



WeldComputer

PRESENTING THE NEW WELDCOMPUTER® ADAPTIVE CONTROL



The WeldComputer® Adaptive Control can provide all monitoring and control requirements for all single, three-phase, and inverter resistance welding applications. Using a modular approach, the system covers the complete range of functions from basic heat control and interaction with standard weld machine peripherals through completely adaptive operation for the most critical resistance welding applications. The system is PC-based and is capable of local, remote or networked operation. The WeldComputer can control up to eight welding heads.

WeldComputer® Adaptive Control technology is protected by the following U.S. Patents:
4,714,913 4,742,473 4,803,331. Other Patents Pending.

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WeldComputer Corporation, 105 Jordan Road, Troy, NY 12180 - (800) 553-9353

THE BASIC WELDCOMPUTER[®] ADAPTIVE CONTROL

The basic WeldComputer[®] Adaptive Control system includes:

- A PC-compatible mainframe computer system with a hard drive, removable digital media drive, a color LCD display, and a splash resistant keyboard.
- A patented precision heat control/ line compensation system that can accommodate voltage fluctuations of up to +/- 50%.
- Twelve Input and twelve Output modules for interface with PLCs, standard weld peripherals and special devices.
- A safety relay panel that protects the operator from a system malfunction by physically disabling weld valve and forge valve voltage when no weld initiation signal is present.
- A NEMA 12 enclosure that environmentally isolates the control electronics from the factory.
- A patented active line filter to protect the electronics from spurious power line transients.
- Upgradeability to partial or complete adaptive control by addition of optional features.

The basic unit is fully programmable with on-line storage for two hundred weld schedules and optional expansion capacity to thousands of schedules. It will emulate any other controller on the market, but provides much greater flexibility and storage capacity. The ample I/O module set (available in AC and DC voltages) allows the unit to interact with PLCs, all standard welding devices (such as force valve actuators) and special devices (such as robotic fixtures).

Precision Heat Control/ Line Input Compensation System.

The patented heat control system improves weld consistency due to its superior transient response, accuracy and wide compensation range.

Desired percent heat settings are transmitted to the heat control system via the high-speed computer bus. Heat settings are updated twice per cycle for single phase machines, three times per cycle for three phase DC half-wave or frequency converter machines, and six times per cycle for three phase DC full-wave welding machines.

SCR trigger times are controlled with 0.5-microsecond resolution and are referenced from a digital phase locked loop that continually maintains precise phase coherence with the line input frequency. A proprietary SCR trigger time generator maximizes the time available for determining SCR trigger times. It also provides improved linearity over prior art controls by compensating for the commutation phenomenon characteristic of the SCR switching process at the weld machine input.

Specialized patented signal processing circuitry working in conjunction with a dedicated microprocessor monitors the heat control performance by simulating the SCR switching process that occurs at the weld machine input and synthesizing a precise replica of the actual percent heat delivered to the welding machine for each SCR pulse. Percent heat information is converted to computer readable format for use by the heat control microprocessor.

Real-time software computes the percent heat error delivered to the weld machine and dynamically adjusts the SCR trigger times to minimize the error. Because the true percent heat error delivered to the weld machine is accurately monitored for any line condition and at any percent heat setting, the system can provide effective heat compensation -- even under severe brownout conditions -- resulting in superior weld consistency.

WELDER TRANSFORMER INTERFACE COMPONENTS

The WeldComputer® Adaptive Control is designed for easy interface to any type of resistance welding machine. The following interface kits are available to facilitate installation.

Single phase/ no existing SCR contactor. For use with a single-phase welder without an existing contactor, this kit includes an SCR contactor, a single phase reference transformer and a single phase firing system.

Three phase/ no existing SCR contactor. For use with a three-phase welder without an existing contactor, this kit includes an SCR contactor, a three-phase reference transformer and a three phase firing system.

Single phase/ existing SCR contactor. For single-phase welders with an existing SCR contactor, only the Single Phase Reference Transformer and the Single Phase Firing Board are required.

Three-phase/ existing SCR contactor. For three phase welders with an existing SCR contactor, only the Three-Phase Reference Transformer and the Three Phase Firing Board are required.

Disconnects, contactors, etc. are also available for the SCR Contactor and Firing Kits.

Any Ignitron contactors - refer to the factory.

In addition to standard equipment interfaces, WeldComputer Corporation Engineering can provide solutions for most special requirements. Refer to the factory for expert assistance.

WELDCOMPUTER® ADAPTIVE CONTROL SYSTEM UPGRADES

For critical resistance welding operations where weld quality is of major importance, the WeldComputer® Adaptive Control is fully upgradeable to achieve the user's desired level of performance. The following standard system upgrades are currently available.

WeldGraphics™ Graphical Quality Monitoring System. Used in conjunction with the optional weld parameter monitoring and feedback upgrades, WeldGraphics is a weld quality monitoring system that provides an instant graphical display of the weld process information in an easy-to-interpret format. Conditions such as flattening electrodes, current shunting, poor parts fit-up, surface contamination, expulsion, and other welding problems are easily detected. Installation of the WeldGraphics Graphical Quality Monitoring System is required in order to utilize the Programmable Nugget Expansion Feedback System, the Weld Force/ Forge Force Monitoring and Feedback System, the Current Monitoring and Feedback System, the Conductance Monitoring and Feedback System, and the Energy Monitoring and Feedback System.

The use of WeldGraphics reduces weld schedule development time and facilitates the development of superior weld schedules that are inherently more immune to process variations.

New Teach, Teach, and interactive graphic editing modes facilitate the rapid generation of upper and lower limits of acceptability and provide for automatic monitoring of the quality and consistency of each weld. Upper and lower limits of acceptability are displayed on the screen in a fashion that allows the user to readily interpret if a variable is within predefined limits. Modes are also available within the menu to abort the process when an out-of-limits condition occurs.

Programmable Digital Air System with Feedback. The Programmable Digital Air System with Feedback provides two channels of digitally controlled pressure regulation ranging from 0.1 to 99.9 PSI with 0.1 PSI pressure resolution. Established pressure settings are automatically stored and recalled with each weld schedule to reduce the possibility of error. Each pressure channel employs automatic closed-loop feedback to continuously maintain regulated pressures at the programmed target values.

Programmable Displacement Feedback System. The Programmable Displacement Feedback System monitors the workpiece thickness and thermal expansion (or, for projection welds, set-down response) of each weld as it is being produced. Displacement information can be monitored and displayed for every half-cycle of heat during the weld and is particularly useful in the development of robust weld schedules and in nondestructively determining the quality and consistency of each individual weld. Half-cycle-by-half-cycle upper and lower limits of acceptability are easily established and the control can be programmed with action to be taken when an “out-of-limits” condition occurs.

Weld Force/ Forge Force Monitoring and Feedback System. The Weld Force/ Forge Force Monitoring and Feedback System monitors the applied electrode force in real-time during each half-cycle of the weld and provides the ability to adapt the control response to detected variations. Because the force monitoring system is an integral part of the control, several advantages are realized over a stand-alone force read-out. Among them are:

- Both weld force and forge force can be measured during each weld.
- The operator can be alerted to any variation in electrode force beyond specified limits and a record of the condition can be stored.
- Force information can be recorded for SPC purposes and future proof of weld repeatability.
- Control of the applied electrode force at the time of heat initiation results in superior weld repeatability.

Fractional Forge Delay Control. The Fractional Forge Delay Control provides forge delay control in 0.1 cycle increments from 00.0 to 99.9 cycles. This upgrade is very useful for aluminum welding operations and other applications that utilize forge pressure and require short weld times. The Fractional Forge Delay Control requires 24 VDC Input/ Output Modules and a DC Power Supply available as optional equipment from WeldComputer Corporation.

Current Monitoring and Feedback System. The Current Monitoring and Feedback System provides real-time current monitoring and adaptive control during each weld. The current read-out can be selected to display RMS amps at the primary or the secondary of the welder transformer. Current can be monitored and displayed for every cycle of heat during the weld. Cycle-by-cycle upper and lower limits of acceptability are easily established as is the action to be taken when an “out-of-limits” condition occurs. Because the current monitoring system is an integral part of the control, several advantages are realized over stand-alone current monitoring equipment. Among them are:

- Continuous cycle-by-cycle monitoring is performed regardless of weld duration, even for long continuous seams consisting of tens of thousands of cycles.
- The welding process can be automatically adapted in response to current variations.
- The operator can be alerted to any variation in current beyond specified limits and a hard copy record of the condition can be produced.

- Current information can be recorded for SPC purposes and for future proof of weld repeatability.

Installation of the WeldGraphics Graphical Quality Monitoring System is required for operation of this upgrade.

Conductance Monitoring and Feedback System. The Conductance Monitoring and Feedback System performs real-time measurements of the conductance of the weld machine/workpiece electrical circuit as the weld is being produced. Conductance can be monitored and displayed for every cycle of heat during the weld. Cycle-by-cycle upper and lower limits of acceptability are readily established, as is the action to be taken when an “out-of-limits” condition occurs.

Programmable conductance monitoring and control commands can be placed in the weld schedule wherever desired by the weld engineer providing the ability to adapt to varying workpiece conditions (such as surface contamination and shunt conditions) and to control nugget resistance in real-time in the fashion specified in the weld schedule.

The conductance monitoring system can also be utilized for diagnostic purposes to detect improper weld machine conditions such as wrong tap setting, poor electrode holder contact and cable wear.

Installation of the WeldGraphics Graphical Quality Monitoring System is required for operation of this upgrade.

Power Monitoring and Feedback System. The Energy Monitoring and Feedback System allows the weld power to be monitored in real-time during each cycle of the weld and provides the ability to adapt the control response to changes in the electrical power delivered to the weld machine. Installation of the WeldGraphics Graphical Quality Monitoring System is required for operation of this upgrade.

WELDCOMPUTER[®] ADAPTIVE CONTROL MOTOR CONTROL OPTIONS

WeldComputer Corporation offers programmable motor controls with and without feedback systems for use in seam welding applications.

Programmable Motor Control System. Specifically designed for seam welders, the Programmable Motor Control System is an open-loop system that provides a variable output from 0 to 10 volts to operate a standard motor controller. The voltage output is fully programmable within the weld schedule. This option is recommended for applications where programmable speed control is needed but precise positioning of welds is not required. With this arrangement, speed variations can occur as a function of motor load. For applications where accurate velocities and/or precise positioning of welds is/are required, the Programmable Motor Feedback System should be utilized.

Programmable Motor Feedback System. The Programmable Motor Feedback System for seam welders is a closed-loop system that allows control of the part position between the seam wheels in a fashion similar to a single axis robot controller. Target positions, maximum velocity, and acceleration rates are fully programmable from within the weld schedule, allowing precise positioning of welds whether operating in an intermittent or continuous seam-welding mode. Target trajectories are programmable directly in inches with a typical position resolution of 0.001 inches. This option is recommended for applications where accurate velocities and/or precise positioning of welds is/are required.

The WeldComputer is also capable of meeting many special requirements through the development of customized hardware and software. For special requirements, please refer to the factory.

WELDCOMPUTER[®] ADAPTIVE CONTROL DATA ARCHIVE SYSTEM UPGRADES

The WeldComputer[®] Adaptive Control Data Archive System Upgrades, used in conjunction with the WeldGraphics[™] Graphical Quality Monitoring System, provides automatic collection and archiving of weld data without affecting production rates. Statistically meaningful upper and lower limits of acceptability can be easily implemented using stored data and the archival proof of weld quality will increase customer confidence. Archive data can be backed up on the removable digital media for a permanent record of weld quality. Archive data can also be read directly from a diskette into the WeldComputer for immediate viewing. Conversion programs and Microsoft Excel[™] macros are supplied so that data can be manipulated with third party spreadsheet software.

On-Line Single-Variable Data Archive. The On-Line Single-Variable Data Archive is available for archiving a single monitored process variable and providing weld response histories for, typically, several thousand welds. Graphical data for any weld stored in the archive can be displayed immediately.

On-Line Multi-Variable Data Archive. The On-Line Multi-Variable Data Archive is available for archiving all monitored process variables and providing complete weld response histories for critical applications requiring future proof of weld quality.

OTHER WELDCOMPUTER[®] ADAPTIVE CONTROL OPTIONS

Report Generation System. The Report Generator is a powerful function that allows the user to document a "snapshot" of the quality of a lot of welds for immediate or future proof of weld quality. Items such as Machine Serial Number, Weld Schedule File Number, Lot Number, Number of Welds, Number of Standard Deviations, etc. can be presented in an easy-to-interpret graphic that can be printed with any Laserjet II compatible printer.

Remote Workstation Simulation System. The Remote Workstation Simulation System is a software package that can operate in a Microsoft Windows[™] environment. It provides the ability to edit and simulate weld schedules and to view archived weld data off-line on a standard IBM PC-compatible computer.

Continuous Heat Control Module. The Continuous Heat Control Module allows the WeldComputer[®] Adaptive Control to be programmed while the heat control remains on. Recommended for continuous welding operations, this function facilitates weld schedule development and process experimentation without interruption of normal production operations.