

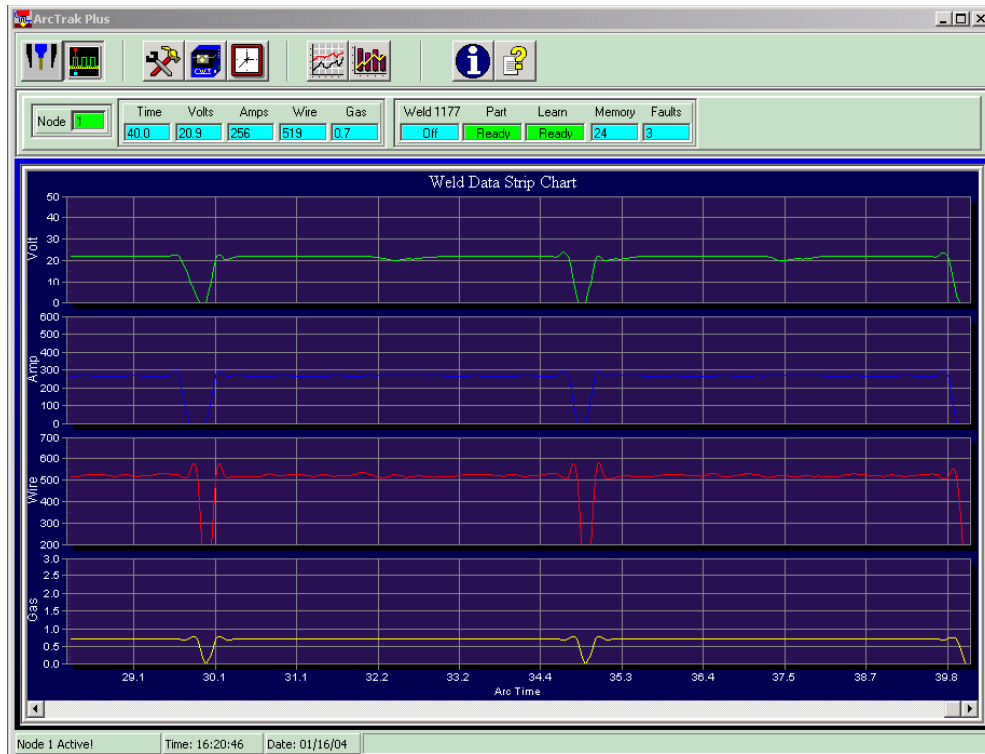
# Arc Trak Plus™

## Micro Arc Data Monitor Statistical Analysis Program

### Operation / Installation Manual

Manual Part Number: A8M5023

Revised: 5/20/2004





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## 1.0 SYSTEM OVERVIEW

### 1.1 General Overview

The *ArcTrak Plus™* program provides a GUI for the Computer Weld Technology Inc. Micro ADM sensor using the ModBus RTU protocol. The Program allows the user to collect; graph and display weld data in a real time mode. The program provides a simple interface to configure the Micro ADM™ sensor parameter. The Micro ADM™ sensor is designed to provide the end user with a simple and cost effective, in-process weld monitoring system.

The sensor provides fault testing of the basic welding parameters (i.e. Volts, Amps, Wire Speed, Gas Pressure and Arc Time). It incorporates an advanced testing algorithm that provides three levels of fault testing. The sensor provides in-process parameter limit testing, Arc Density (AAD) for each weld in a Part and an ADD, Weld Count and Volume Applied test for each Part.

The sensor also features a Part Learn Mode that allows the sensor to establish statistical control limits based on actual production parts. The *ArcTrak Plus™* program allows the user to upload run time weld data and stored SPC weld summary data.

It also allows the user to graphically analyze the stored data and to view the internal sensor parameters and configure the basic sensor parameters.

### 1.2 System Requirements

Processor: 150mhz Pentium™ or higher microprocessor  
Memory: 24 Megs minimum for Windows 95/98/ME®, 32 Megs for Windows NT/2000®  
Hard Drive: 25 Megs of available hard drive space  
Graphics: Minimum SVGA graphics. XVGA recommended  
Serial Port: RS-232 serial port

## 2.0 PROGRAM WINDOWS

### 2.1 Main Window

When the program is invoked the Main window will be displayed. The Tool Bar is used to access the various program functions. The Data Panel below the Tool Bar contains the Communications Frame, Weld Data Frame and the Sensor Status Frame. A Status bar located at the bottom of the screen indicates the status of the ModBus communication Driver and provides program help hints and stored weld file information. When enabled the Main window will display a weld data sweep chart.

### 2.2 Node Frame



The node frame allows the user to select a sensor by setting the Sensor Node ID. To connect a networked sensor to the ArcTrak Plus™ program the user sets a Node ID. To set the ID number (1- 247), click on the Node Frame window and type the new node number. As the number is entered the program will attempt to communicate with the Node ID specified. If successful the window Node ID edit window background will be green. If a communication error occurs the edit window background will be yellow and error prompt message will appear in the Comm Status Bar at the bottom of the window.

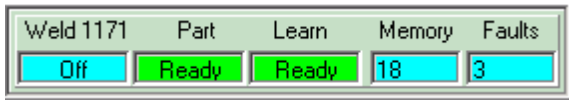
**Note:** You do not need to press the enter key when changing node ID numbers.

### 2.3 Weld Data Frame

Time	Volts	Amps	Wire	Gas
5.2	20.9	256	520	0.7

The Weld data frame displays the sensor weld data. When the sensor detects an arc on condition the data will be the actual run time values. The data is updated at approximate 10hz rate during the arc condition. At the end of the weld the Summary data will be displayed. This will remain until the next arc on condition or if stored data is read from the sensor. If the Part Input is active and the Part has been learned then the fault status for each parameter will be indicated by the value window background color. If the parameter is with in limits the background color will be Aqua. If the parameter is faulted the color will be set to Red. The Faulted parameters status will be displayed until the next arc on is detected. When the weld is off the values displayed are the statistical average for the last weld.

## 2.4 Sensor Status Frame



The status panel displays the current status for various sensor inputs and counters.

The "Weld ###" legend indicates the last weld number. This value is incremented at the end of the weld event. The Weld status window will display the status of the weld "Active" or "Off". If the part input is active additional weld fault status of "Passed" "AAD" or "VOL" will be displayed. If the weld passed the AAD and Volume Test then the "Passed" message is displayed with a green background. If a fault was detected then the "AAD" (Weld Accumulated Arc Density) or "VOL" (Weld Volume) error will be displayed with a red background.

The "Part" window indicates the status of the part input and will display one of the following status message:

"Ready" - Indicates that the Part Input is not set and the background color is green.

"Active" - Indicates that the Part Input is set and the back ground color is yellow.

"AAD" - Indicates that a Part AAD Fault has occurred. This status is set when the Part Input is cleared. This error will have a red background color indicating a part fault condition.

"Vol" - Indicates that a Part Total Volume Fault has occurred. This status is set when the Part Input is cleared. This error will have a red background color indicating a part fault condition.

"Time" - Indicates that a Part Total Arc Time Fault has occurred. This status is set when the Part Input is cleared. This error will have a red background color indicating a part fault condition.

The "Learn" window shows the status of the Learn sensor input. The Status message will be one of the following:

"Ready" - Indicates that the Learn input is not set but the part limits have been set and the background color is green.

"Active" - Indicates that the Learn Input is set and the background color is yellow. This indicates that the sensor is learning the process limits.

"Not Set" - Indicates that the sensor has not set the control limits and the learn sequence must be performed before limit testing is enabled.

The "Memory" window shows the number of weld summaries currently stored in the sensor memory. The maximum number of weld summaries is 1023. The "Fault" window shows the total number of Part Faults that has occurred since last Fault count reset.

## 2.5 Driver Configuration

The program uses a CimQwest Modicon serial communication driver to provide the RTU ModBus protocol for communications to the Micro ADM™ sensor. Before operating the ArcTrak Plus™ program the user must configure Adaptor 1 to provide the necessary communications to the Micro ADM™. The "MSERVCFG.exe" file in the ArcTrak Plus™ directory allows the user to configure the Adaptor. (Note: By default the ArcTrak Plus™ program only uses Adaptor 1.) To configure the communication adapter perform the following steps:

The install program will invoke "MSERVCFG.exe" program. The program can also be invoked by clicking the "Config Driver" shortcut on the ArcTrak Plus™ program menu. The following conditions should be set for the communications driver:

*Step 1 Set Link Seed = "19.2k"*

*Step 2 Set Protocol = "Modbus RTU"*

*Step 3 Set Parity = "None"*

*Step 4 Set DataBits = "8"*

*Step 5 Set StopBits = "2"*

*Step 6 Set Slave ID = "None"*

*Step 7 Set Adapter = "1"*

*Step 8 Set Device Type = "Serial"*

*Step 9 Set Comm Port = "User Specified Comm Port"*

*Step 10 Check the "Enable" box to activate the adaptor.*

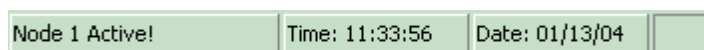
*Step 11 Click the "Apply" button to configure the sensor.*

*Step 12 Click the "Close" button to end the program.*

*Step 13 Follow the on screen prompts and click "Save" then "Ok" to end the routine.*

This completes the ModBus serial port driver installation. When invoking the ArcTrak Plus™ program the CimQest Adapter 1 will be used for all communication to the sensor. To modify the Driver parameters click the "Config Driver" shortcut on the "ArcTrak" program menu.

## 2.6 Status Bar



The Status Bar located at the bottom of the window has four panels. The first panel shows the current status of the ModBus drive. The messages displayed will indicate

serial communication problems associated with the user defined active node. The Second panel displays the end time of the last weld. This Time is updated at the arc off condition and is read from the sensor. The Third panel displays the Date of the weld. This Date is updated at the arc off condition and is read from the sensor. The Fourth panel is the program message panel and will display program hints and various program status messages.

## 2.7 Tool Bar



### **Arc On**

Indicates when the Sensor has detected an arc on condition. When an Arc On is detected the Button ICON will change to show an arc from the Torch to the Part.

### **Sweep**

The Sweep button enables the sweep chart and weld data storage routines. When pressed the Program will display a four-parameter sweep chart. When an Arc on condition is detected the actual real time parameter values will be displayed.

### **Tools**

This button enables the Sensor Setup window. This window is used to configure the active sensor data. A valid Node must be connected for this button to be enabled.

### **Read**

This button reads the stored sensor weld summary data and saves the data in a monthly SPC data file. A valid Node must be connected for this button to be enabled.

### **Clock**

This button will set the internal sensor Real Time Clock to the current PC Date/Time clock. A valid Node must be connected for this button to be enabled.

### **Graph**

This button will invokes the Graph Weld Data window. When pressed the program will open a file dialog box and the user can select the Weld Data file or multiple files to be graphed. After selecting the file(s) the data will be displayed on a four-parameter graph.

## SPC

This button will invoke the SPC Weld Data window. When pressed the program will open a file dialog box and the user can select the SPC Data to be plotted. The selected data file is processed and the stored data is processed as a 5 sample set. The XBAR and RBAR values are calculated and displayed.

## Info

This button invokes the Program Information Dialog box

## Help

This button invokes the windows based help program and displays this help file.

### 2.8 Arc On



Indicates when the Sensor has detected an arc on condition. When an Arc On is detected the Button ICON will change to show an arc from the Torch to the Part. When the Auto Arc Detect is disabled in the sensor Setup toolbox the button acts as a forced arc on condition. When the button is pressed the sensor will log data. When released the sensor will stop logging data.

### 2.9 Sweep Chart Speed Button



The Sweep button enables the sweep chart and weld data storage routines. When pressed the Program will display a four-parameter sweep chart. When an Arc on condition is detected the actual real time parameter values will be displayed. New data is appended to the Left side of the chart. Previous weld data will be shifted to the right. The scroll bar at the bottom of chart can be used to view previous data. The X axis shows the actual arc time for the data samples and is read from the sensor. Up to 2000 samples can be stored on the chart. When the maximum data samples are reached the right most data is shifted off the chart.

## 2.10 Tools Button



This button enables the Sensor Setup window. This window is used to configure the sensor data, Set process Parameter Sigma values and to view the sensor calculated mean values used for process control. A valid Node must be connected for this button to be enabled.

## 2.11 Read Speed Button



This button reads the stored sensor weld summary data and saves the data in a monthly SPC data file. A valid Node must be connected for this button to be enabled.

## 2.12 Clock Speed Button



This button will set the internal sensor Real Time Clock to the current PC Date/Time clock. A valid Node must be connected for this button to be enabled.

## 2.13 Graph Weld Button



This button invokes the Graph Weld Data window. When pressed the program will open a file dialog box and the user can select the Weld Data file or multiple files to be graphed. After selecting the file(s) the data will display on a four-parameter graph. If the *Auto Scale Graph* option is checked in the *Sensor Setup* window then the graph will be scaled using the actual weld data. If this option is not checked then the data will be graphed using the values set for the Sweep chart parameters.

## 2.14 Plot SPC Button



This button will invoke the SPC Weld Data window. When pressed the program will open a file dialog box and the user can select the SPC Data to be plotted. The selected data file is processed and the stored data is processed as a 5 sample set. The XBAR and RBAR values are calculated and displayed. If a previous set of SPC control limits has been set then the UCL, LCL, Rbar and Xbar control limits will be displayed. If no limits have been set then the SPC program will generate the limits based on the collected data. Parameter buttons on the SPC Weld Data window can be used to select different weld parameters.

## 2.15 Info Button



This button invokes the Program information Dialog box, which displays the Firmware version and copyright statement. Press the Ok button to close the dialog.

## 2.16 Help Button



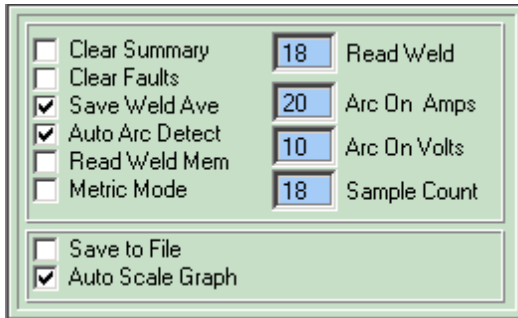
This button invokes the windows based help program and displays this help file.

## 2.17 Sensor Setup Window

The Sensor Setup window allows the user to configure the selected sensor data and to display the internal various sensor parameters. To invoke the Sensor Setup Window click the *Tools* speed button. To exit the window click the *Tools* button or close the window using the window exit button. To view the sensor configuration parameters click the *Setup* button. To view the active sensor Sigma Parameters click the *Limits* button. If the sensor has completed the Learn function then the sensor calculated mean values can be displayed by clicking the *Mean* button.

*Note: The Mean menu button is only active if the sensor has performed a Part Learn function.*

## 2.18 Sensor Setup Dialog Window



The sensor setup consists of a group of check boxes and sensor parameters. The following is summary of the check box items:

**Clear Summary** Check this item to clear the weld summary SPC data stored in the sensor. This should be done after using the Read function to download the data into a SPC data file. The check will be cleared after the sensor has completed the request function.

**Clear Faults** Check this item to clear the Part Fault Counter. The check will be cleared after the sensor has completed the request function.

**Save Weld Ave** Check this box to enable the save weld average function in the sensor. To collect SPC data this option must be enabled.

**Auto Arc Detect** Check this option to enable the auto arc detect function in the selected sensor. If this function is disabled then the Arc On button can be used to force the sensor into a log mode. This mode is used to verify proper sensor operation.

**Read Weld Mem** Check this box to read a stored weld data record from sensor memory. Set the Read Weld variable to the desired record then check this box. When the stored data has been read the box will be unchecked and the data will be displayed in the Weld Data Frame and the Date Time stamp will be displayed on the status bar.

**Metric Mode** Check this box to enable the metric sensor mode. When checked the wire speed is converted to MM/SEC and the Gas pressure is converted to KPA.

**Save to File** Check this box to save the active sensor run time weld data to a sequential data file. This data can then be displayed using the Graph Weld option.

**Auto Scale Graph** Check this box to automatically scale the weld data graphs using the stored weld data. When unchecked the Graph Weld option will use the sweep chart scaling for each parameter.

To change a sensor parameter value place the cursor in the desired window then type the new value. The value is automatically sent to the selected sensor. The following is a summary of the sensor configuration parameters:

**Read Weld** This value is the sensor weld record number to read from the sensor when the Read Weld memory check box is enabled.

**Arc On Amps** This value is the weld current threshold that must be reached to set an Arc On condition.

**Arc On Volts** This is the weld voltage that must be reached to set an Arc On condition.

**Sample Count** This is the number of raw samples that are summed to produce a single tested parameter value.

## 2.19 Limits Frame

The screenshot shows a software interface titled "Parameter Sigma Values". It contains several input fields for configuring sensor parameters. The fields are arranged in two rows. The first row contains five fields: "% Time" (value 21), "Volt" (value 51), "Amp" (value 51), "Gas" (value 51), and "Wire" (value 51). The second row contains three fields: "Weld Sigma Value" (with sub-fields "AAD" and "Volume", both with value 38) and "Start Test Delay Time" (value 5).

The Limits Frame is used to view and edit the selected sensor Sigma values that are used to generate the limits used for In-Process parameter testing and post weld evaluation. The Parameter Sigma values are expressed in internal sensor units and are converted to real fractional values based on the following formula:

$$\text{Sigma} = (\text{Value} / 24) = 51 / 24 = 2.125 \text{ sigma}$$

To change a value place the cursor on the value window to edit and type a new value. The value range is a single byte and has a range of 0-255

**(Warning: Enter only integer values in the range of 0-255).**

The % Time value is used to establish the control limits used for the arc on time. This value is expressed in internal units and is converted to real fractional values based on the following formula:

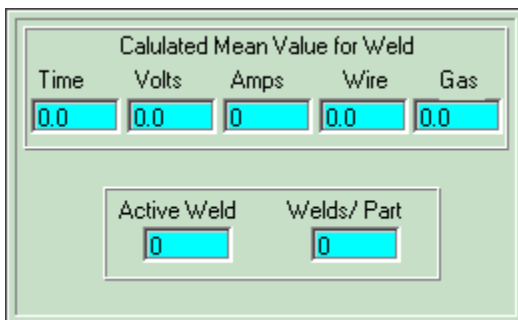
$$\% \text{ Time} = \text{Value} / 2.55 = 21 / 2.55 = 8.2\%$$

The Start Test Delay Time is the arc time in 0.1 second increments that is used to Enable/Disable In-Process Parameter Testing. The arc time must exceed this value to enable testing and when the arc time reaches the Mean Arc time minus this value the Parameter testing is disabled. The following formula is used to set the Test time window

Start Testing Time = Arc Time > Value/10

End Test Time = Arc Time > Mean Time - Value/10

## 2.20 Mean Frame



The Mean Frame allows the user to view the sensor mean values that were calculated during the learn mode. A set of mean weld values is calculated for each weld of a part. During part testing the mean values associated with each weld are displayed. The Active weld number indicates which weld mean values are being displayed. The Welds/Part indicate the total number of welds per part. These values are for display only and cannot be changed.

**Note:** If the learn function has not been performed the Mean Button will not be enabled.

## 2.21 Graph Window

To display Weld Data files click the Graph Toolbar button. When pressed the program will open a file dialog box and the user can select the Weld Data file or multiple files to be graphed. After selecting the file(s) the data will be displayed on a four-parameter graph. If the *Auto Scale Graph* option is checked in the *Sensor Setup* window then the graph will be scaled using the actual weld data. If this option is not checked then the data will be graphed using the values set for the Sweep chart parameters.

To change the file, place the mouse cursor over the Weld File: title. The icon will

change to a Hand symbol then click the left mouse button. The File Dialog box will open. To select multiple files use the mouse to highlight the desired files then click the open button. All of the selected data files will be overlaid on the single graph screen. To print a graph press the "*Shift*" and "*P*" key to invoke the Print Graph dialog. To change the basic Graph parameters place the mouse cursor any where in the graph area and click the right mouse button.

## 2.22 Plot SPC Data

To display Weld Data files click the Plot SPC Toolbar button. When pressed the program will open a file dialog box and the user can select the SPC Data to be plotted. The selected data file is processed and the stored data is processed as a 5 sample set. The XBAR and RBAR values are calculated and displayed. If a previous set of SPC control limits has been set then the UCL, LCL, Rbar and Xbar control limits will be displayed. If no limits have been set then the SPC program will generate the limits based on the collected data. Parameter buttons on the SPC Weld Data window can be used to select different weld parameters. Press a new parameter button and the SPC Open File Dialog will open. Select a file and press the *Open* button. The new parameter data will be displayed.

To change the Mean value limit place the mouse cursor over the "Mean" chart title and click the left mouse button. The Edit SPC Mean value dialog will open. Enter the new value and press the *Ok* button. To change the UCL/LCL values place the mouse cursor over the "XBAR" chart title and click the left mouse button. The Edit SPC UCL value dialog will open. Enter the new UCL value and press the *Ok* button. The Edit SPC LCL value dialog will open. Enter the new value and press the *Ok* button. To change the RBAR limit place the mouse cursor over the "RBar" chart title and click the left mouse button. The Edit SPC RBar value dialog will open. Enter the new value and press the *Ok* button.

To print a SPC Chart press the "*Shift*" and "*P*" key to invoke the Print Graph dialog. To change the basic SPC Chart parameters place the mouse cursor anywhere in the graph area and click the right mouse button.

## 2.23 Read Stored SPC Data

If enabled the each sensor can store weld summary data in its internal memory. This data is time stamped and can be used to generate SPC control charts. To read the stored data click the Read Toolbar Button while the sensor is idle. The program will begin reading the stored data and will build a monthly SPC data file.

The file generated will be in the Subdirectory named:

*C:\Program Files\ArcTrak\Data\Node\_###\SPC\*

Where ### is the number of the active node. The File name will be in the format of MONYR.SPC where MON is the current month and YR is the current year. If the file exists then the new data will be appended to the file. If not a new file will generate.

**Note:** After reading the stored data file clear the weld summary count by clicking the Clear Summary Check box in the Sensor Set Window. This prevents duplicate reads of stored data.

## 2.24 Speed Chart Scaling

The Sweep chart graphs use manual scaling to set the Max and Min Graph limits for each parameter. To change the scaling, place the mouse cursor over the desired chart title and click the left mouse button. The "Input Max Scale value" dialog will open. Enter the new scale value and press the Ok button. The "Input Min Scale value" dialog will open. Enter the new value and press the Ok button.

**Note:** Sensor Data that is above or below the chart scaling will not be displayed.

To print a Sweep Chart press the "Shift" and "P" key to invoke the Print Graph dialog. To change the basic Sweep Chart parameters place the mouse cursor anywhere in the graph area and click the right mouse button.

## 2.25 Weld Data Files

The ArcTrak Plus™ program will automatically generate weld data file names. The file name will have the following format:

*ddmmmyr-###.dat*

Where: *dd* is the current day;  
*mmm* is the current month;  
*yr* is the current year  
*###* is a sequential file number

*Example File Name: 07DEC03-001.dat - Weld file number created on December 07 2003*

The program will save the weld data files in program subdirectories created for each Node ID selected. Two different directory structures are used and are selected by the status of the sensor Part input. The format of the subdirectories are as follows:

Part Input not Active

*C:\Program Files\ArcTrak\Data\Node\_###\Wleds\*

or if Part Input Active

*C:\Program Files\ArcTrak\Data\Node\_###\Part\Weld\_nn\*

Where: ### is the active Node ID number and *nn* is the active weld number for the active Part.

Using this structure the program will group like welds on parts into their own directory. This allows easy graphical analysis of like welds on parts. If the Part Input is not active then all weld data files will be stored in the Weld subdirectory and will be sequential number.