

ST350W

Radiation Counter and Wipe Test System

Operating Manual

September 1999

Model ST350W

RADIATION COUNTER and WIPE TESTER

The ST350W Radiation Counter is designed to operate specifically with NaI(Tl) scintillation counters for detecting low level gamma and X-ray emission from a variety of samples. The system is normally supplied with a well detector for measuring wipes and tube samples and is complete with lead shield, base and cable, counter and a Cs-137 calibration source.

When correctly calibrated, the system will detect gamma and X-rays ranging in energy from 20 keV to several MeV. Each system is factory calibrated and will not require further adjustment unless a component is replaced or exchanged. The Cs-137 calibration source is included for routine checking of overall system performance and quality assurance.

The ST350W requires minimal setup and features simple operation eliminating the need for extensive training. The instrument may be run as a stand-alone benchtop unit or connected to a personal computer and operated from the software package supplied. A Mode switch selects preset time or preset count operation and an alarm level may be preprogrammed to give an audible warning if the count-rate exceed the predetermined level. The high voltage supply for the scintillation detector is controlled by the internal microprocessor and set digitally in step of 25 volts.

Specifications.

Input:	MHV connector for scintillation detector.
Detector:	Scintillation crystal, 1.75" diameter x 2" with 0.7" diameter x 1.5" deep well mounted on 2" PMT. Supplied complete with stand, base, lead shield and one wire connection. Resolution <9% at 662 keV.
High voltage:	0 to +1200 volts, digitally selectable in 25 volt increments.
Display:	6-decade LED, 1 in. numerals. Displays counts, preset counts, time, preset time, CPM, CPS, alarm level, and high voltage.
Modes:	Count for preset time, count for preset count, counts/min., counts/sec., set alarm level 0-999999 cps, set high voltage 0-1200v, and remote.
Audio:	Piezo alarm if countrate exceeds preset level.
Data Link:	DB-9 serial connectors for PC and Mac.
Power:	Input 9 volt DC, at 500mA from AC line/charger. Specify 110-120, 220-240 VAC at time of order. Battery option requires installation of 4 x C size NiCd rechargeable batteries (not supplied).
Software supplied:	ST350 Radiation Counter-PC emulation software. DOS program runs on most IBM compatible PC's including CGA, EGA, VGA, SVGA, and Hercules graphics systems. Real-time display of simulated analog ratemeter with auto-ranging, digital ratemeter in CPM or CPS, count, elapsed time, preset count, preset time, high voltage setting, acquisition time, and run number. Data is loaded into spreadsheet compatible files for transfer. Bi-directional LABLINK offers full control of all functions including preset count, preset time, countrate in CPM or CPS, alarm level, high voltage, start, stop, reset, and data transfer. Requires EGA or VGA graphics. All operations may be run directly from the computer with spreadsheet compatibility.

System setup.

CAUTION

Never operate the ST350 Radiation Counter with the detector disconnected. Dangerous voltages can exist at the input connector so ensure the instrument is in the OFF position and the high voltage is set to zero before disconnecting or reconnecting the detector.

The Wipe Test system has been calibrated at the factory prior to delivery to detect gamma and X-rays over an energy range of 20 keV to several MeV. Under normal circumstances, it should not be necessary to recalibrate the system prior to use.

1. Install the scintillation detector into socket in the base of the stand. Note that the base of the detector is keyed and will only locate in one position in the socket.
2. Carefully place the lead shield over the top of the detector allowing it to rest on the vertical metal support tube.
3. Insert the plastic liner into the well. This liner provides protection from mechanical damage and contamination. The aluminum wall inside the well is very thin and can easily be damaged if a tube is inadvertently dropped into the well without the liner in place.
4. Connect the signal coaxial cable from the detector assembly to the input on the rear of the ST350 Counter.
5. Plug-in the power supply to the ST350 and turn on the power switch located on the rear of the instrument. The numerical display should light.
6. Set the DISPLAY FUNCTION switch to HIGH VOLTAGE and using the UP button, increase the high voltage to the value marked on the detector assembly.
7. Move the switch to the TIME position and using the UP button, set the desired counting time in seconds.
8. Set the switch to display COUNTS.

The Wipe Tester is now ready for use.

Operation.

If power is lost to the ST350 it is necessary to reestablish the high voltage and preset time. Set the high voltage to the value marked on the detector assembly and preset time to 60 sec.

Basic operation of the model ST350 Radiation Counter is straightforward and intuitive. Once the high voltage and preset time have been set, move the DISPLAY switch to COUNTS, press the RESET button to clear the counter and press START to accumulate data. When the preset counting time is reached, the unit will stop automatically and the count data may be recorded from the display. Press RESET followed by START for the next sample.

Checking the System Calibration.

The system is supplied with a Cs-137 source which is used to check the counting efficiency and overall system performance. This source has been calibrated and its activity is marked in counts per minute (cpm) at the date of manufacture. Over time, the source decays with a half-life of 30.1 years and it will be necessary to periodically correct the activity.

1. Place the DISPLAY switch in the TIME position and press RESET to clear the register. Using the UP/DOWN buttons, set a counting time of 60 seconds.
2. Place the calibration source into the plastic carrier in the well of the detector.
3. Move the DISPLAY switch to the COUNTS position, press RESET followed by START. The system will now count for 1 minute. The reading should correspond within $\pm 10\%$ of the activity in cpm recorded on the source. For better accuracy, the average of three separate readings may be used.

Taking a Background Reading.

Wipe tests are inherently low-level measurements and it is necessary to perform background subtraction on all samples to generate accurate activity data. Because the background reading is low, it is normally counted for a longer period to improve the statistics.

1. Remove all radioactive material from the vicinity of the detector.
2. Set a preset time of 600 sec. and start the count.
3. When the unit completes the count, record the value and divide the reading by 10 to derive the background counts/min.

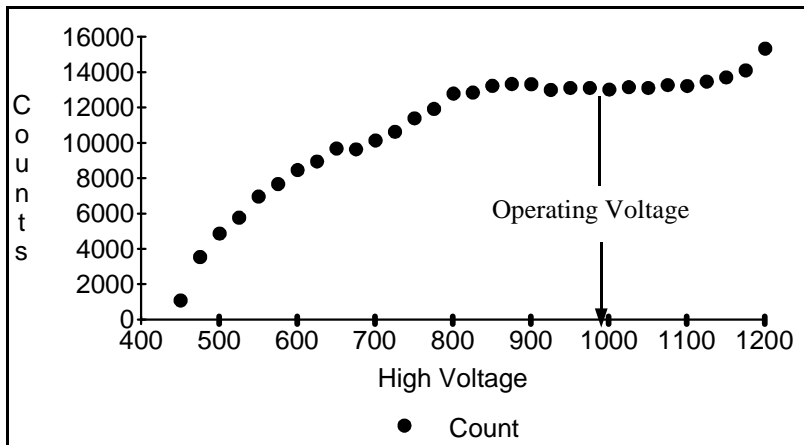
Measuring Wipes.

1. Position the sample into the plastic well liner and place this into the well of the detector.
2. Set the preset time to 60 seconds and press START.
3. When the unit times-out record the count.
4. Subtract the background counts/min. and record the net value. This is the counts/minute for the sample.

System Calibration.

The system has been calibrated at the factory and under normal circumstances recalibration should not be required. However, in the event of a detector or component replacement, it will be necessary to determine the correct operating voltage for the system. This involves recording readings at differing high voltage settings and plotting the operating plateau of the system. This may be accomplished manually or automatically using the computer interface as described later in this manual.

1. Place the Cs-137 calibration source into to the well liner and turn on the power to the ST350.
2. Set the counting time to 10 sec.
3. Select the HIGH VOLTAGE position and begin increasing the voltage observing the ACTIVITY light.
4. When the light just begins to flash, stop increasing the voltage and set the switch to the COUNT position.
5. Press RESET followed by START. After the 10 sec. count is completed record the reading along with the high voltage setting.
6. Repeat the process increasing the voltage in 25 volt increments until the maximum voltage of 1200 volts is reached.
7. Graph the data plotting counts Vs high voltage.
8. Determine the correct operating voltage as shown in the following illustration.



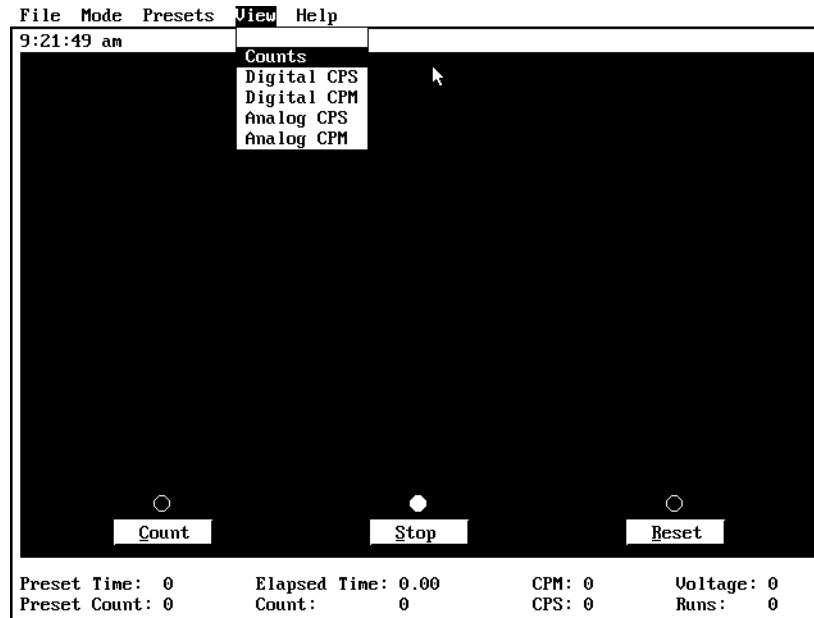
Plot of Detector Plateau using CS-137 source.

Operating with a computer.

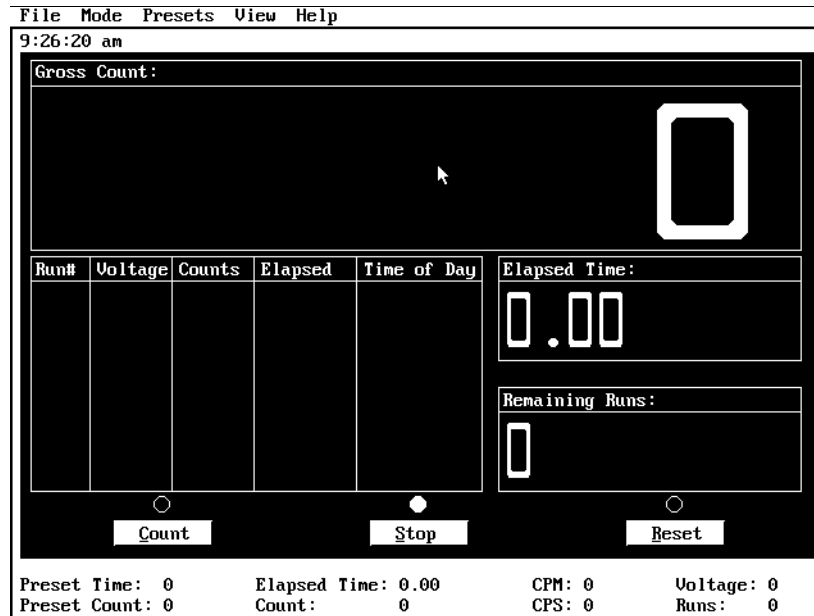
The ST350 includes serial interfaces for both the PC and Macintosh computers. Each platform requires a different interface cable and software. Alternate cables and software may be obtained by contacting the manufacturer Spectrum Techniques, Tel. (423) 482-9937. Latest software is available on our web site at www.spectrumtechniques.com. Operation is essentially the same with both platforms. The following examples are based on the PC version.

1. Create a directory on the computer hard drive with a name of your choice.
2. Copy the contents of the distribution diskette supplied with the system to this directory.
3. Connect the serial cable and turn on the power to the ST350.
4. Place the switch in the REMOTE position.
5. Run the LABLINK.EXE program from the directory on the hard drive.
6. Select the appropriate COM port from the startup screen.

The system should serial link and display the master screen. If you experience difficulty linking with the PC, refer to appendix A.



Select View Counts to display the counter screen.

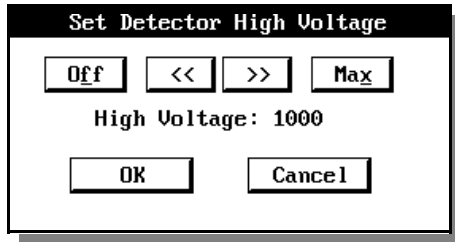


When using the ST350 in the REMOTE position, all functions are controlled via the computer software. Although it is possible to operate the system from the keyboard, the use of a mouse is much more efficient and highly recommended.

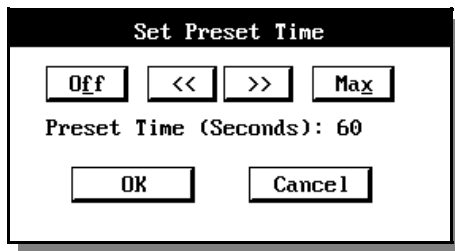
If you are using a DOS based computer, a mouse driver must first be loaded. See appendix B for details. If you are using a WINDOWS based system, create a shortcut on the desktop and run the LABLINK software from this shortcut.

Operation from the software is straightforward using the dropdown menus.

1. Select **Presets High Voltage**. Set the voltage to the operating value marked on the detector assembly.
2. Select **Presets Preset Time**. Set the required counting time (60 sec.).

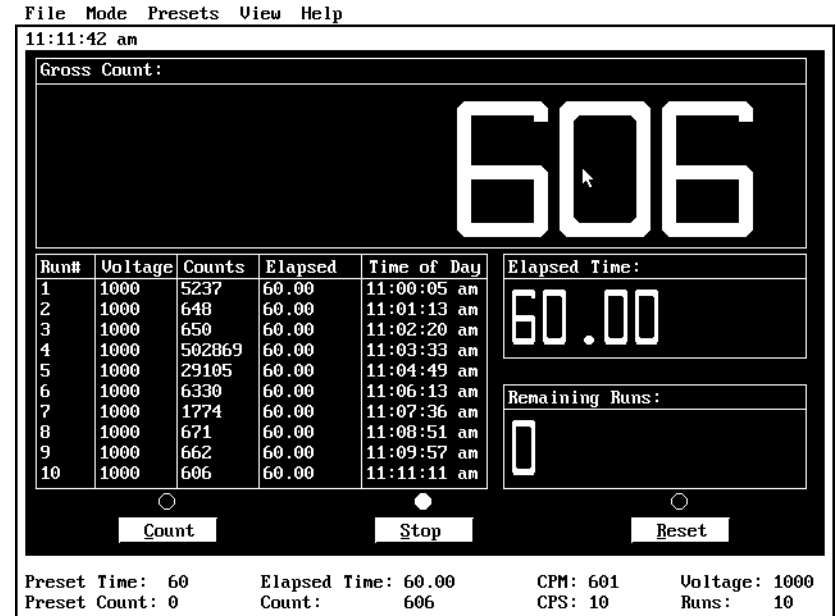


3. To start a count, click on RESET, COUNT. The ST350 will count for 60



seconds and display the value. At the completion of the count, data is stored in memory and displayed in the data table as shown in the following illustration.

- 4.



After all of the samples in a batch have been counted, the data table may be saved to disk at a tab separated variable file (.TSV). This format is generic and is compatible with most common spreadsheet programs such as Excel.

1. To save the data, click on **File, Save**. Enter the file name of your choice not to exceed 8 characters. You may choose to give the file an extension for the spreadsheet being used. If no extension is given, the software will default to .TSV. Data files are saved in the working directory of the LABLINK software.
2. Open the data file in the spreadsheet program.



3. To count a new batch of samples, select **File, New**. This will clear the current data table from memory. If the data was not previously saved to disk, you will be prompted to do so.

Run	Voltage	Count	Elapsed	Time Of Day	Date
1	1000	5237	60	11:00:05 AM	Thu Sep 23 1999
2	1000	648	60	11:01:13 AM	Thu Sep 23 1999
3	1000	650	60	11:02:20 AM	Thu Sep 23 1999
4	1000	502869	60	11:03:33 AM	Thu Sep 23 1999
5	1000	29105	60	11:04:49 AM	Thu Sep 23 1999
6	1000	6330	60	11:06:13 AM	Thu Sep 23 1999
7	1000	1774	60	11:07:36 AM	Thu Sep 23 1999
8	1000	671	60	11:08:51 AM	Thu Sep 23 1999
9	1000	662	60	11:09:57 AM	Thu Sep 23 1999
10	1000	606	60	11:11:11 AM	Thu Sep 23 1999

Transferring data into a spreadsheet is a powerful tool. You can use the spreadsheet to perform many functions such as background subtraction and establishing action limits. Following is a simple example of a custom sheet for wipes.

Run	Date	Count	B/G cpm	NET cpm	Action
1	Thu Sep 23 1999	5237	650	4587	fail
2	Thu Sep 23 1999	648	650	-2	pass
3	Thu Sep 23 1999	650	650	0	pass
4	Thu Sep 23 1999	502869	650	502219	fail
5	Thu Sep 23 1999	29105	650	28455	fail
6	Thu Sep 23 1999	6330	650	5680	fail
7	Thu Sep 23 1999	1774	650	1124	pass
8	Thu Sep 23 1999	671	650	21	pass
9	Thu Sep 23 1999	662	650	12	pass
10	Thu Sep 23 1999	606	650	-44	pass

Appendix A.

ST150 and ST350 Communication Setup for PC Computers.

If you experience problems with serial linking either the ST150 Nuclear Lab Station or the ST350 Radiation Counter when running Windows 95/98, here are a few suggestions that may offer a solution.

1. To operate properly, the computer COM ports must be set to the correct addresses. Boot the computer and enter the BIOS SETUP mode. Select INTERGATED PERIPHERALS and set the ports as follows:
COM1=3F8, IRQ=4
COM2=2F8, IRQ=3
Do not select the AUTO mode.
2. Reboot the computer and check the port configuration. Select My Computer-Control Panel-System-Device Manager-Ports-Properties. Make sure the COM ports are present and showing the above configuration. This is also a good time to check the master interrupt assignment list for conflicts from Device Manager-Computer.
3. If all appears correct, close all open windows, switch on the power to the ST150/ST350 and run the software. If the software asks for a COM port and the system contains a serial mouse on COM1, select COM2. If a PS-2 style mouse is installed and the ST150/ST350 is connected to COM1, select COM1. The serial communication should now link correctly.
4. If the serial link still does not function, try again this time selecting the other COM port. It will be necessary to re-power the computer and ST150/ST350 before trying this other port.
5. If the serial link continues to fail and a serial mouse is installed, try switching the mouse to COM2 and the counter to COM1. If this change is made it will be necessary to re-power both the computer and counter.
6. If you are using a 9 to 26-pin adapter on the serial port, check to see that all 9-pins are connected. We have found that some of these adapters such as the ones supplied with a serial mouse do not have all the pins connected. The adapter available from Radio Shack works correctly. Another solution is to put the mouse on the adapter and connect it to the COM port with the 26-pin connector and the counter to the 9-pin port.
7. If all fails, give us a call at (423) 482-9937 9-5, Eastern time.

Appendix B.

Installing a Mouse on DOS Computers.

If you are using a PC running Windows 95/98/NT or a Macintosh, do not install the mouse driver. These computers already have a mouse installed as part of their operating systems.

Although the ST350W system can be run from the keyboard, using a mouse is much more efficient and highly recommended. The ST350 software disc includes a subdirectory named Mouse containing drivers and installation for a serial or P/S-2 mouse.

Connect the mouse to the computer, turn on the power and run the INSTALL.EXE program from **a:\mouse\install**. Follow the on-screen instruction. The MOUSE subdirectory also includes a README.DOC file containing detailed information on the drivers and setup.

If all fails to correct the problem
Contact Spectrum Techniques at (423) 482-9937, spectech@esper.com

Manufactured by

Spectrum Techniques, Inc.

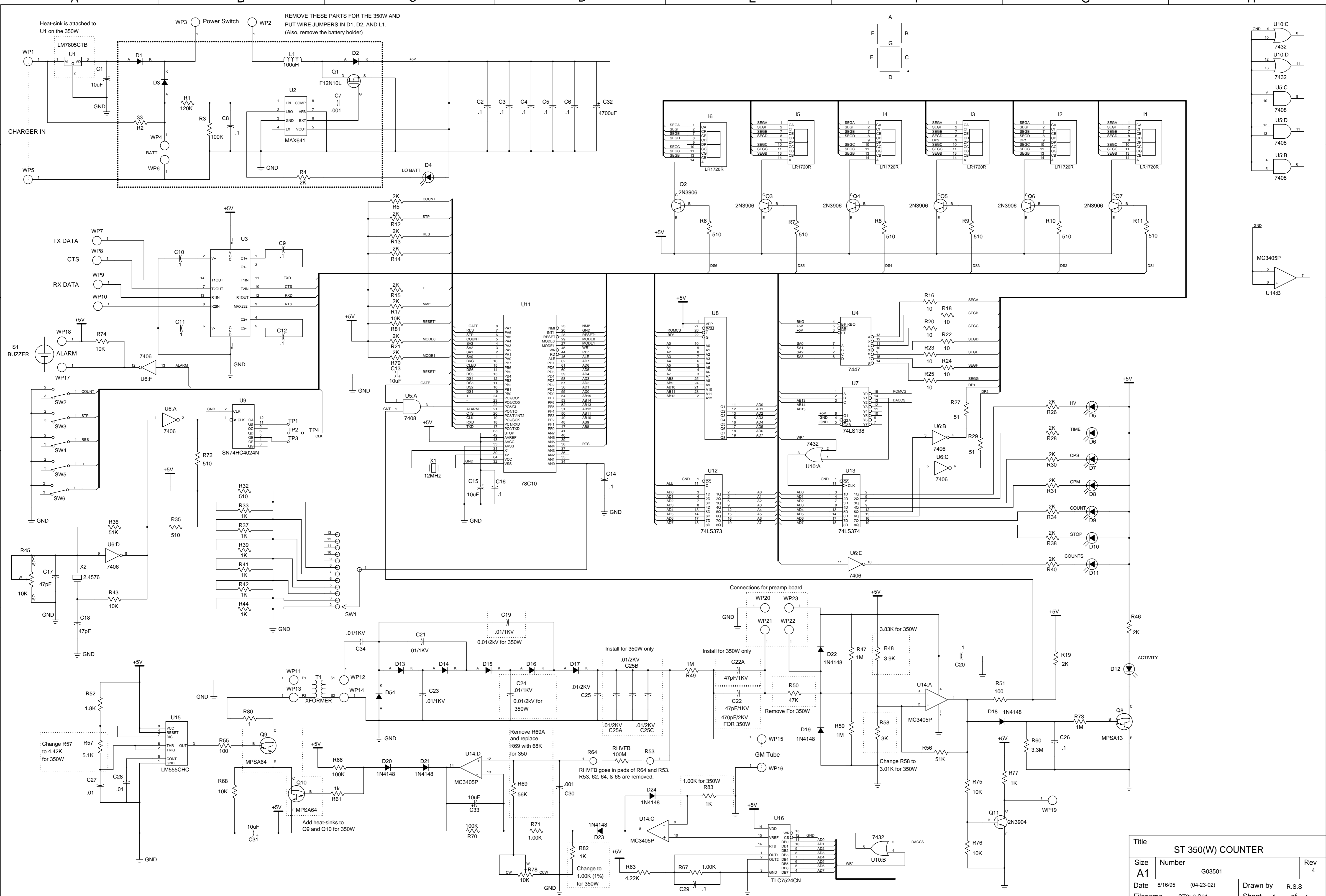
106 Union Valley road
Oak Ridge, TN 37830

Tel: (865) 482-9937

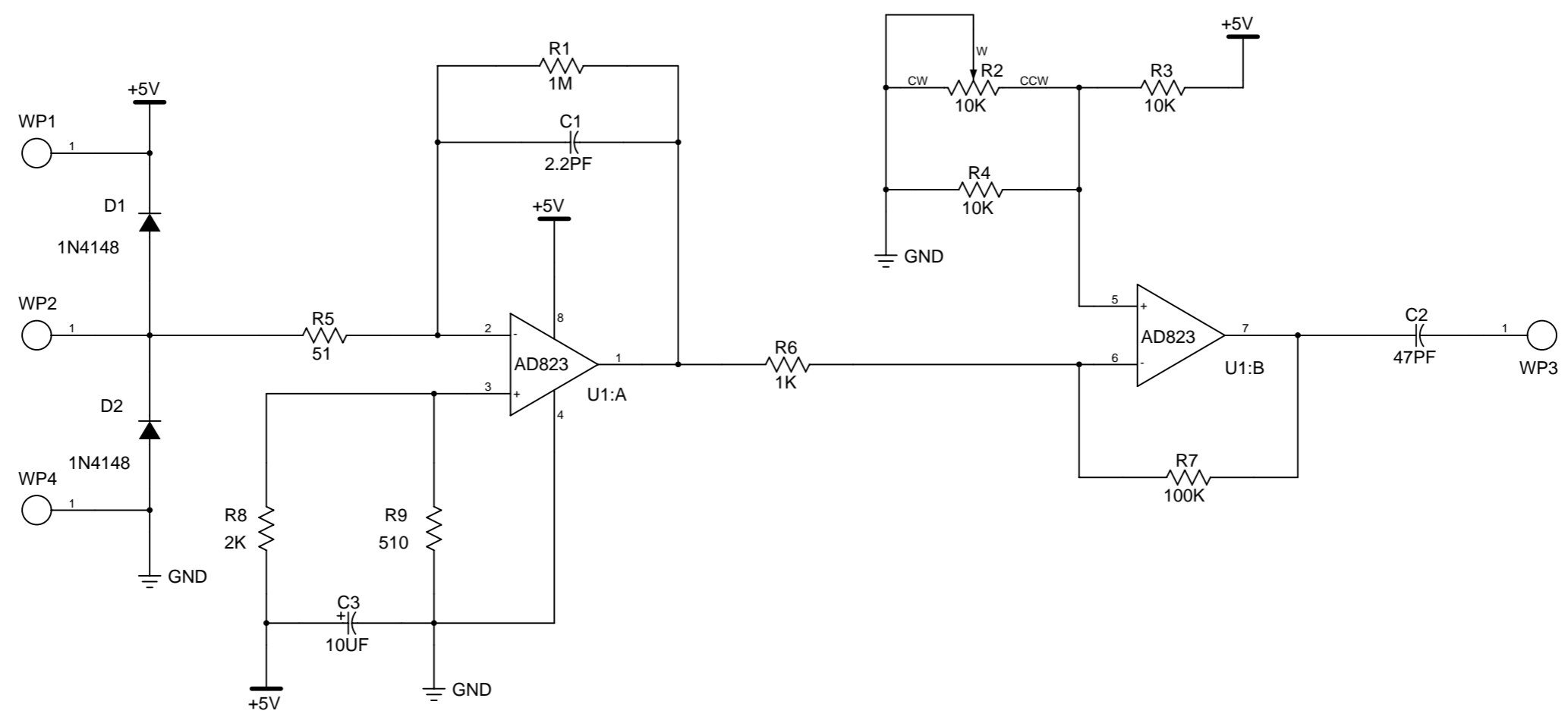
Fax: (865) 483-0473

E-mail: support@spectrumtechniques.com

Web: www.spectrumtechniques.com



Title			ST 350(W) COUNTER		
Size	Number	Rev			
A1	G03501	4			
Date	8/16/95 (04-23-02)	Drawn by		R.S.S	
Filename	ST350.S01	Sheet		1 of 1	



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