ACCU-DYN+

Dynalyzer Accu-Dyn+ Display System

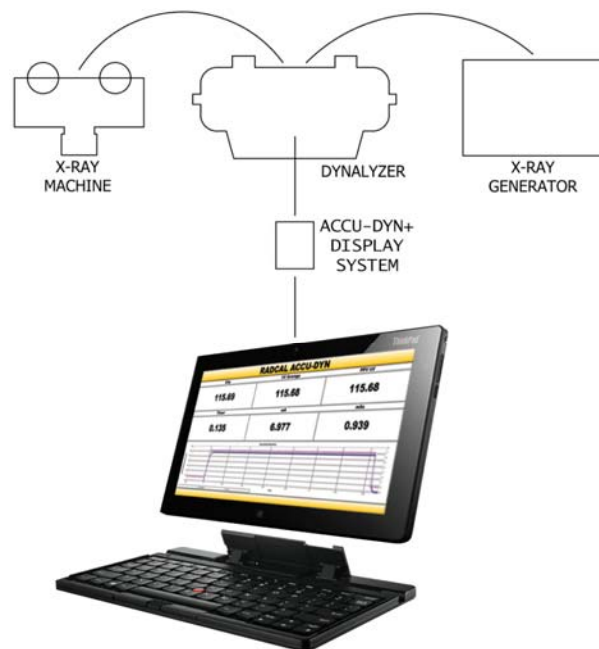**OPERATION MANUAL**

Radcal

The Accu-Dyn+ display system provides the means to display, analyze, and report values measured by the Dynalyzer that support calibration, compliance testing, and troubleshooting. Displayed values include: kV, kV Average, PPV, Time, anode current and mAs. In addition, waveforms of kV and anode current can be displayed and analyzed, providing a deeper understanding of the operation of the system.

Notes: kV and derived quantities are anode+cathode voltage. Waveforms and calculated values reflect a bandwidth of 4 kHz.

Contents

Software Installation

Overview:

The Accu-Dyn+ digitizer interfaces to the computer using *Accu-Gold Excel*. *Accu-Gold Excel* is an Excel interface for Radcal's Accu-Gold measurement system. **Microsoft Excel** for Windows (XP and later) is required, and the interface appears as an Excel add-in. A shortcut is installed on your desktop that opens a folder containing Accu-Gold templates. (These templates are installed in the 'Program Files' folder under Radcal\AccuGoldExcel'.)

Installation:

NOTE: Install Accu-Gold Excel *before* connecting the Accu-Dyn+ digitizer to a USB port.

Plug the flash drive into an available USB port. (Because some USB keys are not polarized, your computer may not recognize the key; in that case rotate the key and plug it in again.)

Double-click 'Setup.exe'. Follow the prompts to install Accu-Gold Excel.

To activate the interface for the Dynalyzer, open the Accu-Gold Excel folder on the desktop, and then open the **Accu-Dyn** template

Connect the Accu-Dyn+ to the computer; the computer will automatically install the device. The Accu-Dyn+ will then be ready for use.

Setup
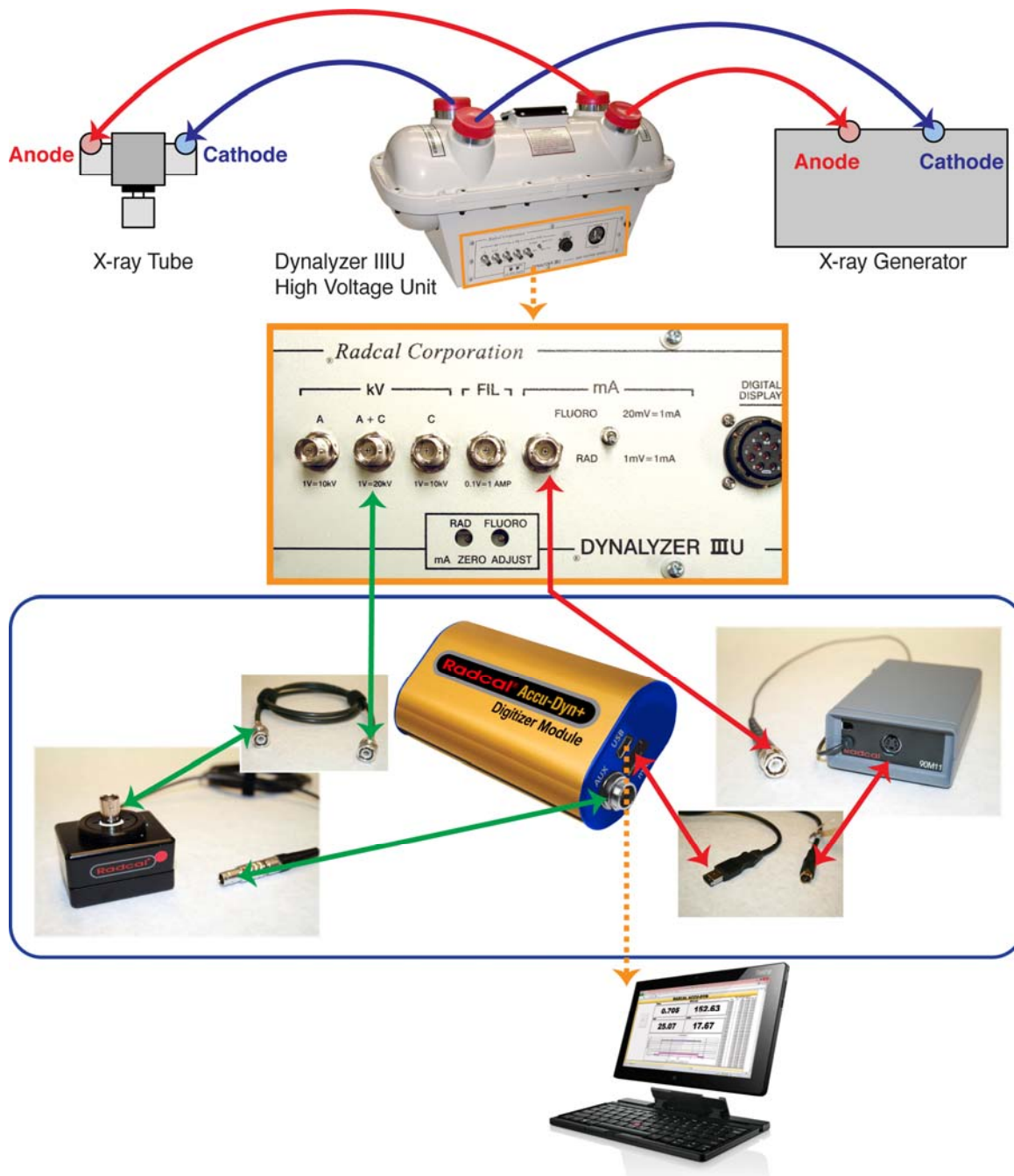
AGkV kV Adapter
1. Connect the kV Adapter BNC to the Dynalyzer A+C BNC using the BNC cable provided.
2. Connect the output connector of the AGkV adapter to the AUX input of the Accu-Dyn+ digitizer.

Dynalyzer
1. Power the Dynalyzer by plugging in the AC cord.
2. Connect a voltmeter to the BNC mA out of the Dynalyzer.
3. While Rad is selected, adjust the Rad potentiometer thru the front panel until the reading is approximately less than 1mVDC.
4. While Flu is selected, adjust the Fluoro potentiometer thru the front panel until the reading is approximately less than 1mVDC.
5. Repeat steps 2 and 3 until both reading are identical.

90M11 mA Adapter
1. Connect the mA adapter BNC to the mA BNC of the Dynalyzer.
2. Switch Rad/Flu to the appropriate setting for the measurements to be made.
3. Connect the output to the Accu-Dyn+ mAs port using the supplied interconnecting cable.
4. Power the mA Adapter using:
   - 9V battery or
   - 9V AC adapter (using the adapter battery cover on the 90m11) or
   - If the Dynalyzer has the built in 9V adapter connector (using the adapter battery cover on the 90m11)

Accu-Dyn+ Digitizer
Connect the digitizer to the computer with Accu-Dyn+ software using the supplied USB cable.

Making Measurements

Open the ***Accu-Dyn*** template. A notification window will appear showing the installed DLL and Driver version. The first entry Cell will be selected automatically and the sheet will be ready for measurements.

The Accu-Dyn+ excel template provides readouts of kVp, Average kV, Practical Peak Voltage (PPV), time, mA, and mAs. Each measurement is placed in a list under Recorded Measurements.

The waveforms displayed are RIAvgkV, and mA. The RI refers to the Region of Interest, which in this case will be the AvgkV between the threshold triggers.
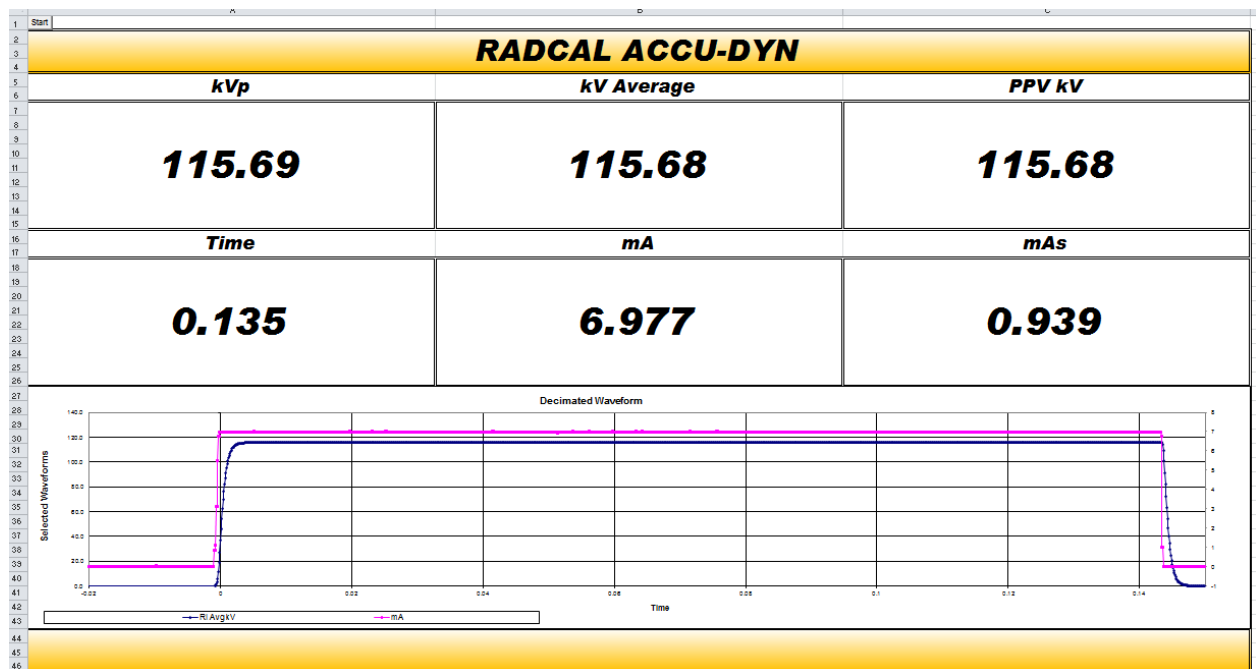
Running the Program

Select a cell in the "Time" column. Press the Start button located in the upper left corner of the sheet to begin the measurement loop. Alternatively, Ctrl+Shift+R can also be used.
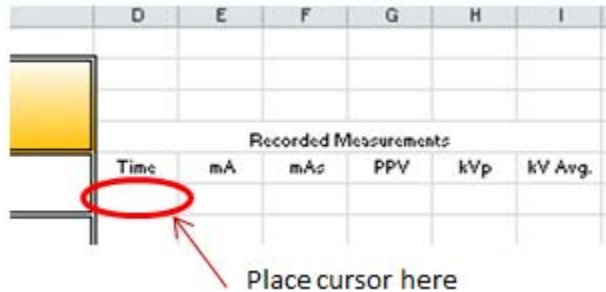
Wait until the selected Cell turns green before making an exposure. Too early may yield errors. Once an exposure is made, data is collected and processed, values displayed and listed, the graph will display kV and mA waveforms, and the cell below is selected for the next exposure.

While the active cell is green, Esc is used to exit the measurement loop. Pressing it while the program is processing an exposure may yield errors or incomplete data.

The program can be restarted using either the button or key combination, picking up where it left off. This is useful in times where breaks between sets of exposures are required such as changing filtration. If a selected Cell is already populated with data, the previous data will be overwritten. This is useful when an exposure was made erroneously or was unnecessary. Alternatively, entries can be manually deleted or moved.

NOTE: When measuring the output in high-voltage machines, it can take several minutes for the generator to settle. If the measure sequence is initialized without waiting, the system will produce errors as it is attempting to re-zero. This particular template accommodates uninterrupted measuring without a wait period by establishing a zero in the initial start. This value then will be used for the subsequent measurements until reset.

Data

After the exposures are made, the sheet can be saved as is or the values can be copied to another sheet. Only the last waveform is saved with the worksheet. To save additional waveforms, use 'Save As..' between measurements.

Hotkeys

Ctrl+Shift+R: (R)un - Starts the measurement process
Esc: Stops the measurement routine
Ctrl+Shift+C: (C)lear - Clears the digitizer's USB connection, and causes recognition of sensor or parameter changes.
Ctrl+Shift+U: (U)pdate - Checks for software updates.

Troubleshooting

Common Error Messages:

> **Cannot find AccuGoldExcelMacro.xls**:
>> The macros did not load because the security settings prevented it. See 'Enable Macros' in the Manuals folder.
>
> **Driver failed to open**
>> Windows did not load the driver, probably because the digitizer is not connected. Check connections, cable, and USB port.
>
> **A relevant zero value is out of range**
> - The zero value that is measured is outside of its specified limits. Check zero offset of Dynalyzer mA and A+C BNC out. Adjust mA offset as described earlier. .
> - Generator noise from making or starting an exposure while the measurement loop is initializing could give this error, wait a few moments for the generator outputs to stabilize before restarting measurement.
>
> **The mAs probe was not connected** or **The connected mAs probe failed to respond**
> - Verify connections between 90M11 and digitizer.
> - Check power source to 90M11.
>
> **Exposures not triggering**
> - Verify connections between AGkV, digitizer, and Dynalyzer.
> - Check Dynalyzer BNC output with oscilloscope.
>
> **No mA readings**
> - Verify connections between 90M11, digitizer, and Dynalyzer.
> - Verify setup of generator and Dynalyzer includes connection between Anode transformer and tube connections.
>
> **Selected cell was not allowed**
> - A cell in any row within the measurement list area under Column D needs to be selected.
>
> **Insufficient kV signal**
>> The width of the waveform is too small. Increase the width of the exposure pulse. Triggering from a brief noise transient can also cause this error.

Definitions

kVp:
The FT algorithm computes kVp using the Fourier Transform of a selected region of the kV waveform. For these selected samples, the major ac components are combined with the biased-average kV to estimate the effects of ripple, leading to a measurement of the "average" peak voltage. This averaging process suppresses the effects of noise, which can result in serious errors for routines that use only small data samples.

Average kV:
The average value of kV in the region of interest above an adaptive kV threshold.

PPV:
The Practical (PPV) mode computes a weighted average of the kV waveform in the region of interest, with weighting toward higher-kV values, employing the algorithm of Kramer, Selbach and Iles.

Time:
The width of the region of interest.

mA:
Average mA is mAs divided by the width of the region of interest.

mAs:
mAs is the sum of mA values during the region of interest.

Region of Interest:
After the exposure, Accu-Gold Excel analyzes a selected portion of the exposure. The region of interest is the area of the pulse determined by the threshold settings. After the pulse is detected, the software post-processes the data and displays the results based on this region of interest.

Additional Notes

Relevant Zero: When measuring the output on high-voltage machines it can take several minutes for the generator to settle. If the measure sequence is initialized without waiting, the system will produce errors as it is attempting to re-zero.

Accu-Dyn+ Template: This template accommodates uninterrupted measuring without a wait period by establishing a zero on the initial start. This value will be used for all other measurements.

Usage: When clicking "Start" or Ctrl + Shift + R to initialize the measure sequence for the first time the first output cell will automatically turn green then immediately stop. Once it has stopped, "Zero" has been established. You can now start the measure sequence again and collect data.

For making low mA measurement (<100 mA) it is recommended that the Accu-Dyn+ template be reset prior to exposure.

Differences between Accu-Dyn and the Digital Display

Differences between the Accu-Dyn and the Digital Display may be observed when used in parallel. The Digital Display measures kVp by finding the maximum voltage (including noise) whereas the Accu-Dyn can ignore noise spikes riding the actual kV waveform. The Digital Display measures mAs and then calculates the mA whereas the Accu-Dyn measures the mA waveform.