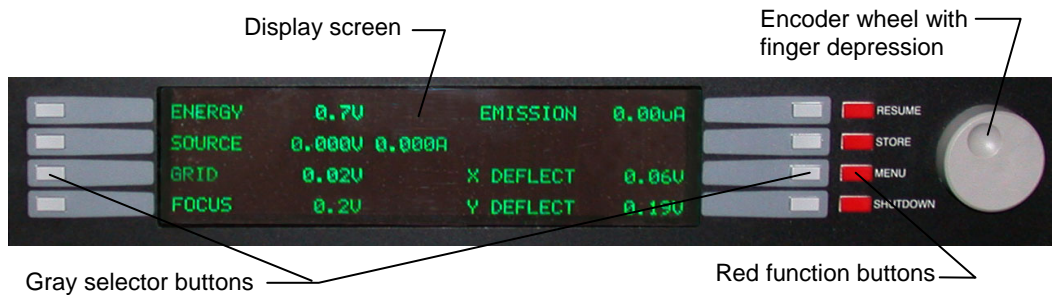Gray selector buttons

Red function buttons

Fig. 4.1-3 FlexPanel Controls on a typical Power Supply unit with encoder wheel and digital display screen

1. To adjust a power supply control with the FlexPanel Controls (programming):
    a. Push the adjacent gray selector button to select (highlight) the desired supply label on the display screen, for example ENERGY or GRID. Some items such as EMISSION are only for metering, not control.
    b. Turn the encoder wheel to adjust the output shown on the display, clockwise to increase or counterclockwise to decrease. Turn quickly to make large changes, then turn slowly for fine adjustment.
        NOTE: The wheel is designed to be turned easily and rapidly with a finger in the depression. The large outer edge allows slower, more precise movement. One slow click with the wheel will adjust the value by one unit in the last decimal place. Because the encoder wheel has a variable rate of increase/decrease, it is possible to turn a control higher than is intended.
    c. For critical supplies such as Energy and Source, the power supply voltages are gradually ramped up to the value set by the encoder wheel. The internal programming has a preset slew rate so that voltage is increased in a number of steps.
    d. Due to capacitance in the gun system, there may a delay in the response to supply voltage changes.
    e. While adjusting, an intermediate value may be saved if desired.
        i.   Push the red function button labeled **STORE** to save the current value.
        ii. Make further adjustments with the encoder wheel.
        iii. To return to the stored value, push the red function button labeled **RESUME**.
    f. When finished adjusting, store the final value in memory by either of the following methods:
        i.   Push the red function button labeled **STORE**, or
        ii. Push the selector button a second time to set and store the voltage displayed. This also deselects the control.

2. To monitor a power supply output with the FlexPanel Controls (metering):
    a. The actual output voltages and currents are shown on the display screen next to the supply label.
    b. **CAUTION:**   If the label and value becomes highlighted, this is a warning that indicates that the value has reached or exceeds the recommended upper limit for that supply. The supply should be turned down with the encoder wheel until it is no longer highlighted.

3. To set a program option with the FlexPanel Controls:
    a. Push the red function button labeled **MENU** to display the list of options.
    b. Push the adjacent gray selector button to select (highlight) the desired option on the display screen.
    c. Use the gray selector buttons to make choices. Turn the encoder wheel to display different values for options, as directed on the screen.
    d. When finished, push the lower right selector button for **Done** to enter changes.
    e. Program settings are retained when the unit is turned off, and so only need to be set if changes are desired.

4. To set the output of one supply (slave output) to vary proportionally with another supply (source output).
    a. Push the red **MENU** button and select **set proportional outputs** and then select **change proportional sources**.
    b. Select **SLAVE OUTPUT** and turn the encoder wheel to choose the desired supply.. Then select **SOURCE OUTPUT** and choose the desired supply. For example, Focus can be set to track with the Energy voltage by setting SLAVE OUTPUT: FOCUS and SOURCE OUTPUT: ENERGY. As Energy is changed, the Focus will adjust automatically to maintain the original spot size at the given working distance.
    c. Press **Done** until the screen returns to the control / meter display.
    d. To cancel the proportional relationship, repeat the process with choosing **SOURCE OUTPUT: FULL RANGE.**