# 4.5 REMOTE ACCESS: METERING / PROGRAMING OF POWER SUPPLIES

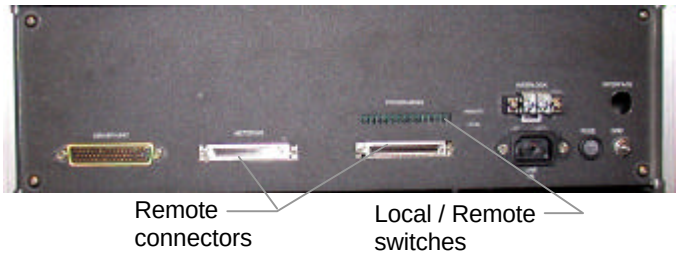


**Fig. 4.5-1 A typical power supply with computer remote access connectors for metering and programming.**

The Power Supply provides two types of remote access: (1) remote monitoring of all meters, and (2) remote programming control of all individual power supplies.

Remote metering allows any digital or analog meter on the front panel be read using a digital voltmeter or a computer with a data acquisition board. For example, the Emission Current meter signal can be connected to a computer, so that emission data can be recorded directly. Remote metering also permits a more sensitive reading than is possible visually on an analog meter face used in some Power Supplies.

Remote programming allows the operation of the gun to be somewhat automated. The programming voltage signal can be obtained from any source, such as a simple analog supply or a computer with a digital to analog converter. For example, a computer program can be used to control the output of an individual power supply (such as Energy or Focus) and increase that parameter in systematic small steps. Note that when a supply is in the remote mode, it can not be controlled manually with the front panel potentiometers.

The remote access uses two D-sub connectors labeled **METERING** and **PROGRAMMING** on the back of the Power Supply (Figure 4.5-1). In addition, the remote programming has individual Local/ Remote slide switches for each supply to be programmed. These switches are accessed from the back of the Power Supply. The meter signals that can be monitored and the supplies that can be programmed depend on the particular gun model and are listed in the tables below. Note that there may be extra pins and switches which are not used with a particular gun.

Separate, optional Power Supply units, such as a stand-alone Rastering unit, may also have supplies that can be controlled remotely in a similar manner.

**Fig. 4.5-2 Typical computer set up running LabView™ program for remote programming and metering written by Kimball Physics**

A National Instruments LabView™ computer program written by Kimball Physics is available for remote computer control (Fig. 4.5-2). The program provides the user with a virtual panel similar to the front panel on the main Power Supply for controlling and metering all supplies.

The programming input uses standard LabView™ controls such as pushbuttons, toggle switches, and digital controls with increment/decrement buttons. The digital controls have the same effect as the physical front panel potentiometers. However, using a numerical input on the digital control will cause the supply to immediately jump to that input value. This could be a problem with some critical supplies, in particular Energy and Source, which should be brought up gradually. For critical supplies, it is recommended that the increment/decrement buttons be used. For lower voltage supplies, such as Grid or Raster size, either numerical or increment/decrement buttons may be used.

For remote metering, the Kimball Physics program uses both LabView™ digital indicators and horizontal fill slides. These virtual meters display the meter signal out of the individual supplies. The horizontal fill slide provides a more visual representation, similar to an analog meter. With the fill slide, it can be seen from a distance whether a supply is turned halfway or all the way up. The fill slides are color coded: red for critical supplies, green for lower voltage meters, and blue for current meters. Details of the control panel for a particular gun are given in Section 4.1.

Other computer programs may be designed by the user to control the power supplies in particular ways or to collect data from the supply meters.

# 4.5 REMOTE ACCESS: METERING / PROGRAMMING OF POWER SUPPLIES cont.

## 4.5.1 REMOTE METERING

**N. I. LabView™ Program by Kimball Physics**

1. Set up the power supplies and cable connections as described in Power Supply Installation Section 2.3.

2. If the program is not already installed, install the National Instruments LabView™ executable program file written by Kimball Physics (ex. 6005.exe) on the computer. Either LabView or LabView Runtime is required.

3. After the Power Supplies have been turned on physically as described in Normal Start-Up Procedure, start the program by clicking the **POWER** button. The green arrow should light and the digital indicator meters show 000. Note that this power button does not energize or shut down the power supplies.

4. As the gun is operated, the digital indicators and horizontal fill slides will display the meter signals out of each supply.

5. To shut down:
   a. Turn off supplies as described in the Normal Shut Down Procedure.
   b. Turn off the program by clicking the **RUN PROGRAM** button. The green arrow and digital readouts should go off. **Do not just close the window** as the program voltages may remain at the values set before the window was closed.
   c. Then the program window can be closed and the computer shut down.
   d. The **EMERGENCY STOP** button is for an emergency situation only and should not be used under normal circumstances. It immediately turns off all Power Supplies. If the **EMERGENCY STOP** button has been used, it must be reset by clicking on the button, before any supplies can be turned on.

**User-designed Remote Metering**

1. Set up a user-supplied system (computer program, DAQ boards etc.) to monitor the meters.

2. Ensure that all Power Supplies are **OFF** before making electrical connections.

3. The meter output signal maps linearly onto supply-dependant ranges shown in Table 4.5-1.
   a. **For digital meters (DVM):** The output signal is either 0 to 2 V or a decimal fraction of the particular power supply output.
   For example, with a 0 to 5 keV Energy supply read on a DVM, a 500 mV signal represents 5000 eV, and a 250 mV signal represents 2500 eV.
   Also, with -150 V to +150 V Deflection supply read on a DVM, a –150 mV signal represents –150 V, and a +75 mV signal represents +75 V.
   b. **For analog meters:** The output signal is 0 to 2 V.
   For example, with a 500 µA analog Emission Current meter, a 2 V signal represents 500 µA, and a 1 V signal represents 250 µA.
   c. Refer to Table 4.5-1 and Fig. 4.5-4 below for the pinout of the **METERING** connector. For each meter, there are a pair of pins: (1) signal output to connect to the output measuring device and (2) common to reference the system to ground.

4. Connect a user-supplied cable from the monitoring system to the D-sub connector labeled **METERING** on the back of the Power Supply to the computer system.

5. Remote metering does not require Remote/ Local switches, and does not affect the use of the front panel controls or meters.

6. Proceed to the remote programming instructions below, or follow the Normal Start Up Procedure to energize and operate the system.

## 4.5.2 REMOTE PROGRAMMING

**N. I. LabView™ Program by Kimball Physics**

1. Set up the power supplies and cable connections as described in Power Supply Installation Section 2.2.

2. If the program is not already installed, install the National Instruments LabView™ executable program file written by Kimball Physics on the computer. Either LabView or LabView Runtime is required.

3. On the back of the main Power Supply, set the small local/ remote slide switches labeled **PROGRAMMING** to the **REMOTE** position (up) for each supply that is to be remotely controlled. Individual supplies can be run in either local or remote mode. (Fig. 4.5-3)

**NOTE:** Once in the Remote mode, the power supply is not controllable by the front panel potentiometers. Front panel meters are not affected by these switches.

4. After the Power Supplies have been turned on physically as described in Normal Start-Up Procedure, start the program by clicking the **POWER** button. The green arrow should light and the digital indicator meters show 000. Note that this power button does not energize or shut down the power supplies.

5. Operate the gun as described in the Normal Start Up or ECC Procedures, using the toggle switches and digital controls on the virtual panel instead of the switches and potentiometers on the Power Supply front panel.

**CAUTION:** Using a numerical input on the digital control will cause the supply to immediately jump to that input value. **For critical supplies, such as Energy and Source, it is strongly recommended that the supplies be turned up gradually using the increment button.**

6. To shut down:
   a. Turn off supplies as described in the Normal Shut Down Procedure.
   b. Turn off the program by clicking the **RUN PROGRAM** button. The green arrow and digital readouts should go off. **Do not just close the window** as the program voltages may remain at the values set before the window was closed.
   c. Then the program window can be closed and the computer shut down.
   d. The **EMERGENCY STOP** button is for an emergency situation only and should not be used under normal circumstances. It immediately turns off all Power Supplies. If the **EMERGENCY STOP** button has been used, it must be reset by clicking reset on the button, before any supplies can be turned on.

**User-designed Remote Programming Control**

1. Set up a user-supplied system (computer program, DAQ boards etc.) to provide a source for controlling the individual power supplies.

2. Ensure that all Power Supplies are **OFF** before making electrical connections.

3. The voltage source signal maps linearly onto the supply-dependant range shown in Table 4.5-2 below.
   a. **For supplies with a range of 0 to X** (most supplies): Provide a voltage source that produces a 0 to +10 V signal.
   For example, with a 0 to –5 keV Energy power supply, a +10 V signal supplies –5000 eV, and a +5 V signal supplies –2500 eV.
   b. **For supplies with a range of ± X** (Deflection or Alignment): Provide a voltage source that produces a –10 V to +10 V signal.
   For example, with a –150 V to +150 V Deflection power supply, a -10 V signal supplies –150 V, a +5 V signal supplies +75 V, and a 0 V signal supplies no deflection.
   c. **For toggle switches:** Provide an on/off +5 V or 0 V signal. For example, with the Source/ECC switch, +5 V sets the switch to ECC, and 0 V sets it to Source mode.
   d. Refer to Table 4.5-2 and Fig. 4.5-4 for the pinout of the **PROGRAMMING** connector. For each supply, there are a pair of pins: (1) signal program to connect to the voltage programming signal and (2) common to reference the system to ground.

4. On the Power Supply front panel, turn all potentiometers fully counterclockwise, to avoid problems due to unexpected settings if the unit is switched back to local mode.

5. On the Power Supply front panel, preset any toggle switches that are not controlled by the remote programming, such as ECC or HIGH/ LOW switches.

7. On the back of the main Power Supply, set the small local/ remote slide switches labeled **PROGRAMMING** to the **REMOTE** position (up) for each supply that is to be remotely controlled. Individual supplies can be run in either local or remote mode. (Fig. 4.5-3)

**NOTE:** Once in the Remote mode, the power supply is not controllable by the front panel potentiometers. Front panel meters are not affected by these switches.

6. Connect a user-supplied cable from the programming control system to the D-sub connector labeled **PROGRAMMING** on the back of the Power Supply to the computer system.

7. Follow the Normal Start Up Procedure to energize the system and operate the controls that are not programmed remotely. Front panel pushbuttons need to be on (lighted) for the remote programmed supplies to operate.