WSI WELD SYSTEMS INTEGRATORS, INC.

RESISTANCE WELDING. SOLVED.

ADVANCED DATA ANALYSIS MONITOR

WM-100A

OPERATION MANUAL

AMADA

AMADA WELD TECH

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Revision Record

Revision	EO	Date	Basis of Revision
A	31282	07/10	None. Development only, not released.
B	40824	12/10	None. Original edition.
C	40994	05/11	Additional instructions and clarifications.
D	41869	03/12	Added reference notes, updated screen changes.
E	42582	07/13	Updated I/O schematics.
F	42861	11/13	Updated to Miyachi America name and logo.
G	43482	11/14	Updated to AMADA WELD TECH name and logo.
H	43878	09/15	Updated to AMADA WELD TECH format.
J	44602	04/17	Miscellaneous Manual Corrections + updates
K	45821	04/20	Updated Company Name (Amada Weld Tech) + Update Model Names

Your New Advanced Data Analysis Monitor (WM-100A) Shipment Contains The Following Items:

1. WM-100A Processing Module.
2. WM-100A Sensor Module
3. Computer Monitor & Mouse
4. Ship Kit # 4-81179-01 which includes:

AMADA WELD TECH PART NUMBER	DESCRIPTION
205-339	AC Power Cord, 1 Each
525-065	Power Supply, 1 Each
205-337	Shielded Data Cable, 100 D, Type, 1 Each
205-338	Shielded Data Cable, 68-D-Type, 1 Each
250-776	Connector 8 Position, 2 Each
250-781	Connector 14 Position, 2 Each
4-35670-02	Voltage Pickup Cable
MB-400K	Toroidal Coil, 1 Each
250-829	Connector 16 Position, 1 Each
4-38454-01	CD ROM Containing PDF WM-100A Operator Manual [990-877 Rev K], 1 Each

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CONTACT US

Thank you for purchasing the Amada Weld Tech WM-100A Advanced Data Analysis Monitor.

Upon receipt of your equipment, please thoroughly inspect it for shipping damage prior to its installation. Should there be any damage, please immediately contact the shipping company to file a claim, and notify us at:

AMADA WELD TECH INC.
1820 South Myrtle Avenue
P. O. Box 5033
Monrovia, California 91016-7133
Phone: (626) 303-5676
FAX: (626) 358-8048
E-mail: info@amadamiyachi.com

The purpose of this manual is to provide the information required for proper and safe operation and maintenance of the Amada Weld Tech WM-100A.

We have made every effort to ensure that information in this manual is both accurate and adequate. If you have any questions or suggestions to improve this manual, please contact us at the phone number or addresses above.

Amada Weld Tech is not responsible for any loss or injury due to improper use of this product.

SAFETY NOTES

DANGER

- **DEATH ON CONTACT** may result if you fail to observe all safety precautions. ***Lethal voltages*** are present in the Power Supply.
- ***Never*** perform any welding operation without wearing protective safety glasses.

This instruction manual describes how to operate, maintain and service the WM-100A, and provides instructions relating to its *safe* use. Procedures described in these manuals *must* be performed, as detailed, by *qualified* and *trained* personnel.

For *safety*, and to effectively take advantage of their full capabilities, please read these instruction manuals before attempting to operate weld heads and power supplies.

Procedures other than those described in these manuals or not performed as prescribed in them, may expose personnel to electrical shock or burn hazards.

After reading these manuals, keep them for future reference.

Please note the following conventions used in this manual:

WARNING: Comments marked this way warn the reader of conditions which might result in *immediate death or serious injury*.

CAUTION: Comments marked this way warn the reader of conditions which might result in damage to the equipment.

LIMITED WARRANTY

GENERAL TERMS AND CONDITIONS FOR THE SALE OF GOODS

1. Applicability.

(a) These terms and conditions of sale (these "**Terms**") are the only terms which govern the sale of the goods ("**Goods**") by Amada Weld Tech Inc. ("**Seller**") to the buyer identified in the Sales Quotation and/or Acknowledgment (as each defined below) to which these Terms are attached or incorporated by reference ("**Buyer**"). Notwithstanding anything herein to the contrary, if a written contract signed by authorized representatives of both parties is in existence covering the sale of the Goods covered hereby, the terms and conditions of said contract shall prevail to the extent they are inconsistent with these Terms.

(b) The accompanying quotation of sale (the "**Sales Quotation**") provided to Buyer, and/or sales order acknowledgement ("**Acknowledgement**") and these Terms (collectively, this "**Agreement**") comprise the entire agreement between the parties, and supersede all prior or contemporaneous understandings, agreements, negotiations, representations and warranties, and communications, both written and oral. For clarification, after the Acknowledgement is received by Buyer, the order for Goods is binding and cannot be cancelled by Buyer for any reason and the full purchase price amount set forth in the Acknowledgement shall be due and payable by Buyer to Seller pursuant to the payment schedule set forth in the Acknowledgement unless otherwise agreed to in writing by Seller. All terms and conditions contained in any prior or contemporaneous oral or written communication which are different from, or in addition to, the terms and conditions in this Agreement are hereby rejected and shall not be binding on Seller, whether or not they would materially alter this Agreement. These Terms prevail over any of Buyer's terms and conditions of purchase regardless whether or when Buyer has submitted its purchase order or such terms. Fulfillment of Buyer's order does not constitute acceptance of any of Buyer's terms and conditions and does not serve to modify or amend these Terms. Notwithstanding anything herein to the contrary, all orders for Goods must be for a minimum purchase price of $100 or such orders will be rejected by Seller.

2. Delivery.

(a) The Goods will be delivered within a reasonable time after Seller provides Buyer the Acknowledgment, subject to availability of finished Goods. Seller will endeavor to meet delivery schedules requested by Buyer, but in no event shall Seller incur any liability, consequential or otherwise, for any delays or failure to deliver as a result of ceasing to manufacture any product or any Force Majeure Event. Delivery schedules set forth in the Acknowledgment are Seller's good faith estimate on the basis of current schedules. In no event shall Seller be liable for special or consequential damages resulting from failure to meet requested delivery schedules.

(b) Unless otherwise agreed in writing by the parties in the Acknowledgement, Seller shall deliver the Goods to Seller's plant in Monrovia, CA, USA (the "**Shipping Point**") using Seller's standard methods for packaging and shipping such Goods. Buyer shall take delivery of the Goods within three (3) days of Seller's written notice that the Goods have been delivered to the Shipping Point. Buyer shall be responsible for all loading costs (including freight and insurance costs) and provide equipment and labor reasonably suited for receipt of the Goods at the Shipping Point. Seller shall not be liable for any delays, loss or damage in transit.

(c) Seller may, in its sole discretion, without liability or penalty, make partial shipments of Goods to Buyer, if applicable. Each shipment will constitute a separate sale, and Buyer shall pay for the units shipped whether such shipment is in whole or partial fulfillment of Buyer's purchase order.

(d) If for any reason Buyer fails to accept delivery of any of the Goods on the date fixed pursuant to Seller's notice that the Goods have been delivered at the Shipping Point, or if Seller is unable to deliver the Goods at the Shipping Point on such date because Buyer has not provided appropriate instructions, documents, licenses or authorizations: (i) risk of loss to the Goods shall pass to Buyer; (ii) the Goods shall be deemed to have been delivered; and (iii) Seller, at its option, may store the Goods until Buyer picks them up, whereupon Buyer shall be liable for all related costs and expenses (including, without limitation, storage and insurance).

3. Non-delivery.

(a) The quantity of any installment of Goods as recorded by Seller on dispatch from Seller's place of business is conclusive evidence of the quantity received by Buyer on delivery unless Buyer can provide conclusive evidence proving the contrary.

(b) Seller shall not be liable for any non-delivery of Goods (even if caused by Seller's negligence) unless Buyer gives written notice to Seller of the non-delivery within three (3) days of the date when the Goods would in the ordinary course of events have been received.

(c) Any liability of Seller for non-delivery of the Goods shall be limited to (in Seller's sole discretion) replacing the Goods within a reasonable time or adjusting the invoice respecting such Goods to reflect the actual quantity delivered.

4. Shipping Terms. Unless indicated otherwise in the Acknowledgment, Delivery shall be made EXW (Incoterms 2010), Shipping Point, including without limitation, freight and insurance costs. If no delivery terms are specified on the Acknowledgement, the method of shipping will be in the sole discretion of Seller. Unless directed in writing otherwise by Buyer, full invoice value will be declared for all shipments.

5. Title and Risk of Loss. Title and risk of loss passes to Buyer upon delivery of the Goods at the Shipping Point. As collateral security for the payment of the purchase price of the Goods, Buyer hereby grants to Seller a lien on and security interest in and to all of the right, title and interest of Buyer in, to and under the Goods, wherever located, and whether now existing or hereafter arising or acquired from time to time, and in all accessions thereto and replacements or modifications thereof, as well as all proceeds (including insurance proceeds) of the foregoing. The security interest granted under this

provision constitutes a purchase money security interest under the California Commercial Code.

6. Amendment and Modification. These Terms may only be amended or modified in a writing which specifically states that it amends these Terms and is signed by an authorized representative of each party.

7. Inspection and Rejection of Nonconforming Goods.

(a) Buyer shall inspect the Goods within two (2) days of receipt ("**Inspection Period**"). Buyer will be deemed to have accepted the Goods unless it notifies Seller in writing of any Nonconforming Goods during the Inspection Period and furnishes such written evidence or other documentation as required by Seller. "**Nonconforming Goods**" means only the following: (i) product shipped is different than identified in Buyer's Acknowledgement; or (ii) product's label or packaging incorrectly identifies its contents. Notwithstanding the foregoing, for shipped Goods that require field installation, the "re-verification" terms in the Acknowledgement shall apply and for custom installations, the inspection and verification shall take place at Buyer's site immediately after the installation is completed.

(b) Seller will only accept Nonconforming Goods that are returned under Seller's Return Material Authorization procedures then in effect ("**RMA**"). Buyer shall obtain a RMA number from Seller prior to returning any Nonconforming Goods and return the Nonconforming Goods prepaid and insured to Seller at 1820 South Myrtle Avenue, Monrovia, CA 91016 or to such other location as designated in writing by Seller for the examination to take place there. If Seller reasonably verifies Buyer's claim that the Goods are Nonconforming Goods and that the nonconformance did not developed by use from Buyer, Seller shall, in its sole discretion, (i) replace such Nonconforming Goods with conforming Goods, or (ii) credit or refund the Price for such Nonconforming Goods pursuant to the terms set forth herein. Notwithstanding the foregoing, the only remedy for Nonconforming Goods that are custom systems is repair (not refund or replacement). No returns for Nonconforming Goods are allowed after thirty (30) days from the original shipping date.

(c) Buyer acknowledges and agrees that the remedies set forth in Section 7(a) are Buyer's exclusive remedies for the delivery of Nonconforming Goods. Except as provided under Section 7(a) and Section 14, all sales of Goods to Buyer are made on a one-way basis and Buyer has no right to return Goods purchased under this Agreement to Seller.

8. Price.

(a) Buyer shall purchase the Goods from Seller at the prices (the "**Prices**") set forth in Seller's published catalogue literature in force as of the date of the Sales Quotation. However, the Prices shown in such catalogue literature or any other publication are subject to change without notice. Unless specifically stated to the contrary in the Sales Quotation, quoted Prices and discounts are firm for thirty (30) days from the date of the Sales Quotation. Unless otherwise stated, prices are quoted EXW (Incoterms 2010), Shipping Point. Unless otherwise stated in the Acknowledgement, if the Prices should be increased by Seller before delivery of the Goods to a carrier for shipment to Buyer, then these Terms shall be construed as if the increased prices were originally inserted herein, and Buyer shall be billed by Seller on the basis of such increased prices.

(b) All Prices are exclusive of all sales, use and excise taxes, and any other similar taxes, duties and charges of any kind imposed by any governmental authority on any amounts payable by Buyer. Buyer shall be responsible for all such charges, costs and taxes (present or future); provided, that, Buyer shall not be responsible for any taxes imposed on, or with respect to, Seller's income, revenues, gross receipts, personnel or real or personal property or other assets.

9. Payment Terms.

(a) Unless otherwise provided in the Acknowledgement, if Buyer has approved credit with Seller, Buyer shall pay all invoiced amounts due to Seller within thirty (30) days from the date of Seller's invoice. If Seller does not have Buyer's financial information and has not provided pre-approved credit terms for Buyer, the payment must be made in cash with order or C.O.D. in US dollars. If Buyer has approved credit terms, the payment may be made by cash with order, wire transfer of immediately available funds, or check in US dollars. Certain products require a down payment. Any payment terms other than set forth above will be identified in the Acknowledgement. Notwithstanding anything herein to the contrary, all prepaid deposits and down payments are non-refundable. If a deposit is not received when due, Seller reserves the right to postpone manufacturing of Goods until payment is received. Seller will not be responsible for shipment delays due to deposit payment delays.

(b) In Seller's sole discretion, Seller may access Buyer interest on all late payments at the lesser of the rate of 1.5% per month or the highest rate permissible under applicable law, calculated daily and compounded monthly. Buyer shall reimburse Seller for all costs incurred in collecting any late payments, including, without limitation, attorneys' fees. In addition to all other remedies available under these Terms or at law (which Seller does not waive by the exercise of any rights hereunder), Seller shall be entitled to suspend the delivery of any Goods if Buyer fails to pay any amounts when due hereunder and such failure continues for ten (10) days following written notice thereof.

(c) Buyer shall not withhold payment of any amounts due and payable by reason of any set-off of any claim or dispute with Seller, whether relating to Seller's breach, bankruptcy or otherwise.

10. Intellectual Property; Software License.

(a) To the extent that any Goods provided under this Agreement contains software, whether pre-installed, embedded, in read only memory, or found on any other media or other form ("**Software**"), such Software and accompanying documentation are licensed to Buyer, not sold and shall remain the sole and exclusive property of Seller or third party licensors of Seller. Seller grants Buyer a non-exclusive license to use the Software solely as provided in and in connection with the use of the Goods in which such Software is contained and in accordance with any applicable user documentation provided with such Goods and subject to the provisions of this Agreement. Certain of Seller's Goods may include third party software such as computer operating systems. Licenses to such third party software are subject to the terms and conditions of any applicable third party software license agreements. Unless identified in the Acknowledgement, no license is granted by Seller with respect to such third party software products that may be provided with the Goods (if any). Seller makes no warranties regarding any third party software that may accompany the Goods or otherwise and such software is explicitly included in the definition of Third Party Products below.

(b) Buyer shall not copy, modify, or disassemble, or permit others to copy, modify, or disassemble, the Software, nor may Buyer modify, adapt, translate,

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(d) If Buyer is the United States Government or any agency thereof, each of the components of the Software and user documentation are a "commercial item," and "computer software" as those terms are defined at 48 C.F.R. 2.101, consisting of "commercial computer software" and "commercial computer software documentation," as such terms are used in 48 C.F.R. 12.212. Consistent with 48 C.F.R. 12.212 and 48 C.F.R. 227.7202-1 through 227.7202-4, all United States government Buyers acquire only those rights in the Software and user documentation that are specified in this Agreement.

11. Installation and Other Services. Seller shall provide installation services ("**Installation Services**") to Buyer if set forth in the Acknowledgment. If Installation Services are provided for in the Acknowledgement, Buyer will prepare the location for the installation consistent with Buyer's written specifications and Buyer will install necessary system cable and assemble any necessary equipment or hardware not provided by Seller, unless agreed otherwise in writing by the parties. For Goods that will be operated on or in connection with Buyer supplied hardware or software, Buyer is responsible for ensuring that its hardware and software conform with Seller minimum hardware and software requirements as made available to Buyer. Seller shall provide other field services, such as maintenance visits and field repairs (the "**Other Services**" and together with the Installation Services, the "**Services**") if set forth in the Acknowledgement.

12. Limited Warranty.

(a) Subject to the exceptions and upon the conditions set forth herein, Seller warrants to Buyer that for a period of one (1) year from the date of shipment ("**Warranty Period**"), that such Goods will be free from material defects in material and workmanship.

(b) Notwithstanding the foregoing and anything herein to the contrary, the warranty set forth in this Section 12 shall be superseded and replaced in its entirety with the warranty set forth on **Exhibit A** hereto if the Goods being purchased are specialty products, which include, without limitation, laser products, fiber markers, custom systems, workstations, Seller-installed products, non-catalogue products and other custom-made items (each a "**Specialty Product**").

(c) **EXCEPT FOR THE WARRANTY SET FORTH IN SECTION 12(A), SELLER MAKES NO WARRANTY WHATSOEVER WITH RESPECT TO THE GOODS (INCLUDING ANY SOFTWARE) OR SERVICES, INCLUDING ANY (a) WARRANTY OF MERCHANTABILITY; (b) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; (c) WARRANTY OF TITLE; OR (d) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.**

(d) Products manufactured by a third party and third party software ("**Third Party Product**") may constitute, contain, be contained in, incorporated into, attached to or packaged together with, the Goods. Third Party Products are not covered by the warranty in Section 12(a). For the avoidance of doubt, **SELLER MAKES NO REPRESENTATIONS OR WARRANTIES WITH RESPECT TO ANY THIRD PARTY PRODUCT, INCLUDING ANY (a) WARRANTY OF MERCHANTABILITY; (b) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; (c) WARRANTY OF TITLE; OR (d) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.** Notwithstanding the foregoing, in the event of the failure of any Third Party Product, Seller will assist (within reason) Buyer (at Buyer's sole expense) in obtaining, from the respective third party, any (if any) adjustment that is available under such third party's warranty.

(e) Seller shall not be liable for a breach of the warranty set forth in Section 12(a) unless: (i) Buyer gives written notice of the defect, reasonably described, to Seller within five (5) days of the time when Buyer discovers or ought to have discovered the defect and such notice is received by Seller during the Warranty Period; (ii) Seller is given a reasonable opportunity after receiving the notice to examine such Goods; (iii) Buyer (if requested to do so by Seller) returns such Goods (prepaid and insured to Seller at 1820 South Myrtle Avenue, Monrovia, CA 91016or to such other location as designated in writing by Seller) to Seller pursuant to Seller's RMA procedures and Buyer obtains a RMA number from Seller prior to returning such Goods for the examination to take place; and (iii) Seller reasonably verifies Buyer's claim that the Goods are defective and that the defect developed under normal and proper use.

(f) Seller shall not be liable for a breach of the warranty set forth in Section 12(a) if: (i) Buyer makes any further use of such Goods after giving such notice; (ii) the defect arises because Buyer failed to follow Seller's oral or written instructions as to the storage, installation, commissioning, use or maintenance of the Goods; (iii) Buyer alters or repairs such Goods without the prior written consent of Seller; or (iv) repairs or modifications are made by persons other than Seller's own service personnel, or an authorized representative's personnel, unless such repairs are made with the written consent of Seller in accordance with procedures outlined by Seller.

(g) All expendables such as electrodes are warranted only for defect in material and workmanship which are apparent upon receipt by Buyer. The foregoing warranty is negated after the initial use.

(h) Subject to Section 12(e) and Section 12(f) above, with respect to any such Goods during the Warranty Period, Seller shall, in its sole discretion, either: (i) repair or replace such Goods (or the defective part) or (ii) credit or refund the price of such Goods at the pro rata contract rate, provided that, if Seller so requests, Buyer shall, at Buyer's expense, return such Goods to Seller.

(i) **THE REMEDIES SET FORTH IN SECTION 12(H) SHALL BE BUYER'S SOLE AND EXCLUSIVE REMEDY AND SELLER'S ENTIRE LIABILITY FOR ANY BREACH OF THE LIMITED WARRANTY SET FORTH IN SECTION 12(A).** Representations and warranties made by any person, including representatives of Seller, which are inconsistent or in conflict with the terms of this warranty, as set forth above, shall not be binding upon Seller.

13. Limitation of Liability.

(a) **IN NO EVENT SHALL SELLER BE LIABLE FOR ANY CONSEQUENTIAL, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR PUNITIVE DAMAGES, LOST PROFITS OR REVENUES OR DIMINUTION IN VALUE, LOSS OF INFORMATION OR DATA, OR PERSONAL INJURY OR DEATH ARISING IN ANY WAY OUT OF THE MANUFACTURE, SALE, USE, OR INABILITY TO USE ANY GOODS, SOFTWARE OR SERVICE, ORARISING OUT OF OR RELATING TO ANY BREACH OF THESE TERMS, WHETHER OR NOT THE POSSIBILITY OF SUCH DAMAGES HAS BEEN DISCLOSED IN ADVANCE BY BUYER OR COULD HAVE BEEN REASONABLY FORESEEN BY BUYER, REGARDLESS OF THE LEGAL OR EQUITABLE THEORY (CONTRACT, TORT OR OTHERWISE) UPON WHICH THE CLAIM IS BASED, AND NOTWITHSTANDING THE FAILURE OF ANY AGREED OR OTHER REMEDY OF ITS ESSENTIAL PURPOSE.**

(b) **IN NO EVENT SHALL SELLER'S AGGREGATE LIABILITY ARISING OUT OF OR RELATED TO THIS AGREEMENT, WHETHER ARISING OUT OF OR RELATED TO BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE) OR OTHERWISE, EXCEED THE TOTAL OF THE AMOUNTS PAID TO SELLER FOR THE GOODS SOLD HEREUNDER.**

(c) **ALL WARRANTIES SET FORTH HEREIN, DIRECT OR IMPLIED, ARE VOIDED IF THE INITIAL INSTALLATION AND START-UP OF THE SUBJECT GOOD IS NOT SUPERVISED BY AN AUTHORIZED REPRESENTATIVE OF SELLER. AFTER INSTALLATION, ANY RE-ALIGNMENT, RE-CLEANING, OR RE-CALIBRATION, PROVIDED THEY ARE NOT RELATED TO A PROVEN DEFECT IN MATERIALS OR WORKMANSHIP, SHALL BE PERFORMED BY AN AUTHORIZED REPRESENTATIVE OF SELLERAT THE CURRENT SERVICE RATES.**

(d) **WHERE GOODS ARE SUBJECT TO A MOVE TO ANOTHER LOCATION AFTER THE ORIGINAL INSTALLATION HAS BEEN MADE, THE WARRANTY MAY BE MAINTAINED ONLY IF SUPERVISED BY AN AUTHORIZED REPRESENTATIVE OF SELLER. SELLER, FOR A SERVICE CHARGE, WILL ARRANGE FOR AND SUPERVISE THE DISCONNECTION, TRANSPORTATION, REINSTALLATION AND START-UP OF THE EQUIPMENT. CLAIMS FOR DAMAGE IN SHIPMENT ARE THE RESPONSIBILITY OF BUYER AND SHALL BE FILED PROMPTLY WITH THE TRANSPORTATION COMPANY.**

14. Return Goods Policy. Seller's products may be returned to Seller for credit within sixty (60) days of shipment subject to the following conditions.

(a) In order to return products for credit, Buyer must obtain a RMA number from Seller. Upon receipt, it must be executed by an authorized person and then returned with the Goods. Goods returned to Seller without a RMA will be returned at Buyer's expense.

(b) Goods are to be returned to Seller at 1820 South Myrtle Avenue, Monrovia, CA 91016 with Freight Prepaid. Seller will not accept collect shipments.

(c) Restocking fees will be assessed in accordance with the following schedules: (i) Goods returned within the first thirty (30) days from shipment date will be restocked less twenty percent (20%) of the amount billed on the original invoice. (ii) Goods returned over thirty (30) days of shipment but less than sixty (60) days will be restocked less thirty percent (30%) of the amount billed on the original invoice. (iii) No returns are allowed after sixty (60) days from the original shipping date.

(d) The restocking fees set forth above are the minimum fees. If a returned Good requires rework to restore it to a saleable condition, further charges will be assessed. Seller's quality assurance department will document the condition of the Goods when received by Seller and report their findings to Buyer.

(e) **Notwithstanding the foregoing provisions of this Section 14, the following Goods cannot be returned, are not eligible for any credit and cannot be restocked: (i) custom or modified products and (ii) any expendable product(s) that have been used.**

15. Compliance with Law and Indemnification. Buyer shall comply with all applicable laws, regulations and ordinances. Buyer shall maintain in effect all the licenses, permissions, authorizations, consents and permits that it needs to carry out its obligations under this Agreement. Buyer shall comply with all export and import laws of all countries involved in the sale of the Goods under this Agreement or any resale of the Goods by Buyer. Goods, Services and technical data delivered by Seller shall be subject to U.S. export controls. Buyer shall, and shall cause its customers to, obtain all licenses, permits and approvals required by any government and shall comply with all applicable laws, rules, policies and procedures of the applicable government and other competent authorities. Buyer will indemnify and hold Seller harmless for any violation or alleged violation by Buyer of such laws, rules, policies or procedures. Buyer shall not transmit, export or re-export, directly or indirectly, separately or as part of any system, the Goods or any technical data (including processes and Services) received from Seller, without first obtaining any license required by the applicable government, including without limitation, the U.S. government. Buyer also certifies that none of the Goods or technical data supplied by Seller under this Agreement will be sold or otherwise transferred to, or made available for use by or for, any entity that is engaged in the design, development, production or use of nuclear, biological or chemical weapons or missile technology. No Buyer information will be deemed "technical data" unless Buyer specifically identifies it to Seller as such. Buyer assumes all responsibility for shipments of Goods requiring any government import clearance. Seller may terminate this Agreement if any governmental authority imposes antidumping or countervailing duties or any other penalties on Goods. For all international shipments, Seller requires that all required Export Control documentations, including Form BIS-711 Statement by Ultimate Consignee and Purchases, are submitted by Buyer along with the purchase order. Seller reserves the right to postpone shipment until all documentations are completed and submitted to Seller. Seller will not be responsible for shipment delays due to non-compliance by Buyer of the foregoing two sentences.

16. Termination. In addition to any remedies that may be provided under these Terms, Seller may terminate this Agreement with immediate effect upon written notice to Buyer, if Buyer: (i) fails to pay any amount when due under this Agreement and such failure continues for ten (10) days after Buyer's receipt of written notice of nonpayment; (ii) has not otherwise performed or complied with any of these Terms, in whole or in part; or (iii) becomes insolvent, files a petition for bankruptcy or commences or has commenced against it proceedings relating to bankruptcy, receivership, reorganization or assignment for the benefit of creditors.

17. Waiver. No waiver by Seller of any of the provisions of this Agreement is effective unless explicitly set forth in writing and signed by Seller. No failure to exercise, or delay in exercising, any rights, remedy, power or privilege arising from this Agreement operates or may be construed as a waiver thereof. No single or partial exercise of any right, remedy, power or privilege hereunder precludes any other or further exercise thereof or the exercise of any other right, remedy, power or privilege.

18. Confidential Information. All non-public, confidential or proprietary information of Seller, including, but not limited to, specifications, samples, patterns, designs, plans, drawings, documents, data, business operations, customer lists, pricing, discounts or rebates, disclosed by Seller to Buyer, whether disclosed orally or disclosed or accessed in written, electronic or other form or media, and whether or not marked, designated or otherwise identified as "confidential," in connection with this Agreement is confidential, solely for the use of performing this Agreement and may not be disclosed or copied unless authorized in advance by Seller in writing. Upon Seller's request, Buyer shall promptly return all documents and other materials received from Seller. Seller shall be entitled to injunctive relief for any violation of this Section 18. This Section 18 does not apply to information that is: (a) in the public domain through no fault of Buyer; (b) known to Buyer at the time of disclosure without restriction as evidenced by its records; or (c) rightfully obtained by Buyer on a non-confidential basis from a third party.

19. Force Majeure. Seller shall not be liable or responsible to Buyer, nor be deemed to have defaulted or breached this Agreement, for any failure or delay in fulfilling or performing any term of this Agreement when and to the extent such failure or delay is caused by or results from acts or circumstances beyond the reasonable control of Seller including, without limitation, acts of God, flood, fire, earthquake, explosion, governmental actions, war, invasion or hostilities (whether war is declared or not), terrorist threats or acts, riot, or other civil unrest, national emergency, revolution, insurrection, epidemic, lock-outs, strikes or other labor disputes (whether or not relating to either party's workforce), or restraints or delays affecting carriers or inability or delay in obtaining supplies of adequate or suitable materials, materials or telecommunication breakdown or power outage (each a "**Force Majeure Event**"), provided that, if the event in question continues for a continuous period in excess of thirty (30) days, Buyer shall be entitled to give notice in writing to Seller to terminate this Agreement.

20. Assignment. Buyer shall not assign any of its rights or delegate any of its obligations under this Agreement without the prior written consent of Seller. Any purported assignment or delegation in violation of this Section 20 is null and void. No assignment or delegation relieves Buyer of any of its obligations under this Agreement.

21. Relationship of the Parties. The relationship between the parties is that of independent contractors. Nothing contained in this Agreement shall be construed as creating any agency, partnership, joint venture or other form of joint enterprise, employment or fiduciary relationship between the parties, and neither party shall have authority to contract for or bind the other party in any manner whatsoever.

22. No Third-Party Beneficiaries. This Agreement is for the sole benefit of the parties hereto and their respective successors and permitted assigns and nothing herein, express or implied, is intended to or shall confer upon any other person or entity any legal or equitable right, benefit or remedy of any nature whatsoever under or by reason of these Terms.

23. Governing Law. All matters arising out of or relating to this Agreement is governed by and construed in accordance with the internal laws of the State of California without giving effect to any choice or conflict of law provision or rule (whether of the State of California or any other jurisdiction) that would cause the application of the laws of any jurisdiction other than those of the State of California.

24. Dispute Resolution.

(a) If Buyer is an entity formed under the laws of the United States of America, or any of its states, districts or territories ("**U.S. Law**"), then any dispute, legal suit, action or proceeding arising out of or relating to this Agreement shall be adjudicated and decided in the federal courts of the United States of America or the courts of the State of California in each case located in the City of Los Angeles and County of Los Angeles, California and each party irrevocably submits to the exclusive and personal jurisdiction of such courts in any such dispute, suit, action or proceeding.

(b) If Buyer is an entity formed under the laws of any country, state, district or territory other than U.S. Law, then the parties irrevocably agree that any dispute, legal suit, action or proceeding arising out of or relating to this Agreement shall be submitted to the International Court of Arbitration of the International Chamber of Commerce ("**ICC**") and shall be finally settled under the Rules of Arbitration of the ICC. The place and location of the arbitration shall be in Los Angeles, California, pursuant to the ICC's Rules of Arbitration and shall be finally settled in accordance with said rules. The arbitration shall be conducted before a panel of three arbitrators. Each party shall select one arbitrator and the two arbitrators so selected shall select the third arbitrator, who shall act as presiding arbitrator. Notwithstanding the foregoing, if the matter under dispute is $500,000 or less, there shall only be one arbitrator who shall be mutually selected by both parties. If the party-selected arbitrators are unable to agree upon the third arbitrator, if either party fails to select an arbitrator, or in the case that only one arbitrator is required and the parties are unable to agree, then the International Court of Arbitration shall choose the arbitrator. The language to be used in the arbitral proceeding shall be English. The arbitrator(s) shall have no authority to issue an award that is contrary to the express terms of this Agreement or the laws of the State of California or applicable US Federal Law, and the award may be vacated or corrected on appeal to a court of competent jurisdiction for any such error. The arbitrator(s) shall be specifically empowered to allocate between the parties the costs of arbitration, as well as reasonable attorneys' fees and costs, in such equitable manner as the arbitrator(s) may determine. The arbitrator(s) shall have the authority to determine issues of arbitrability and to award compensatory damages, but they shall not have authority to award punitive or exemplary damages. Judgment upon the award so rendered may be entered in any court having jurisdiction or application may be made to such court for judicial acceptance of any award and an order of enforcement, as the case may be. In no event shall a demand for arbitration be made after the date when institution of a legal or equitable proceeding based upon such claim, dispute or other matter in question would be barred by the applicable statute of limitations. Notwithstanding the foregoing, either party shall have the right, without waiving any right or remedy available to such party under this Agreement or otherwise, to seek and obtain from any court of competent jurisdiction any interim or provisional relief that is necessary or desirable to protect the rights or property of such party, pending the selection of the arbitrator(s) hereunder or pending the arbitrator(s)' determination of any dispute, controversy or claim hereunder.

25. Notices. All notices, request, consents, claims, demands, waivers and other communications hereunder (each, a "**Notice**") shall be in writing and addressed to the parties at the addresses set forth on the face of the Acknowledgement or to such other address that may be designated by the receiving party in writing. All Notices shall be delivered by personal delivery, nationally recognized overnight courier (with all fees pre-paid), facsimile (with confirmation of transmission) or certified or registered mail (in each case, return receipt requested, postage prepaid). Except as otherwise provided in this Agreement, a Notice is effective only (a) upon receipt of the receiving party, upon confirmation of delivery by nationally recognized overnight courier or

upon forty-eight (48) hours after being sent by certified or registered mail (as applicable), and (b) if the party giving the Notice has complied with the requirements of this Section 25.

26. Severability. If any term or provision of this Agreement is invalid, illegal or unenforceable in any jurisdiction, such invalidity, illegality or unenforceability shall not affect any other term or provision of this Agreement or invalidate or render unenforceable such term or provision in any other jurisdiction.

27. Survival. Provisions of these Terms which by their nature should apply beyond their terms will remain in force after any termination or expiration of this Order including, but not limited to, the following provisions: Compliance with Laws, Confidentiality, Governing Law, Dispute Resolution, Survival, and the restrictions on Software in Sections 10(b), (c) and (d).

WSI WELD SYSTEMS INTEGRATORS, INC.

WSI WELD SYSTEMS INTEGRATORS, INC.

CHAPTER 1
Description

Section I: Overview

Features

The Amada Weld Tech **Advanced Data Analysis Monitor** (**WM-100A**) is a versatile instrument providing a range of weld monitoring capabilities and processes. It has a comprehensive set of I/O connecting it to the weld process. An array of screens display weld information for **CURRENT, VOLTAGE, POWER, RESISTANCE, WELD FORCE/PRESSURE, DISPLACEMENT,** and **ALTERNATE SENSOR** along with other critical aspects of welding applications.

Designed for maximum flexibility and ease of operation, you can select from a large variety of parameters to monitor specific aspects of your welding process, yet selecting these parameters is a simple matter of "point and click" and "fill in the blanks" on the **Advanced Data Analysis Monitor** (**WM-100A**) configuration screens.

The WM-100A collects, displays, and stores all weld data in graphic and alphanumeric formats. In addition, the WM-100A has an ODBC database server that allows you to access stored weld data through third party programs via an Ethernet connection or directly from the WM-100A itself. For the rest of this manual, the **Advanced Data Analysis Monitor** (**WM-100A**) will simply be called ***the Monitor***.

CHAPTER 1: DESCRIPTION

Section II: Major Components

Monitor, Keyboard & Mouse

The computer monitor is a standard high-resolution widescreen monitor sized for optimal display of the WM-100A screens.

CHAPTER 1: DESCRIPTION

WM-100A Data Processing Module

This is a specially configured high-speed computer using *Microsoft Windows7®* as the operating system. The high-speed processors are specifically configured to process the large amount of data received and present it graphically in high-resolution format.

There are USB ports on the front of the **WM-100A Data Processing Module** for file transfer and software upgrades. There are Ethernet and RS-232 ports on the back for external communications.

CHAPTER 1: DESCRIPTION

WM-100A Sensor Interface Module

This device is the I/O interface to the weld process. **Current, Voltage, Force/Pressure, Displacement, and Alternate Sensor (Gas Flow)** inputs connect to the front of this device and a range of digital I/O and Relay outputs connect to the back.

The **WM-100A Sensor Interface Module** processes all the I/O signals so they can be routed to the **WM-100A Data Processing Module** in order to make them available for the full spectrum of the Monitor's monitoring and logging functions.

CHAPTER 1: DESCRIPTION

WM-100A Sensors

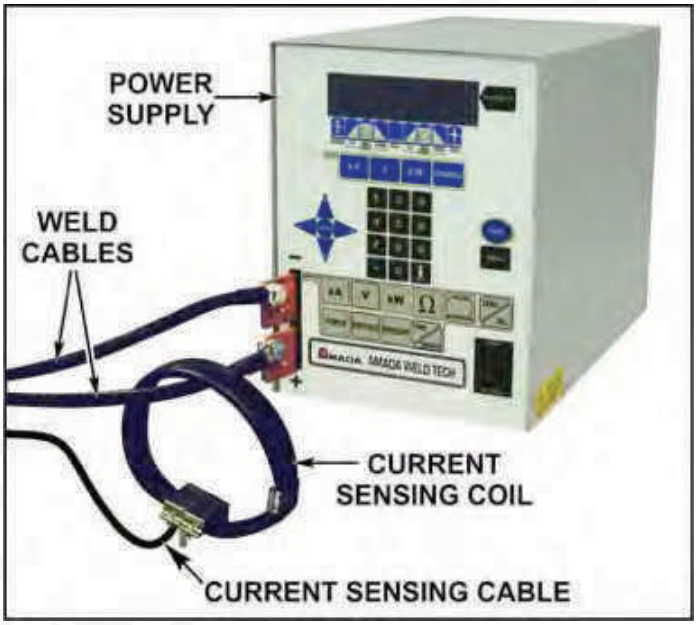
The Monitor accepts single channel inputs from **CURRENT**, **VOLTAGE**, and **ALTERNATE SENSOR (GAS FLOW)** inputs and dual channel inputs from **DISPLACEMENT** and **FORCE/PRESSURE** inputs.

Current

Inputs for the weld current can be made from either a Rogowski **CURRENT SENSING COIL** or a voltage measurement across a resistance load (shunt) A Rogowski **CURRENT SENSING COIL** can be used to measure currents up to 200,000 Amps.

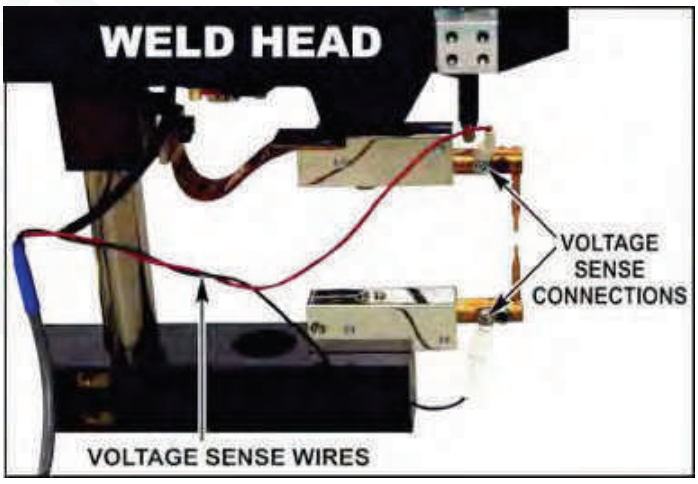
A shunt of approximately 0.001 or 0.004 ohms can be used to measure currents of less than approximately 2,000Amps.

For lower current levels, such as below 200 amps, the user is advised to consider a 0.004 ohm shunt instead of a 0.001 ohm shunt. The 0.004 ohm shunt will provide for greater accuracy of the current measurement and higher resolution of the current plot lines on the **Monitor** screens.



Voltage

The Monitor accepts direct voltage measurement from 0 to 15 Volts.



CHAPTER 1: DESCRIPTION

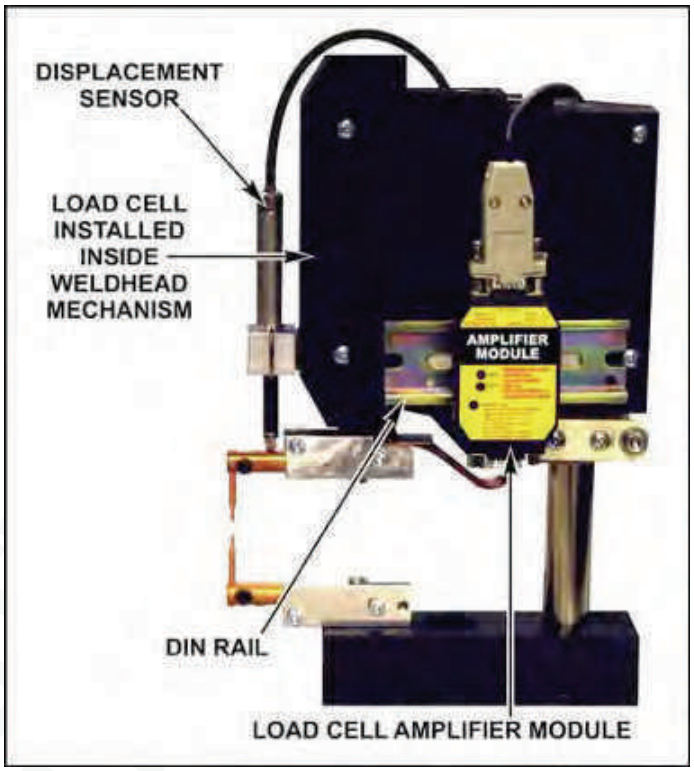
Displacement Sensor

Heidenhain glass scale sensors are the standard Amada Weld Tech **Displacement** sensors for the Monitor.

Force / Pressure

The Monitor's **FORCE / PRESSURE** inputs accept signals from 0-10 Volts. The photo to the right shows a load cell mounted internally to a weld head with an amplifier to provide the 0-10 Volt signal required by the Monitor's inputs.

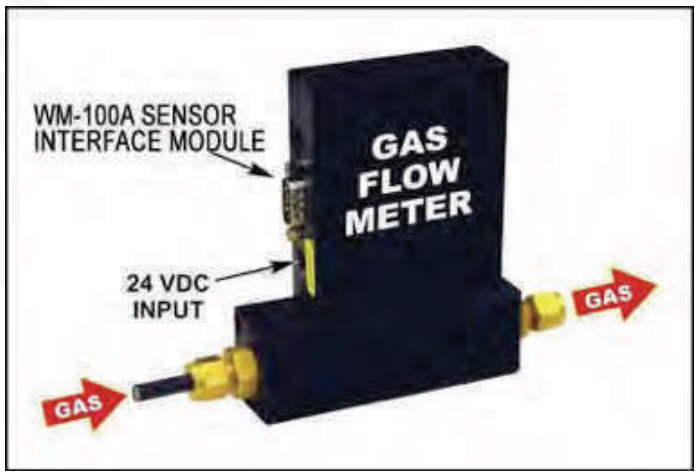
You can connect a variety of sensors, including strain gauge and piezo-electric devices. You can select force or pressure units using the Monitor's configuration setup screens.



Alternate Sensor (Gas Flow)

The Monitor's **ALTERNATE SENSOR** input accepts signals from 0-10 Volts. One possible use of this input is to connect an output from a gas flow meter that measures gas flow over the weld zone.

A sample gas flow sensor is shown on the right.

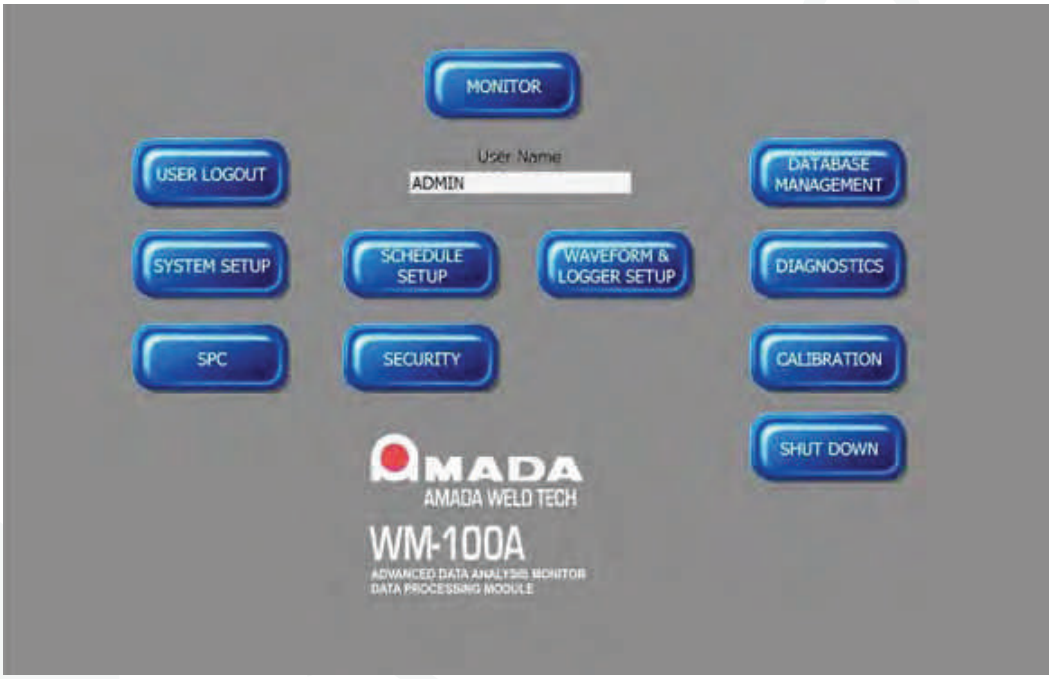


Section III: Monitor Software

Overview

This is a brief overview of the software screens to show the power and flexibility of the Monitor software. Complete details on the software and functions are in *Chapters 3, 4, and 5*.

Large, intuitive screens are designed to allow you to see related information at a glance. All Monitor functions are accessed through a flattened menu structure centered on the **Main Menu** screen shown below.



CHAPTER 1: DESCRIPTION

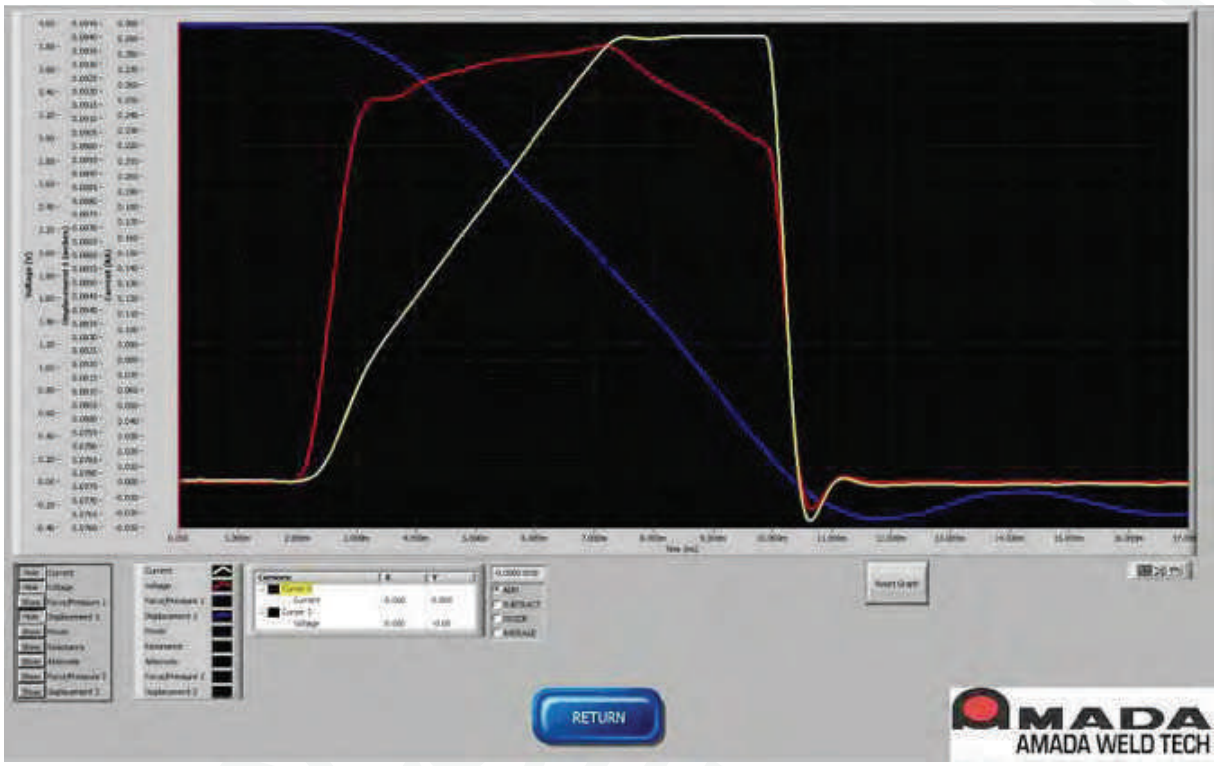
Monitor Screens

The Monitor displays information in alphanumeric and graphical format as shown by the following **Weld Monitoring** screen. The weld parameter waveforms, **Current, Voltage, Power, Resistance, Weld Force / Pressure, Weld displacement, and Alternate Sensor**, are color coded for easy viewing when switching from screen to screen.

If you want to see a precise view of details on a graph screen, you can enlarge the graphical display by clicking the **EXPAND** buttons on various screens to get a large view such as the following **GRAPH** screen.

CHAPTER 1: DESCRIPTION

Zoom Feature



The expanded screen shows you entire waveforms for a weld. If you want to see details, the **ZOOM** controls on the right allow you to enlarge any portion of the screen. In addition, you can "grab and move" the screen so you can get see any portion of the screen in high-resolution detail.

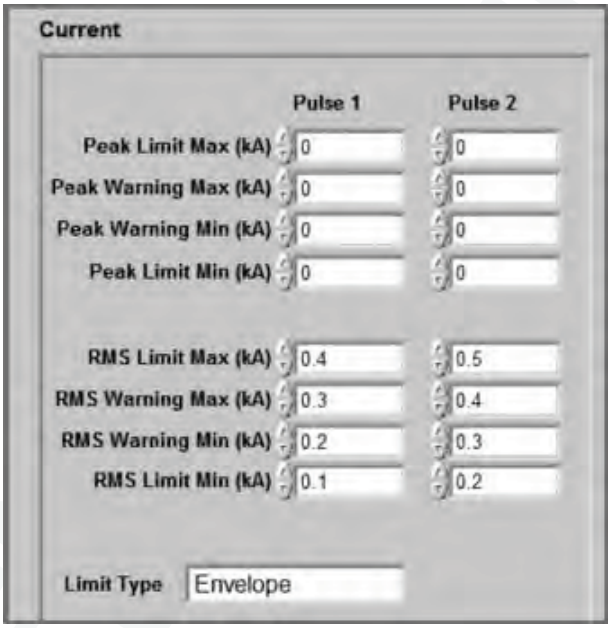
CHAPTER 1: DESCRIPTION

Weld Error Levels

The Monitor provides the ability to set error points on the weld parameters and trigger message notices when those error levels are passed. The Monitor has two levels of error, **Limit** and **Warning**.

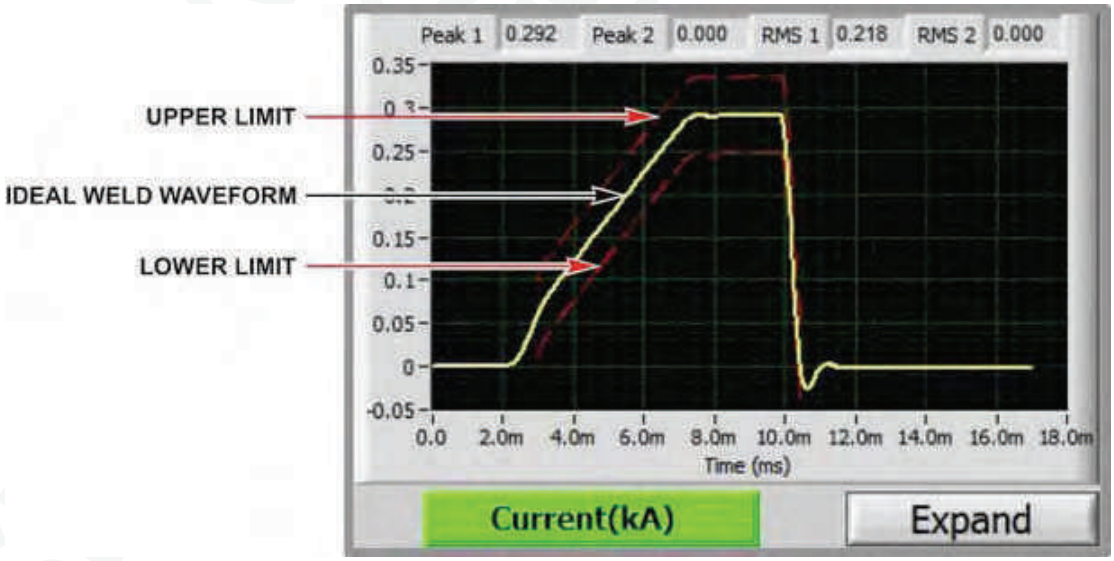
The **Limit** levels can be used as out of tolerance values for a process. The **Warning** levels can be set within the **Limit** values to provide an early warning that a process may be drifting to its out of tolerance levels.

On the right is a close-up of the setup screen for setting the **Limit** and **Warning** levels for **Current**. As you can see, you have the option of entering fixed values for upper and lower **Peak** and **RMS Limit** and **Warning** levels.



Envelope

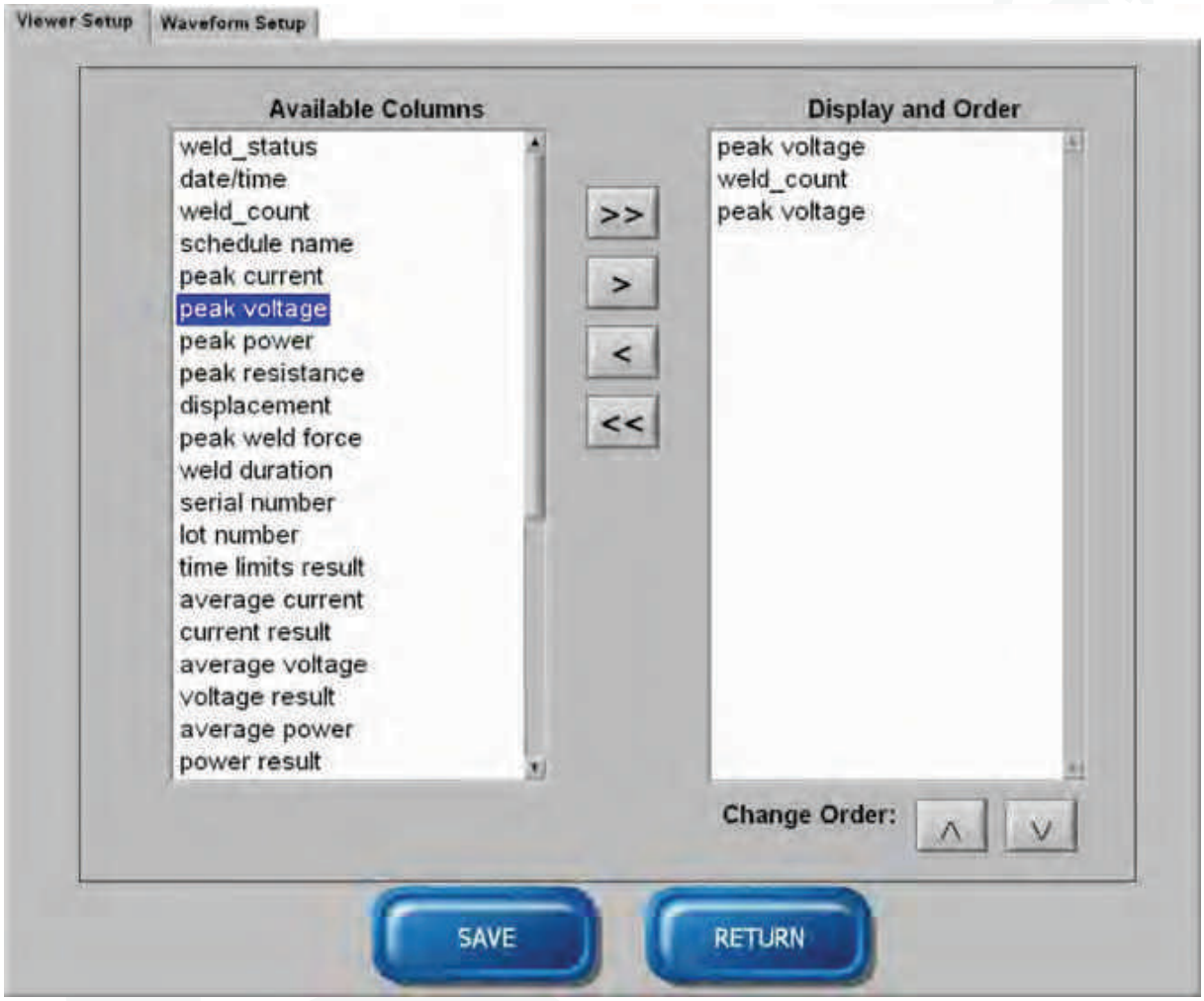
An **Envelope**, another capability to identify process errors, can be established to set the maximum and minimum limits above and below a sample waveform. Within the Monitor, you choose or create the "ideal" waveform for the welds you want to make.



CHAPTER 1: DESCRIPTION

Weld Data Log

The Monitor stores and displays alphanumeric data for the weld parameters and process results. Configuration screens, such as the following **Logger Setup** screen, allow you to tailor the setup of the Monitor to provide you with clear visibility of the weld information most important to your application.



CHAPTER 1: DESCRIPTION

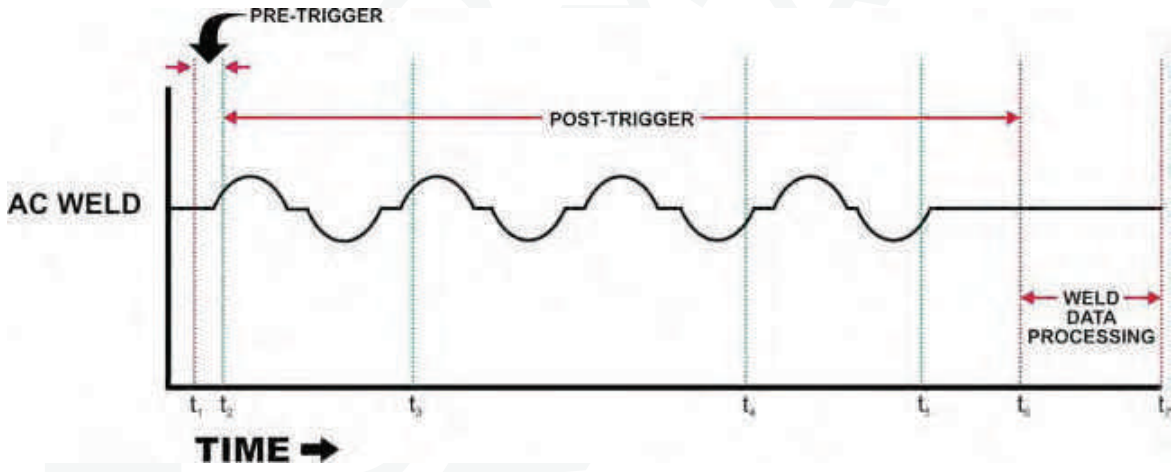
Section IV: Measurement Method

When the Monitor is set to **Monitoring Mode**, it continually polls the I/O looking for a user-set Trigger point. When the Monitor recognizes a trigger point, it stores the information, processes the information and sets outputs.

The Monitor will analyze and record data that occurs during the user-set Pre-Trigger time and the user-set Post Trigger time. At the end of the Post-Trigger time, the Monitor requires a period of time "Weld Data Processing" to process the weld information before it is ready to look for the Trigger point of the next weld.

The following two diagrams show sample AC and DC Welds and present definitions of key measurements.

AC Weld



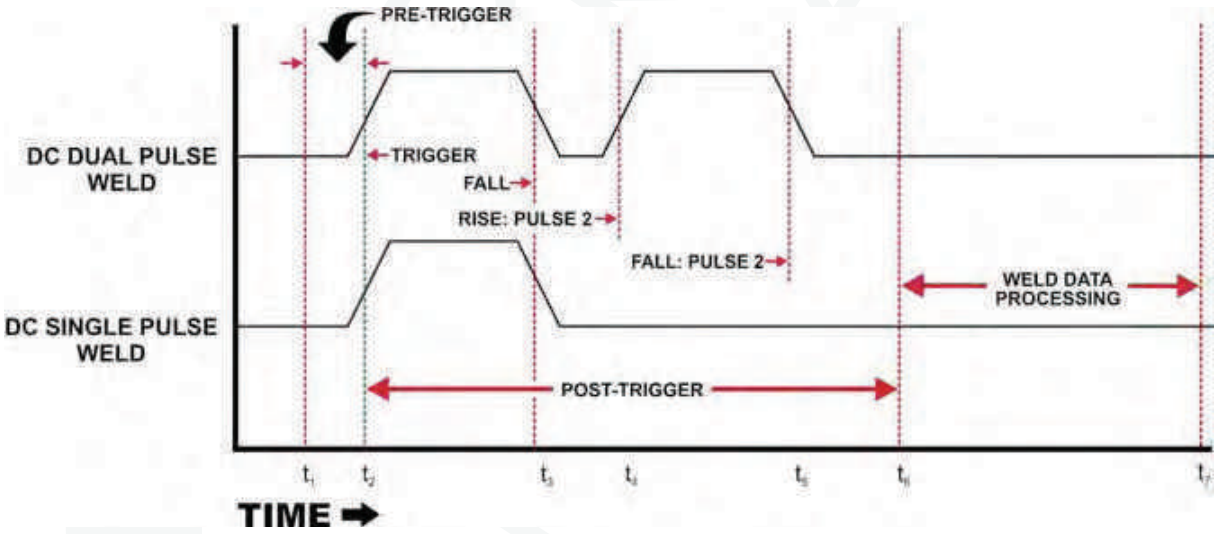
In the above AC Weld:

- t_2 is the Trigger Point
- t_3 is the Rise Point for the second cycle. A Rise Point is the first current value of any cycle after the first cycle at a point where the current reaches a current level equal to the current level at the Trigger Point.
- t_4 and t_5 are both Fall Points. A Fall Point is a point where the peak current for the waveform multiplied by the user set Current Fall Level equals the absolute value of the actual current
- The Weld Time for an AC Weld is always the time between the Trigger Point and the last Fall Point of a waveform. In the above diagram this is between t_2 and t_5

- The RMS value will be calculated between the Trigger or Rise Point of the user set **Start Cycle** and the Fall Point of the user set End Cycle. In the above diagram, if the user sets a Start Cycle of 2 and an End Cycle of 3, the RMS value will be calculated between t_3 and t_4. The following rules apply to the calculation of the RMS value:

  1) If number of cycles detected by the **Monitor** is greater than or equal to user set **End Cycle**, then the RMS value is calculated from the Trigger or Rise of the **Start Cycle** to Fall of the **End cycle**
  2) If number of cycles is less than the user set **End Cycle** and greater than or equal to the user set **Start Cycle**, then the RMS value is calculate from the Trigger or Rise of **Start Cycle** to last Fall Point
  3) If number of cycles is less than **Start Cycle**, the RMS value will be assigned to zero

DC Weld



In the above DC Weld:

- t_2 is the Trigger Point
- RMS is calculated between t_2 and t_3 for first pulse and t_4 and t_5 for second pulse
- Weldtime is calculated between t_2 and t_3, t_4 and t_5, or t_2 and t_5 based on the settings you choose
- The Fall points t_3 and t_5 are set by the you in the **Setup** screen

CHAPTER 1: DESCRIPTION

Section V: Monitor Processes

The Monitor performs several process functions in addition to the monitoring of the weld parameters. This Section presents an overview of those functions. Refer to the remaining *Chapters* and *Appendices* for additional details on these process functions.

Weld to Displacement

The Monitor can set digital outputs based on the positions of the displacement sensors to accomplish a weld-to-displacement function. The schedule settings and I/O connections you choose are used to perform one of four possible weld-to-displacement methods. When the user-set displacement distance is reached, the Monitor will set digital outputs, called **Power Supply Cutoff Outputs**, which can be used to switch a Power Supply off.

The four configuration choices for a **Weld to Displacement** process are:

A. PLC control in Part Measurement Mode with initial thickness measurement input as the setpoint for the point that WM-100A begins displacement measurement. (This is Weld-to-displacement from the point at which the electrodes contact the part)

B. PLC control for weld-to-displacement with the PLC only setting the initial thickness measurement. (This is Weld-to-displacement from the point at which the electrodes contact the part)

C. Using a contact closure such as a limit switch or firing switch to close the Initial Thickness Measurement input. The Thickness Delay Time setting is used for this method. The Thickness Delay Time begins when the Initial Thickness Measurement Input is set and can be used to time the moment the displacement count is set. (This is Weld-to-displacement from the point at which the electrodes contact the part)

D. The displacement measurement for Weld-to-displacement begins when the weldhead is in the fully retracted position. The Weld Value is set to be the point of travel for the electrodes where the Power Supply will be cutoff. At the start of the weld cycle, when the weldhead is in the fully retracted position, the Initial Thickness measurement input is set. The Power Supply Cutoff outputs will then be switched when the weldhead has traveled the distance specified in the Weld Value.

The Monitor has two input displacement channels, 1 & 2 and can accomplish the weld-to-displacement function on both of the displacement channels. You select weld-to-displacement for Displacement Channel 1, Displacement Channel 2, or both (AND) Displacement Channels 1 & 2 based on your connections to the Monitor's output connector, J105.

Force Firing

The Monitor can set a digital output based on the value of the Force 1 measurement channel. This function can be used to fire a power supply or send an output to a device when the force reaches a user-set value.

CHAPTER 1: DESCRIPTION

When the Monitor is in **Monitor Mode**, the Force Fire Digital output will be set active if the force measured on the Force 1 channel is ***greater*** that the user-set force value. If the force measured is ***less*** than the user-set force fire value, the Force Fire Digital output will be set inactive.

The Force Fire Digital Output will switch within 20 microseconds after the actual force moves above or below the user-set value.

When the Monitor is ***not*** in **Monitor Mode**, the Force Fire Digital Output will remain in the inactive state.

CHAPTER 1: DESCRIPTION

Section VI: Monitor Functions

Waveforms

The Monitor can save graphs (waveforms) of values over time of the measured current, voltage, two force channels, two displacement channels and alternate sensor inputs, as well as the calculated resistance and power. The Monitor saves each waveform as a separate file in binary (Big Endian) format. The Monitor has functions that can be used to convert individual waveforms to ASCII format files.

Serial Numbers and Lot Numbers

The Monitor can save a serial number and lot number for each weld record. Each Schedule can be setup to allow entry of a serial number, a lot number, or both serial number and lot number. For Schedules that allow entry of both a serial number and lot number, the Tab key can be used to jump back and forth between the serial number and lot number entry boxes. The Tab key will also highlight any characters in a serial number or lot number box so that the characters can be overwritten.

Any ASCII character can be entered as part of a serial or lot number.

Each Schedule can be setup to automatically increment integer serial numbers. If this option is selected, the Monitor will increment the serial number by one after every weld. The Monitor will increment the serial number until 4294967295 is reached. Once 4294967295 is reached the Monitor will reset the next serial number to 1 and then continue incrementing after each weld (1, 2, 3…).

Hard Disk Space Management

The Monitor has functions to manage the hard disk space to ensure continuous uninterrupted operation. The user should carefully select the user-settings for these parameters. The Monitor saves a database record for every weld. In addition to the database record, the Monitor saves waveform data separately from the database record.

Every weld record may be up to 2000 bytes. Some of the weld record fields are variable, so the actual size for each record will vary from weld to weld.

Every waveform will have a size in bytes of the length of the pre and post trigger times multiplied by 1000. If the pre-trigger time is 10 milliseconds and the post trigger time is 60 milliseconds, then each waveform will be 70,000 bytes. If the user has selected to save all nine waveforms, then all nine waveforms will occupy a total of 630,000 bytes.

The user can conserve disk space and reduce the time to manual delete records by not using an excessively long weld measurement period and by only saving the waveforms that may be examined in the future.

The **Monitor's Data Processing Module** includes two hard drives identified as C: and D:. The **Monitor's** SQL database is on the D: drive and is the only information on the D; drive. The C: drive contains all

remaining software and information, including the ***Windows 7®*** operating system, weld waveform data, and the Monitor software.

CAUTION

The **Monitor** is designed so that the only information on the **D:** drive is the SQL database. The user should ***not*** save any other information on the **D:** drive and should ***not*** use the **D:** drive for any function. Failure to follow this **CAUTION** will potentially cause database performance issues.

Data Backup

To enable restoring of all weld data and envelopes in case of a hard disk failure, it is recommended that the user backup the following items:

1. All files in the **C:\test_date_file** directory.
2. All files in the **C:\envfile** directory.
3. All files in both the **db** files and **db** backup directories on the **D:** drive.

Result Checking – Limits and Warnings – Special Notes

For **Current**, **Voltage**, **Resistance**, and **Power**, a user can select to monitor **RMS**, **Peak**, or **Envelope**. If the user enters 0 for a limit or warning, then WM-100A will not compare the actual value to that particular limit or warning. For example, if user selected to monitor the **RMS** parameter and set RMS Warning minimum to 0, then WM-100A will not check the RMS warning minimum.

For **Force**, **Weldtime**, and **Formula**, you can select whether or not **Min/Max** should be monitored. If you select to monitor **Min/Max**, and you entered a min or max parameter of 0, then the Monitor will ***not*** check that particular parameter. For example, for **Weldtime**, if the user-selected **Min/Max** monitoring and the Min limit is 0, then WM-100A will ***not*** check the minimum limit for **Weldtime**.

For displacement, use the check boxes to select if a parameter will be monitored.

NOTE: If you are ***not*** monitoring Min or Max values for a parameter, but you still want to display that parameter on a **Run Chart** of **Histogram**, then you ***must*** enter **Max** and **Min** values for proper display of the **Run** screen.

CHAPTER 1: DESCRIPTION

Monitor Processing Rate

The **Monitor** is capable of capturing one weld a second when all nine waveforms are saved and the measurement time is 100 milliseconds or less. The following table shows the weld rate capabilities for other measurement times when all nine waveforms are saved.

Weld Time (pre-trigger + post-trigger)	Weld Rate (Welds per minute)
100 milliseconds	60
200 milliseconds	30
500 milliseconds	12
1 second	7.5
2 seconds	3

If less than nine waveforms are saved for each weld, then the weld rate can be maintained at rates greater than shown in the above table. When the **Monitor's** memory and processing capacity has been reached due to excessively high weld rates, the **Monitor** will keep the **Ready to Measure** digital output set to inactive and the yellow highlighted "Processing" message displayed on the **Run** or **Monitoring** screens until the **Monitor** completes processing of all information from past welds.

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CHAPTER 2
Installation and Setup

Section I: Before You Start

WARNING

To avoid burns, shock, or electrocution, make sure the welding system has been turned OFF and all stored welding energy has been discharged ***before*** you install the Monitor and sensors.

Unpacking

Make sure you have all the Monitor components listed on Page **ii** of this manual.

Verify that all Monitor components show no signs of damage. If they do, please contact the carrier. Also, contact Amada Weld Tech Customer Service immediately at the postal or e-mail address or telephone or FAX number shown in the Foreword of this manual.

Space Requirements

We recommend that the **Monitor** be installed in a well-ventilated area that is free from excessive dust, acids, corrosive gasses, salt, and moisture. Other installation considerations are:

- Allow sufficient clearance around all sides for power and signal cable runs.
- Allow ample workspace around the Monitor so that it will not be jostled or struck while welding.
- The work surface must be level, stable, free from vibration, and capable of supporting the combined weight of the total welding system.
- The Monitor must be far enough from the weld head to avoid contact with weld splash.
- Assure that there are no sources of high-frequency energy close by.

CHAPTER 2: INSTALLATION AND SETUP

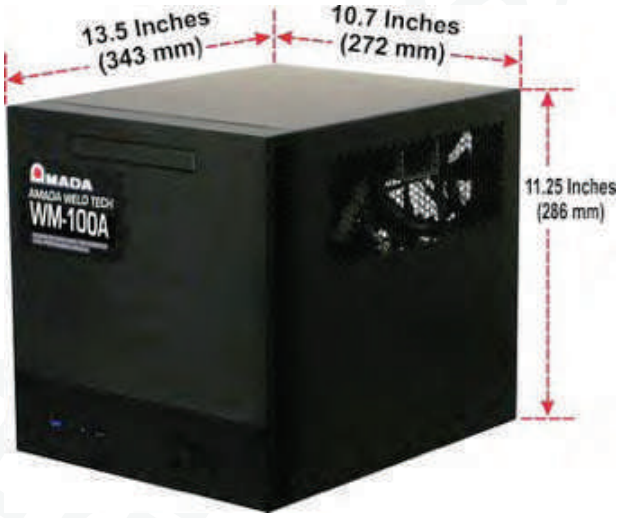
Input Power

Separate input power is required for the **Data Processing Module**, **Sensor Interface Module**, and Computer Monitor (display).

Data Processing Module

Input Power requirement: 100-240 VAC / 9 amps - 4.5 amps/50-60Hz/Single phase

The **Data Processing Module** includes an input power cord with a three prong plug (phase, neutral, ground)



Sensor Interface Module

Input Power Requirement: 100-240 VAC, 3.2 amps - 1.6amps, 50-60Hz, single phase

The **Sensor Interface Module** includes an input power cord with a three prong plug (phase, neutral, ground)

CHAPTER 2: INSTALLATION AND SETUP

Monitor, Keyboard & Mouse

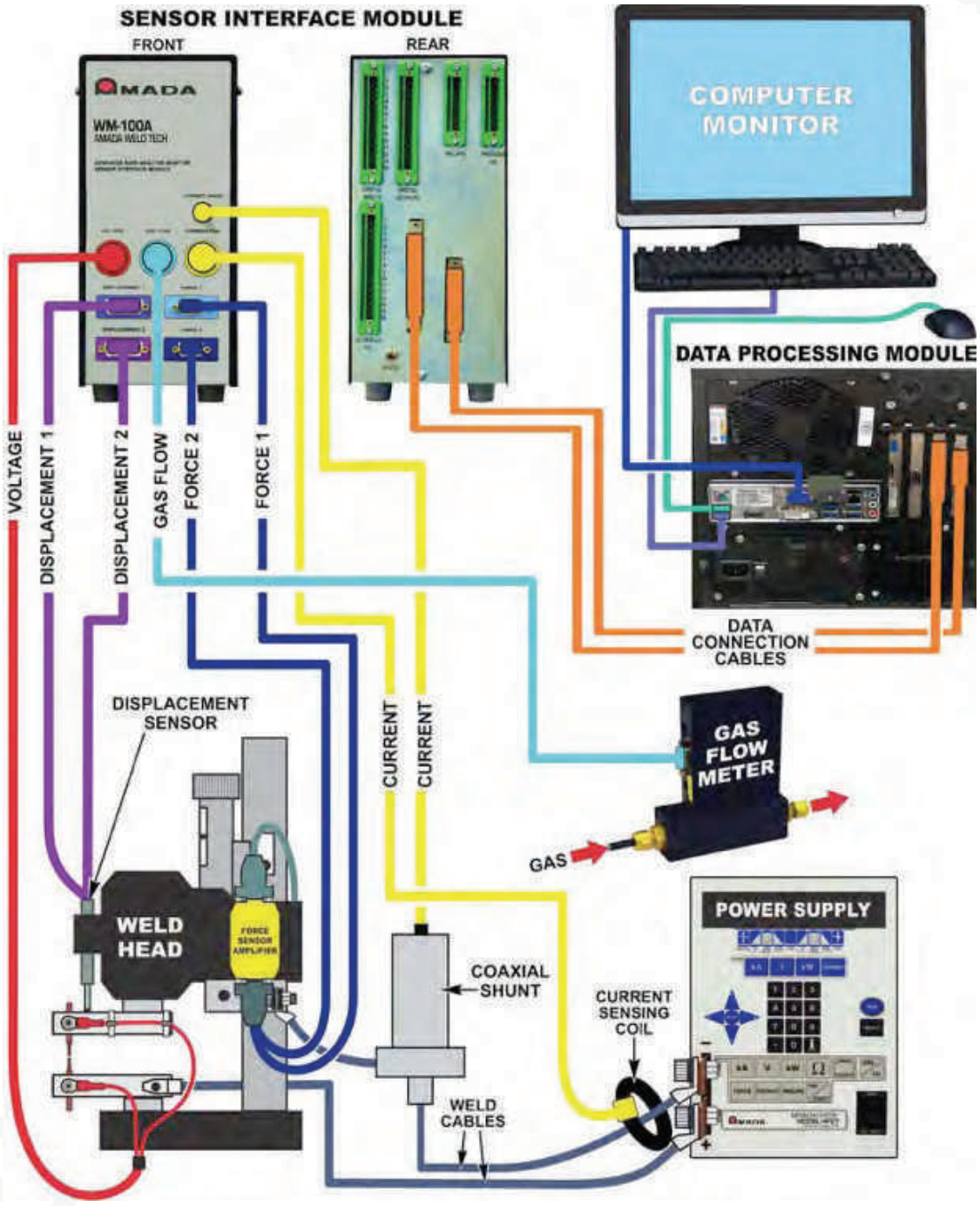
Input Power Requirement: 100-240 VAC, 1.0 amp, 50-60Hz, single phase.

The Monitor includes an input power cord with a three prong plug (phase, neutral, ground).

NOTE: Monitor size is approximately 21" wide x 17" high x 9" deep (530mm x 430mm x 230mm). Size of the monitor may vary.

CHAPTER 2: INSTALLATION AND SETUP

Section II: System Connections



CHAPTER 2: INSTALLATION AND SETUP

The proceeding diagram shows the connections between the **Data Processing Module**, **Sensor Interface Module**, Computer Monitor, Keyboard and Mouse of the **Monitor**. The diagram also shows the connections between the Monitor and Welding Power Supply, Weldhead, Shunt Resistor, and an Alternate Sensor (gas flow meter).

CAUTION

To avoid damaging the connector pins, take extra care when plugging these connectors to the **Data Processing Module** and **Sensor Interface Module**. Insert plugs properly into their mating connectors.

All connections between the Monitor and connecting equipment should be secure. The Data Connection cables between the **Data Processing Module** and **Sensor Interface Module** have high pin density connectors. The **Data Processing Module** and **Sensor Interface Module** should be placed so that the connectors on Data Connection cables are coming straight out the back of the **Data Processing Module** and **Sensor Interface Module** and are not exerting side loads on their mating connectors.

CAUTION

The body of the displacement sensor and its tip must be insulated from the welding current. Failure to provide this insulation will result in electrical noise and erroneous parameter readings.

CHAPTER 2: INSTALLATION AND SETUP

Section III. Basic Functions

Power Up

Once all of the connections have been made as described in *Section II* of this chapter, the unit can be powered-up.

1. First, remove any USB Flash Drives that may be plugged into the **Data Processing Module.**
2. Press the power ON button on the front of the computer monitor.
3. Push the rocker power switch on the back of the **Data Processing Module** to the ON state.
4. Press the circular power on button on the front of the **Data Processing Module**. The Monitor will start and when bootup is completed, the ***Windows 7***® Desktop will be displayed on the computer monitor. You will see an WM-100A shortcut on the monitor desktop.
5. Double click the icon to start the Monitor program. The Monitor software will start and display the **Main Menu** ready for sign on. Follow instructions in *Chapter 3* to login and the **Main Menu** will be ready to use.

CHAPTER 2: INSTALLATION AND SETUP

Main Menu Screen after Login

Shutdown

Click on **Shutdown** button on the **Main Menu** to exit and close the Monitor application. To shutdown *Windows 7*® and power down the **Data Processing Module**, click on the **Start** button in the lower left corner of the screen to access the *Windows 7*® **Shutdown** button, click the **Shutdown** button and *Windows 7*® will close and the **Data Processing Module** will turn off.

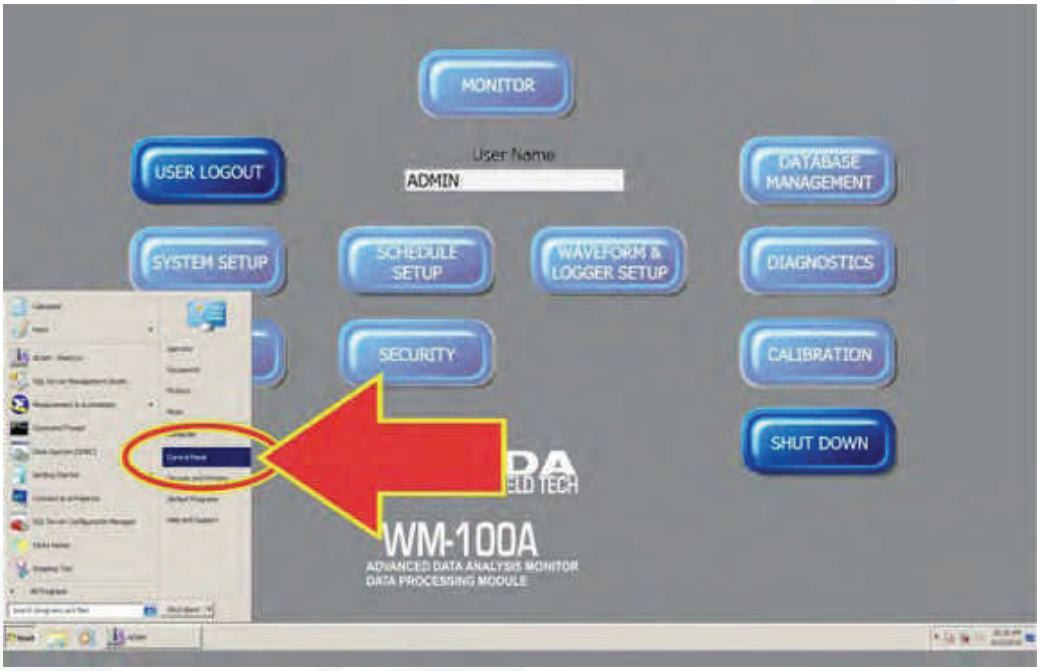
CHAPTER 2: INSTALLATION AND SETUP

Section IV. Windows Setup

Disable Automatic Updates for *Windows 7*®

To ensure that the Monitor functions are not interrupted during automatic *Windows 7*® updates, automatic updates should be disabled in the **Windows 7 Setup**. To disable, follow the following instructions

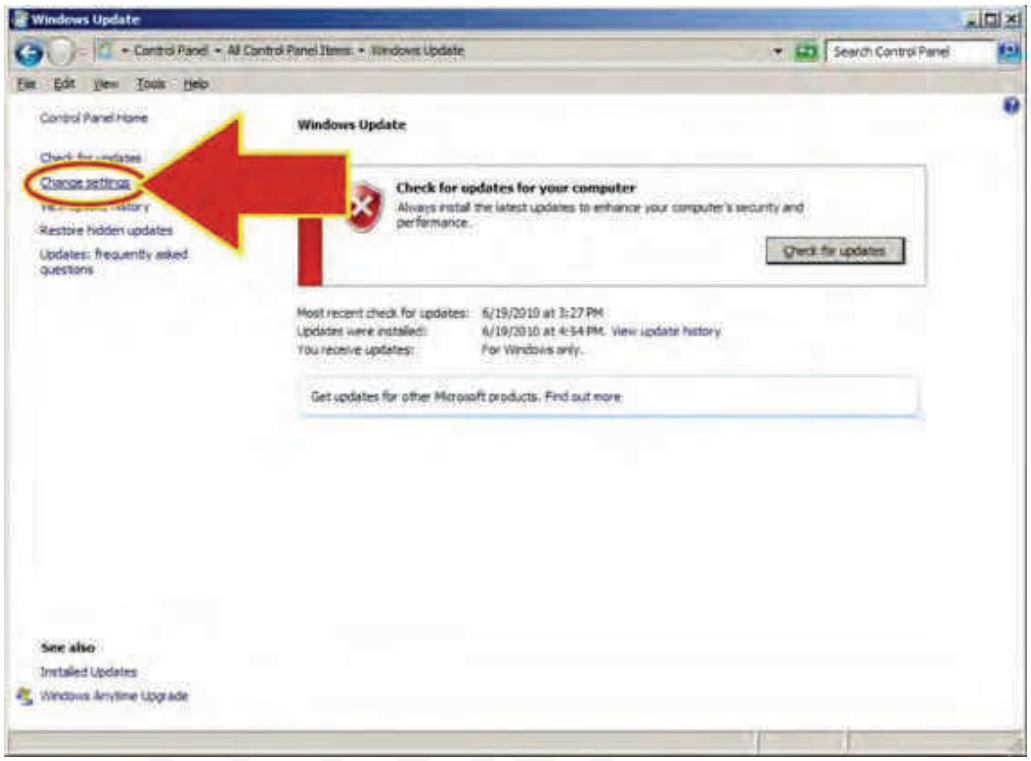
1. Click the *Windows 7* **Start** button to view the **Start Menu**, then click on the **Control Panel** option.



2. When the **Control Panel** window opens, click the **Windows Update** selection from the **Control Panel** window.

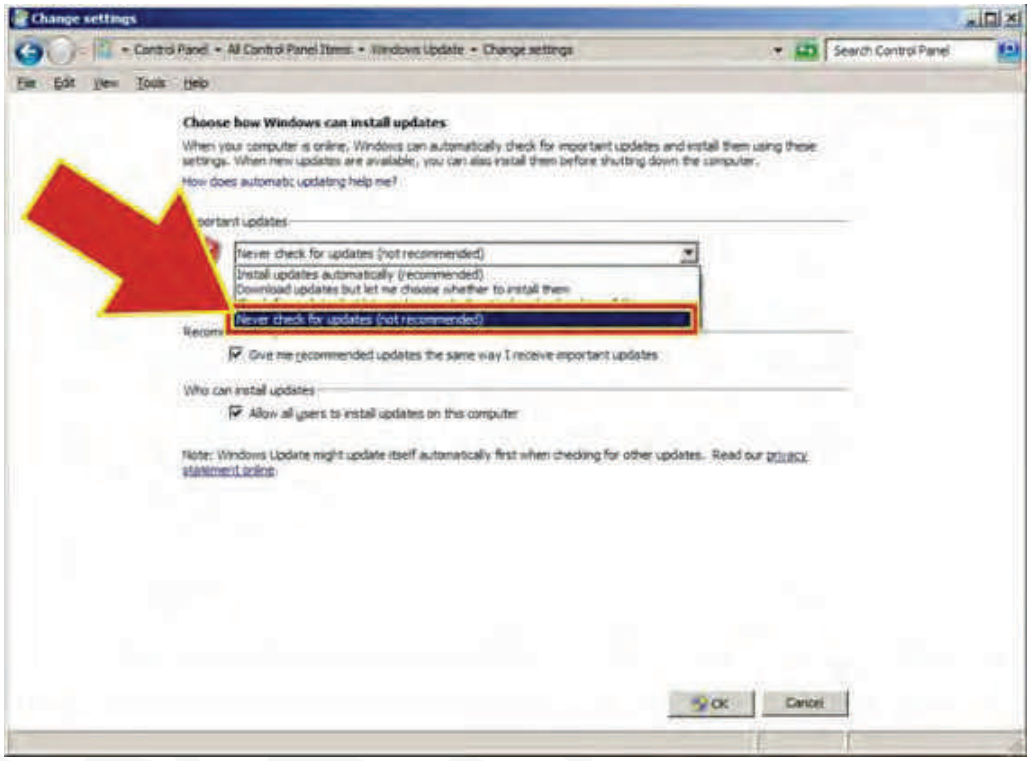
CHAPTER 2: INSTALLATION AND SETUP

3. When the **Windows Update** screen of **Control Panel** opens, select the **Change settings** link located on the left side of the screen.

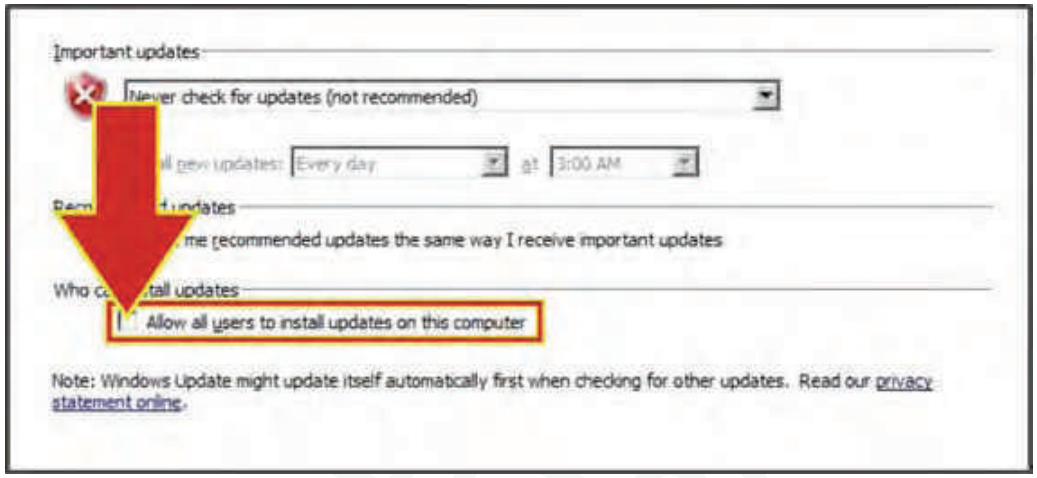


CHAPTER 2: INSTALLATION AND SETUP

4. When the **Change settings** screen displays, a pull-down menu which will allow you to **Choose how Windows can install updates**. Select the option **Never check for updates (not recommended)** to disable *Windows*® updates.



5. Also on the **Change settings** screen, the check box under **Who can install updates** should be unchecked as shown in the following screen. When you have made sure there is no ✓ in the box, select **OK** to save setting and exit **Control Panel**.



Power Options for Computer and Computer Monitor for *Windows 7®*

Windows 7® provides power saving setting for the computer and computer monitor. The Monitor should be set so that it is ***never*** turned off by *Windows 7®*

In addition, the **Data Processing Module** should be set so that it is ***never*** put into sleep mode.

CHAPTER 2: INSTALLATION AND SETUP

Section V. Activating the Minitab Software License

If the Minitab license has not already been assigned to the purchaser of the Monitor, the license must be activated in order to use the SPC and Minitab features of the **Monitor.**

To determine if the Minitab license is activated, Click on the Minitab icon on the ***Windows 7***® Desktop. If a screen referencing Activation of Minitab appears, then the license is not activated. If a Minitab user screen appears, then the license has already been activated.

To activate the Minitab license, you will need the Minitab CD that was shipped with your Monitor and a USB flash drive. To activate, complete the following steps:

1. Insert a USB flash drive into one of the USB ports on the front of the Processing Module**.**
2. Click the **Minitab** icon on the ***Windows 7***® Desktop
3. Select **Activate Minitab** with a product key. Click **NEXT**
4. Enter the product key that is on the packaging holding the Minitab CD. Click **NEXT**
5. Select **File Activation**. STEP 1: Click Generate File. A file with a .c2V extension will be generated. Save file to a USB flash drive.
6. Call Minitab Technical Support at 814-231-2682. Inform the technical representative that you want to activate a Minitab license and that you have a .c2v file. You will need to tell the technical representative the Product Key entered in Step 4. The technical representative will give you an email address.
7. Send an email to the address with the .c2V file along with the following customer information:
   - Customer Contact Name
   - Contact email address
   - Company Name
   - Company address
   - Phone Number

   The technical representative will email you a .v2c file. Save the .v2c file to a USB flash drive.
8. Put USB flash drive with the .v2c file into WM-100A computer. Do ***not*** do STEP 2.
9. Click **Browse** to find the .v2c file on the USB flash drive.
10. Click **OPEN**. You will get the message "**successfully applied**…" Click **OK**. Minitab will start.
11. Close Minitab.

    NOTE: The .v2c and .c2v files do ***not*** need to be saved.

Section VI. Third Party Software

CAUTION

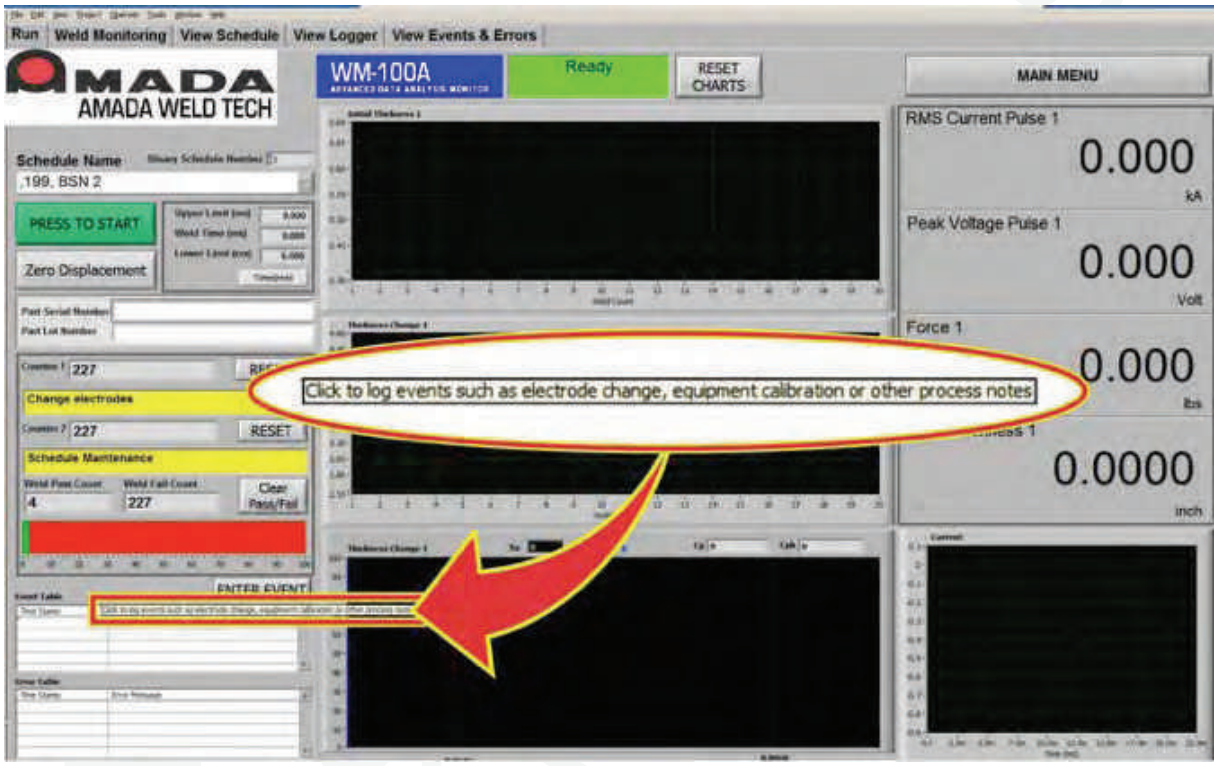
Installing third-party software onto the Monitor's **Data Processing Module** may cause Monitor errors and slow Monitor performance.

To avoid software conflicts, it is recommended that you do ***not*** install ***any*** additional software onto the **Data Processing Module**. In particular, virus scanning software may cause unpredictable Monitor behavior.

CHAPTER 2: INSTALLATION AND SETUP

Section VII. Help

The Monitor provides help messages integrated into the Monitor program. Many of the active elements in the program contain help messages. Hold the mouse over an active element, such as a click button, for a couple seconds to display the help message for that active element in a pop up message window.



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Chapter 3
Monitoring

Section I. User Login/Logout & Shutdown

The Monitor is shipped from the factory with a W*indows 7*® username of "operator" with a password of "password". This username has access to the **Monitor** computer and its W*indows 7*® functions. This W*indows 7*® username has security permissions outside the **Monitor** application, following W*indows 7*® functionality. There are separate usernames and passwords assigned within the **Monitor** application to control security when working inside the **Monitor** application. Users are encouraged to establish additional W*indows 7*® usernames to maintain appropriate security for their environments.

Login to the Monitor

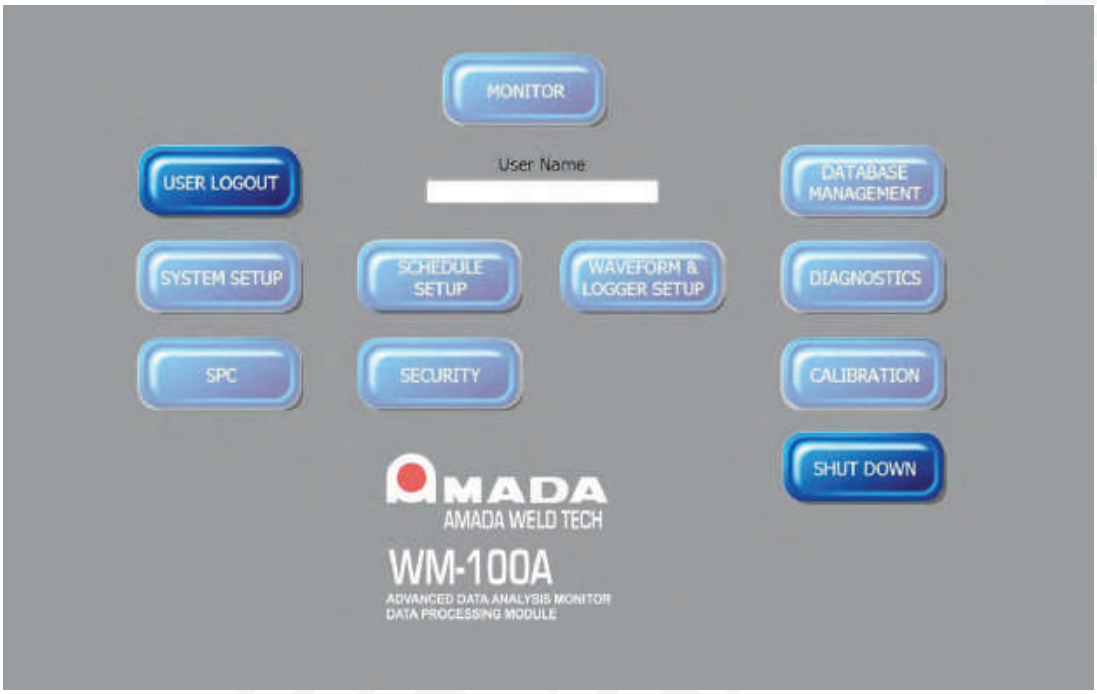
1. Double-click on the **WM-100A** icon to start the **Monitor** application and to display the **USER LOGIN** screen.

   NOTES:

   - The **USER LOGIN** button is a "Push ON/Push OFF" button. When you push the button to log in, the button display will revert to **USER LOGOUT**.
   - Do ***not*** have a USB flash drive in one of the processing modules' USB ports, otherwise a W*indows 7*® message will appear requesting user to remove USB flash drive.

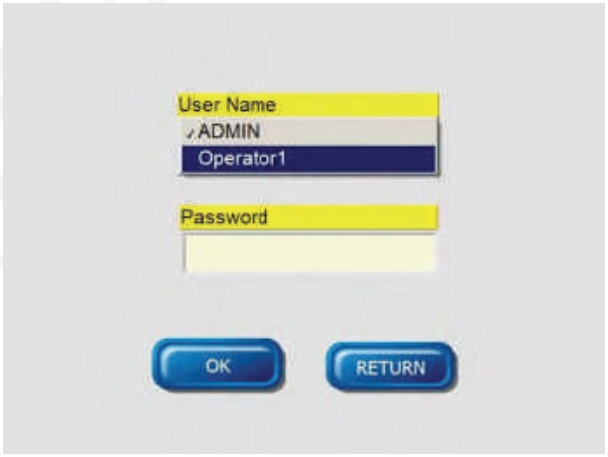
2. Select the **USER LOGIN** button to login to the system.

CHAPTER 3: MONITORING



3. A window will open which allows you to select a user name and password. Select your user name from the drop down list in the **User Name** box.

   IMPORTANT NOTE: A new **Monitor** shipped from the factory is provided with one user name and password, which are both "**admin**". This user name has level 4, Administrative Level, security. Users are encouraged to create their own user names and delete the "**admin**" user to maintain system security.



4. Click the mouse pointer in the **Password** text entry box. Then, enter your password using the mouse pointer and the pop up keyboard.

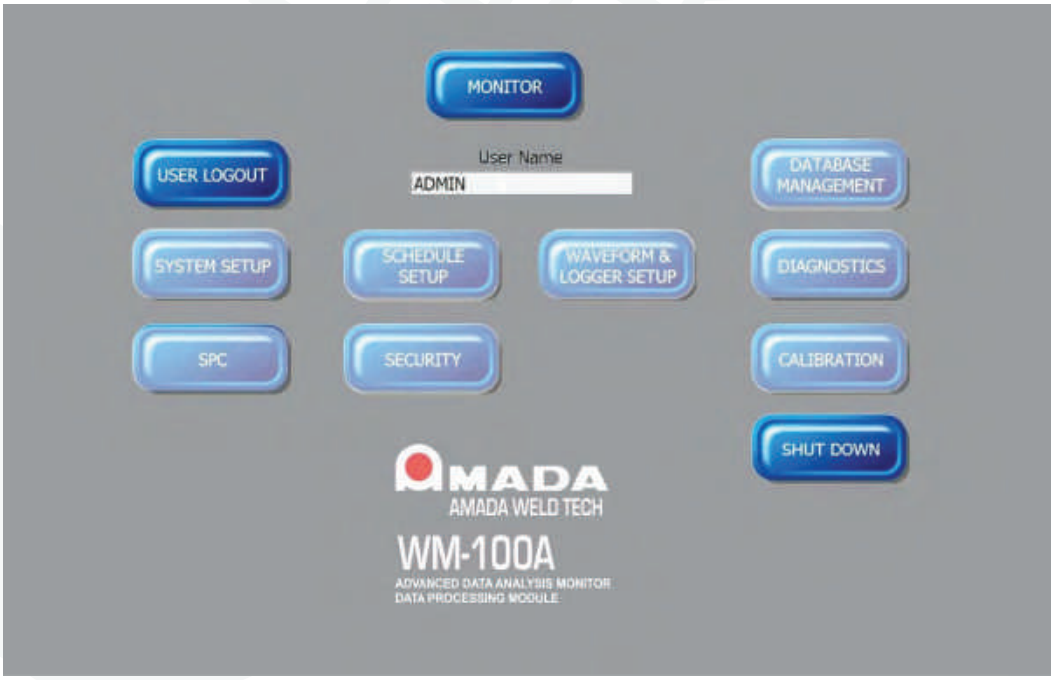
CHAPTER 3: MONITORING

5. Click on **OK** on the keyboard when you're finished entering a password. The screen will appear as shown to the right.

NOTE: If your **Password** is not correct, an "**invalid password**" message will be displayed. Click **OK**, then click on the password text box again to re-enter your password.

When you see that your **User Name** and **Password** have been entered, click on **OK** button to get the **Main Menu** shown below.

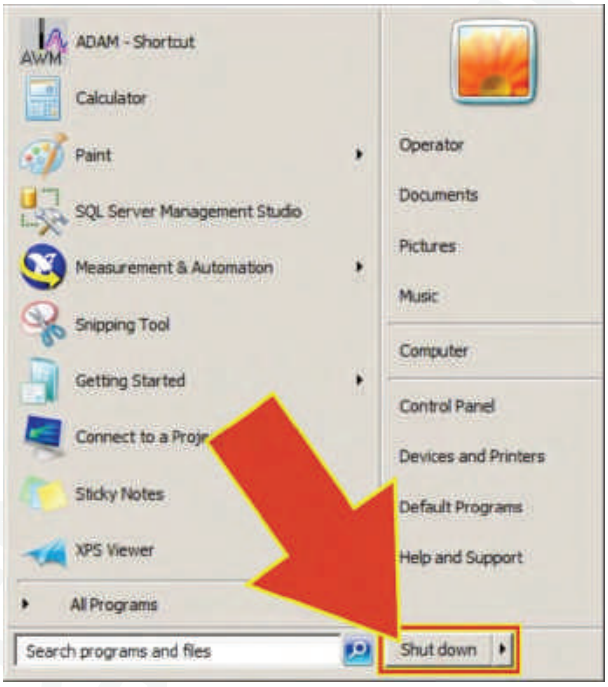
The buttons on the **Main Menu** screen with be either **dark blue** or **light blue** depending on the particular user's security level. A user has access ***only*** to the functions behind the **dark blue** buttons.



CHAPTER 3: MONITORING

Shutdown

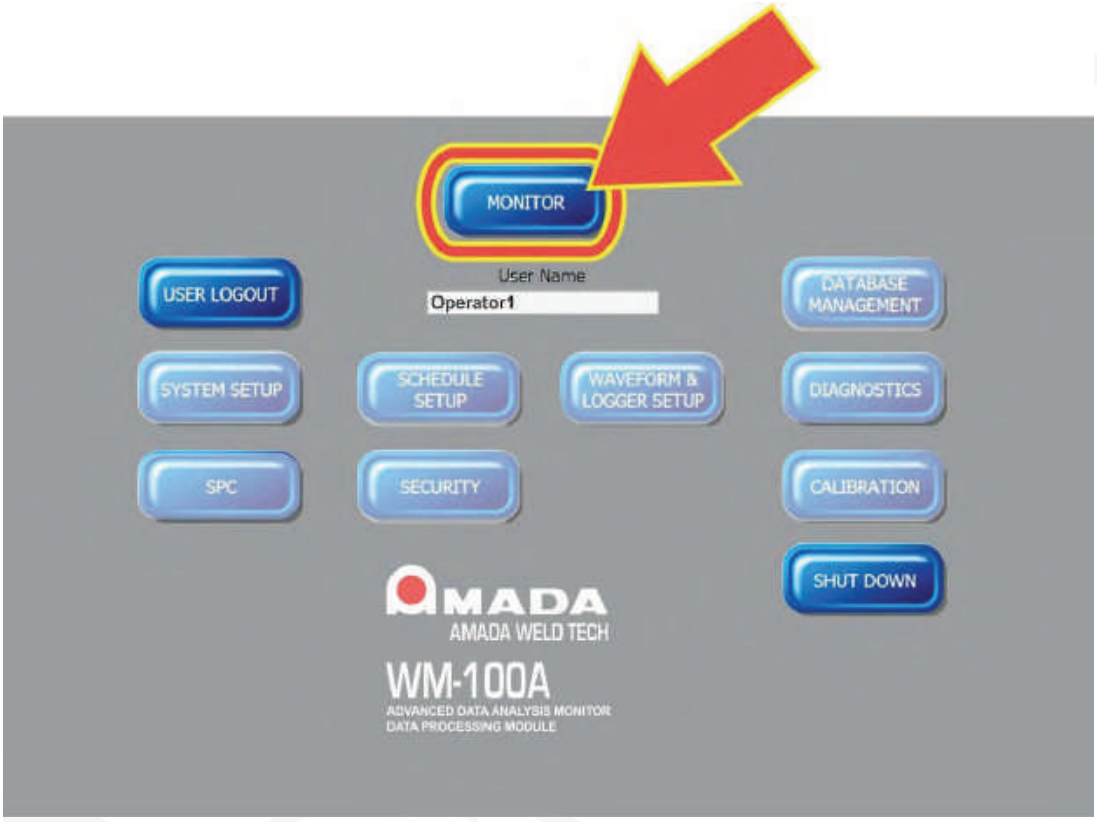
1. From the **Monitor** Main Menu, click on **Shutdown** button to close the **Monitor** application.
2. From the *Windows 7*® desktop, click on the **Start** button in the lower left corner of the screen to access the **Shutdown** button to close *Windows 7*® and power down **Data Processing Module**,



3. Click on the **Shutdown** button. The *Windows 7*® application will close and the **Data Processing Module** will turn OFF.

Section II. Monitor Section: Run Screen

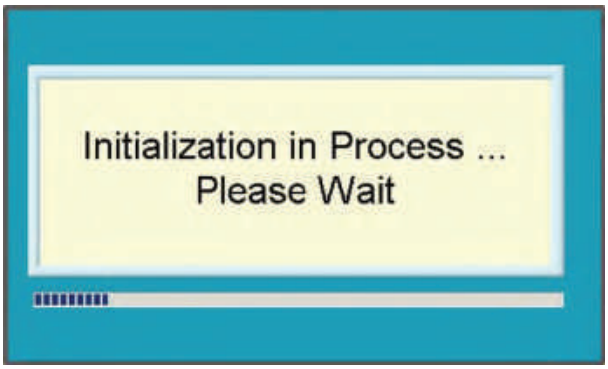
To access the **Run** Screen, click the **Monitor** button on the main menu.



Window Tabs

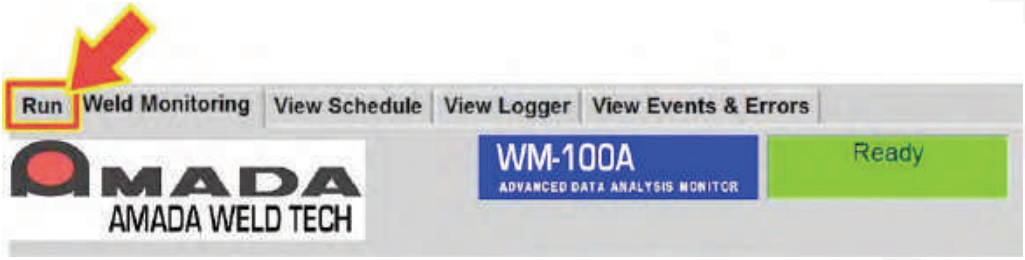
At the top of the **Monitor** screen there are five tabs used to access additional monitor screens: **Run, Weld Monitoring, View Limits, View Logger,** and **View Events & Errors**. When you click the **Monitor** button the **Run** screen will display.

Prior to full display of the **Run** screen, the **Monitor** will initialize the monitoring functions by loading a schedule, loading data, setting up internal monitoring functions and performing the daily and weekly database maintenance if this maintenance was not performed when last scheduled because the Monitor was turned off or a screen other than the **Monitor** screen was displayed at the time of the scheduled database maintenance. The Monitor will display the message box on the right while it is initializing. Once the initialization is complete, the message box will no longer be displayed.



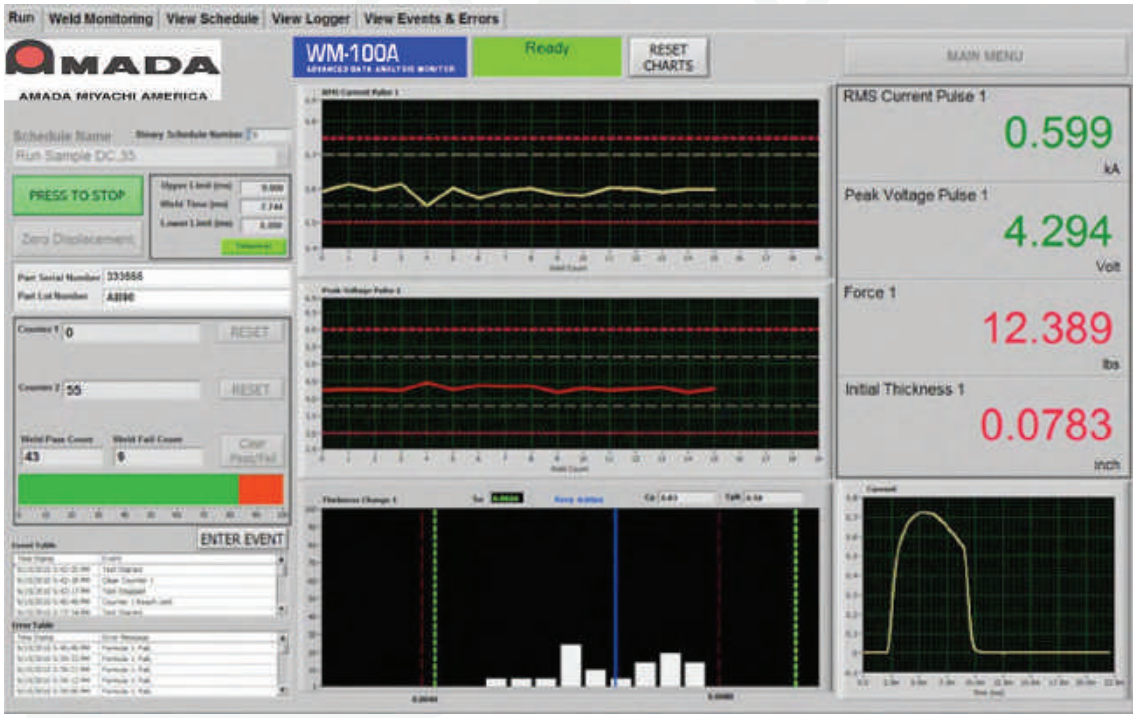
CHAPTER 3: MONITORING

Clicking the **Run** Tab when any of the other four tab screens are displayed will display the **Run** Screen.



The **Run** screen is a very informative display of real time welding information including actual process figures, process results, historical trends, and error information. The **Run** screen is particularly useful for production monitoring.

Run Screen

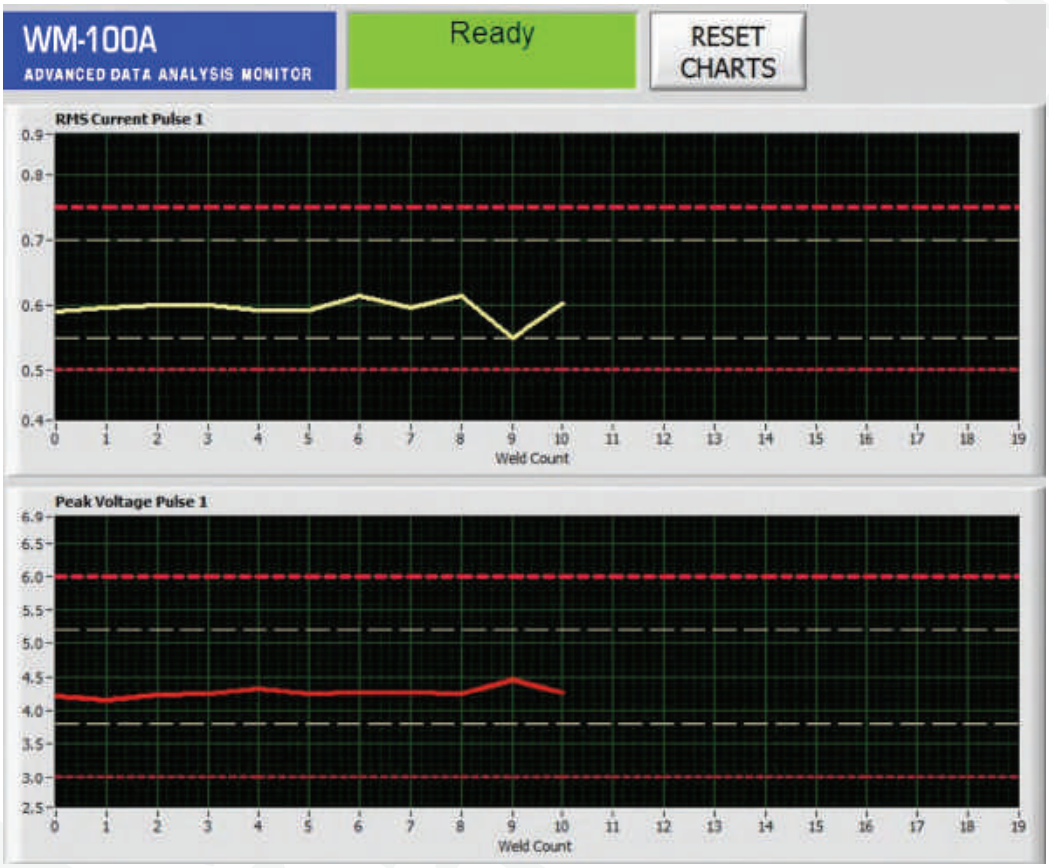


When you access the **Run** Screen, the Monitor will load historical data into the **Run Charts** and **Histogram** for the loaded Schedule from the past 24 hours or since the **RESET CHARTS** button was last pressed if it was pressed within the past 24 hours.

If the **Run** Screen is presently displayed and you select a different Schedule, the **Run** Screen will ***not*** load historical data. In the case where you select a different Schedule, exiting the **Run** Screen to the **Main Menu** and then returning to the **Run** Screen will load the historical data into the **Run Charts** and **Histogram**.

CHAPTER 3: MONITORING

Real Time Graphs



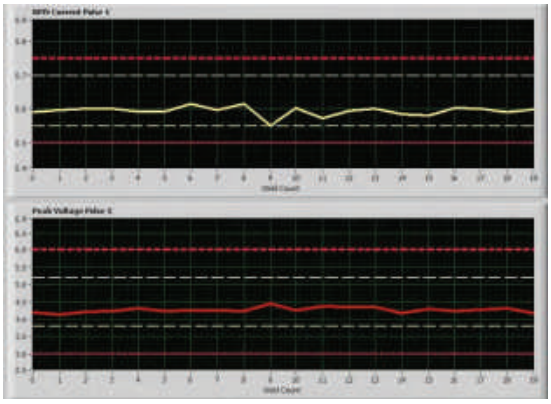
Run Charts

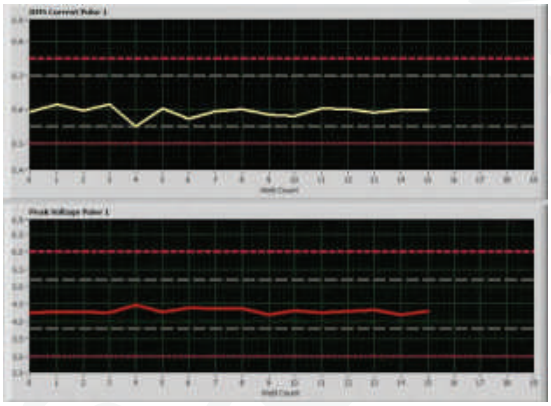
There are two run charts which each plot a user-selected parameter. The run charts are updated after every weld. The actual measured value line will not begin to be plotted until the first two welds are completed.

The upper and lower **Limits** from the **Schedule** are shown as **red** dashed lines and the upper and lower Warnings are shown as dashed **yellow** lines. The Y axis is scale automatically by the values chosen for the upper and lower Limits. The Y axis will be scaled such that roughly 15% of the Y axis will be above the upper Limit and 15% of the Y axis will be below the lower Limit.

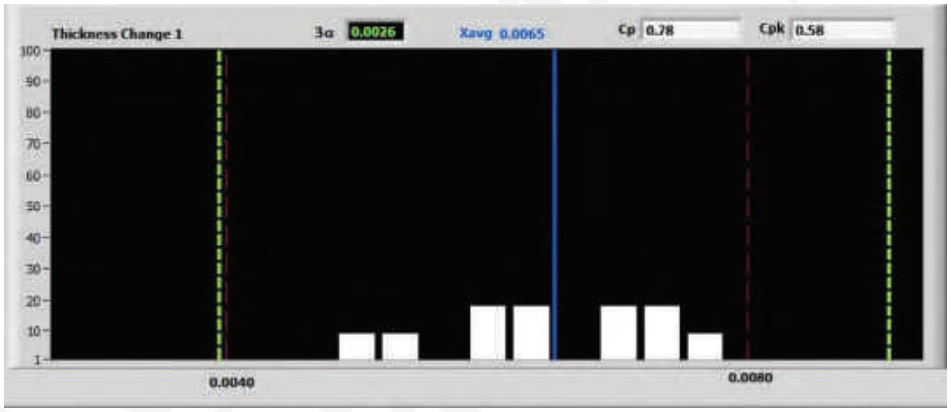
When the **Run Chart** plot has reached the right side of the chart, the plotted line will automatically move approximately 25% to the left on the **Run Chart** after the next weld. The plotted line will then continue plotting with each weld.

CHAPTER 3: MONITORING





Histogram



There is a one histogram which plots a user-selected parameter. The histogram contains **grey** vertical columns which represent the distribution of the values of the user-selected parameter. The **grey** vertical columns are updated after every weld. The Y axis units are % and represent the percent of the total number of data points presently displayed in the histogram.

There are **red** vertical dashed lines placed at 20% and 80% on the X axis. The **red** vertical lines represent the upper and lower Limits set in the Schedule. If the Schedule does not have upper and lower Limits, these **red** vertical lines will be set based on the setting in the **Higher Range** and **Lower Range** boxes on the **Run Screen** setup screen in **Schedule Setup**.

An average value of the parameter assigned to the histogram is recalculated after every weld and is displayed at the top of the histogram in **blue** font. A solid **blue** vertical line is plotted in the histogram representing the average value. The **blue** vertical average line is repositioned after every weld.

A sigma value is recalculated after every weld and displayed at the top of the histogram in **green** font. There are two **green** vertical dashed lines which represent the upper and lower sigma ranges centered on the average value. The green vertical sigma lines are repositioned after every weld.

Values for Cp and Cpk are calculated and displayed at the top of the histogram after every weld. The equations used for calculating Cp and Cpk are shown on the next page.

Calculations for Cp and Cpk:

$$Cp = \frac{\text{(Maximum Limit – Minimum Limit}}{\text{6s Actual}}$$

$$Cpk = \frac{\text{(Maximum Limit – Mean)}}{\text{3s}}$$

OR

$$Cpk = \frac{\text{(Mean – Minimum Limit)}}{\text{3s}}$$

Where: s is actual sigma and Mean is average of the data points contained in the histogram.

The histogram will accumulate data points up until the number of data points equals the user-set value for the number of data points in the **Run Screen Setup** for the Schedule. After the number of data points equals the user-set value, the histogram will maintain the histogram with the user-set number of data points using a first in and first out method. The average, sigma, Cp, and Cpk values are also calculated based on this same first in and first out method.

Process Parameters and Waveform

Large Parameter Display

Four user-selected parameters, as setup by the user in the Schedule, display on the right side of the **Run** screen in large font. The parameter values displayed are updated after every weld.

If there are no limits or warnings set for a particular parameter, the actual value will be displayed in **black** font.

If there are **Limits** or **Warnings** set for the particular parameter, the actual value will be displayed in **green** font if the value is within **Limits** and **Warnings**, in **yellow** font if the value is within **Limits** but not **Warnings**, and in **red** font if the value is outside of Limits.

Waveform

One user-selected waveform, as setup by the user in the Schedule, is displayed in the lower right of the **Run** screen. The waveform is re-plotted after every weld.

CHAPTER 3: MONITORING

Schedule, Counters, Events, Errors

Schedule Name (top, left). This box displays the Schedule that is presently loaded for monitoring. This field includes the **Schedule Name** followed by the **Schedule Number**. To select a new schedule, click on the **Schedule** box to display a list of saved schedules. Clicking on one of the saved schedules shown in the list will load the clicked schedule for monitoring.

Binary Schedule Number. This is the binary number associated with the loaded schedule. The Binary Schedule Number is for display only and is updated when a different Schedule is loaded.

PRESS TO START/PRESS TO STOP Button. The Monitor does not start monitoring until you press this button. When the **PRESS TO START** button is pressed, it will immediately change to **PRESS TO STOP** and the **Monitor** will then be actively monitoring for a weld trigger. When you wish to stop monitoring, press the **PRESS TO STOP** button. The button will then switch back to **PRESS TO START** and the **Monitor** will no longer be monitoring.

Upper Limit This shows you the upper limit of weld time that you set in the loaded Schedule.

Weld Time This shows you the actual time of the last weld performed.

Lower Limit This shows you the lower limit of weld time that you set in the loaded Schedule.

The **Time** (ms) indicator will be shown in green if the most recent weld time was within its limits and will be shown in red if the most recent weld time was outside its limits.

Zero Displacement Button. This is located under the **Press To Start/Press to Stop** Button. Pressing this button will tare the displacement sensors and set their current position to zero. This button is only functional when the **Monitor** is ***not*** in **Monitoring** mode.

Part Serial Number This is located under the **Zero Displacement** button. Enter a **Serial Number** in this box if you want the serial number to be recorded in the record for the next weld to be captured by the Monitor. Refer to *Chapter 1* for additional information on the part serial number functionality.

Part Lot Number This is located under the **Part Serial Number** box. Enter a **Lot Number** in this box if you want the lot number to be recorded in the record for the next weld to be captured by the Monitor. Refer to *Chapter 1* for additional information on the lot number functionality.

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Counter 1. Displays the number of welds made since the counter was last reset.

Counter 2. Displays the number of welds made since the counter was last reset.

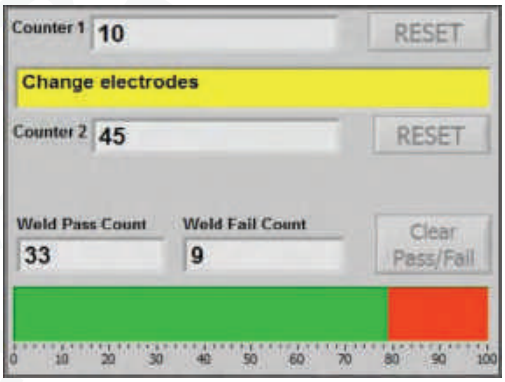
RESET Buttons. Pressing these buttons when the Monitor is not in **Monitor** mode will set **Counter 1** or **Counter 2** back to zero.

Weld Pass Count Displays how many welds were within the user-set limits since the **Clear Pass/Fail** counter was last reset.

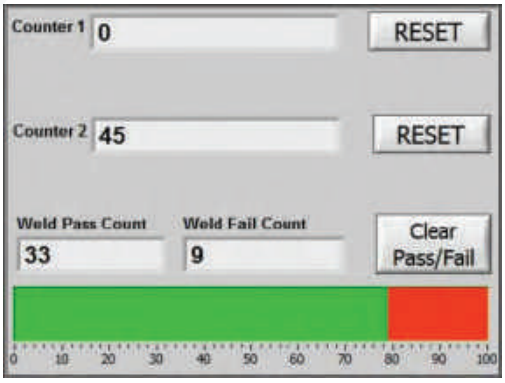
Weld Fail Count Displays how many welds were outside of the user-set limits since the **Clear Pass/Fail** counter was last reset.

Weld Count Graph (bar) The **green** part of the bar shows the proportion of welds passed, the **red** part shows the proportion of welds failed.

Clear Pass/Fail Button. Pressing this button when the Monitor is not in Monitor Mode will reset the **Weld Pass Count** to zero, reset the **Weld Fail Count** to zero, and clear the **Weld Count Graph (bar)**.



The screen to the right shows **Counter 1** after its **RESET** button was pressed.



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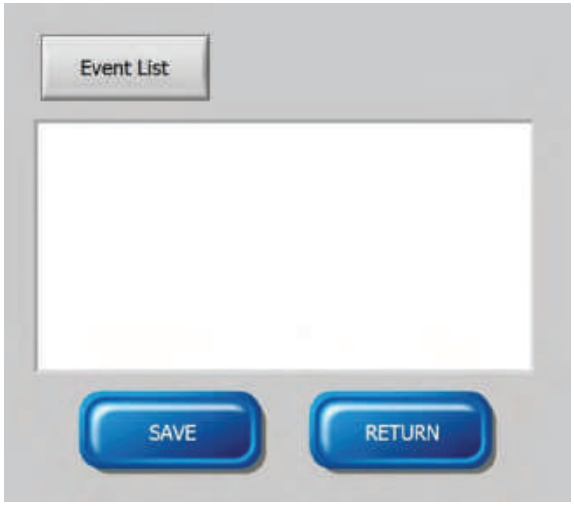
Entering Events

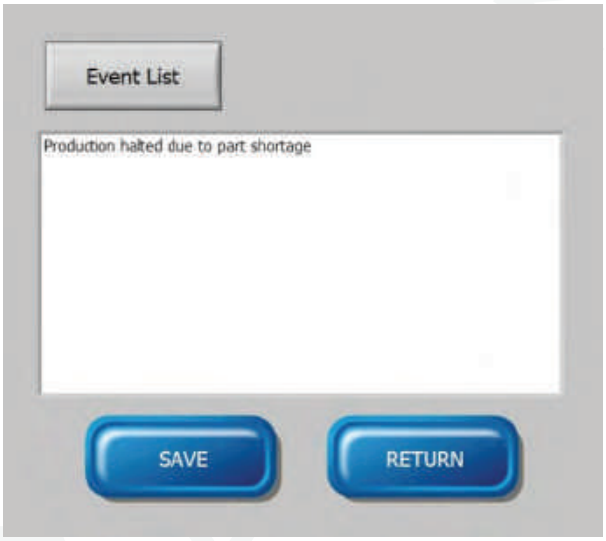
The **ENTER EVENT** button enables you to log text in the database. The text is time stamped with the time when you log an event. You can select events from a predefined list of events or you can enter text with the keyboard. You can log events such as an electrode change, equipment calibration, or other process note.

1. To enter an event, click on the **ENTER EVENT** button. The **Event List** text box will appear.

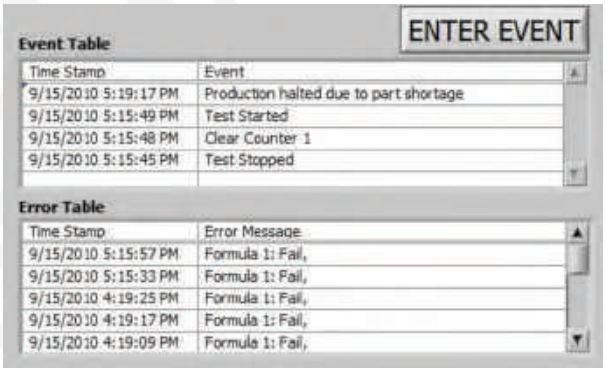


CHAPTER 3: MONITORING

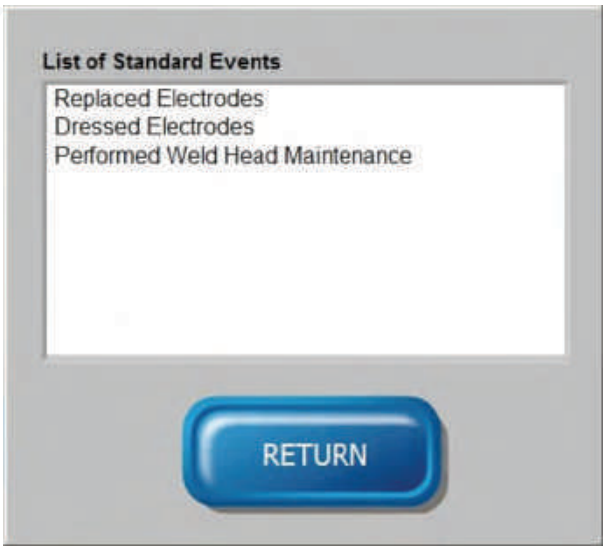
2. Type text in the text box with information that you want to log, then press **SAVE**.



NOTE: When you **SAVE** your event it will display at the top of the **Event Table** list as shown on the right.



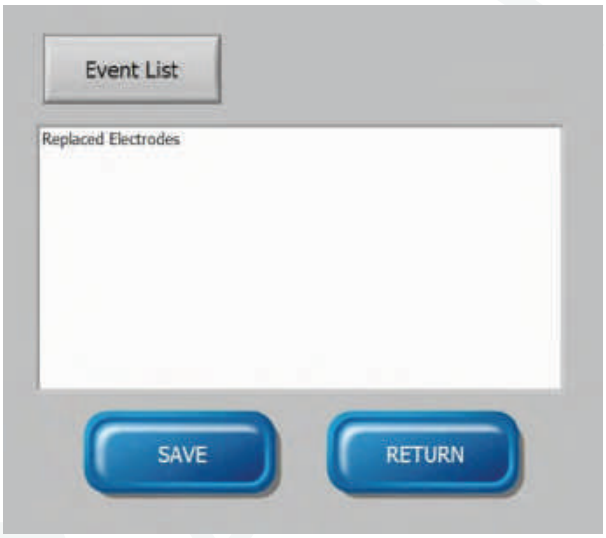
3. To choose from a list of predefined events, click on the **EVENT LIST** button to display a list such as the one shown to the right. You define the **Standard Events** shown in this list in the **System Setup** Screen.
4. Select the event you want, such as **Replaced Electrodes**, then press **RETURN**.



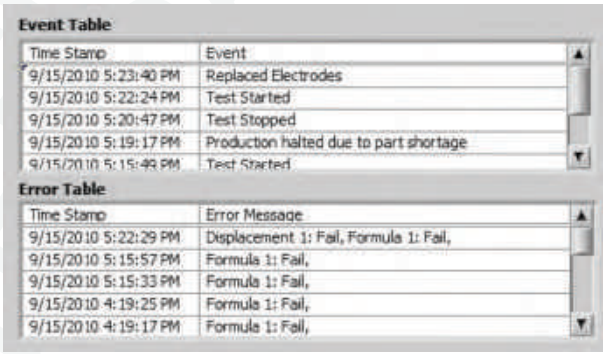
CHAPTER 3: MONITORING

After you have selected an event it appears in the **Events** text box.

5. Click **SAVE** if you wish to save the event information.



6. When you click **SAVE** the event will now appear at the top of the **Event Table** list.

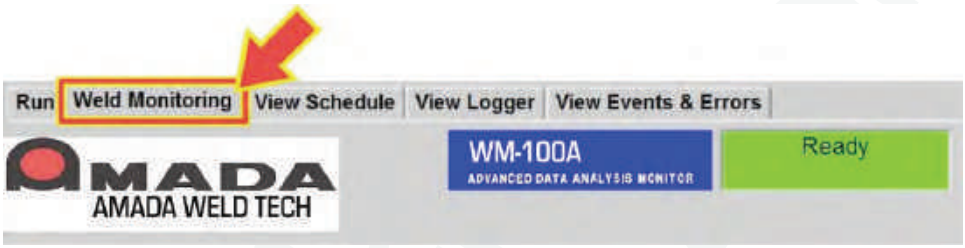


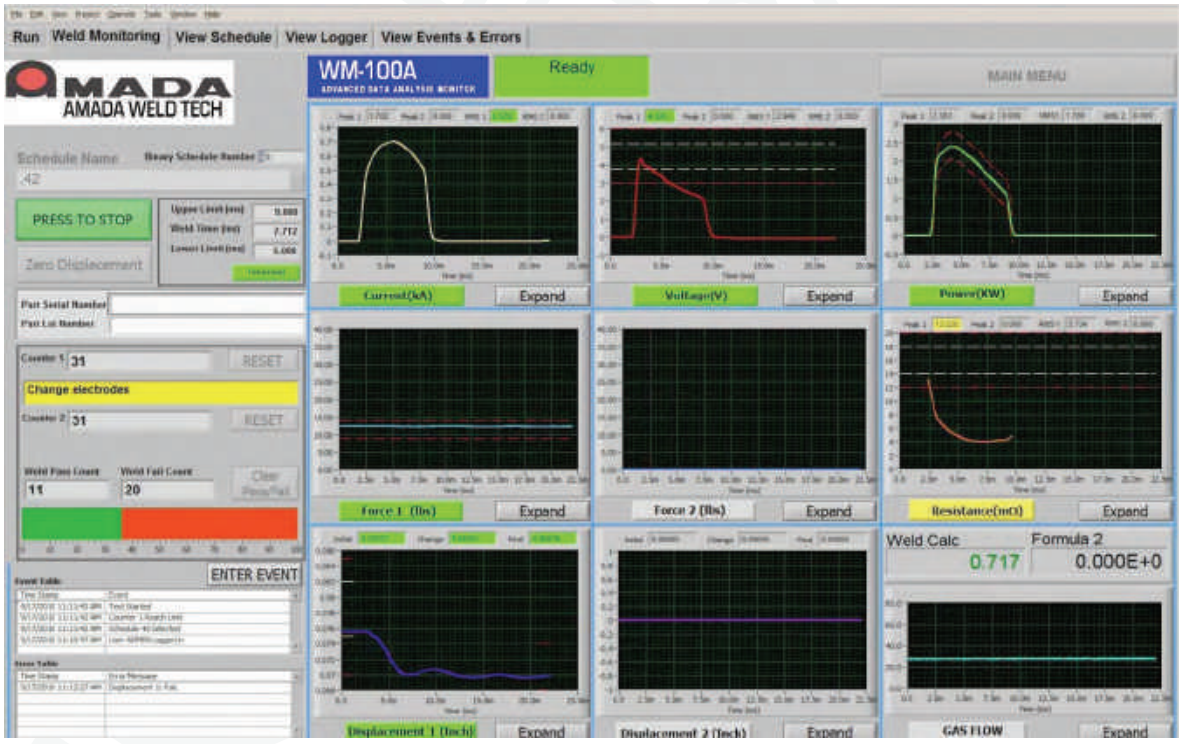
Section III. Monitor Section: Weld Monitoring Screen

Weld Monitoring Screen

The **Weld Monitoring** Screen displays waveforms of the nine process variables, all at the same time, as well as other critical information including weld results and error information. This screen is particularly useful for process development and process troubleshooting.

To access the **Weld Monitoring** Screen, click the **Weld Monitoring** Tab after having pressing the **Monitor** button on the main menu.





The left side of the **Weld Monitoring** screen, comprising approximately a quarter of the screen area, is the same as the left side of the **Run** Screen. Refer to *Section II* of this Chapter for information on the functions on the left side of this screen.

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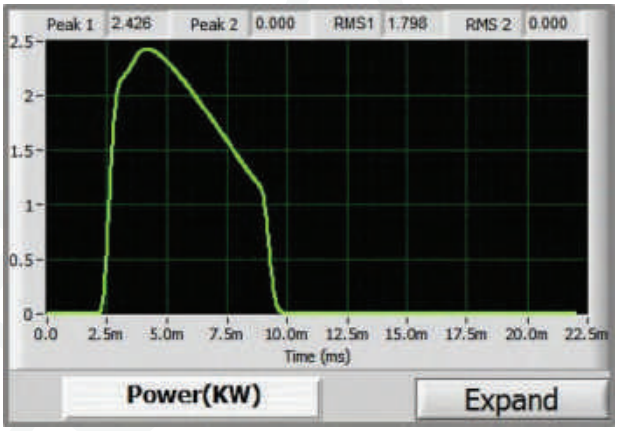
The right side of the **Weld Monitoring** screen displays nine waveforms and the results of the two user defined formulas. The nine waveforms and two formulas are updated after every weld with the data from the most recent weld.

The waveforms for **Current**, **Voltage**, **Force 1**, **Force 2**, **Displacement 1**, **Displacement 2** and **Alternate Sensor** (Gas Flow) are all measured values. The waveforms for **Power** and **Resistance** are calculated. The two **Formulas** are also calculated.

Current, Voltage, Resistance, Power

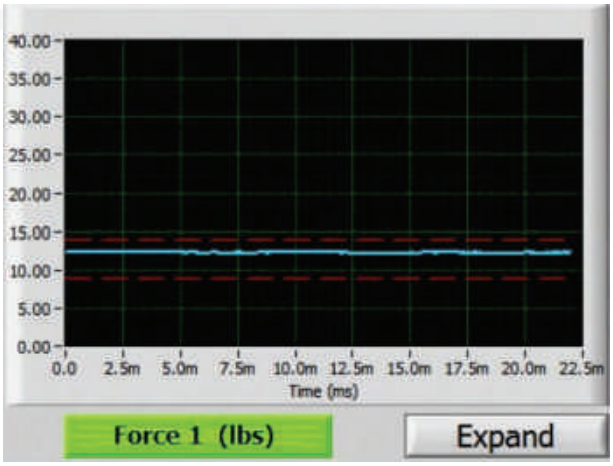
The graphs for **Current**, **Voltage**, **Resistance**, and **Power** all show similar information as shown in the Power graph show to the right. The waveform and the numeric figures for the actual **Peak** and **RMS** values are shown. If the weld is a single pulse weld, only the **Peak 1** and **RMS 1** display boxes will show values. If the weld is a dual pulse weld, **Peak 1** and **RMS 1** apply to the first pulse and **Peak 2** and **RMS 2** to the second pulse.



REFERENCE NOTE: The X axis scale is automatically scaled in fixed increments by the **Monitor**. Thus the actual waveform may not extend to the far right edge of the graph. For example, the user-set the pre and post trigger time for the waveform shown to the above to a total of 22 mseconds, but the Monitor scaled the X axis to the fixed size of 22.5 mseconds.

Force 1, Force 2, Alternate Sensor

The graphs for **Force 1**, **Force 2**, and **Alternate Sensor** are displayed as waveforms without any numeric data.



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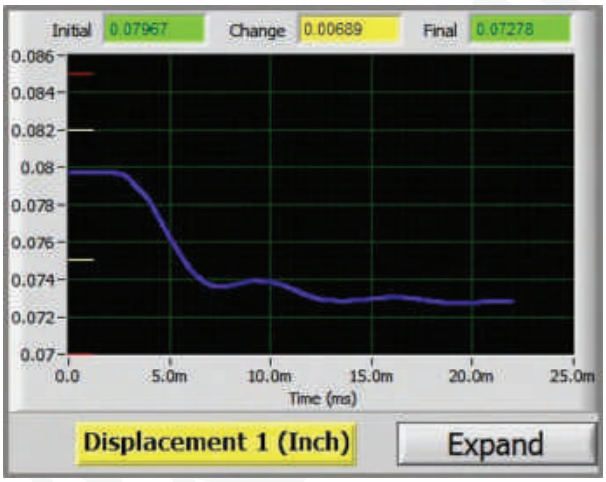
Displacement 1, Displacement 2

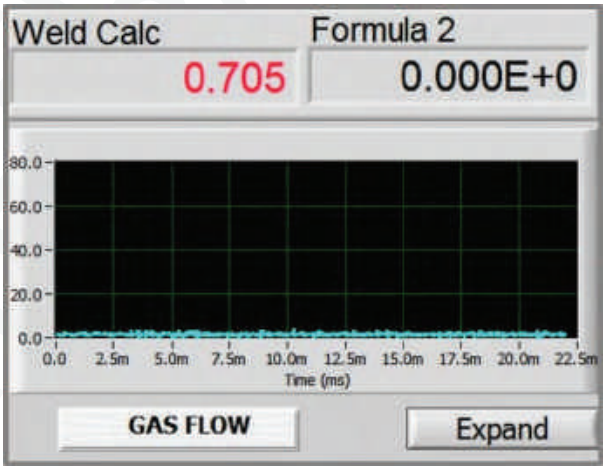
The graphs for **Displacement 1** and **Displacement 2** show the displacement waveform and the numeric values of the **Initial Position**, **Final Position** and **Thickness Change**.



Formula 1, Formula 2

The results of **Formula 1** and **Formula 2** are shown in text boxes just above the **Alternate Sensor** waveform shown in the lower right of the screen.

In the example shown to the right, the user has assigned a label of **"Weld Calc"** to **Formula 1** in the **Schedule Setup**.



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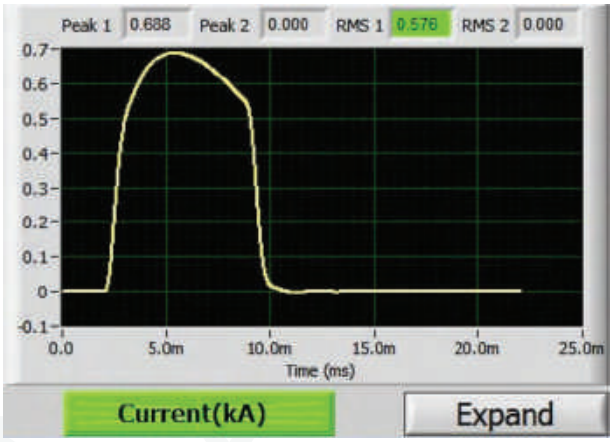
Limits, Warnings, and Envelopes

Limits and Warnings Indicators

If a numeric parameter has assigned limits or warnings, its result will be indicated by the colored background behind the numeric display. **Green** indicates the parameter is within warnings and limits. **Yellow** indicates the parameter is within limits but out of warnings. **Red** indicates the parameter is out of Limits. Numeric parameters that are ***not*** being monitored with limits or warnings have a grey background color.

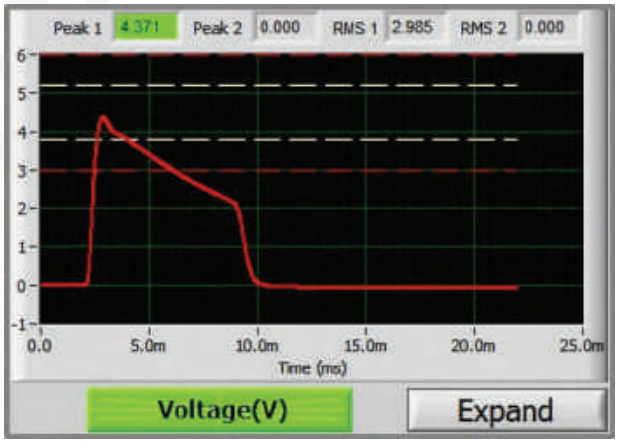


In the graph shown to the right, the **RMS 1** parameter was within limits and warnings.

The indicator containing the label for the graph, such as the **green** **Current** box shown in the graph to the above right, indicates if any aspect of the parameter was out of warnings or limits following the same color coding as described above for numeric parameters

Limits and Warnings Lines

Limit lines are shown as **red** dashed horizontal lines and warning lines are shown as **yellow** dashed horizontal lines for **Peak** parameters.



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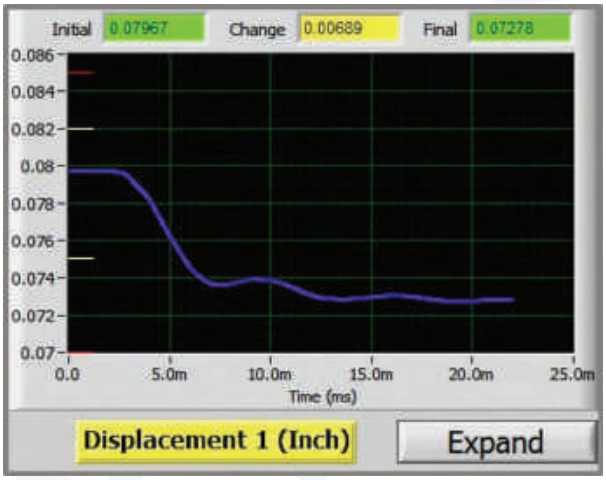
The limits and warnings lines on the displacement graphs do ***not*** extend across the entire graph but are only displayed close to both the left and right Y axis.

The **Initial Thickness** limit and warning lines are indicated on the left Y axis and the **Final Thickness** limit and warning lines are indicated on the right Y axis.

NOTE: The limit and warning lines for thickness change are ***not*** shown on the graph.



Envelopes

The envelopes are shown as **red** dashed lines as displayed in the **Power** graph to the right.

Expanded Graph

Each of the nine waveform graphs on the **Weld Monitoring** Screen has an **Expand** button in their lower right corner. When an **Expand** button is pressed a new screen is displays showing an enlarged graph of the corresponding weld parameter.

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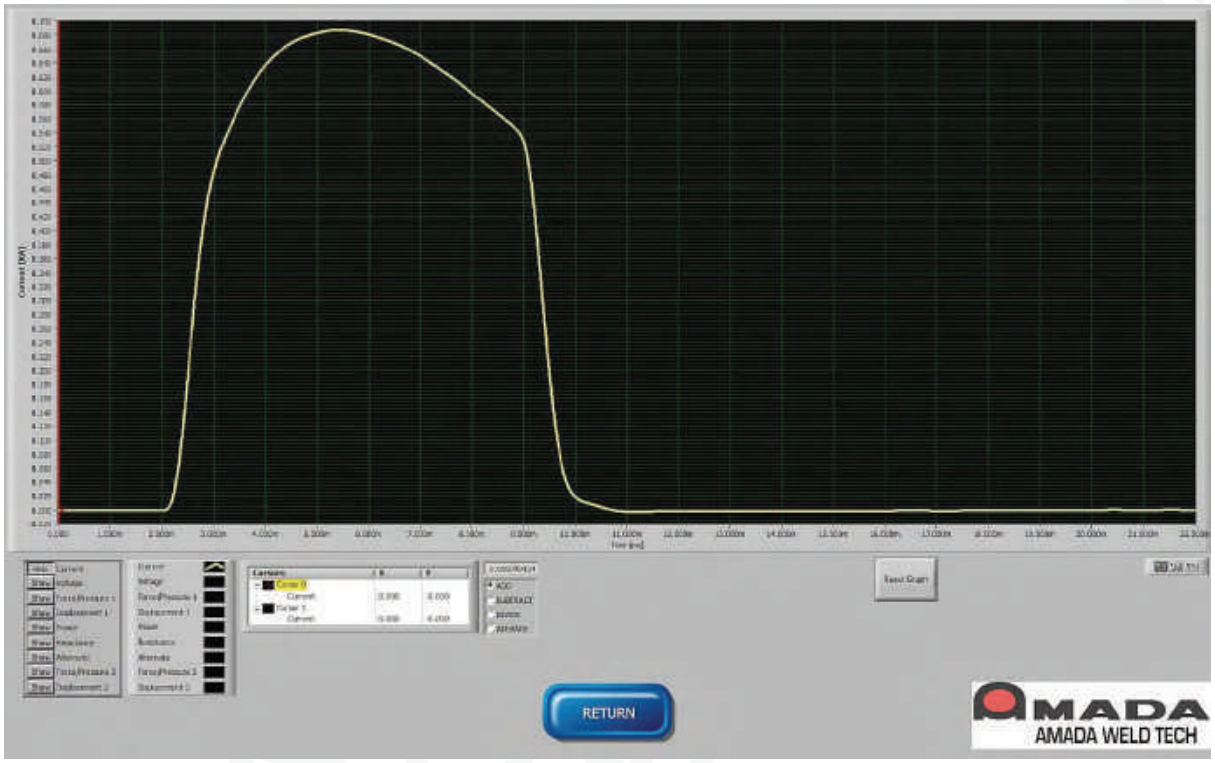
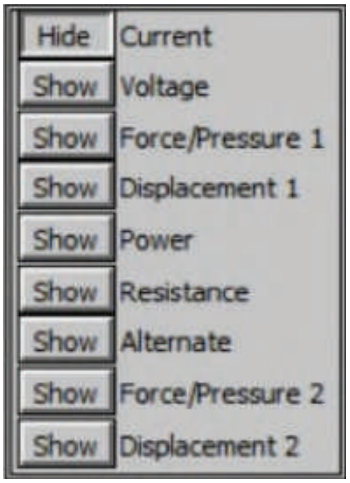
The following screen shows the result when you press the **Expand** button for the **Current** waveform.



The waveforms for the other weld parameters can also be added to the graph by clicking the **Hide/Show** buttons that are in the lower left corner of the screen.



If the **Show** buttons are clicked on the above screen for **Voltage** and **Displacement 1**, the screen looks like the following screen. The additional **Voltage** and **Displacement 1** waveforms and their corresponding Y axis scale have been added to the graph.

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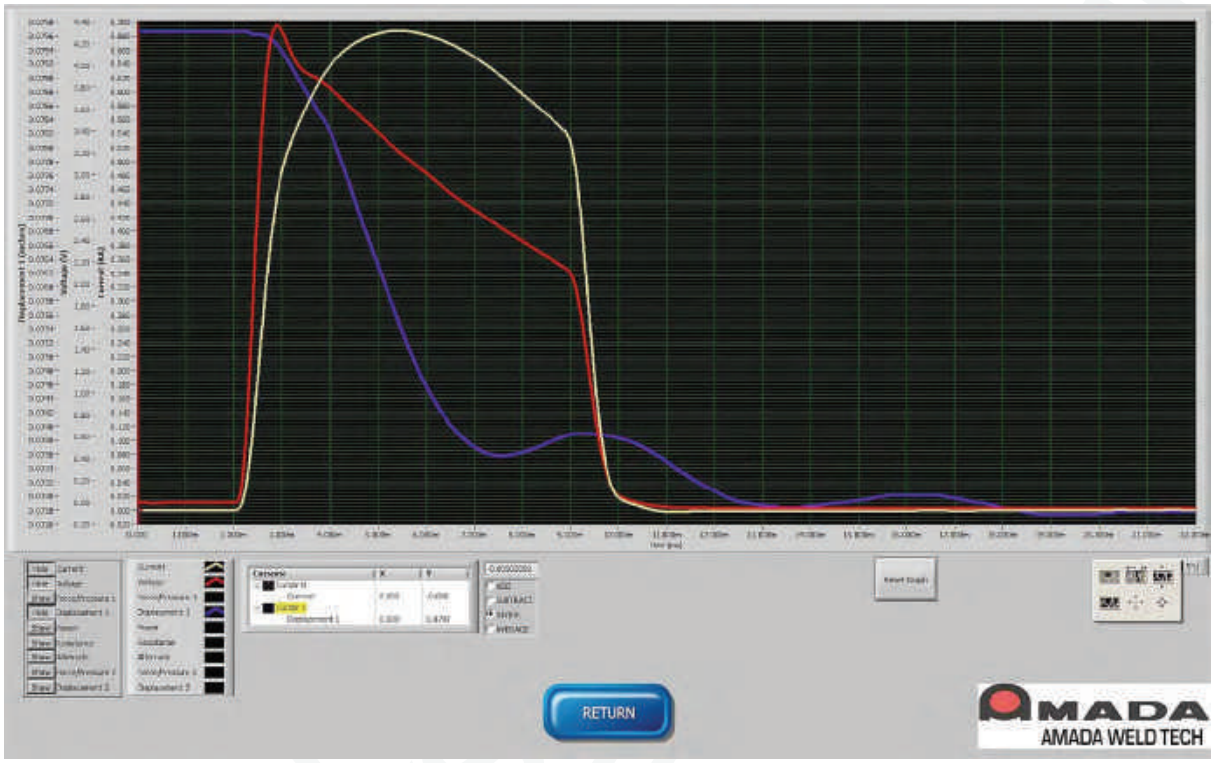
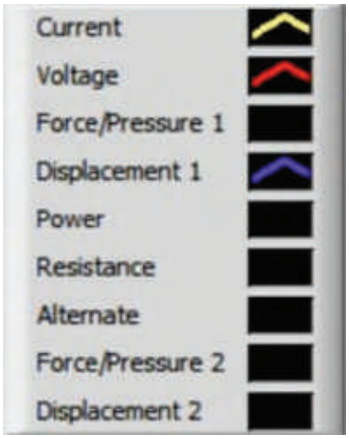


Waveforms are color coded for easy identification. The color code assignments are shown in the table located in the lower left of the screen.



Cursors

The Expanded graph screen has two cursors, drawn as vertical lines as shown in the following screen. These cursors can be moved into the graph to indicate the X and Y value of the point at which the cursor intersects the waveform. To move a cursor into the graph, click on one of the cursors, which are both on the left Y axis of the graph, and then drag the cursor into the graph.

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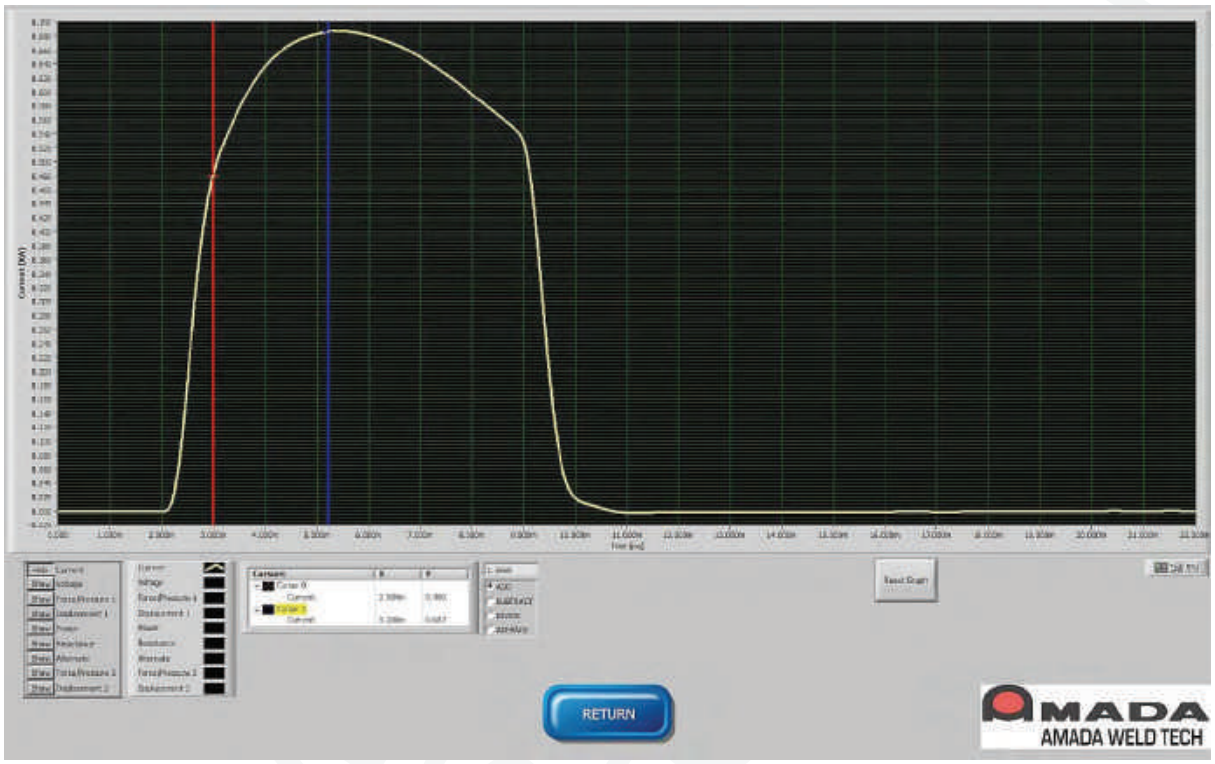
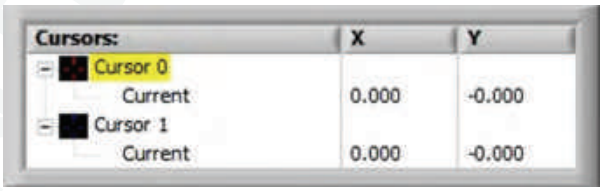


The X and Y values of the cursor are shown in the Cursor table located in the lower center section of the screen.



If two waveforms and two cursors are displayed on the screen, the first cursor will apply to the first waveform that was displayed on the screen and the second cursor will apply to the second waveform displayed as shown in the example above. If more than two waveforms are displayed, the second cursor will apply to the last waveform that was selected with the **Show** button.

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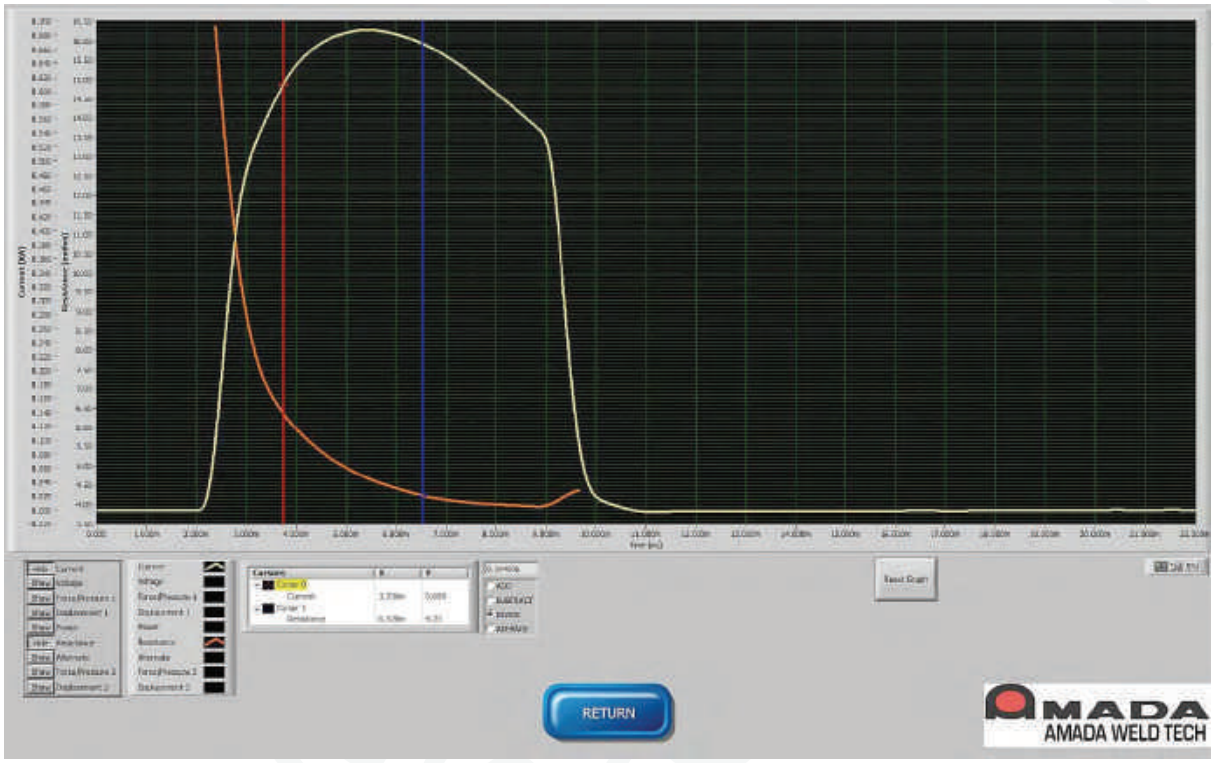
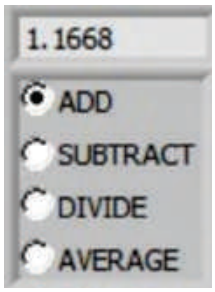


Arithmetic Functions with Cursors

The **Add, Subtract, Divide,** and **Average** functions can be applied to the Y values of the two cursors. Once the cursors are in the desired position, click one of the circles next to the **Add**, **Subtract, Divide,** and **Average** labels to perform the math function. The resulting calculation is displayed just above the **Add** label.



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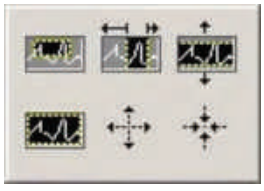
Zoom Controls (Expanded Screen Only)

The icons in the lower right of the **Expanded Screen** (shown on the right) are used to zoom in and move around the graph. The icon on the ***left*** is presently not active in the Monitor.

The icon on the ***right*** allows you to click on the graph and move the graph around while the mouse button is held down. The icon in the ***center*** makes additional icons available that allow you to expand sections of the graph.

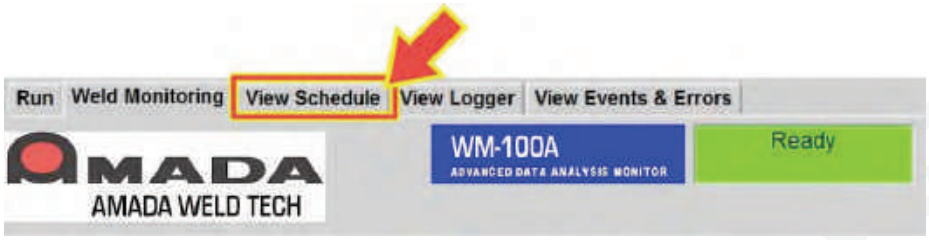


There are two rows of additional icons (shown on the right). Those in the first row, from left to right, allow you to zoom in a selected graph section, zoom in on a section while maintaining the entire height of the graph, and zoom in on a section while maintaining the entire width of the graph. This row of icons are used by clicking on the icon to select a function, then clicking on the graph and holding the mouse button while moving the mouse to select an area of the graph. When you release the mouse button, the graph will re-size.

Those in the second row, from left to right, allow you to return the graph to full size, zoom in, or zoom out. To use the icons in this row, click on the icon to select a function, then click on the graph.

The **Reset Graph** button can be clicked to reset the graph to full size after repositioning or re-sizing the graph.

Section IV. Monitor Section: View Schedule



The **View Schedule** tab selects the screen that allows you to view the **Schedule** setup information without exiting the **Monitoring** section of the **Monitor**. The **View Schedule** tab can be viewed while the **Monitor** is actively recording welds.

You can ***not*** make any changes to any of the Schedules on this screen. You may want to take notes for future editing of the Schedule. If you want to edit Schedules, exit the **Monitoring** section of the **Monitor** and go to the functions behind the **Schedule Setup** button.

View Schedule Screen

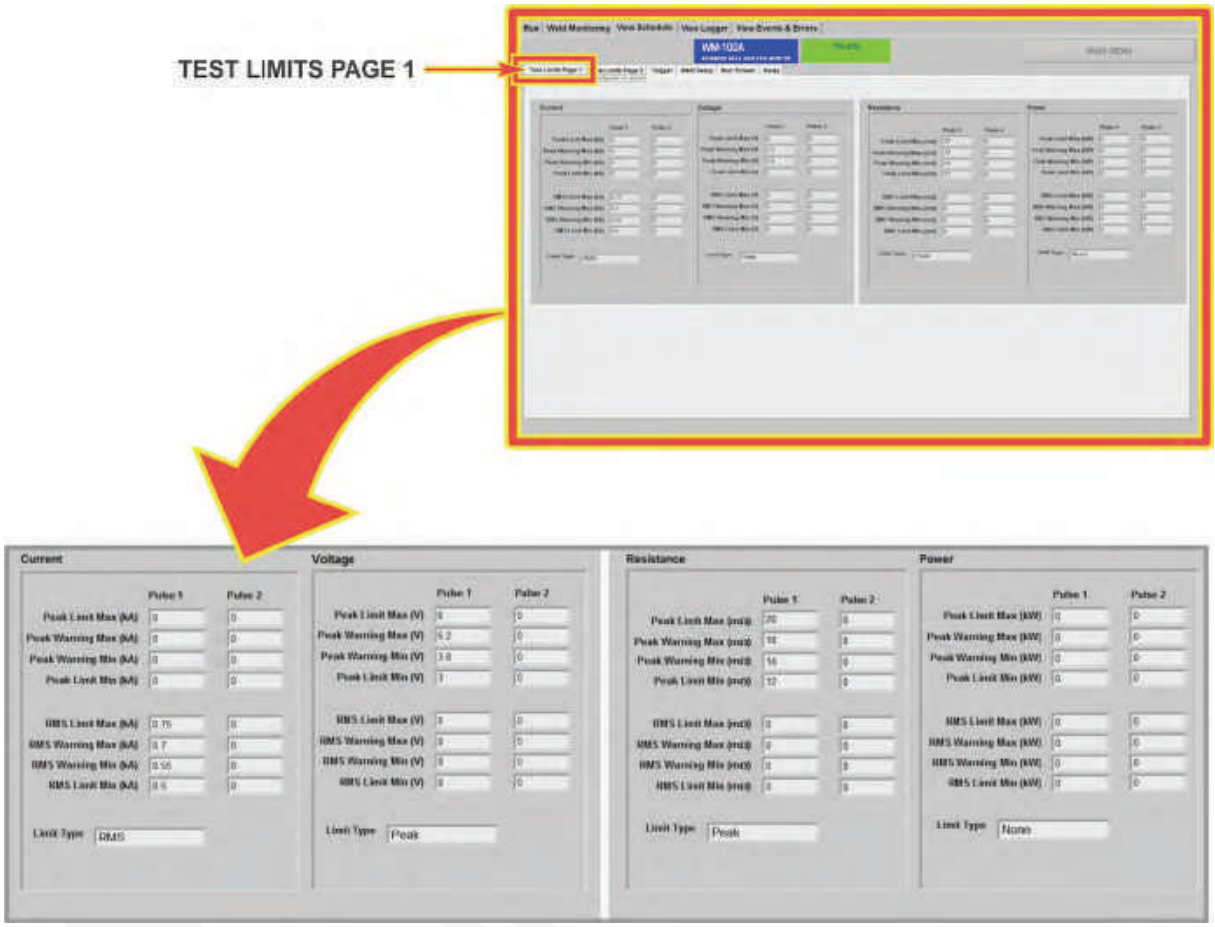
The **View Schedule** Screen has additional tabs that allow you to see the following **Schedule Setup** Screens.

Test Limits Page 1
Test Limits Page 2
Trigger
Weld Setup
Run
Relay

The **Envelope Setup** information is ***not*** accessible from the **View Schedule** Tab.

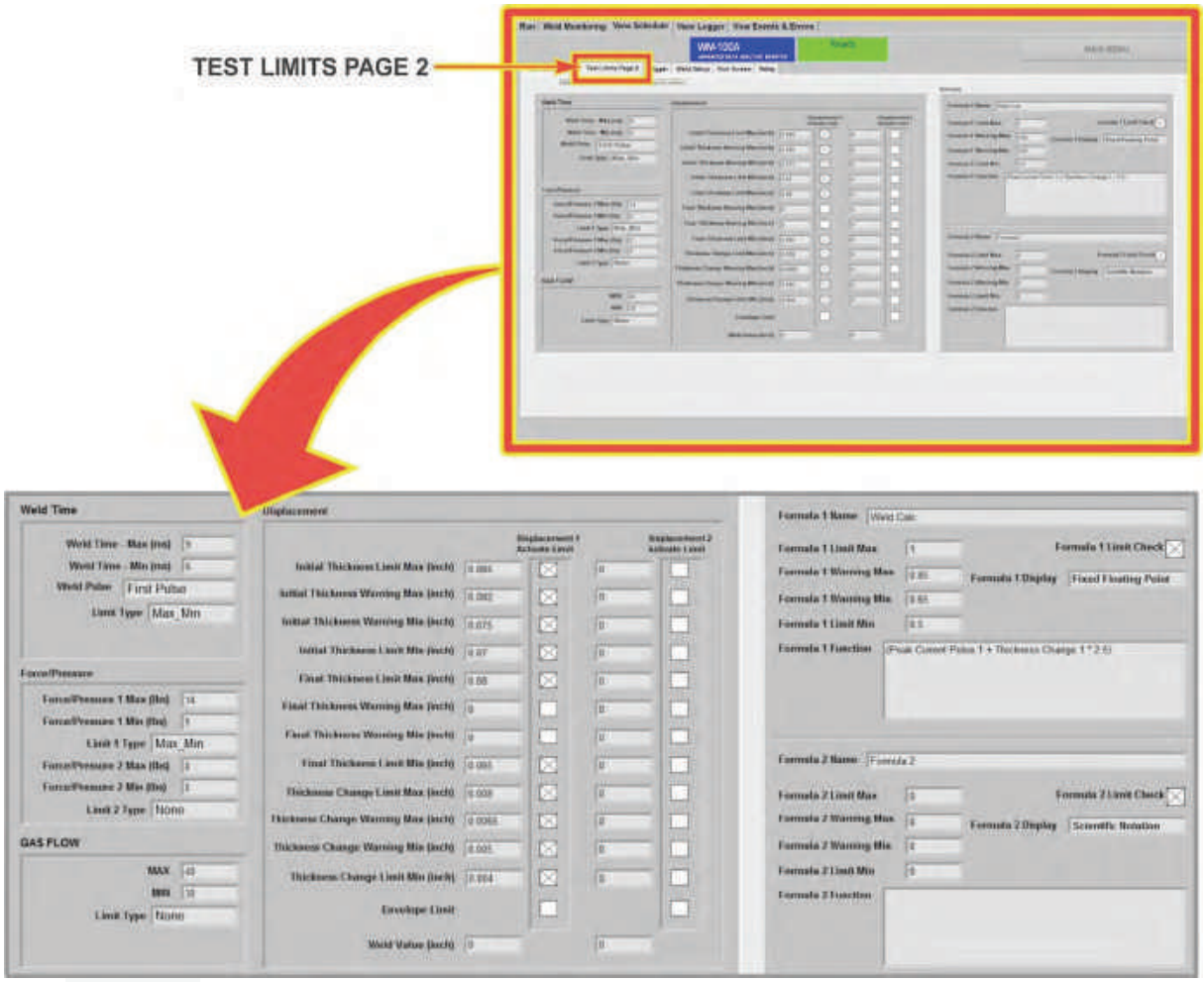
CHAPTER 3: MONITORING

Test Limits Page 1



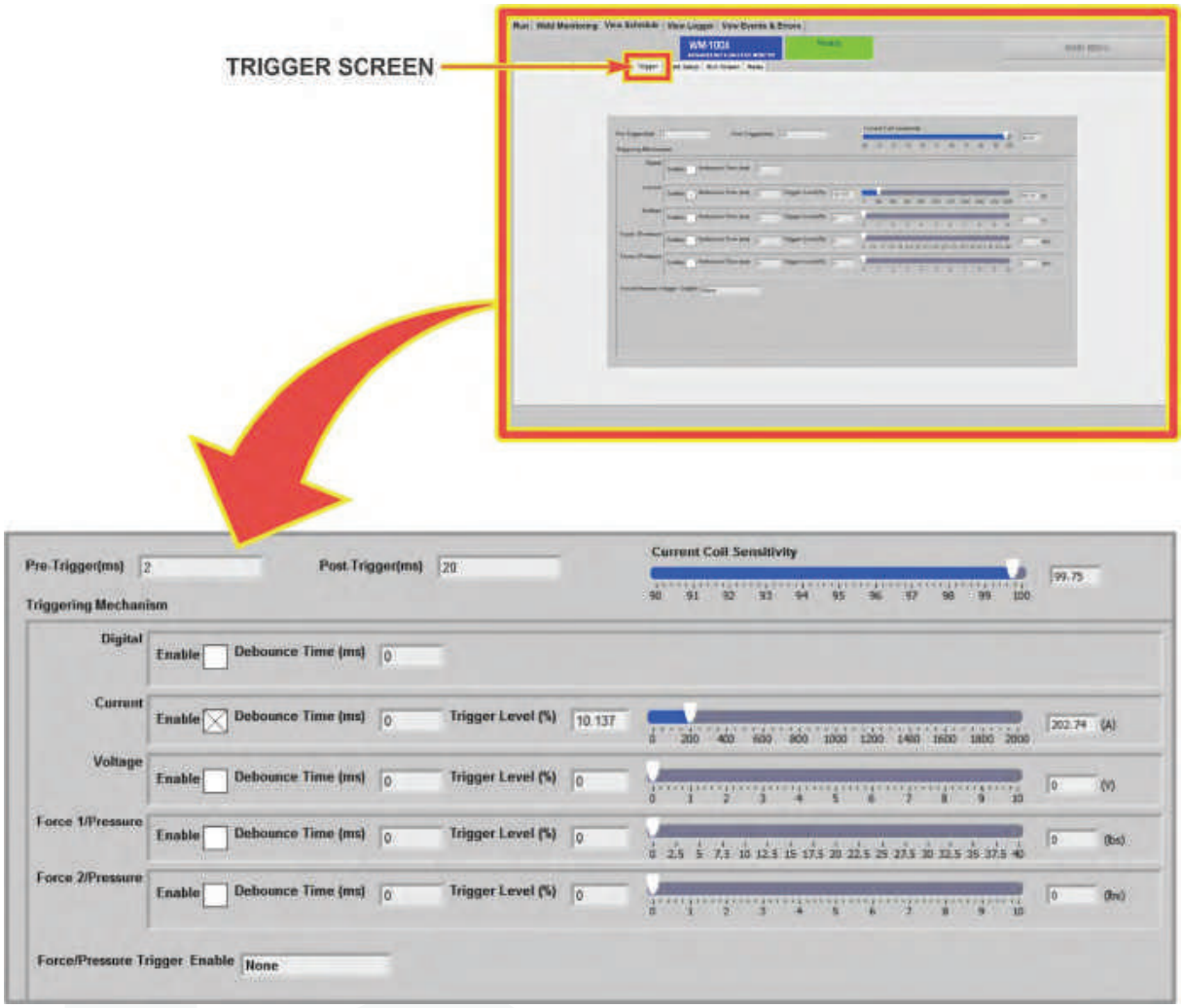
CHAPTER 3: MONITORING

Test Limits Page 2



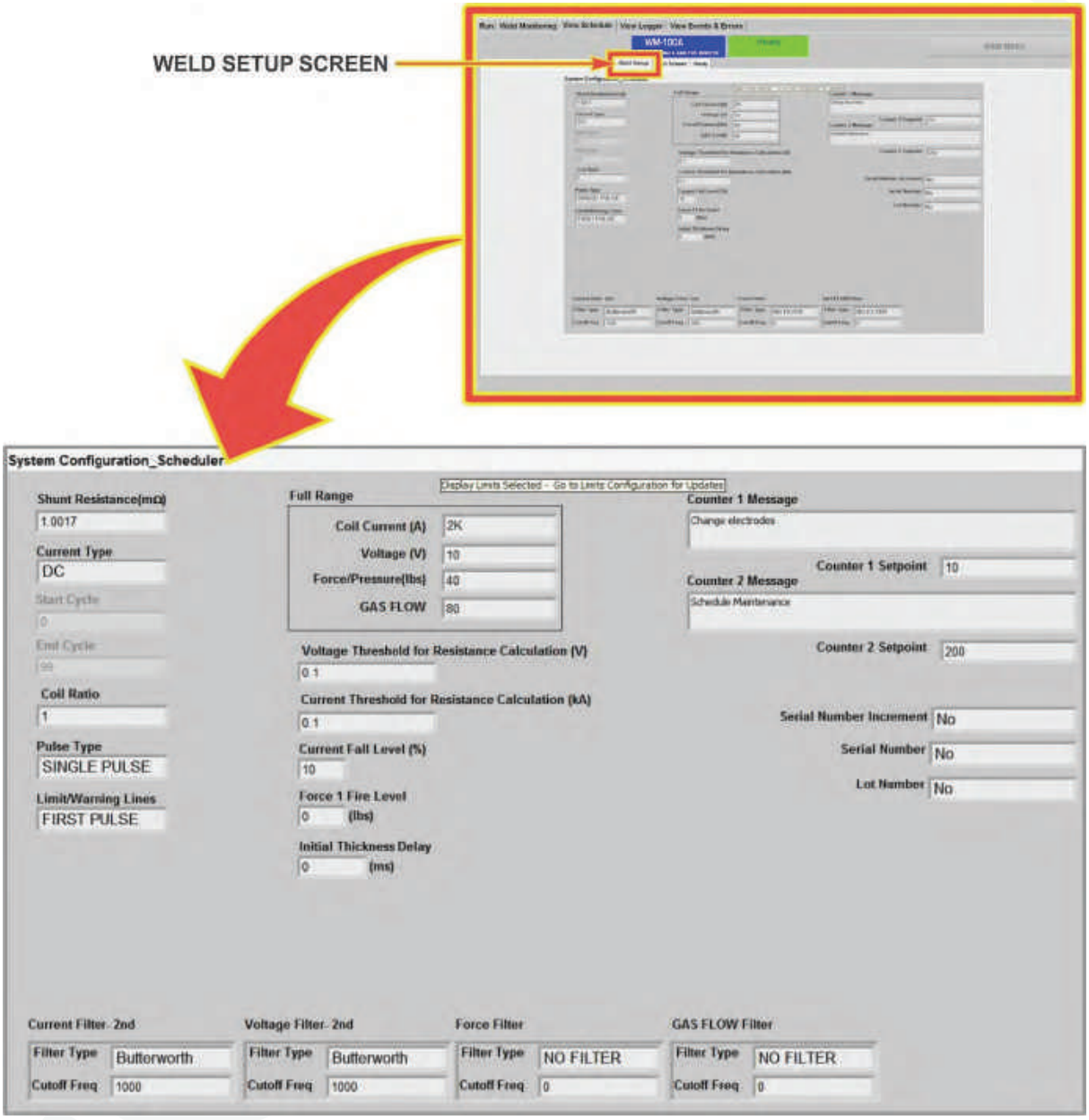
CHAPTER 3: MONITORING

Trigger



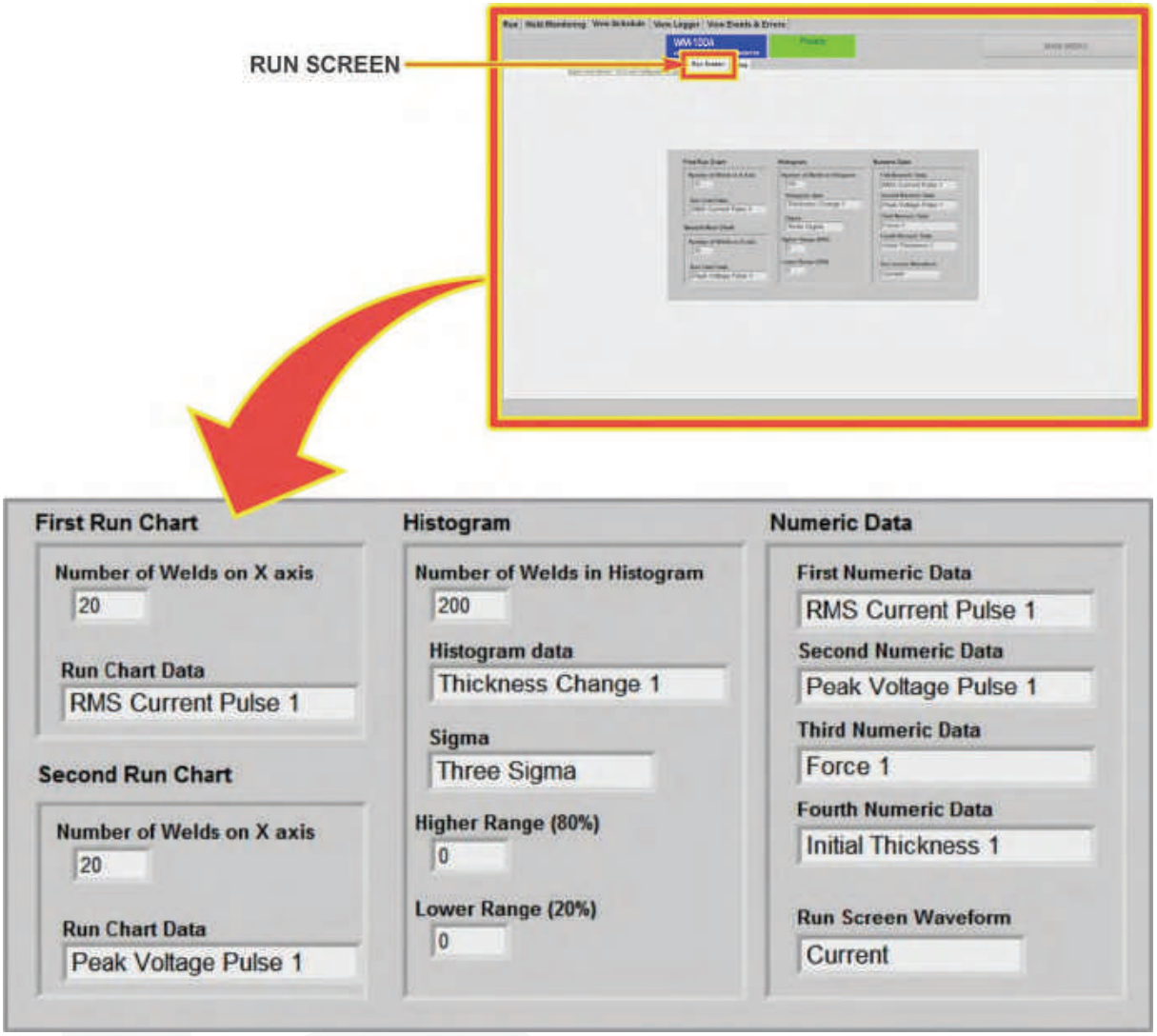
CHAPTER 3: MONITORING

Weld Setup



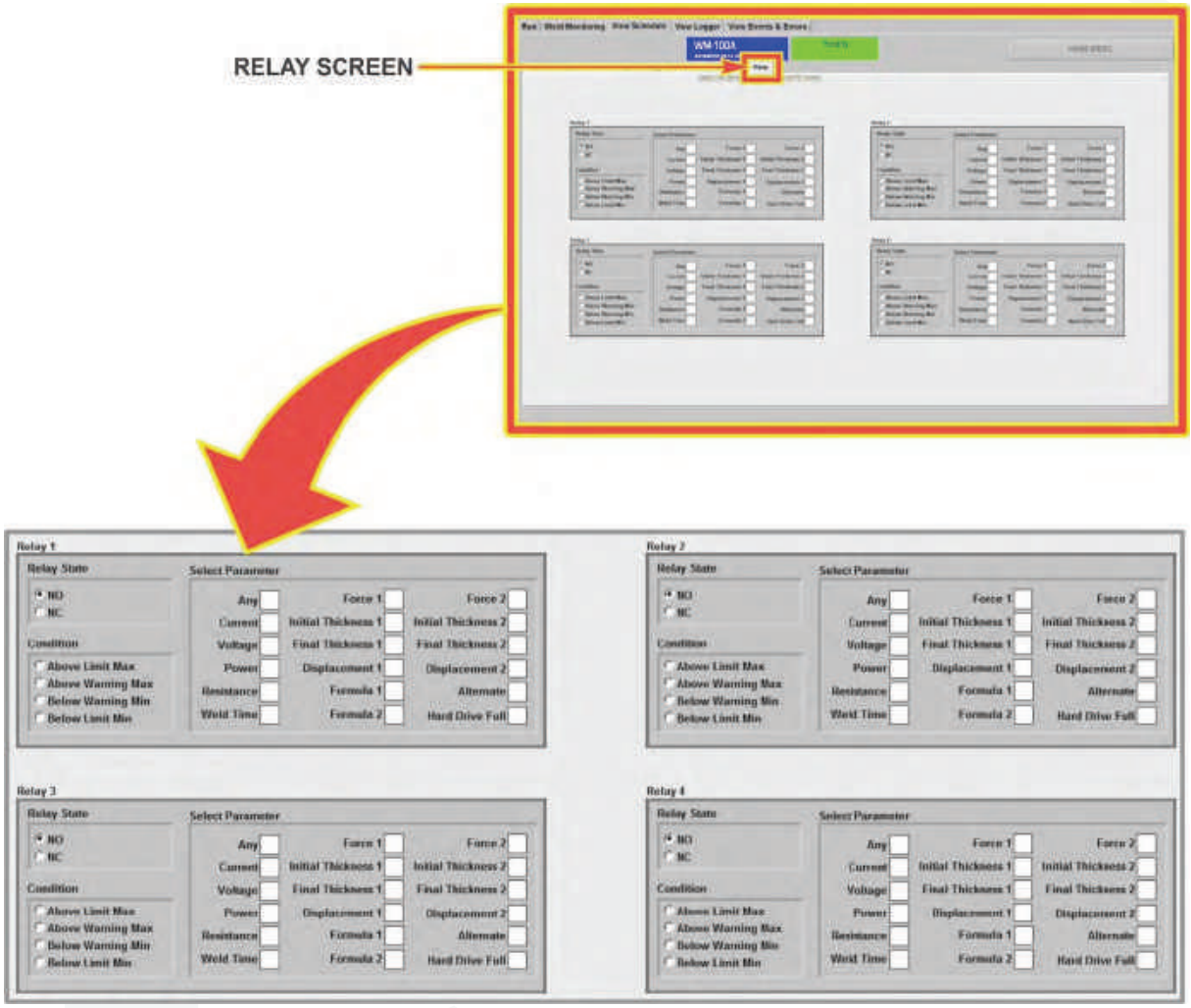
CHAPTER 3: MONITORING

Run Screen



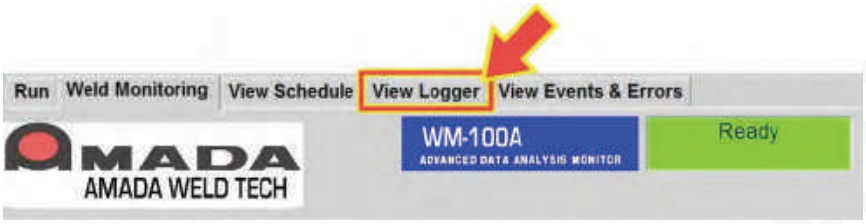
CHAPTER 3: MONITORING

Relay Screen



CHAPTER 3: MONITORING

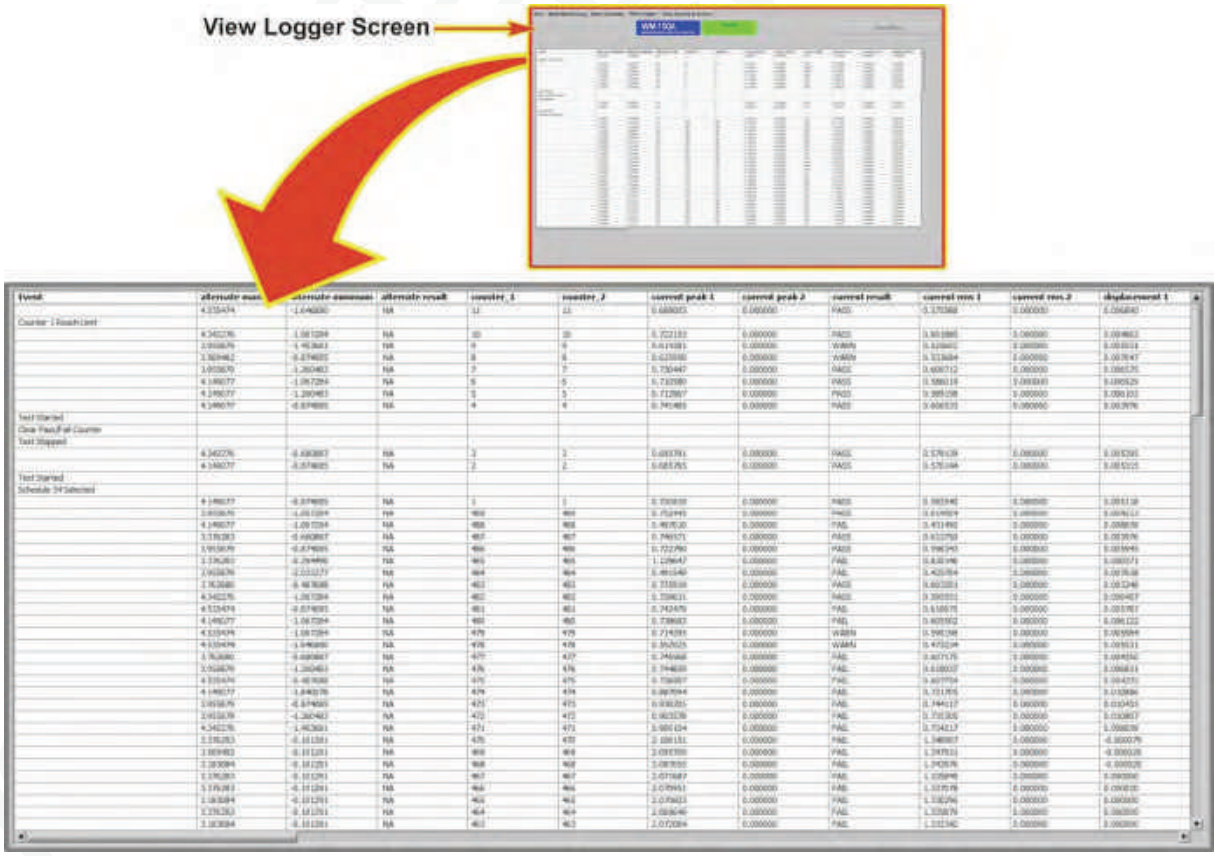
Section V. Monitor Section: View Logger



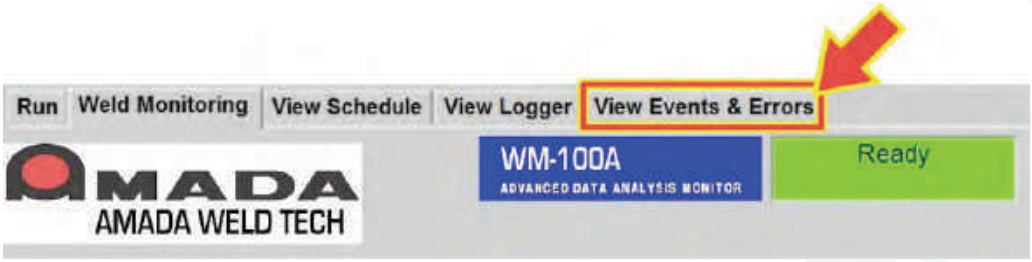
The **View Logger** tab selects the screen that allows you to view the **Logger** information without exiting the **Monitoring** section of the Monitor. The **View Logger** tab can be viewed while the Monitor is actively recording welds.

This screen will display the logger information configured in the **Logger Setup**. This screen will also display events in the left most column. Only the most recent 200 welds will be displayed. If you want to see more or older logger information, exit the **Monitoring** section of the Monitor and go to the functions behind the **Waveform & Logger Setup** button.

View Logger Screen

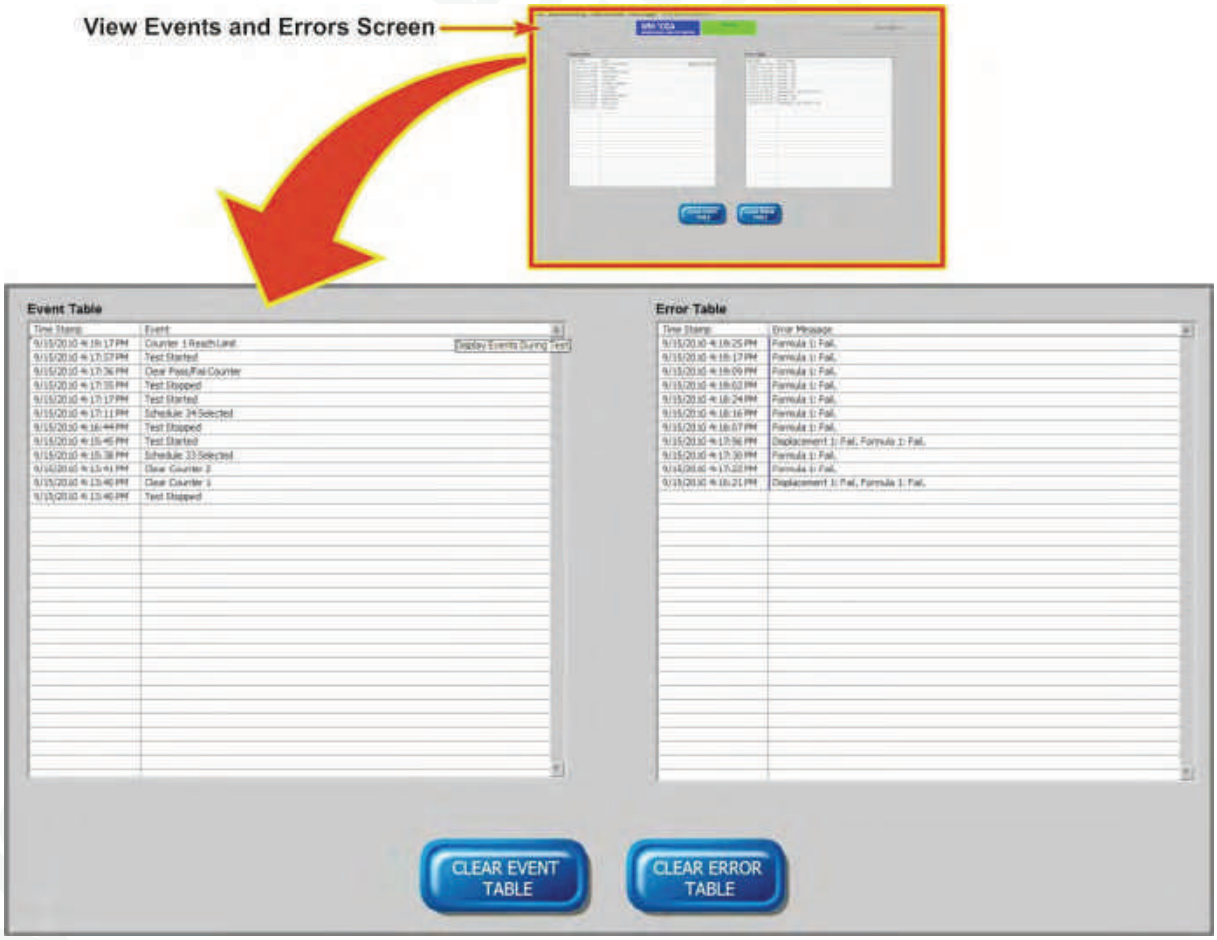


Section VI. Monitor Section: View Events & Errors



The **View Events & Errors** tab selects the screen that allows you to view the **Events** and **Error** tables without exiting the **Monitoring** section of the **Monitor**. The **View Events & Errors** tab can be viewed while the **Monitor** is actively recording welds.

Events appear in the left table and **Errors** in the right table. The tables on this screen show up to the most recent 200 events or errors. If you want to see more or older events or errors, exit the **Monitoring** section of the **Monitor** and go to the functions behind the **Waveform & Logger Setup** button.



CHAPTER 3: MONITORING

The two lower buttons at the bottom of the screen will clear the **Event** table and clear the **Error** table. Press either button to clear the corresponding table. The following screen shows the screen ***after*** the **Clear Event Table** button was pressed.

Chapter 4
Monitor Setup

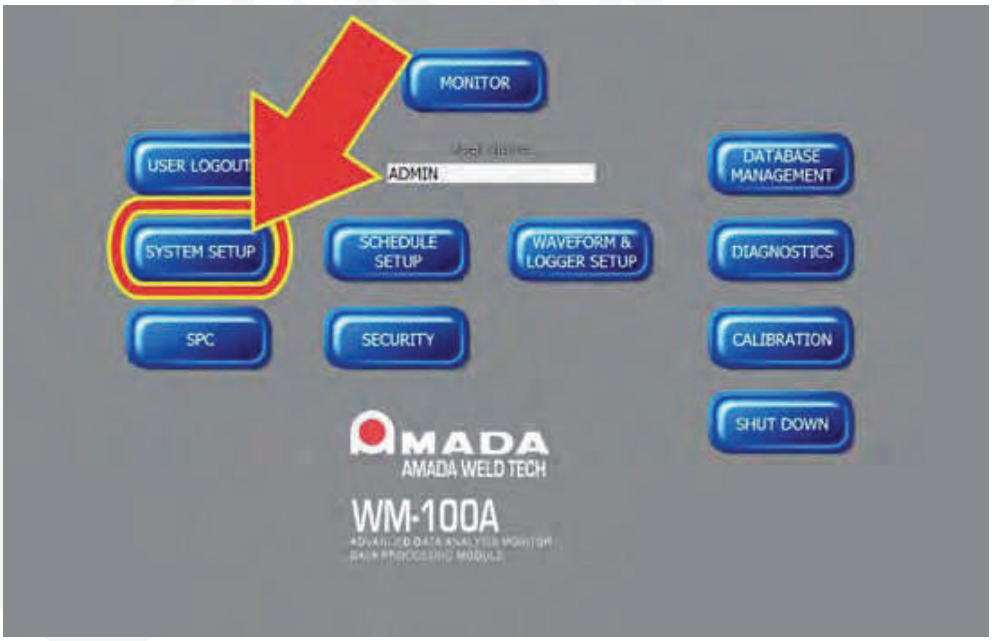
The Monitor has 5 main areas that you can use to setup up the Monitor for the specific application and specific parts to be welded.

1. **System Setup** – This area includes global parameters that apply to every Schedule.
2. **Schedule Setup** – This area includes the setup items that are specific to each Schedule.
3. **Security** – This area is used to setup users and passwords
4. **Logger Setup** – This area is used to setup the weld parameters displayed in table views of the weld data.
5. **Waveform Setup** – This area defines which waveforms will be saved for each weld.

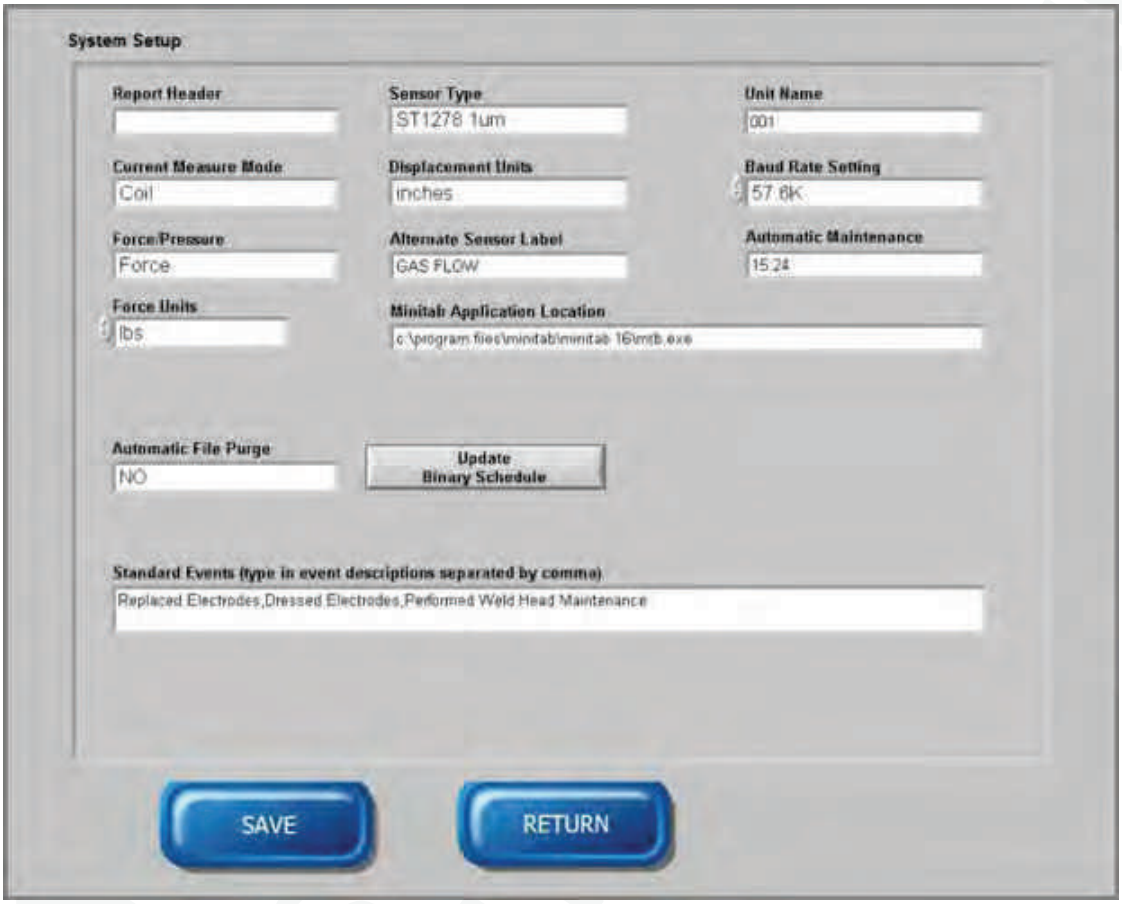
Section I. System Setup

The System Setup establishes "global" settings for the Monitor.

From the **Main Menu**, click on **System Setup**.



CHAPTER 4: MONITOR SETUP



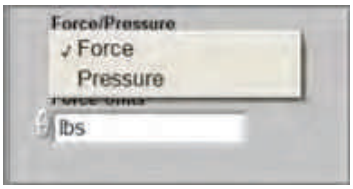
Report Header

The text entered here will print on reports printed by pressing the Print buttons on the Monitor screens. Enter up to 50 ASCII characters in this box.

Current Measure Mode

You can select either **Shunt** or **Coil** based on the method of current measurement setup with the welder.

Force/Pressure

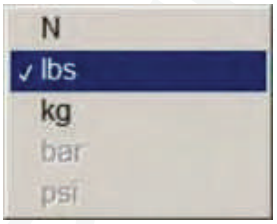


Force/Pressure Type allows you to select force or pressure units. Select either **Force or Pressure** from the list box.

CHAPTER 4: MONITOR SETUP

Force Units

Select the units for Force or Pressure from a drop down box. Choose **Kg** (kilograms), **lbs** (pounds), or **N** (Newtons) for Force applications. Chose **bar** or **psi** for pressure applications.



Automatic File Purge

Choose **Yes** or **No** to select if the Monitor will automatically delete data from the hard drive. If you select **Yes**, the Monitor will automatically delete database records to keep the hard disk space below a maximum of 75% full. If you select **No**, you must manually delete records as the hard disk becomes full. Refer to *Chapter 5* for more information.

Standard Events

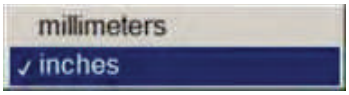
Enter the event descriptions that will appear in the Event box on the **Run** and **Monitoring** screens. Enter up to 1000 ASCII characters for the event text. Each event should be separated by a comma without any spaces before or after the comma.

Sensor Type

Select the particular displacement sensor installed on the weldhead from the list box.

Displacement Units

Select either **Millimeters** or **Inches** for the displacement units from the list box. The units selected will appear with the displacement readings on the Monitor screens.

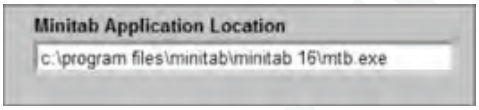


Alternate Sensor Label

The text entered in this box will appear on the Monitor screens as the reference for the **Alternate Sensor**. Enter up to 10 characters of text. For example, if the **Alternate Sensor** input is being used to measure gas flow, enter "Gas Flow" in this entry box to provide a better label for this sensor than the standard "Alternate Sensor" label.

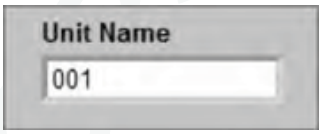
CHAPTER 4: MONITOR SETUP

Minitab Application Location



The file path for the Minitab application should be entered in this entry box. This file path is entered at the factory and should ***not*** need to be changed unless notified by Amada Weld Tech.

Unit Name

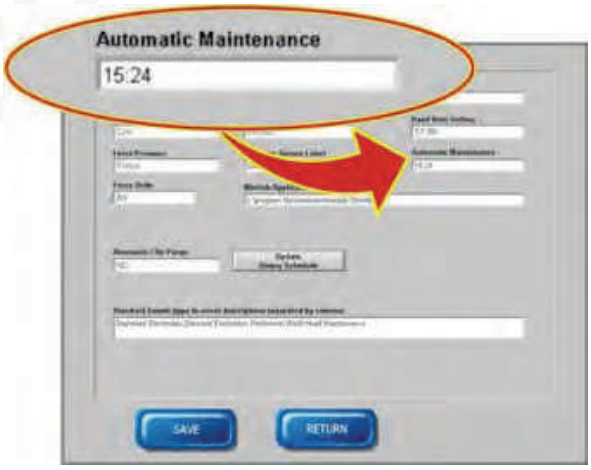


The unit name will be included in the ASCII character string output after every weld on the RS-232 port on the Monitor's Processing Module. Enter up to a three digit number from 0 to 999. The Monitor will add zero's at the beginning of the unit number you entered as needed to create a three digit unit name.

Baud Rate

Select the baud rate to be used for RS-232 communications from the list box.

Automatic Maintenance



Enter the time of day in the 24 hour clock format of XX,XX to set the time of day when the daily and weekly database maintenance will be automatically performed. The entered time should be in the range of 00:00 to 23:59. For example, enter 15:24 if you want the maintenance to be performed at 3:24 PM. If you enter in an incorrect format for the time, an error message will appear when you click the **SAVE** button.

The **Monitor** must have the **Monitor Screen** displayed for the Automatic Maintenance to occur. The Monitor can be either in or out of **Monitor Mode** for the Automatic Maintenance to occur.

If the Monitor does not have the **Monitor Screen** displayed when the user set maintenance time occurs, the Monitor will perform the **Automatic Maintenance** the next time that the **Monitor Screen** is displayed. The automatic maintenance will typically take a few seconds to a minute.

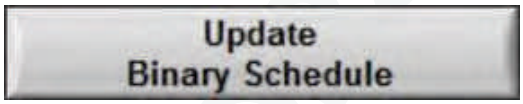
When the **Monitor** is performing the database maintenance, a message will be displayed that Database Maintenance is in progress. When the maintenance is complete, the message window will disappear.

CHAPTER 4: MONITOR SETUP

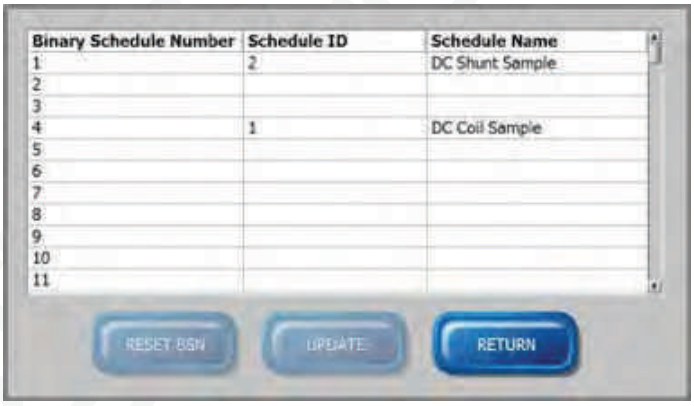
In addition, if the **Monitor** is in **Monitoring Mode**, the **Ready to Measure** digital input will be switched to inactive and the **Monitor** will not trigger any welds while the maintenance is being performed. Once the maintenance is completed, the **Ready to Measure** digital input will switch back to active. The database maintenance completes *Microsoft* SQL functions that maintain good speed for database functions.

Update Binary Schedule

Up to 127 schedules can be loaded using the Schedule Digital Inputs. The Binary Schedule Table is used to assign the Binary Schedule Numbers (BSN) from 1 to 127 to Schedules.

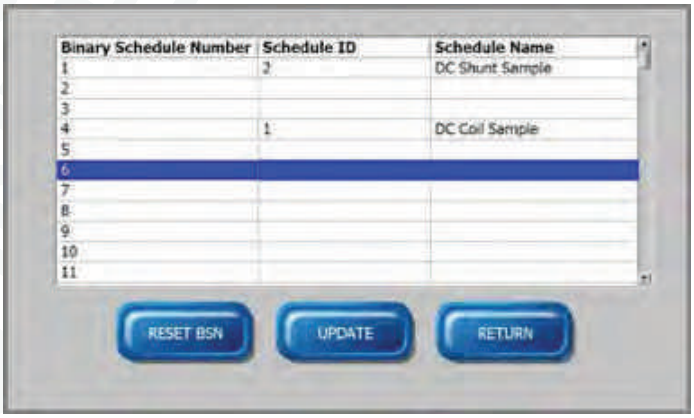


Click the **Update Binary Schedule** button to open the Binary Schedule Table. This table shows the schedules currently assigned to the **Binary Schedule Numbers**.



To assign a Schedule to a **Binary Schedule Number**, the number must not have a current Schedule assigned to it.

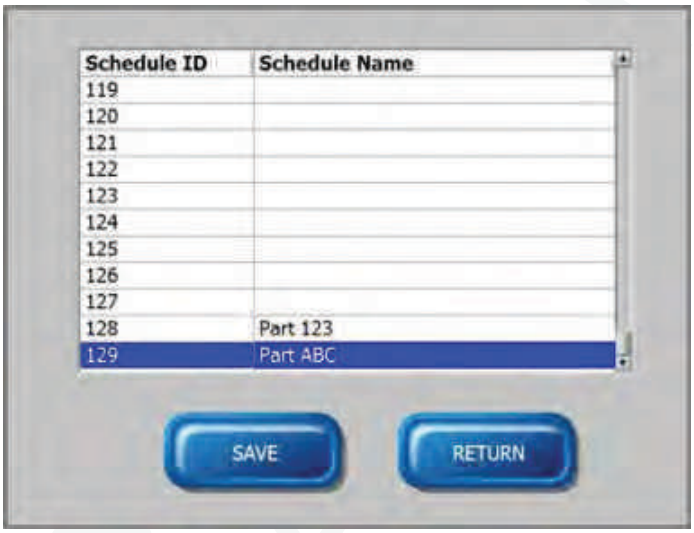
1. Click the line for desired **Binary Schedule Number** to highlight the line. The **RESET BSN** and **UPDATE** buttons will then become accessible.
2. Click the **Update** Button



CHAPTER 4: MONITOR SETUP

A table with all the Schedules will appear.

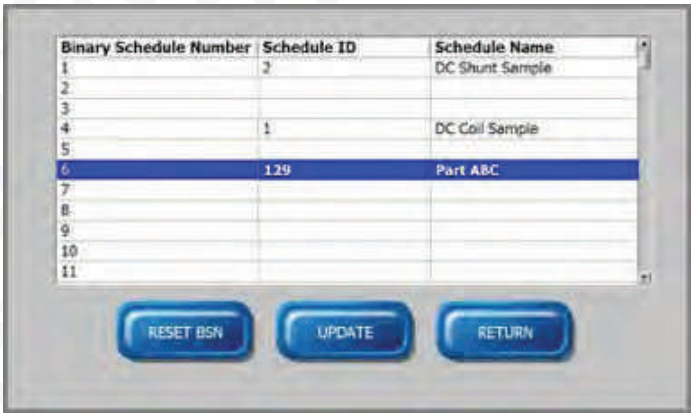
1. Click on the desired **Schedule ID** and **Schedule name** line to select that Schedule.
2. Click **SAVE**.



The **Binary Schedule** Table will then appear showing that the selected Schedule has been assigned to the highlighted **Binary Schedule Number**.

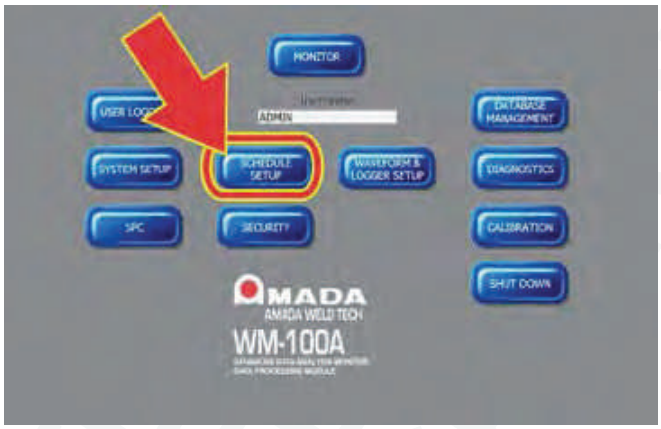
To remove a Schedule assigned to a Binary Schedule, highlight the row for the **Binary Schedule Number** and click the **RESET BSN** button.

When finished updating the **Binary Schedule Number** table, click the **Return** button to close the **Binary Schedule Number** table.



Section II. Schedule Setup

The **Schedule Setup** section of the Monitor is used to establish separate schedules for every part to be welded. The Monitor includes a **Schedule Name** and **Schedule ID** number. You enter the schedule name. The Monitor automatically assigns a unique **Schedule ID** number to a schedule every time you save a schedule. The Monitor increments the **Schedule ID** by 1 for each schedule you save. This feature provides for Schedule traceability.



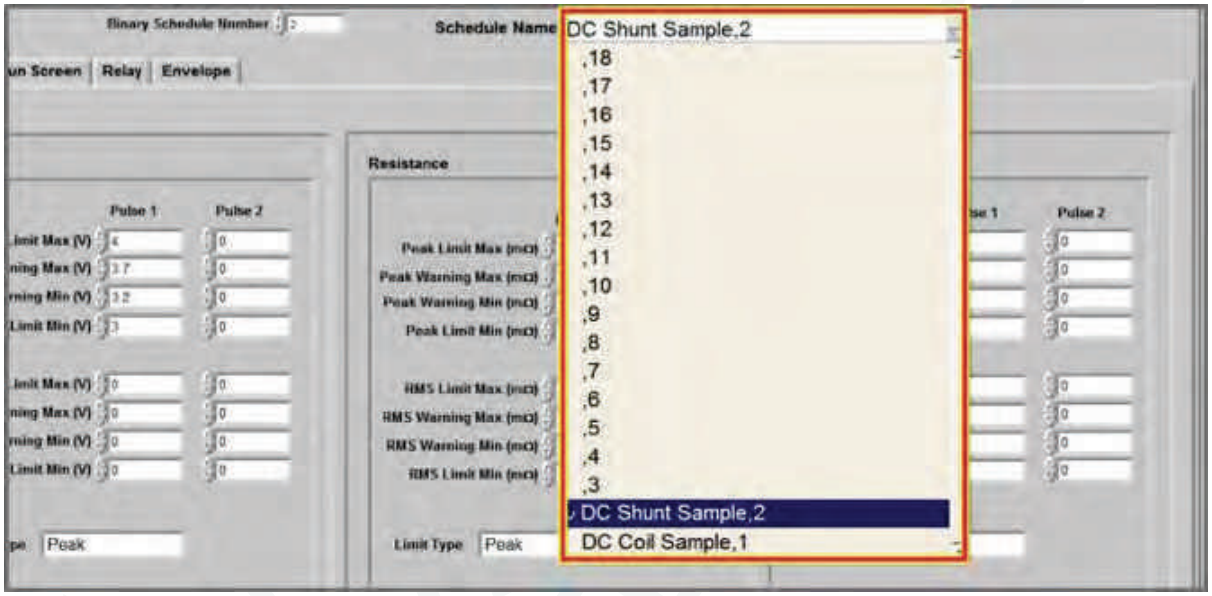
Test Limits Page 1

From the Main Screen click on the **Schedule Setup** button to get the screen below.

CHAPTER 4: MONITOR SETUP

The **Schedule Name** and **Schedule ID** number of the schedule that is loaded and available for editing is shown in the upper right area of the screen. The **Schedule Name** and **Schedule ID** appear in the same text box and are separated by a comma. If the **Schedule Name** box is clicked a drop down list of all schedules will appear. You can select a different schedule if you choose.

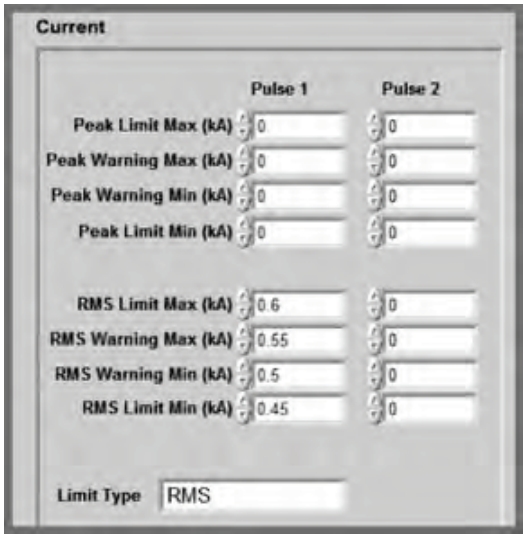
The **Binary Schedule Number** assigned to this schedule appears in the upper center part of this screen. If the Schedule has not been assigned to a **Binary Schedule Number** this text box will display a **0**. This text box cannot be used to select a different schedule.



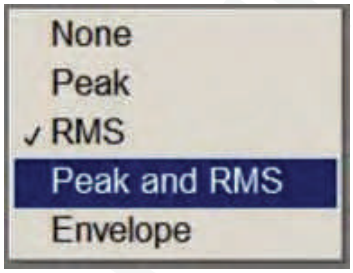
Current

Enter the **Limit** and **Warning** values in the text boxes for **Pulse 1** and **Pulse 2**.

A decimal number **0** or greater can be entered for all the **Limits** and **Warnings** on **Test Limits Page 1**



CHAPTER 4: MONITOR SETUP



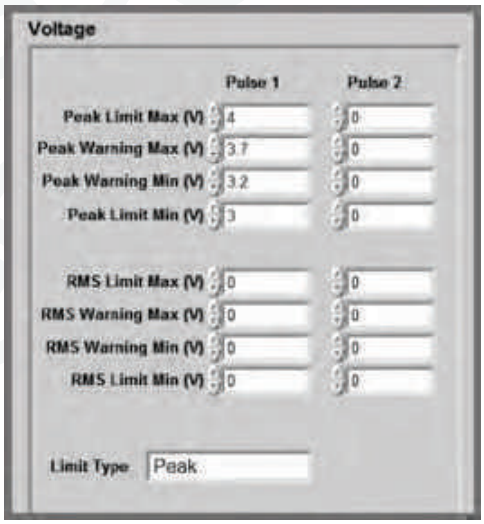
The selection made for **Limit Type** will determine what limits, warnings, or envelope will be monitored. If you have entered limit or warnings values, you must still select **Peak**, **RMS**, or **Peak** and **RMS** for **Limit Type**. If you have defined an envelope for current, you must still select Envelope for **Limit Type** to monitor the envelope for current.

Select the **Limit Type** using the drop down list.

None – no limits, warnings, or envelope will be monitored
Peak – Peak limits and warnings will be monitored
RMS – RMS limits and warnings will be monitored
Peak and RMS – Peak and RMS limits and warnings will be monitored
Envelope – envelope limit will be monitored

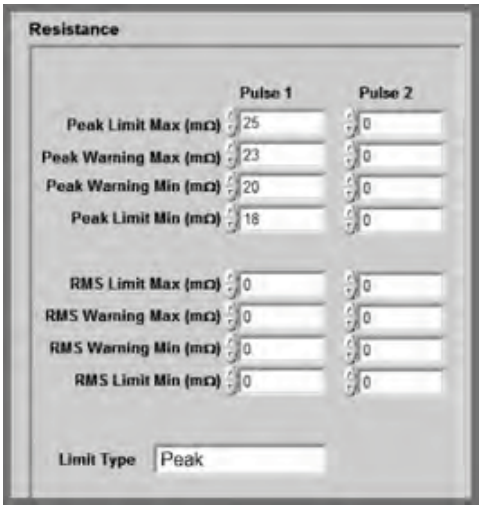
Voltage

Set **Limits, Warnings**, and **Limit Type** as described above for **Current**.



Resistance

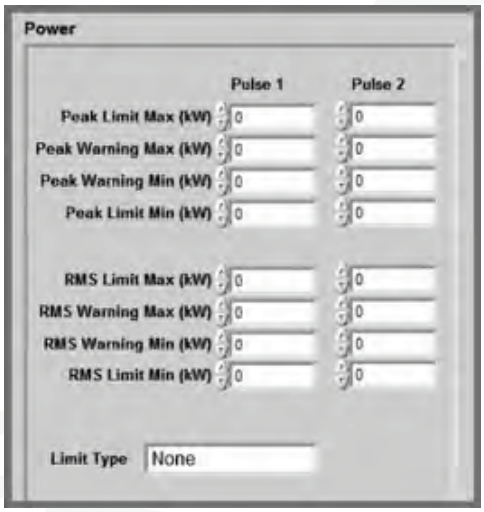
Set **Limits, Warnings**, and **Limit Type** as described above for **Current**.



CHAPTER 4: MONITOR SETUP

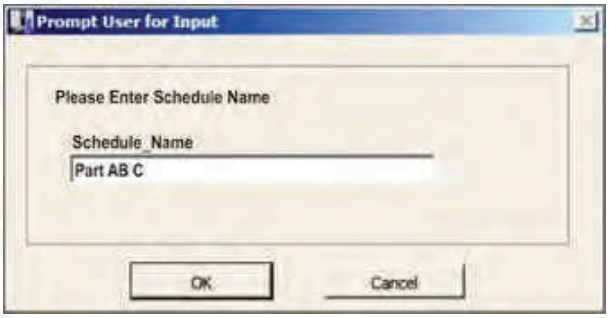
Power

Set **Limits, Warnings**, and **Limit Type** as described above for **Current**.

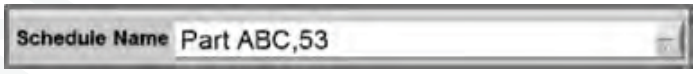


SAVE Limits

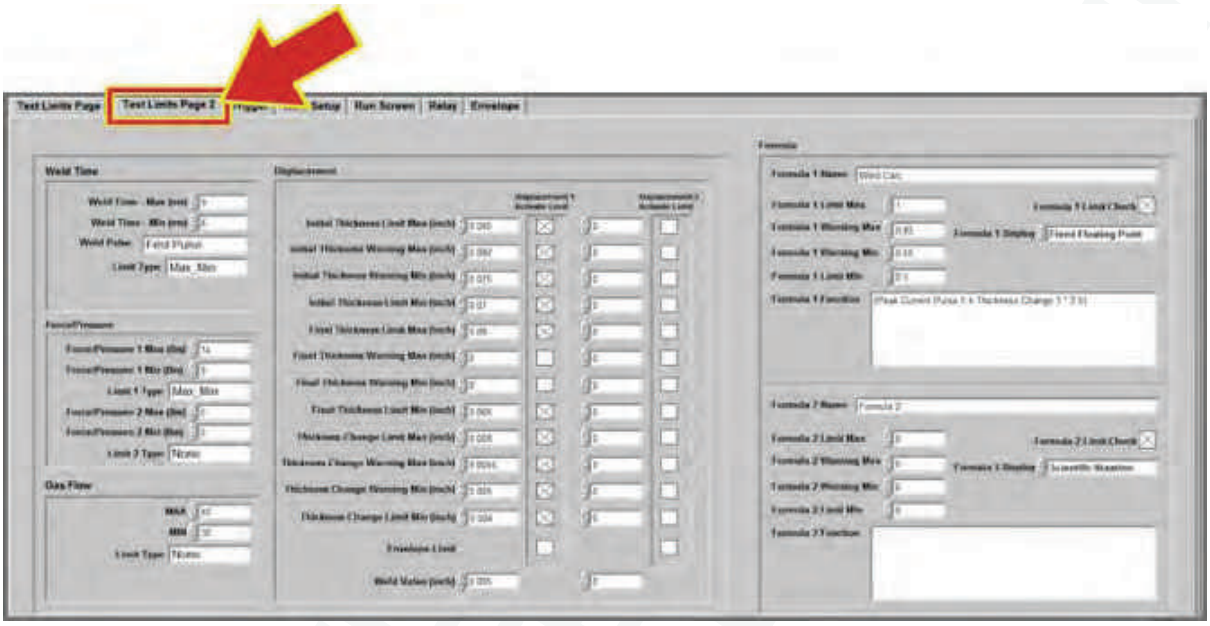
1. When you have finished making all your changes, click on **SAVE**. A window will open which will prompt for a **Schedule Name**.
2. Enter a schedule name in the text box, such as, **Part ABC,** as shown in the diagram to the right. When you are finished, click on **OK**.



The new schedule name will appear in the **Schedule Name** box in the upper right of the screen. The new **Schedule Number** will appear after the schedule name separated by a comma.

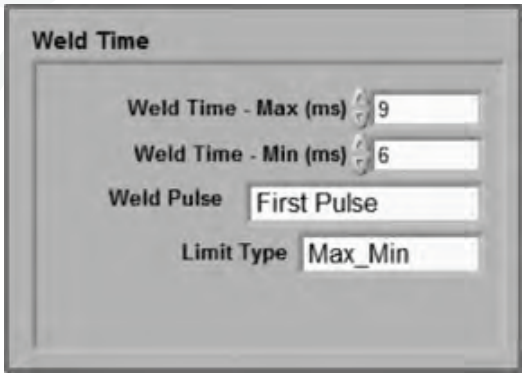


Test Limits Page 2

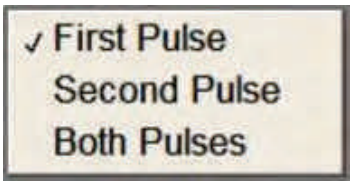


Weld Time

Enter the **Max** and **Min** Weld Time Limits. Enter a decimal number **0** or greater.



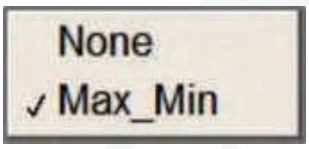
Select the desired weld pulse setting from the **Weld Pulse** drop down list.



The **Weld Time** limits can be applied to the first weld pulse the second weld pulse or both pulses. If **Both Pulses** is selected for **Weld Pulse** the Monitor will compare the limits you set to the time between the trigger of the first pulse and fall of the second pulse.

CHAPTER 4: MONITOR SETUP

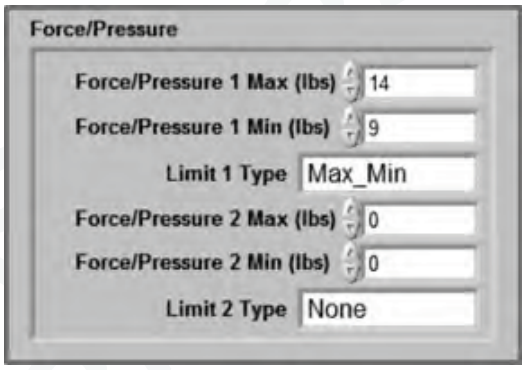
The selection made for **Limit Type** will determine if the Weld time limits you set are monitored. You should select **None** if the Weld time limits are ***not*** to be monitored or **Max_Min** if the limits are to be monitored.



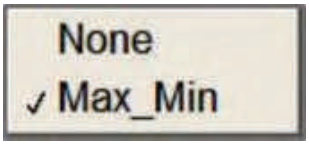
Select the desired **Limit Type** to from the drop down list.

Force 1 and 2

Enter the **Max** and **Min** limits for Force 1 and 2. Enter decimal numbers 0 or greater.



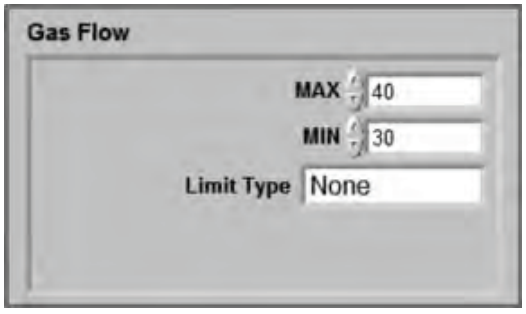
The selections made for **Limit 1 Type** and **Limit 2 Type** will determine if the Force 1 or 2 limits you set are monitored. You should select **None** if the Force limits are not to be monitored or **Max_Min** if the limits are to be monitored.



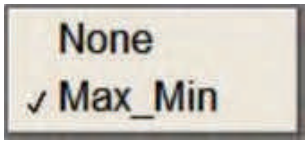
Select the desired **Limit Type** from the drop down list.

Alternate Sensor

This example shows the **Alternate Sensor** you labeled as **Gas Flow**. Enter the **Max** and **Min** Limit values. Enter decimal numbers **0** or greater.



The selections made for **Limit Type** will determine if the Alternate Sensor limits you set by are monitored. You should select **None** if the Alternate Sensor limits are not to be monitored or **Max_Min** if the limits are to be monitored.



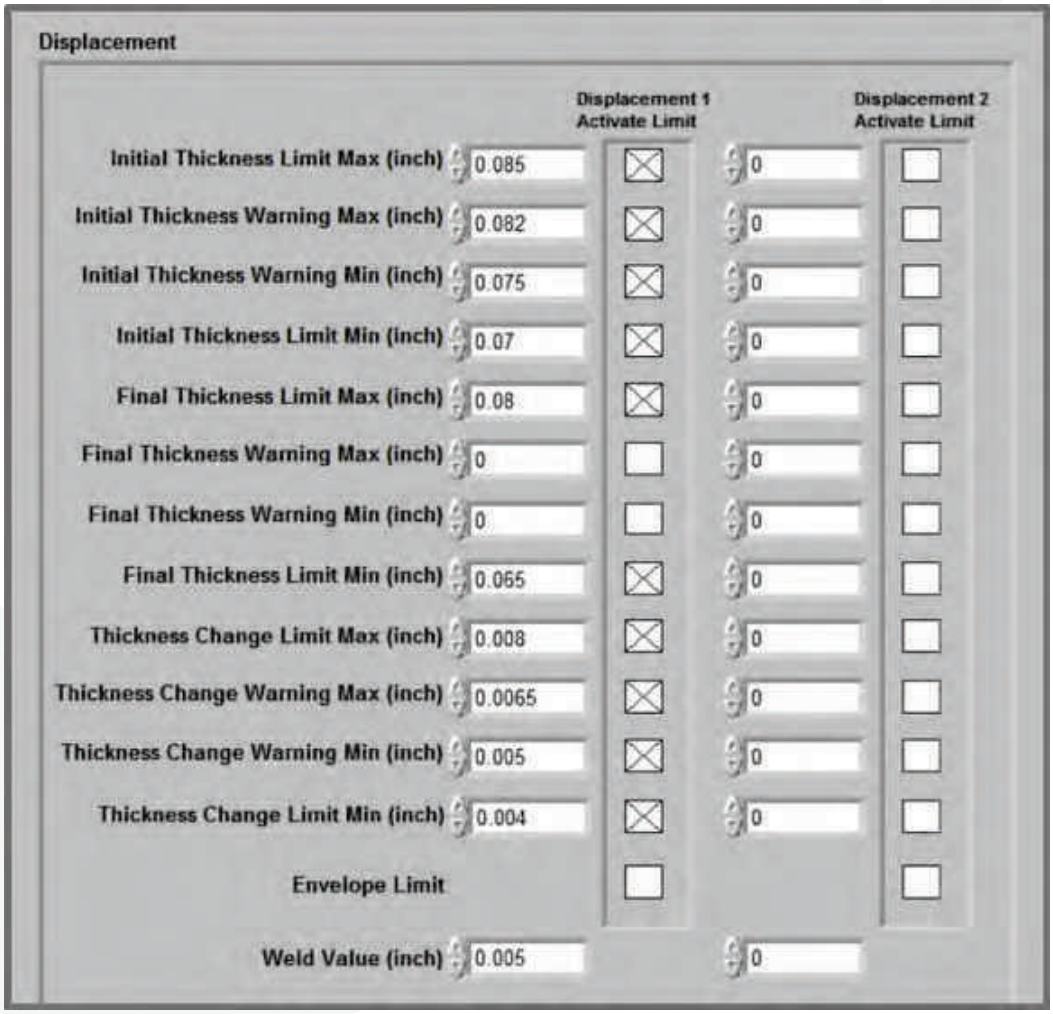
Select the desired **Limit Type** to from the drop down list.

CHAPTER 4: MONITOR SETUP

Displacement Limits

Enter the limits and warnings for **Initial Thickness**, **Final Thickness**, and **Thickness Change for both Displacement 1** and **Displacement 2**. Enter positive or negative decimal numbers as shown on the following page.

Click the check box next to the limit or warning for the Monitor to monitor that limit or warning. If the **Activate Limit** box is left unchecked, that limit or warning will ***not*** be monitored.



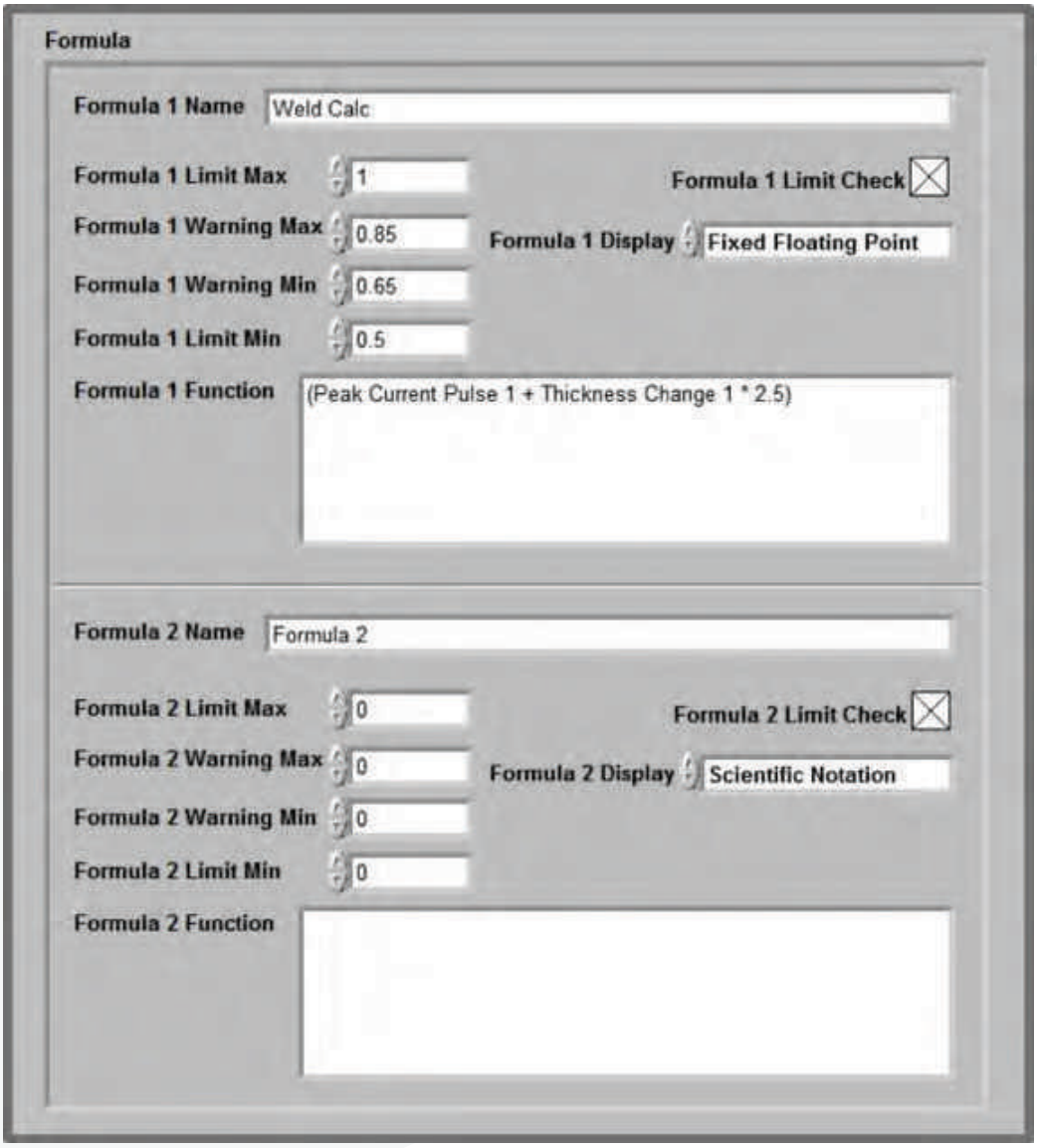
Click an **X** in the **Envelope Limit** check box if the envelope limit is to be monitored for **Displacement 1** and **Displacement 2.**

If a **Weld to Displacement** process is implemented, enter values in the **Weld Value** box.

CHAPTER 4: MONITOR SETUP

Formula

Formulas can be created and the results used for comparison to **Limit** or **Warning** values.



Formula 1 Name

Enter up to a 10 character name for the Formula. This name will be displayed on the Monitoring Screens as a reference for Formula 1. If this box is left blank, the Monitor will display **Formula 1** as the reference.

CHAPTER 4: MONITOR SETUP

Formula 1 Limit Max, Warning Max, Warning Min, Limit Min

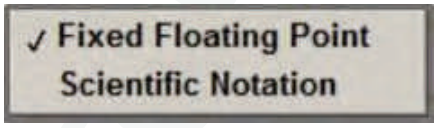
Enter the desired values for the upper and lower Limits and Warnings. Enter positive or negative decimal numbers.

Formula 1 Limit Check

Click this box if the Monitor is to monitor this Formula's Limit and Warning levels.

Formula 1 Display

Select either **Fixed Floating Point** or **Scientific Notation** for the format to be used for the display of the formula result.



Formula 1 Function

Formulas up to 250 characters can be entered.

The formula should consist of weld parameter names, arithmetic functions and parenthesis.

Arithmetic functions: Add (+), subtract (-), multiple (*), divide (/).

Parenthesis (or) used to sequence calculations.

Weld parameter names

Peak Current Pulse 1	RMS Resistance Pulse 2
RMS Current Pulse 1	Peak Power Pulse 2
Peak Voltage Pulse 1	RMS Power Pulse 2
RMS Voltage Pulse 1	Initial Thickness 1
Peak Resistance Pulse 1	Final Thickness 1
RMS Resistance Pulse 1	Displacement 1
Peak Power Pulse 1	Initial Thickness 2
RMS Power Pulse 1	Final Thickness 2
Peak Current Pulse 2	Displacement 2
RMS Current Pulse 2	Force 1
Peak Voltage Pulse 2	Force 2
RMS Voltage Pulse 2	Alternate Sensor Maximum
Peak Resistance Pulse 2	Alternate Sensor Minimum

If the formula calculation results in a calculation that is not mathematically possible, the Monitor will assign the Formula calculation a value of 0.

To setup the parameters for **Formula 2**, refer to the above instructions for **Formula 1**.

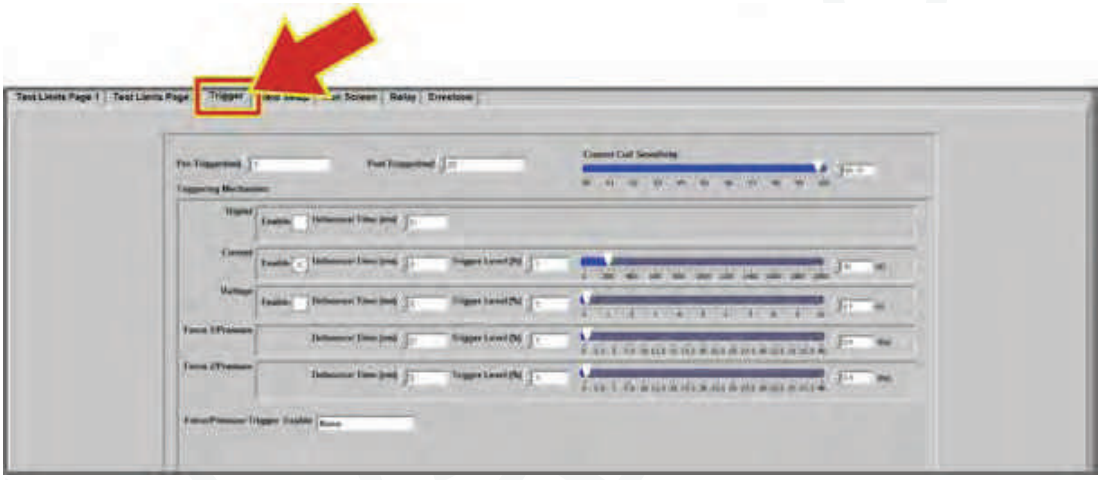
CHAPTER 4: MONITOR SETUP

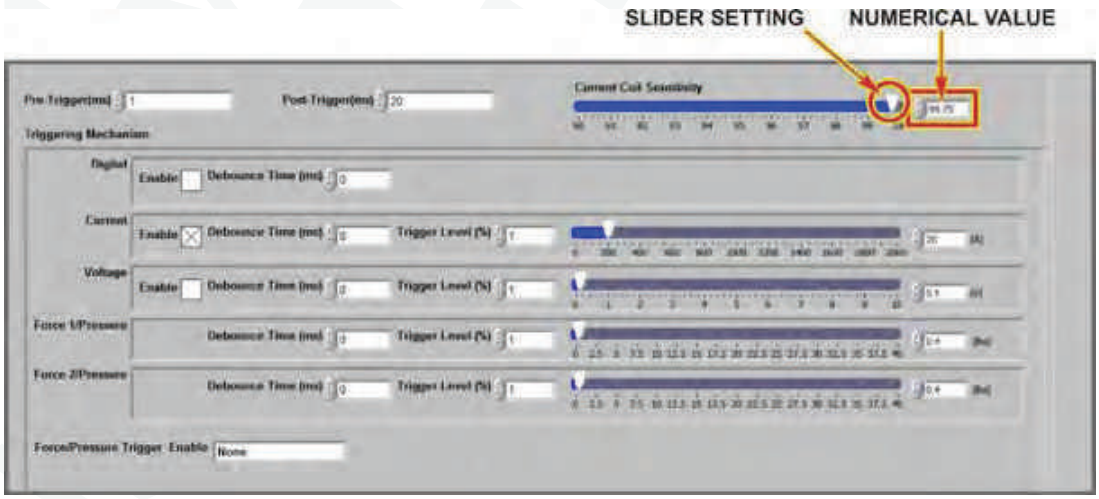
Trigger

The Trigger settings set the beginning of the first weld pulse. In addition, the Monitor uses the trigger settings to determine if a weld pulse has occurred.

The Monitor can monitor one parameter to determine the trigger. The choices for this parameter are the **Digital Trigger Input**, **Current**, **Voltage**, **Force1/Pressure**, or **Force2/Pressure**. The **Digital Trigger Input**, **Current** or **Voltage** are selected with a Check Box. **Force1/Pressure** and/or **Force2/Pressure** are selected from a drop down list.

A **Debounce Time** can be set for the trigger function to address noise or signal variability so that false triggers are prevented. The process will need to be above the trigger value for the length of the **Debounce Time** in order for the Monitor to set the trigger point.





CHAPTER 4: MONITOR SETUP

Pre-Trigger

Enter the **Pre-Trigger (ms)** value to set the Pre-Trigger time in milliseconds. The Pre trigger time can be set from 0 to 2000 milliseconds with the restriction that the total of the Pre and Post Trigger times must sum to 2000 milliseconds or less.

Post-Trigger

Enter the **Post-Trigger (ms)** value to set the Post-Triggering time in milliseconds. The Post Trigger time can be set from 1 to 2000 milliseconds with the restriction that the total of the Pre and Post Trigger times must sum to 2000 milliseconds or less.

Current Coil Sensitivity

Set the **Current Coil Sensitivity** using the slide bar in the upper right corner of the **Trigger Setup** screen. The Current Coil Sensitivity will determine the trigger point for coil applications when Current is selected as the parameter to monitor for the trigger point. The instructions under the following Current Trigger section must also be followed for current triggering applications.

A higher value for coil sensitivity will increase the chance of false **Monitor** triggers when an actual weld has not occurred. A possible method for establishing a **Current Coil Sensitivity** for an application is to start with a Sensitivity of 98%. Increase the **Current Coil Sensitivity** if the **Monitor** is not triggering on all of the actual welds. Reduce the **Current Coil Sensitivity** if the **Monitor** is recording false triggers.

Triggering Mechanism

The Monitor can monitor one parameter to determine the trigger. The choices for this parameter are the **Digital Trigger Input**, **Current**, **Voltage**, **Force1/Pressure**, or **Force2/Pressure**. The Digital Trigger Input, **Current** or **Voltage** is selected with a Check Box. **Force1/Pressure** and/or **Force2/Pressure** are selected from a drop down list.

Digital Trigger

Click an **X** in the **Enable** box if you want to use the Current to set the trigger point.

The Monitor will set the trigger point at the moment that it reads the Digital Trigger input is active. The Monitor polls the **Digital Trigger Input** once every 100 milliseconds. You should consider this 100 millisecond time window- when selecting the pre- and post- trigger times.

Current Trigger

Click an **X** in the **Enable** box if you want to use **Current** to set the trigger point for either a coil or shunt application.

For shunt applications, set a **Debounce Time** between 0 and 10 milliseconds as a decimal number. The actual trigger parameter must be above the user-set trigger level for the length of the **Debounce Time** before the Monitor will initiate a trigger. The start of the post-trigger time will begin at the start of the **Debounce Time.** If you set a **Debounce Time** greater than the post trigger time, the Monitor will use the post trigger time in place of the user-set **Debounce Time** when it evaluates debounce periods and determines trigger points.

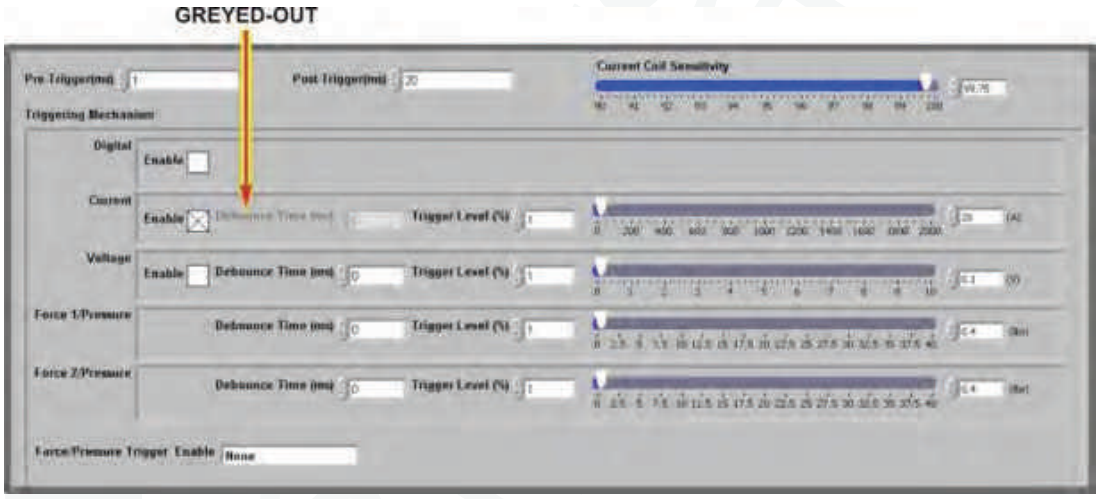
CHAPTER 4: MONITOR SETUP

Set a value for current level using the slider bar on the **Current Trigger** line on the screen. Moving the slider bar will change the % of range (2000 amps) and the amps boxes. This value will be used for current triggering for shunt applications. The maximum current trigger level for shunt applications can be 2000 amps.

For shunt applications with a dual pulse, the value set for the current level is also used to identify the point at which time and RMS calculation begin for the second pulse.

For coil applications with a single pulse, the value set for the current level is not used for any function. For coil applications with a dual pulse, the value set for the current level is used to identify the point at which time and RMS calculation begin for the second pulse.

For coil applications, **Debounce Time** does not apply. If the schedule has been setup for a coil on the **Weld Setup** Screen, the **Debounce Time** will be greyed-out on the **Current Trigger** line as shown on the screen below.



NOTE: For applications with a current trigger level of 50 amps or less it is strongly recommended to select either the **Butterworth** or **IIR** filter on the **Weld Setup** Screen. If a filter is not selected, there is a possibility of false or missed trigger points due to any low electrical noise that may be present.

Voltage Trigger

Click an **X** in the **Enable** box if you want to use Voltage to set the trigger point.

Set a **Debounce Time** between 0 and 10 milliseconds as a decimal number. The actual trigger parameter must be above the user-set trigger level for the length of the **Debounce Time** before the Monitor will initiate a trigger. The start of the post-trigger time will begin at the start of the **Debounce Time.** If you set a **Debounce Time** greater than the post trigger time, the Monitor will use the post trigger time in place of the user-set **Debounce Time** when it evaluates debounce periods and determines trigger points.

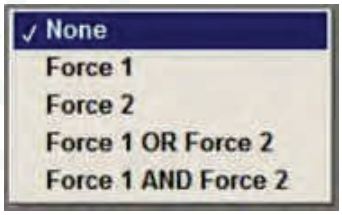
Set a value for voltage level using the slider bar on the **Voltage Trigger** line on the screen. Moving the slider bar will change the % of range (10 volts) and the volts boxes. The maximum voltage trigger level can be 10 volts.

Force 1/Pressure and Force2/Pressure Trigger

Set **Debounce Times** between 0 and 10 milliseconds as a decimal number. The actual trigger parameter must be above the user-set trigger level for the length of the **Debounce Time** before the Monitor will initiate a trigger. The start of the post-trigger time will begin at the start of the **Debounce Time.** If you set a **Debounce Time** greater than the post trigger time, the Monitor will use the post trigger time in place of the user-set **Debounce Time** when it evaluates debounce periods and determines trigger points.

Set values for force 1 and 2 levels using the slider bar on the **Force/Pressure Trigger** lines on the screen. Moving the slider bar will change the % of range (set on the **Weld Setup Screen**) and the numeric boxes. The maximum force trigger level is the value entered on the **Weld Setup Screen**.

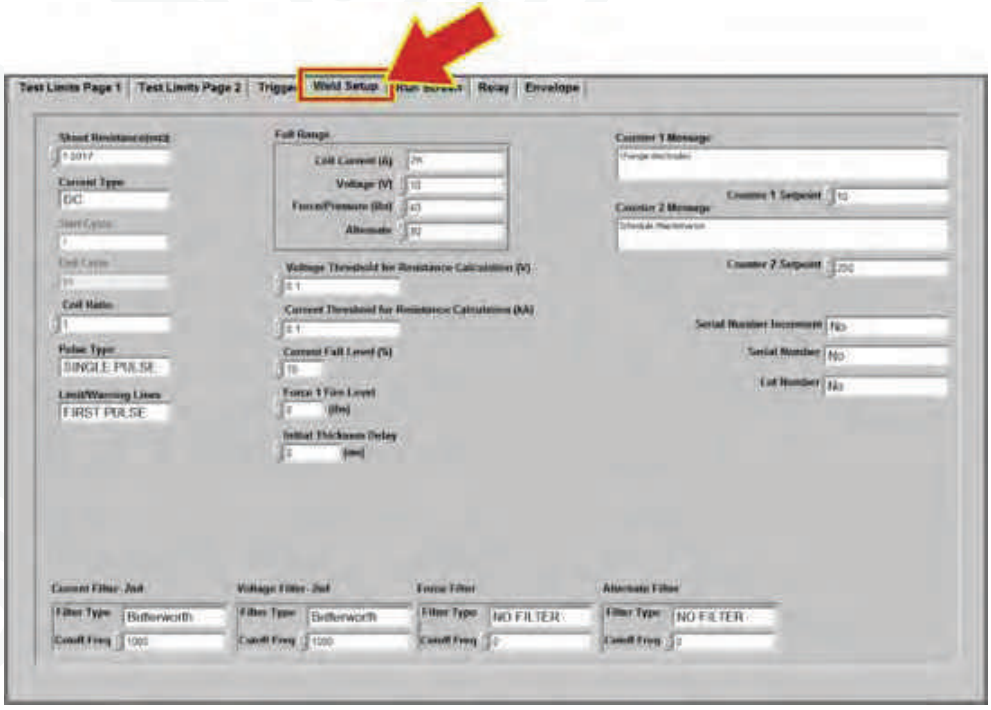
Force Pressure Trigger Enable



Force triggering can be based on only the Force 1/Pressure channel, only the Force 2/Pressure channel or both Force/Pressure Channels. If **Force 1 OR Force 2** is selected for **Force Pressure Trigger Enable** setting then the trigger point will be set when either Force 1/Pressure or Force2/Pressure is greater than the trigger setpoint for the length of the debounce time. If **Force 1 AND Force 2** is selected for **Force Pressure Trigger Enable** setting then the trigger point will be set when both **Force 1/Pressure** and **Force2/Pressure** are greater than the trigger setpoint for the length of the debounce time.

Weld Setup

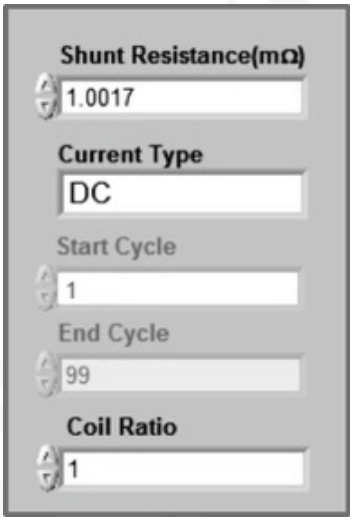
The **Weld Setup** Screen sets a number of parameters for the Schedule.



CHAPTER 4: MONITOR SETUP

Shunt Resistance

For a current shunt application, enter a shunt resistance as a decimal number 0 or greater.



Coil Ratio

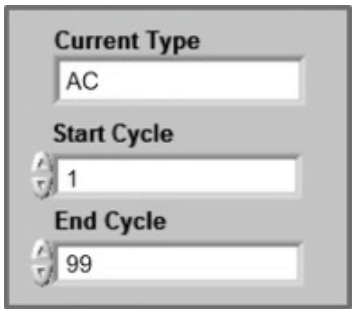
For a coil application enter the coil multiplier. For example, enter **1** for a 1 X coil. Enter **10** for a 10X coil. Enter the **Coil Ratio** as a decimal value 1 or greater.

Current Type

The choices for **Weld Current Type** are **AC** or **DC**. Choose either **AC** or **DC** setting based on type of welding power supply used for the application.

Start Cycle and End Cycle

For an AC Weld application, a **Start Cycle** and **End Cycle** must be entered. These values are used for calculating RMS values. Refer to Chapter 1 for more details of RMS calculations.



Start Cycle can be from 1 to 119. **End Cycle** can be from 1 to 120. If the user enters in a Start Cycle number greater than the End Cycle, the RMS value reported will be 0.

If DC is selected for **Current Type**, entry of settings into the **Start Cycle** and **End Cycle** boxes is prevented by the Monitor.

Pulse Type

Select **Single** or **Dual** for **Pulse Type.**

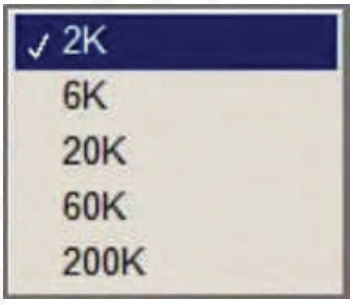
CHAPTER 4: MONITOR SETUP

Limit/Warning Lines

The **Limit/Warning Line** parameter will determine if the limit lines for the first or second pulse will be displayed on the Weld Monitoring Graphs.

Full Range – Coil Current

Select the range for the coil used for the application from the drop down box.



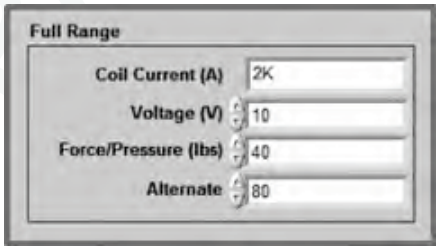
Full Range – Voltage, Force/Pressure/ Alternate

The **Full Range** parameters can be set to provide better proportions in the graph displays.

Voltage can be set from 0 to 15 Volts as a decimal number.

Force/Pressure can be set from 0 to 1000000 as a decimal number.

The **Alternate Sensor** can be set from 0 to 1000000 as a decimal number.

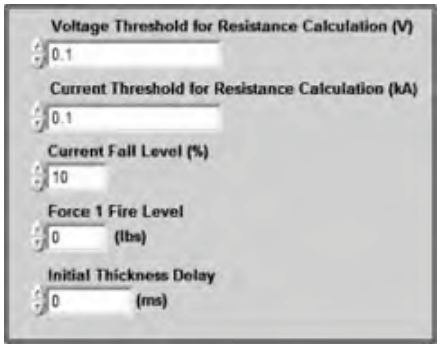


Voltage Threshold for Resistance Calculation

Enter a value from 0 to 15 volts as a decimal number. The resistance for the resistance waveform will not be calculated when the voltage is below the value entered into this box.

Current Threshold for Resistance Calculation

Enter a value from 0 to 200 k amps as a decimal number. The resistance for the resistance waveform will not be calculated when the current is below the value entered into this box.



Setting the **Current** and **Voltage** thresholds enables you to eliminate the spikes in the **Resistance** value that would be calculated from very low **Voltage** or **Current** levels. Data points for the **Resistance** waveform will ***not*** be plotted unless both the **Voltage** and **Current** settings are met.

CHAPTER 4: MONITOR SETUP

Current Fall Level

Enter a value from 10 to 90 as a whole number. This value determines the end of a weld pulse for RMS and time calculations for DC and AC Welds. This value represents the level of the signal from zero. If the pulse has a peak current of 1000 amps and a **Current Fall Level** of 90% is entered, 900 amps will be the end of the weld pulse for RMS and time calculations.

Force 1 Fire Level

Enter a value from 0 to 1000000 as a decimal number. This value sets the point at which the **Force Fire Digital Output** J105-6 will switch active. When the Force 1 channel is below the **Force 1 Fire Level**, the **Force Fire Digital Output** will be inactive. When the Force 1 channel is above the **Force 1 Fire Level**, the **Force Fire Digital Output** will be active.

Refer to *Chapter 1* for additional information on the Force Fire Function.

Initial Thickness Delay

Enter a value from 0 to 9999 milliseconds as a decimal number. This parameter is used to set the amount of time that the Monitor will wait after reading the Initial Thickness Measurement Input go from inactive to active before taking the Initial Thickness Measurement.

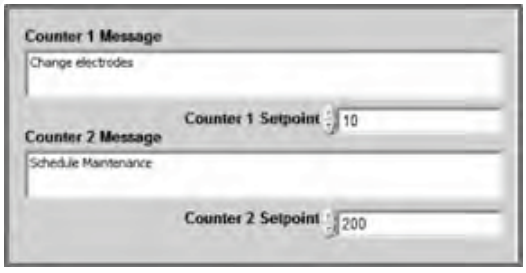
Refer to *Appendix C* for additional information on use of the **Initial Thickness Delay**.

Counters

The Monitor provides two user-settable weld counters which can be used to display messages or switch digital outputs. Each counter will display the user-defined message when the user-specified weld count is reached.

Counter 1 and 2 Messages

Enter the messages for Counters 1 & 2 as ASCII characters with up to 200 characters.

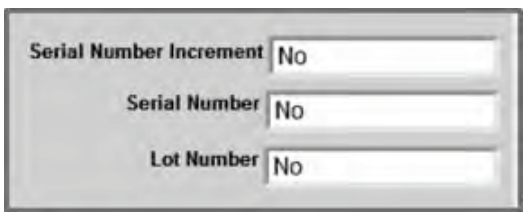


Counter 1 Setpoint

Enter values for Counter 1 and 2 Setpoints from 0 to 2147483647 as a whole number.

Serial Numbers and Lot Numbers

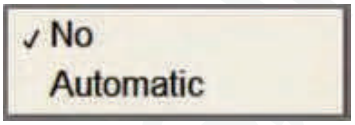
Parameters can be set to control the use of serial and lot numbers.



CHAPTER 4: MONITOR SETUP

Serial Number Increment

The choices for **Serial Number Increment** are **No** or **Automatic**. If **Automatic** is selected then the Monitor will increment the serial number after every weld.



Serial Number

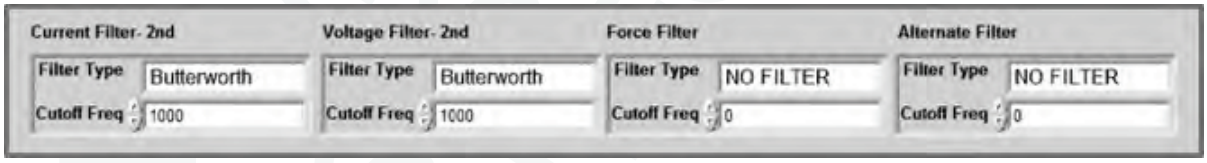
The Choices for Serial Number are **Yes** or **No**. If **No** is selected, the Serial Number field on the **Run** and **Weld Monitoring** Screens will not be accessible.

Lot Number

The Choices for Lot number are Yes or No. If **No** is selected, the Lot Number field on the **Run** and **Weld Monitoring** Screens will not be accessible.

Filters

The Monitor has filters which can be selected to filter noise on the analog input channels.

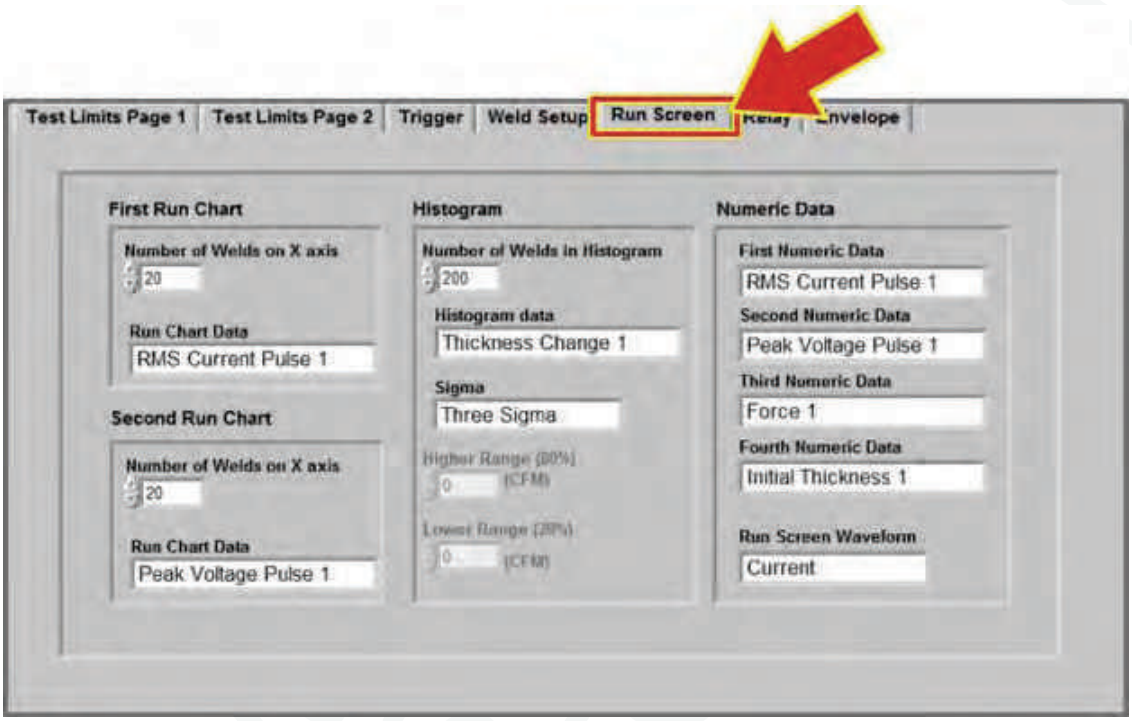


The Filter choices for each of the analog channels are **Butterworth**, **IIR**, or **NO FILTER**.

Enter Cutoff Frequency from 100 to 20000.

CHAPTER 4: MONITOR SETUP

Run Screen



The **Run Screen** Setup Screen is used to select the parameters that will be displayed on the **Run Screen** and also select some screen formats.

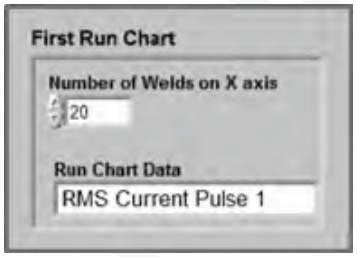
The following parameters can be selected for display on the two Run Charts, Histogram, four Numeric Displays and Waveform on the **Run Screen**.

Peak Current Pulse 1
RMS Current Pulse 1
Peak Voltage Pulse 1
RMS Voltage Pulse 1
Peak Resistance Pulse 1
RMS Resistance Pulse 1
Peak Power Pulse 1
RMS Power Pulse 1
Peak Current Pulse 2
RMS Current Pulse 2
Peak Voltage Pulse 2
RMS Voltage Pulse 2
Peak Resistance Pulse 2
RMS Resistance Pulse 2
Peak Power Pulse 2
RMS Power Pulse 2
Initial Thickness 1
Final Thickness 1
Thickness Change 1
Initial Thickness 2
Final Thickness 2
Thickness Change 2
Force 1
Force 2
Alternate
Formula 1
Formula 2

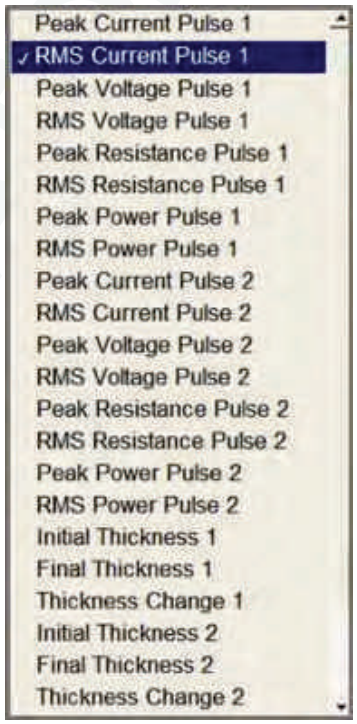
CHAPTER 4: MONITOR SETUP

First Run Chart

For the first **Run Chart** enter the number of welds which can be displayed on the X axis. Enter a value from 10 to 4000.

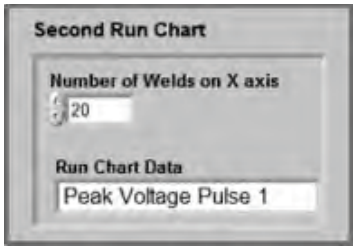


Select the parameter to be plotted in the first **Run Chart** from a drop down list.



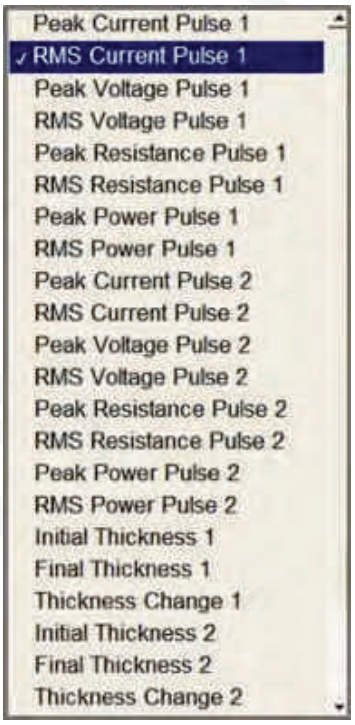
Second Run Chart

For the second **Run Chart** enter the number of welds which can be displayed on the X axis. Enter a value from 10 to 4000.



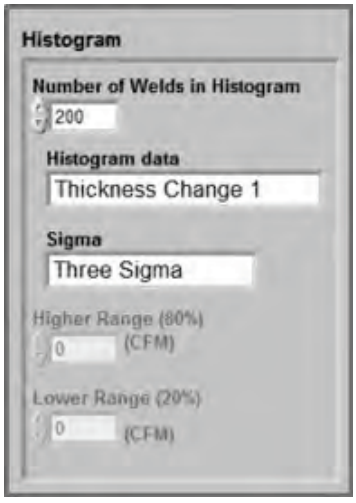
CHAPTER 4: MONITOR SETUP

Select the parameter to be plotted in the second **Run Chart** from a drop down list.



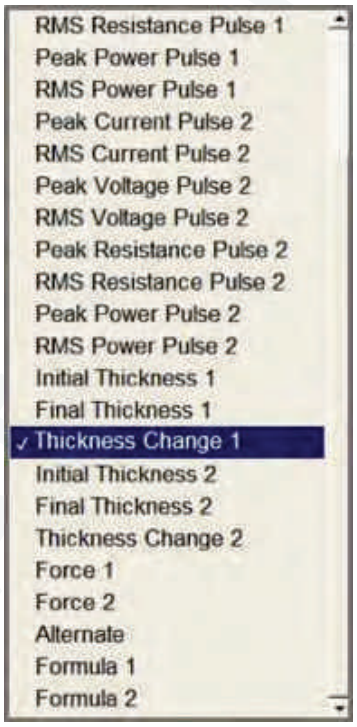
Histogram

For the **Histogram,** enter number of welds that will be retained in the histogram. Enter a number from 10 to 4000. Once the number is reached, the Monitor will maintain the histogram using a first in first out basis.

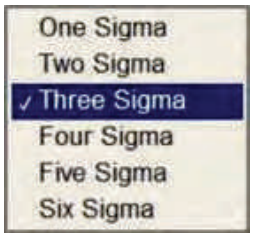


CHAPTER 4: MONITOR SETUP

Select the parameter to be plotted in the **Histogram** from a drop down list.

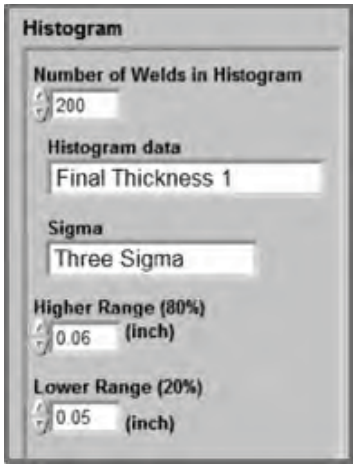


Select the number of sigma to be displayed on the histogram for the standard deviation calculation.



If the parameter selected for the **Histogram** does not have limits set on either the Limits Page 1 or 2 screens the higher range and lower range will be in black font indicating that these parameters should be entered. The Higher and Low Ranges are used to scale the X Axis of the Histogram.

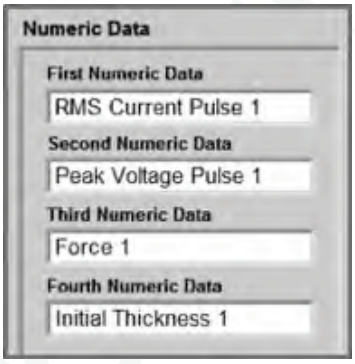
Enter Higher and Lower range as a decimal number from 0 to 100



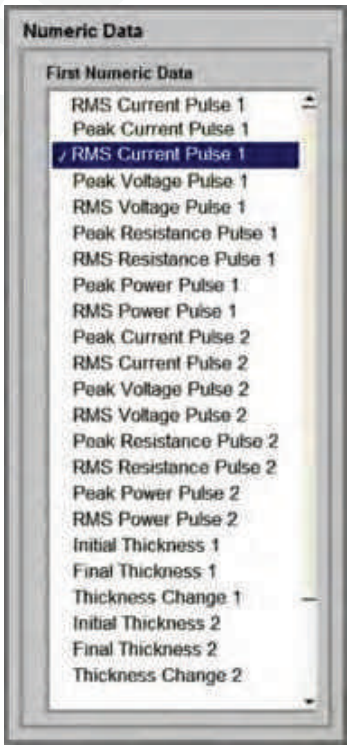
CHAPTER 4: MONITOR SETUP

Numeric Data and Waveform

Up to four Numeric parameters can be selected to be displayed in large font in the upper right corner of the **Run Screen**.



Select the parameter for each of the Numeric display.



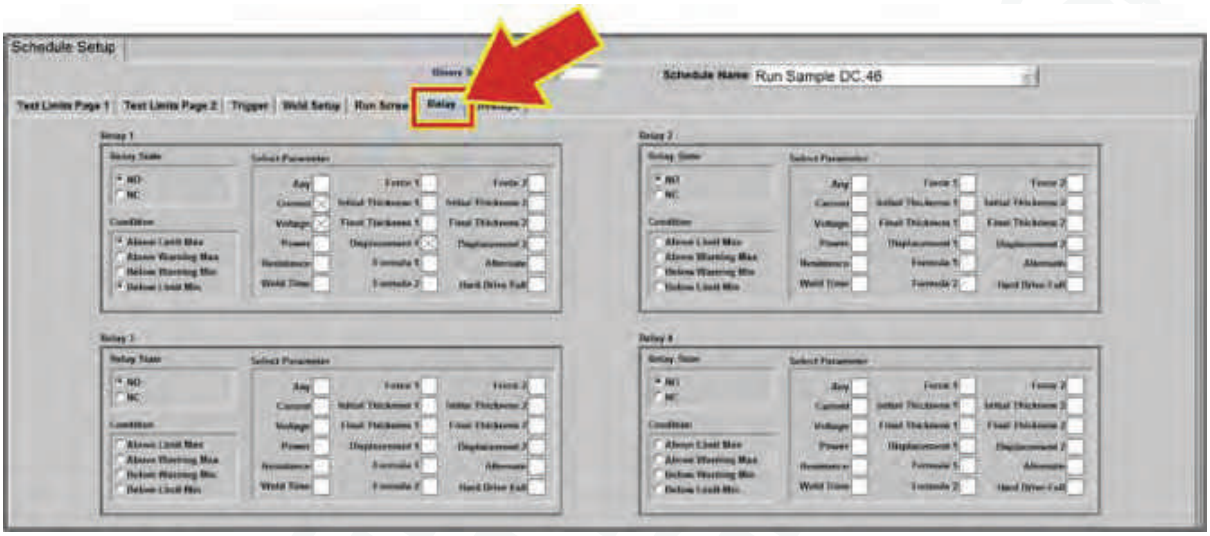
Waveform

The waveform needs to be selected for the lower right of the **Run Screen**.

CHAPTER 4: MONITOR SETUP

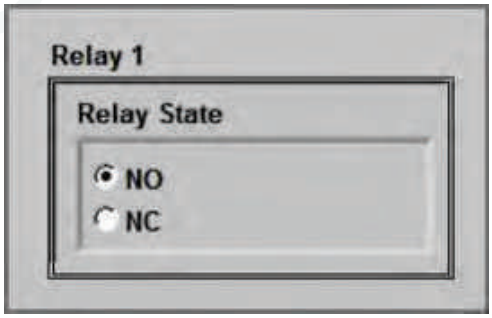
Relay

The **Relay Setup Screen** below allows you to set when you want each of the four Monitor relays to activate. This screen also allows you to set the **Condition** and **Relay State** for each of the relays. The process for setting these parameters is the same for each relay.



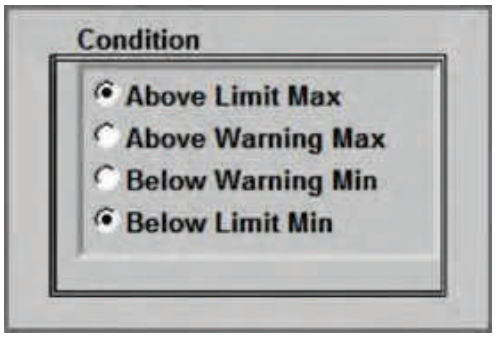
Relay State

Select **NO** (Normally Open) or **NC** (Normally Closed).



Condition

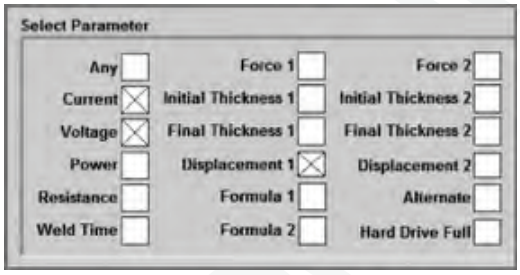
Set the **Condition** of when the relay should activate. Select **Out of Limits, Above Upper Limit,** or **Below Lower Limit.**



CHAPTER 4: MONITOR SETUP

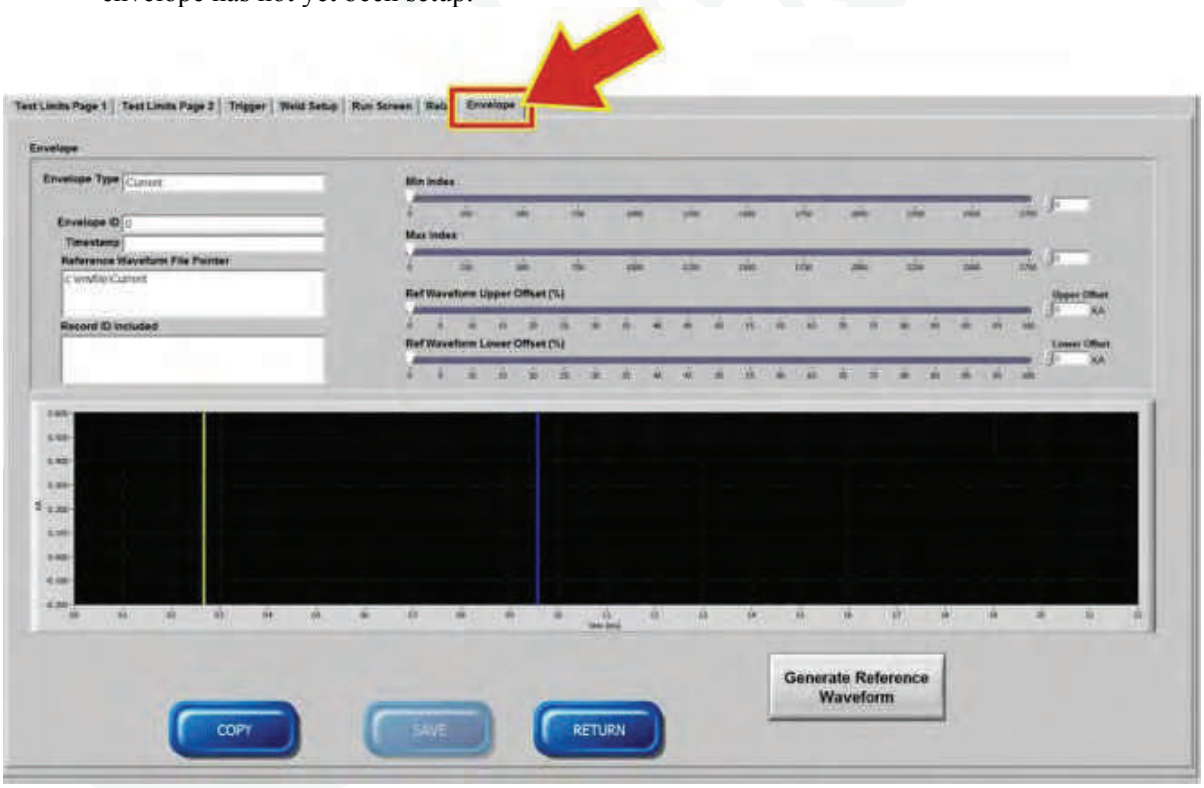
Channels Selected

You may select any individual Parameter or any combination of these parameters. If you select **Any**, the relay will activate any time any one of these parameters goes out of limits.



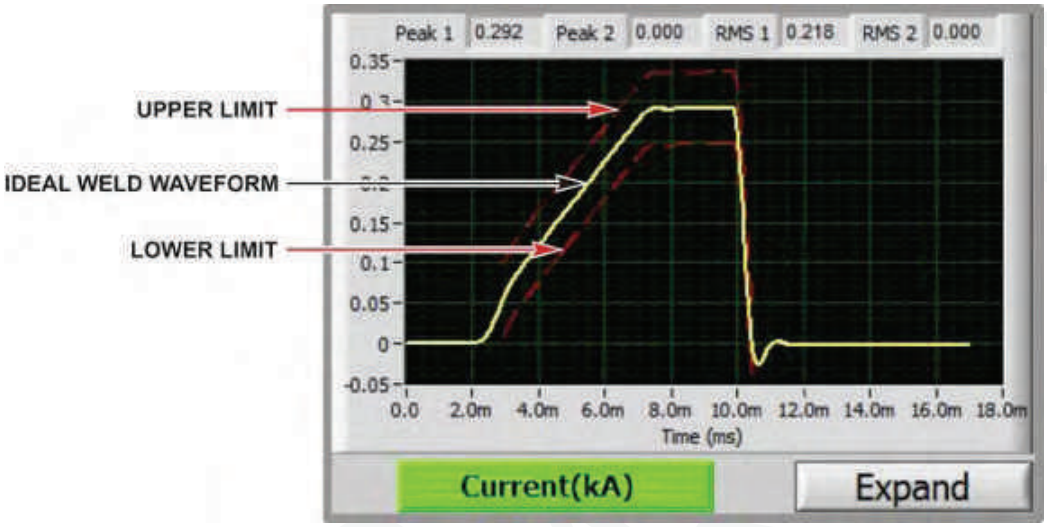
Envelope

1. Click on the **Envelope** tab on the **Schedule Setup** to setup an envelope for a schedule. When the **Envelope** tab is accessed, the current waveform will be displayed by default for the selected schedule. The screen below does not display an envelope waveform, indicating that the current envelope has not yet been setup.

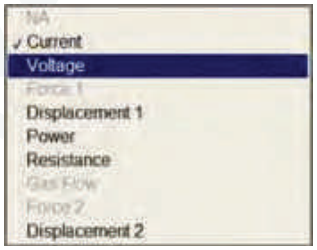


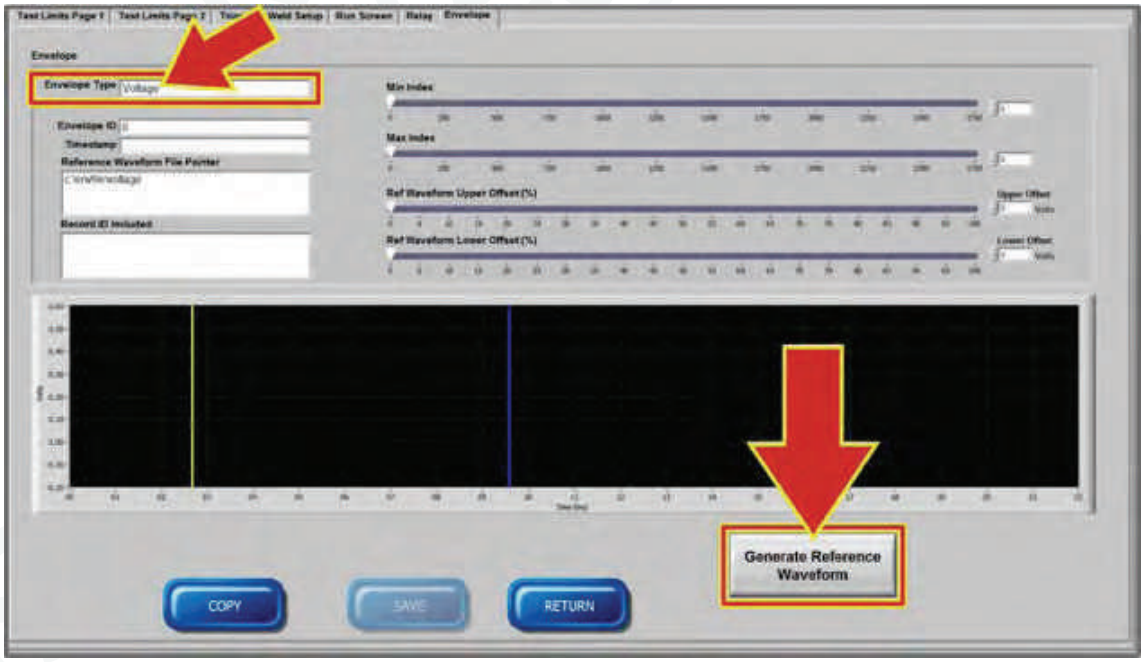
Envelope limits sets the maximum and minimum limits above and below a waveform from a previous weld (or welds) for a specific parameter. You may choose a single waveform around which to create an envelope or you may average several waveforms together in order to get an "ideal" reference for the welds you want to make. The upper and lower bounds of the envelope remain a constant distance from the reference waveform.

CHAPTER 4: MONITOR SETUP



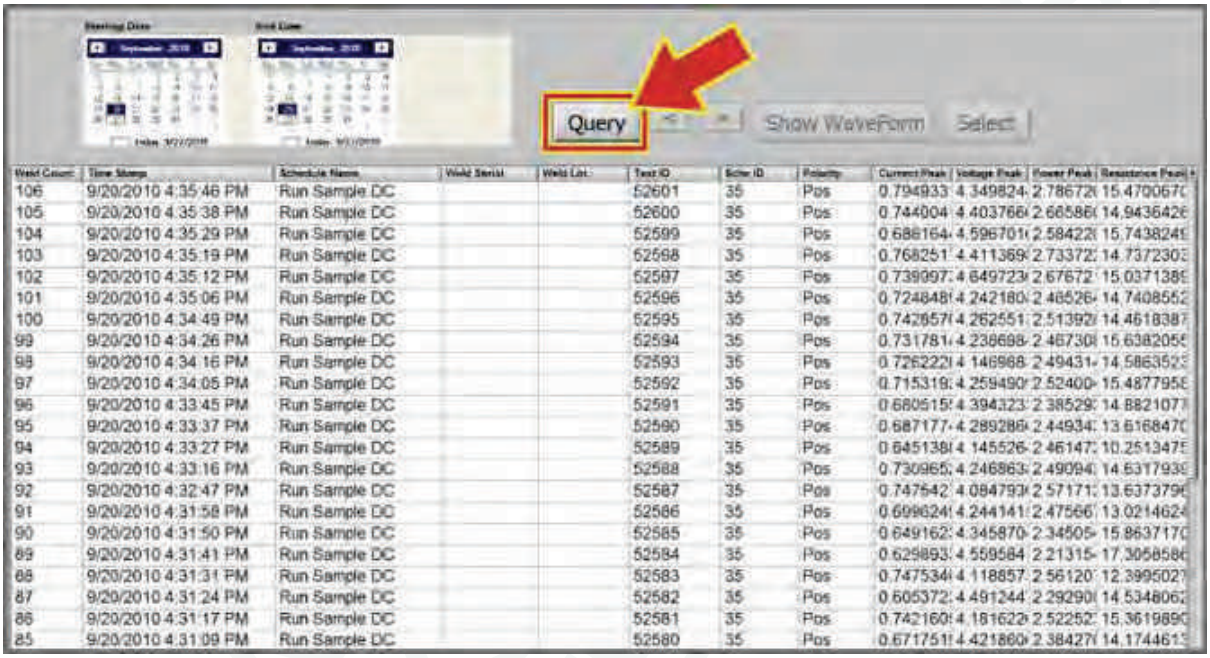
2. Click the **Envelope Type** box to display a drop down box listing the envelopes available for this schedule. If the voltage waveform is selected the screen will appear as shown below.





CHAPTER 4: MONITOR SETUP

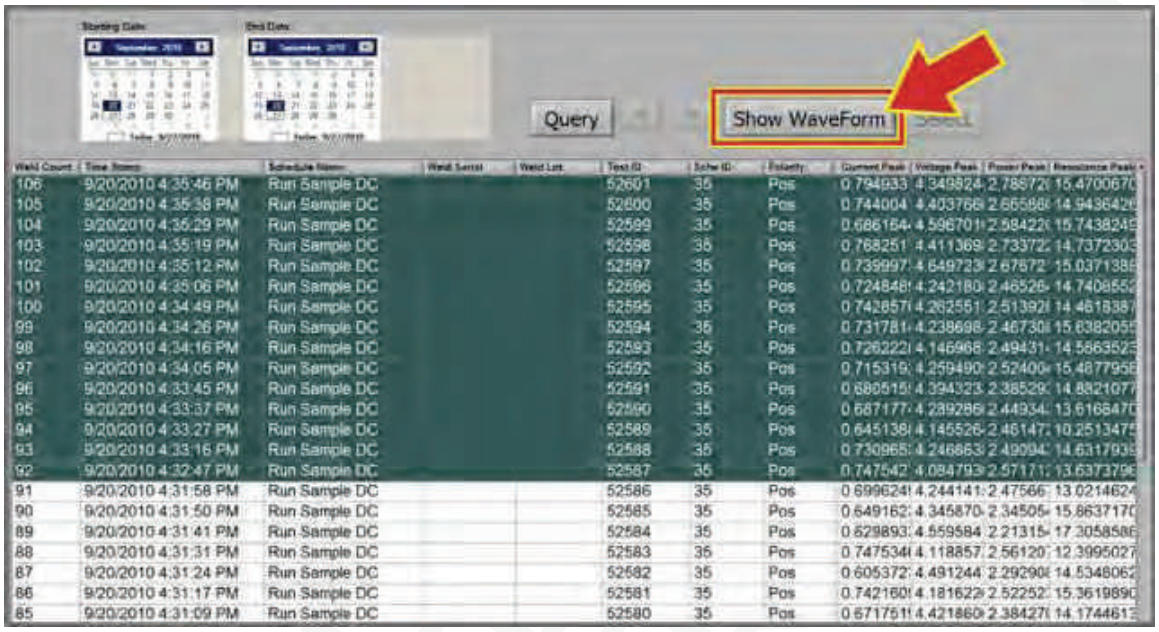
3. Click on **Generate Reference Waveform** and then a **Query** screen will appear. Do a query which, at a minimum, includes the desired welds that will be averaged into the envelope for this schedule. This will give a screen with a query as shown in the following screen.



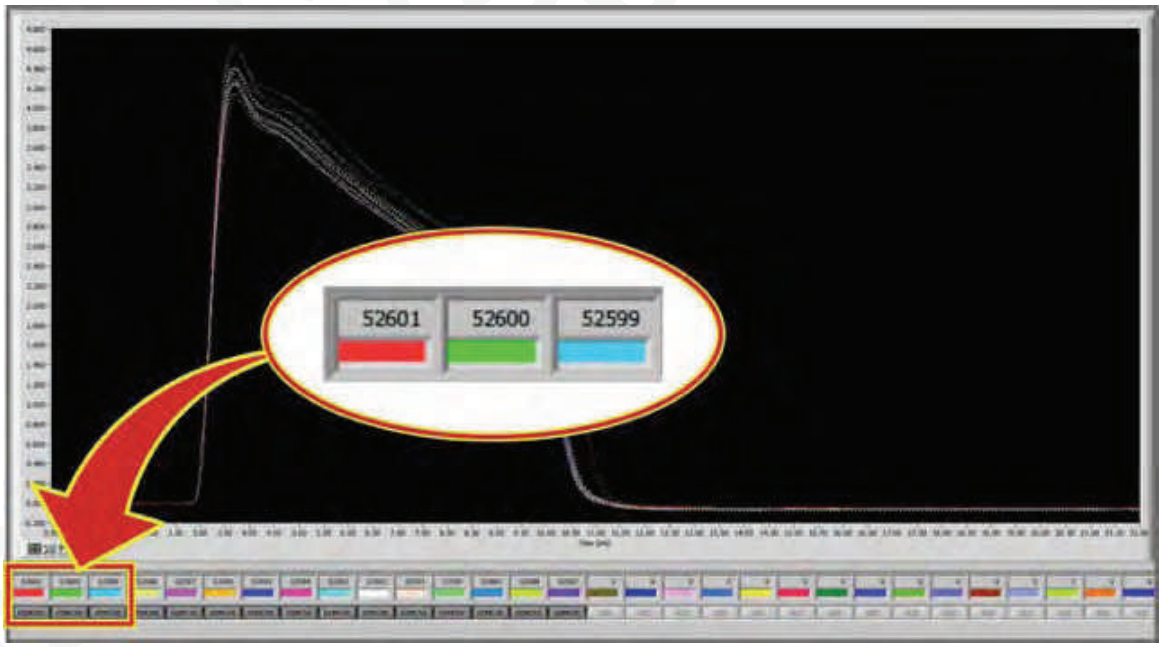
Weld Count	Time Stamp	Schedule Name	Weld Serial	Weld Lot	Test ID	Schr ID	Polarity	Current Peak	Voltage Peak	Power Peak	Resistance Peak
106	9/20/2010 4:35:46 PM	Run Sample DC			52601	35	Pos	0.794933	4.349824	2.78672	15.470067
105	9/20/2010 4:35:38 PM	Run Sample DC			52600	35	Pos	0.744004	4.403766	2.66586	14.9436426
104	9/20/2010 4:35:29 PM	Run Sample DC			52599	35	Pos	0.686164	4.596701	2.58422	15.7438245
103	9/20/2010 4:35:19 PM	Run Sample DC			52598	35	Pos	0.768251	4.411369	2.73372	14.7372303
102	9/20/2010 4:35:12 PM	Run Sample DC			52597	35	Pos	0.739097	4.649723	2.67672	15.0371385
101	9/20/2010 4:35:06 PM	Run Sample DC			52596	35	Pos	0.724848	4.242180	2.46526	14.7408552
100	9/20/2010 4:34:49 PM	Run Sample DC			52595	35	Pos	0.742657	4.262551	2.51392	14.4618387
99	9/20/2010 4:34:26 PM	Run Sample DC			52594	35	Pos	0.731781	4.238698	2.46730	15.6382055
98	9/20/2010 4:34:16 PM	Run Sample DC			52593	35	Pos	0.726222	4.146968	2.49431	14.5863523
97	9/20/2010 4:34:05 PM	Run Sample DC			52592	35	Pos	0.715319	4.259490	2.52400	15.4877958
96	9/20/2010 4:33:45 PM	Run Sample DC			52591	35	Pos	0.680515	4.394323	2.38529	14.8821077
95	9/20/2010 4:33:37 PM	Run Sample DC			52590	35	Pos	0.687177	4.289286	2.44934	13.6168470
94	9/20/2010 4:33:27 PM	Run Sample DC			52589	35	Pos	0.645138	4.145526	2.46147	10.2513475
93	9/20/2010 4:33:16 PM	Run Sample DC			52588	35	Pos	0.730965	4.246863	2.49094	14.6317939
92	9/20/2010 4:32:47 PM	Run Sample DC			52587	35	Pos	0.747542	4.084793	2.57171	13.6373796
91	9/20/2010 4:31:58 PM	Run Sample DC			52586	35	Pos	0.699624	4.244141	2.47566	13.0214624
90	9/20/2010 4:31:50 PM	Run Sample DC			52585	35	Pos	0.649162	4.345870	2.34505	15.8637170
89	9/20/2010 4:31:41 PM	Run Sample DC			52584	35	Pos	0.629893	4.559584	2.21315	17.3058586
88	9/20/2010 4:31:31 PM	Run Sample DC			52583	35	Pos	0.747534	4.118857	2.56120	12.3995027
87	9/20/2010 4:31:24 PM	Run Sample DC			52582	35	Pos	0.605372	4.491244	2.29290	14.5348062
86	9/20/2010 4:31:17 PM	Run Sample DC			52581	35	Pos	0.742160	4.181629	2.52252	15.3619890
85	9/20/2010 4:31:09 PM	Run Sample DC			52580	35	Pos	0.671751	4.421860	2.38427	14.1744613

4. You may choose an individual waveform or up to 30 waveforms to average together as the baseline for the envelope. Select multiple waveforms by holding down the **Ctrl** key and selecting, or you may select a block by holding down the **Shift** key and click on the first and last selections and all waveforms in between will be selected. The following screen shows selected welds.

CHAPTER 4: MONITOR SETUP

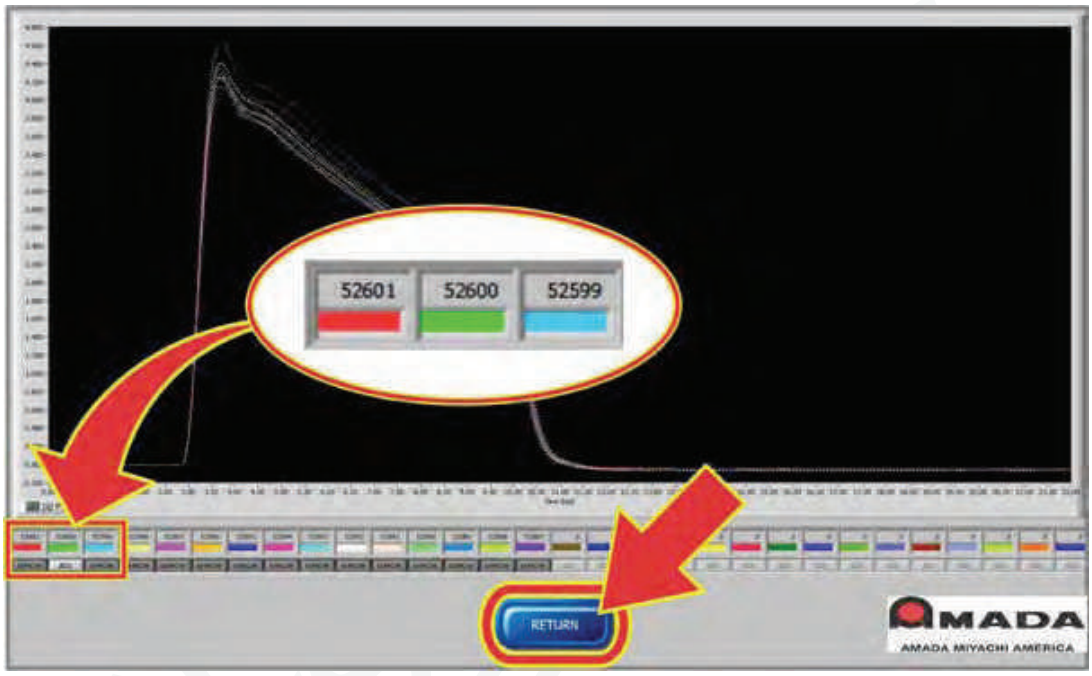


5. Click the **Show Waveform** button to display the waveforms selected. Each waveform will be shown as a dashed line in a unique color. The color is coded to one of the **Remove/Add** buttons that appear along the bottom of the screen. The **Remove/Add** buttons in grey font do not have an assigned waveform. This screen provides an opportunity to deselect waveforms if it is not desired to include them in the final average baseline for the envelope.

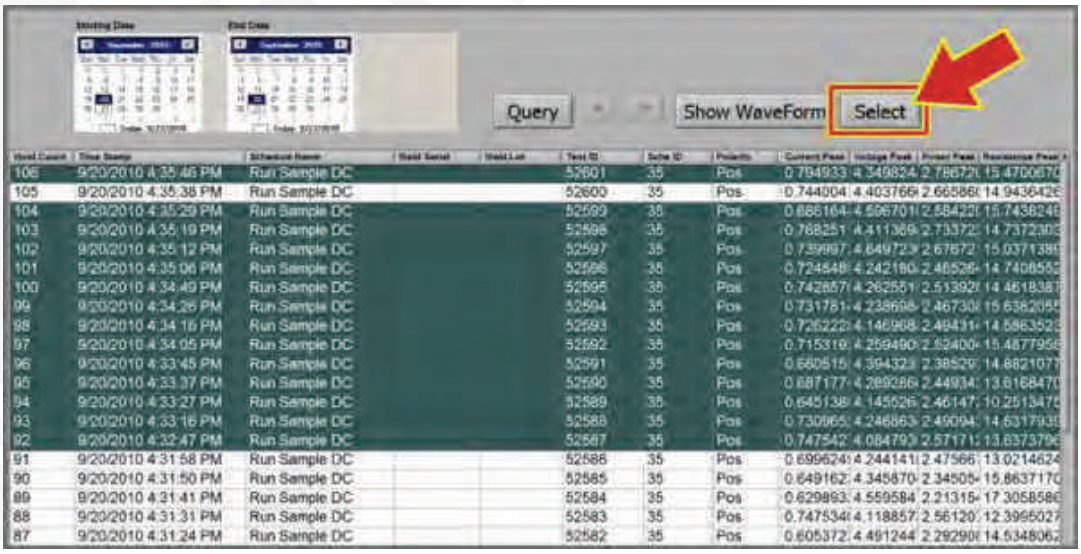


CHAPTER 4: MONITOR SETUP

6. If there is a waveform that should not be included in the average of waveforms for the baseline, then the **Remove/Add** button can be clicked for that particular waveform. In the following screen, the waveform 52600 has been removed as indicated by the **Remove/Add** button which is shown as **Add**.



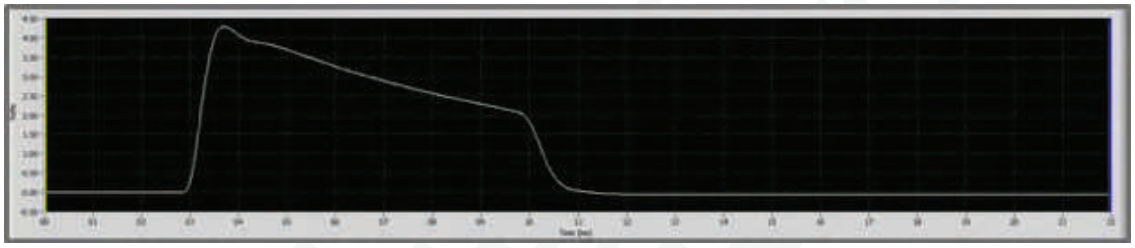
7. Click the **Return** button when finished removing or adding waveforms. The **Query** screen for the waveforms will then appear and only the waveforms that remain selected will be highlighted.



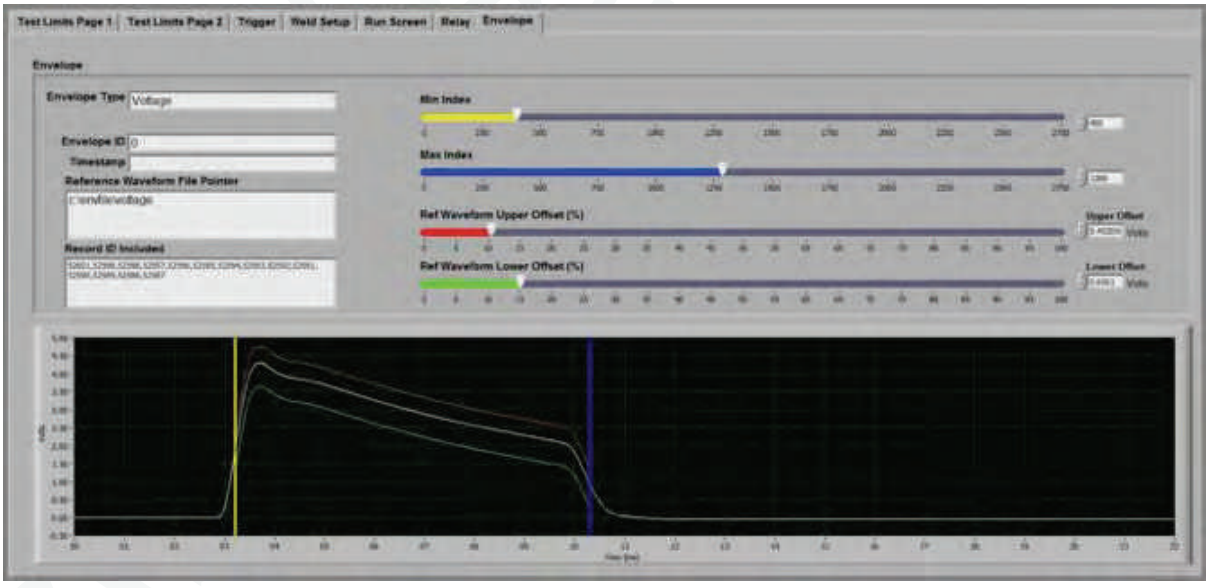
CHAPTER 4: MONITOR SETUP

8. Then click the **Select** button. The **Select** button will then appear in grey font indicating it has been pressed.

9. Then click on **Return.** The waveforms selected will be averaged into one waveform which will be shown on the **Envelope** screen as a white line.



10. The slider bars for the **Min Index** and **Max Index** can be moved to select the beginning and end of the envelope. The **Ref Waveform Lower Offset** sets the lower limit of the envelope, and the **Ref Waveform Upper Offset** sets the upper limit.



11. When the envelope has been defined, click the **Save** button and a window will open prompting for the schedule name.

CHAPTER 4: MONITOR SETUP

The information in the upper left of the screen is updated as follows:

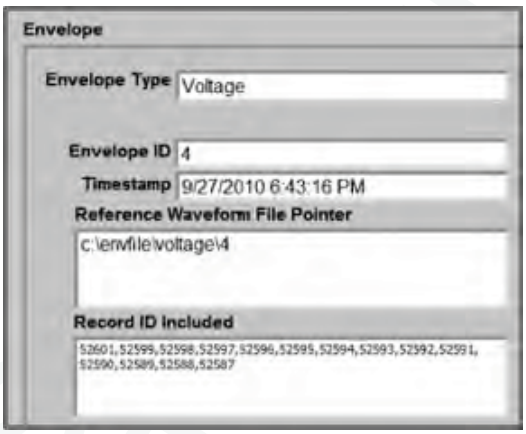
Envelope ID is a reference number.

Timestamp is time that envelope was created.

Reference Waveform File Pointer is file location of the waveform.

Record ID Included lists the waveforms averaged into the baseline for the envelope.

The **Envelope ID** and **Reference Waveform File Pointer** are for historical reference.

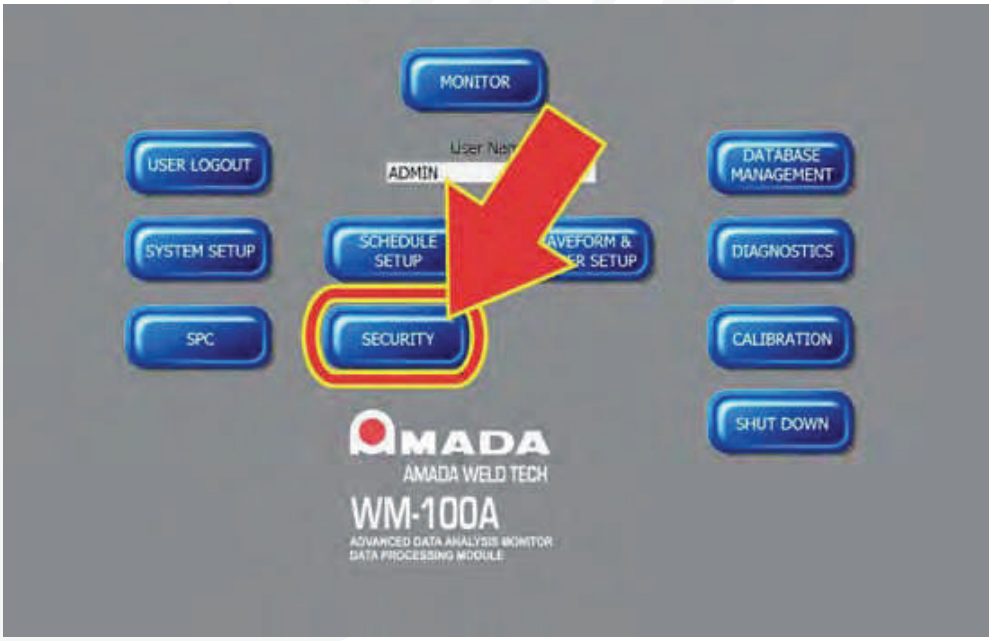


Section III. Security

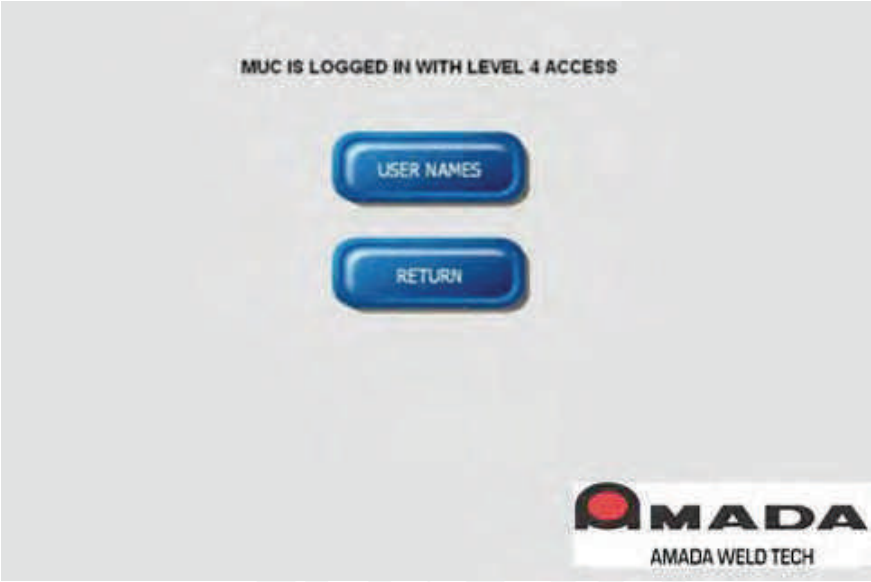
The Monitor maintains a list of users and their passwords. There are four levels of security. Only users with the highest level of security can add or delete users.

Level	Description	Access
0	**Operator**	Access to view screen ***only***.
1	**Technician**	Access to **Diagnostics, Calibration,** and **Monitor** screens.
2	**Engineer**	Access to all screens ***except*** the **Security** screen.
3	**Administrator**	Access to ***all*** screens.

From the **MAIN MENU**, click on the **SECURITY** button**.** When the **SECURITY MENU** screen appears it automatically displays the user currently logged-on to the Monitor and what the security level is for that user.



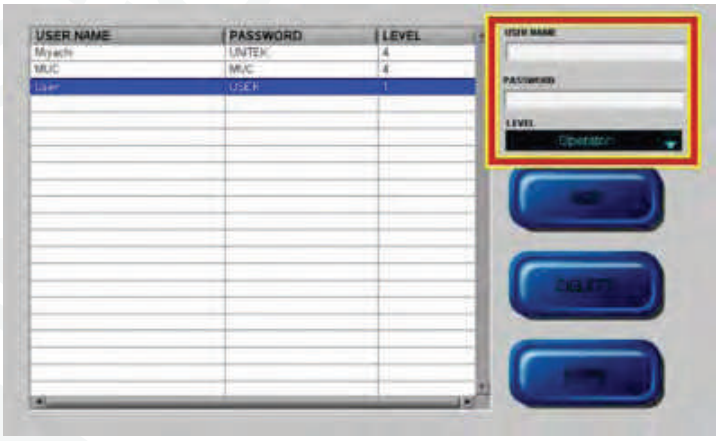
CHAPTER 4: MONITOR SETUP



Click on the **USER NAMES** button to go to the user name and password table.

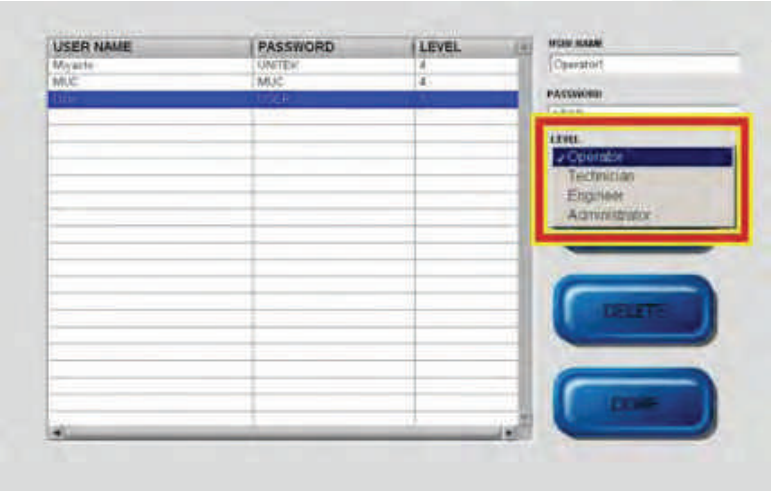
To Add A User

1. Type a new username in **USER NAME** box
2. Type a new password in **PASSWORD** box
3. To set the security level, click on the **LEVEL** text box to open a list of security levels.



CHAPTER 4: MONITOR SETUP

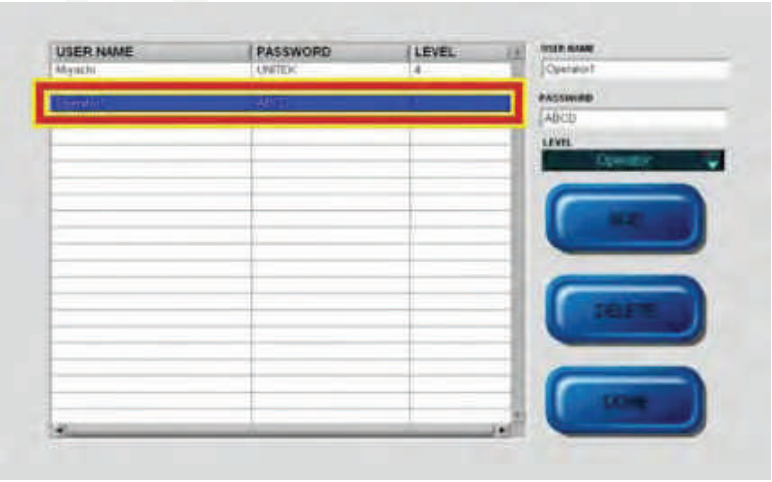
4. Click **Operator, Technician, Engineer, or Administrator** to select the security level.



NOTE: The **User Name** and **Password** table only displays the security levels of users as numbers which correspond to the descriptions below.

Level	Description	Access
1	**Operator**	Access to view screen ***only***.
2	**Technician**	Access to **Diagnostics, Calibration,** and **Monitor** screens.
3	**Engineer**	Access to all screens ***except*** the **Security** screen.
4	**Administrator**	Access to ***all*** screens.

5. Click the **ADD** button. The new user name will appear in the **USER NAME** list



CHAPTER 4: MONITOR SETUP

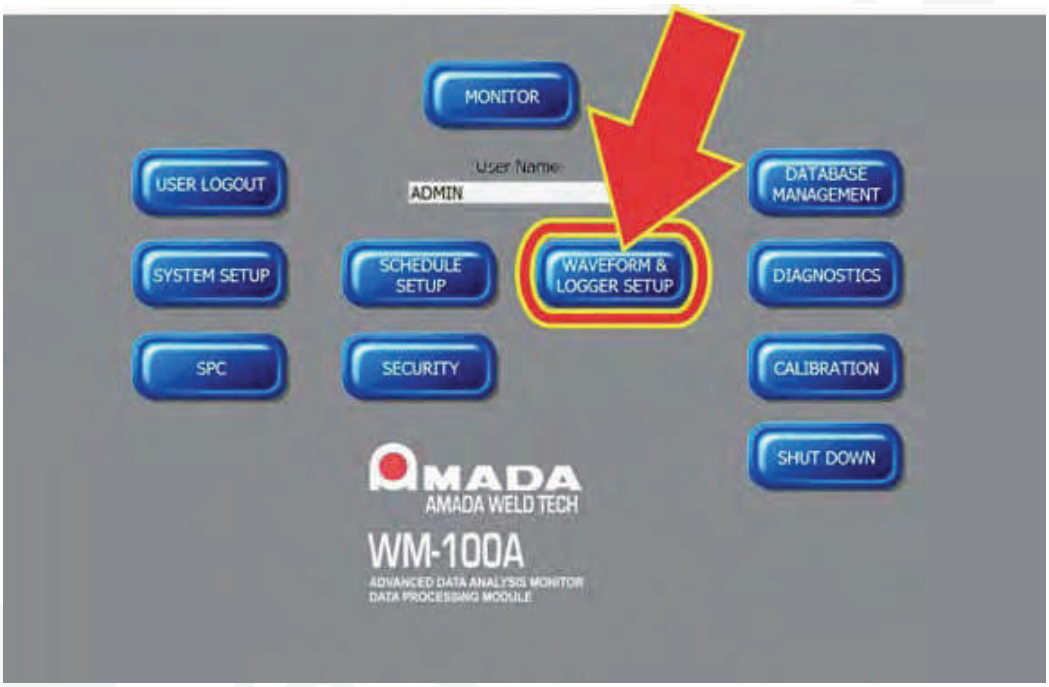
To Delete A User

1. To delete a user, click on the user you want to delete to highlight the user and then press **DELETE**.
2. When you are finished adding or deleting users, press the **DONE** button to return to the main **SECURITY** menu.
3. Click on **RETURN** to go back to the **MAIN MENU**.

Section IV. Logger Setup

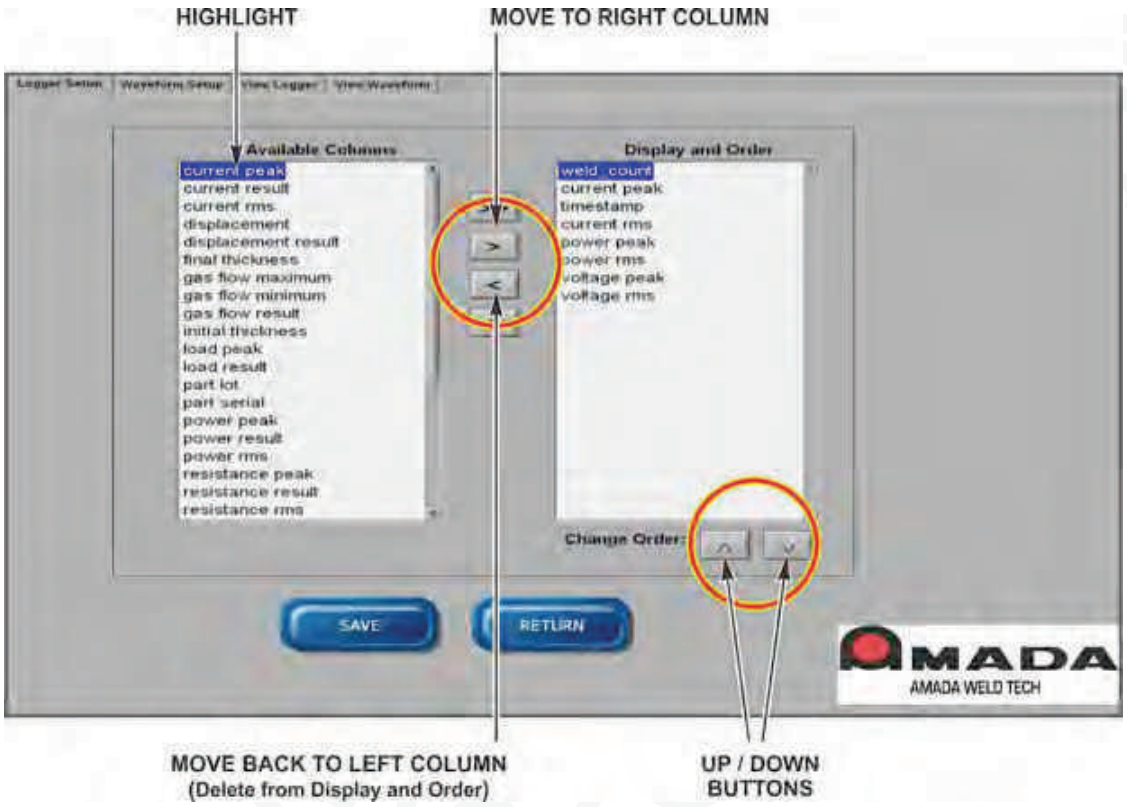
For **Logger Setup**, you select which weld parameters will be displayed in listings of weld data on the Monitor's **View Logger** Screens.

From the **Main Menu**, click the **Waveform & Logger Setup** button and then the screen for the **Logger Setup** Tab will display.



There are two columns of weld parameters displayed on the **Logger Setup** screen. The column on the left shows all the weld parameters which can be selected for display on the screens listing weld data. The column on the right shows the weld parameters which have been selected for display.

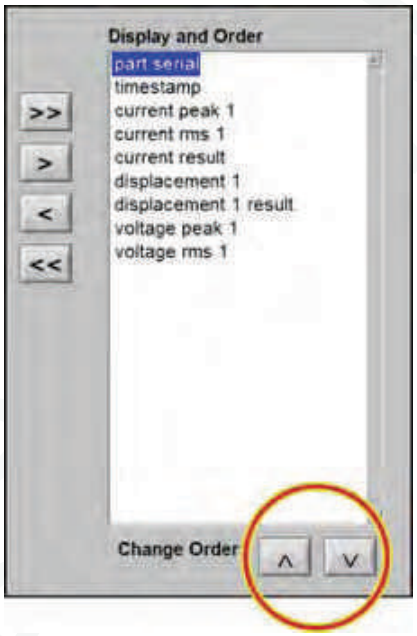
CHAPTER 4: MONITOR SETUP



1. To add a parameter to the right column, click on a parameter in the left column and press the **>** key to add it to the right column
2. To remove a parameter from the right column, click on a parameter in the right column and press the **<** key to remove it.
3. To add all the parameters in the left column to the right column, click on the **>>** key. To remove all parameters from the right column press the **<<** key.

CHAPTER 4: MONITOR SETUP

The sequence that parameters will be displayed from left to right on the **View Logger** screens is the order in which the parameters appear in the right column. The sequence can be changed using the Λ or V keys. Highlight a parameter in the right column and then click the Λ or V keys to move it up or down in the list.

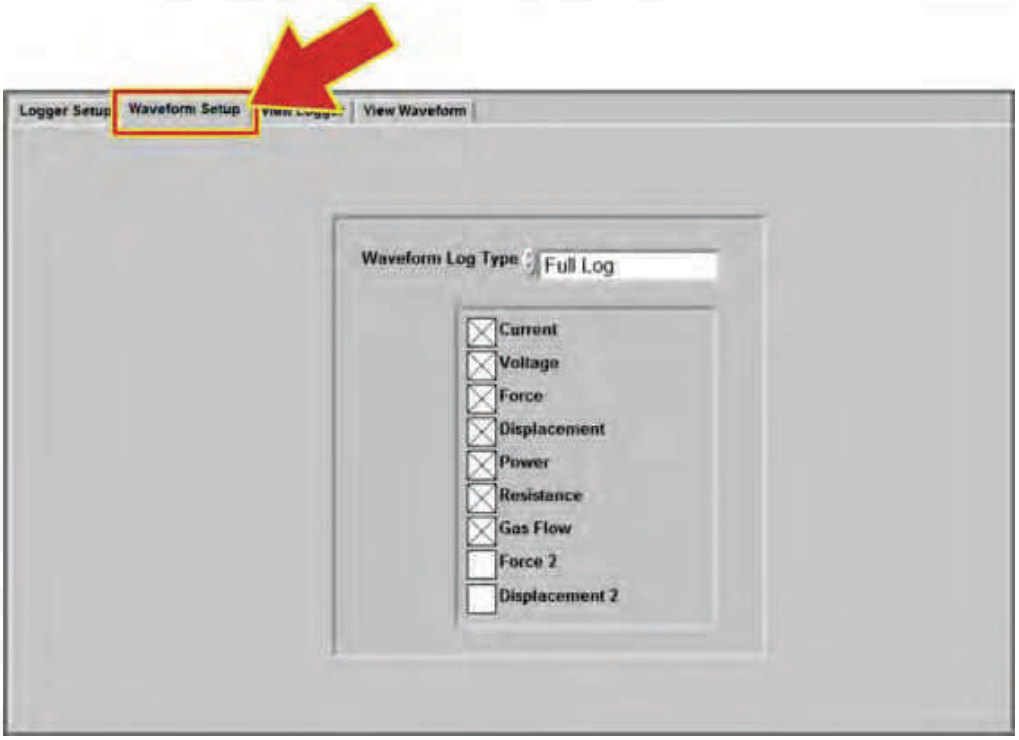


CHAPTER 4: MONITOR SETUP

Section V. Waveform Setup

For **Waveform Setup**, select which waveforms you want to save for each weld. This selection will be applied to all welds. You can save all or only a subset of the waveforms, which include **Current, Voltage, Force (1), Displacement (1), Power, Resistance**, **Alternate Sensor**, **Force 2** and **Displacement 2** waveforms.

From the **Main Menu**, click the **Waveform & Logger Setup** button and then the **Waveform Setup** Tab to get to the **Waveform Setup** screen.



CHAPTER 4: MONITOR SETUP

Select Waveform Log type.

The **Waveform Log Type** applies additional selection criteria on the wave forms selected from the waveform list.

- **No Log = Monitor** will not save any waveforms.
- **Full Log** = For every weld, the **Monitor** will save all the waveforms which have been selected in waveform list.
- **Out of Limits Log** = For only every weld with an out of limits parameter, the **Monitor** will save only the waveforms selected in the waveform list.

Waveform List.

Below the **Waveform Log Type** is a list of waveforms. Click an **X** in the box to the left of the weld parameter to select that parameter as a waveform to be saved based on the **Waveform Log Type** configured.

The **Monitor** is shipped with the **Current**, **Voltage**, **Force**, **Displacement**, **Power**, **Resistance**, and **Alternate Sensor** waveforms selected. If the user wants to save the waveforms for the second channels of force and displacement, **Force 2** and **Displacement 2** should also be checked.

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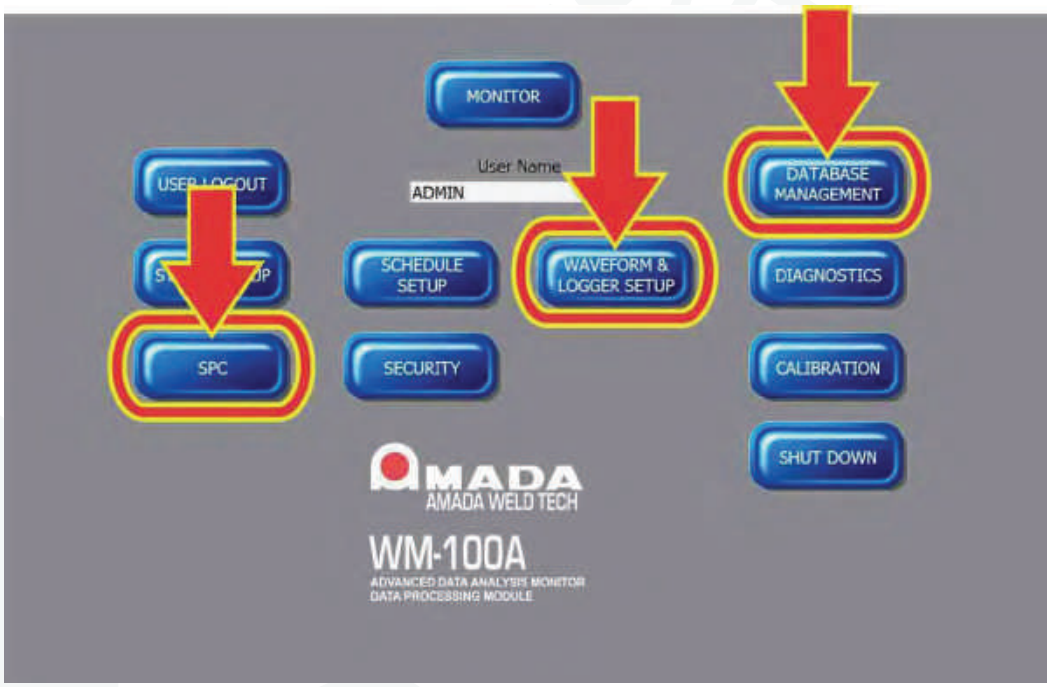
Chapter 5
Using The WM-100A Database

Section I. Database Overview

You can access the Monitor's database through several of the Monitor's screens and you can access it by using third-party software. This chapter will describe how to retrieve and analyze weld data from the database as well as how to manage the database as it grows.

Chapter 5 will cover **Monitor** functions behind the **Waveform & Logger Setup**, **Database Management**, and **SPC** buttons on the Main Menu.

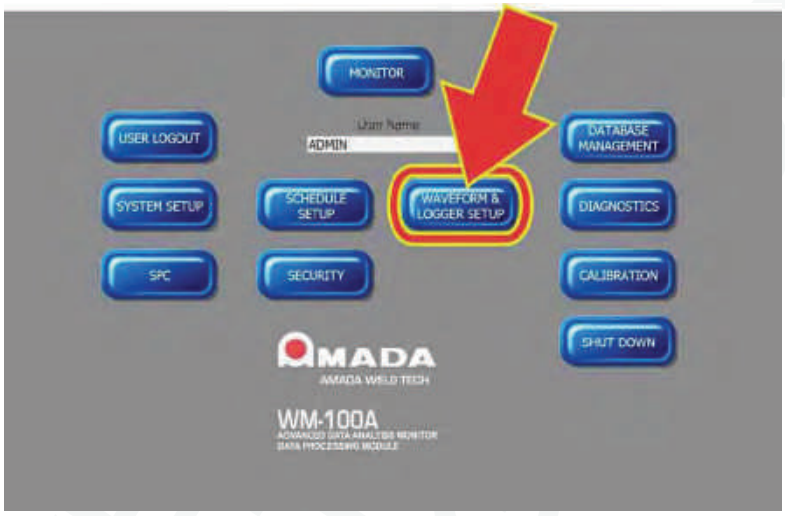


CHAPTER 5. USING THE WM-100A DATABASE

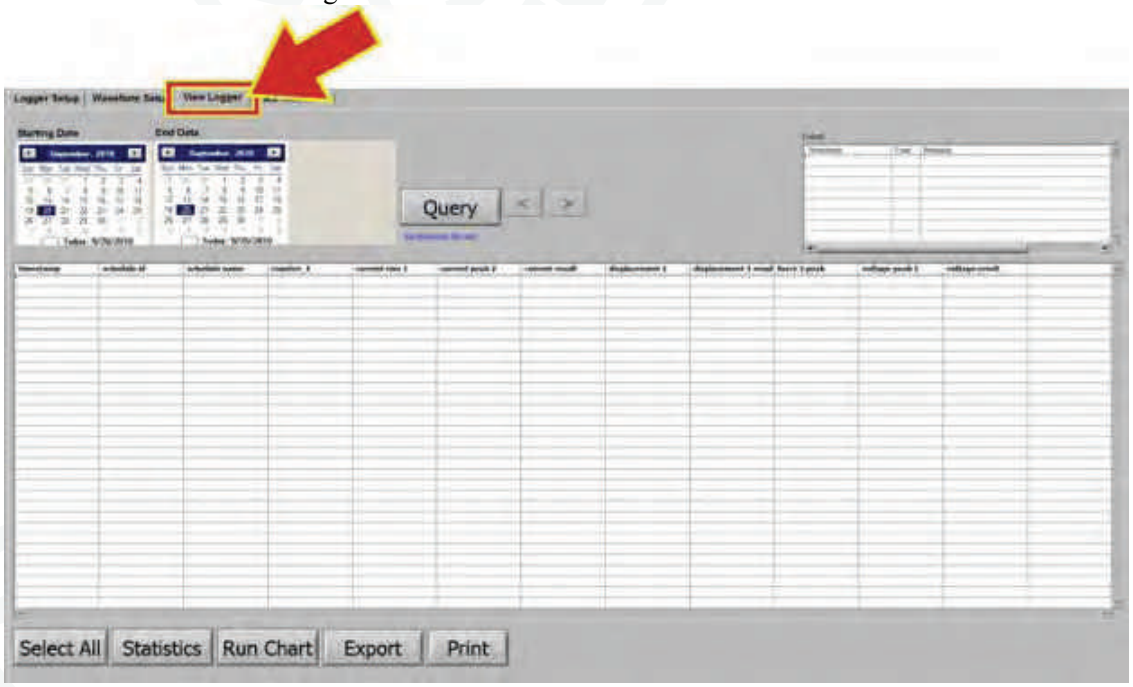
Section II. View Logger

To view the weld data information in alphanumeric format in the Monitor database, access the functions behind the **Waveform & Logger Setup** button. The weld data can be viewed for a range of welds.

1. Click the **Waveform & Logger Setup** button.



2. The screen for logger and waveform setup and viewing will be displayed. To view the alphanumeric weld data, click on the **View Logger** tab to access the **View Logger Screen** as shown on the following screen.

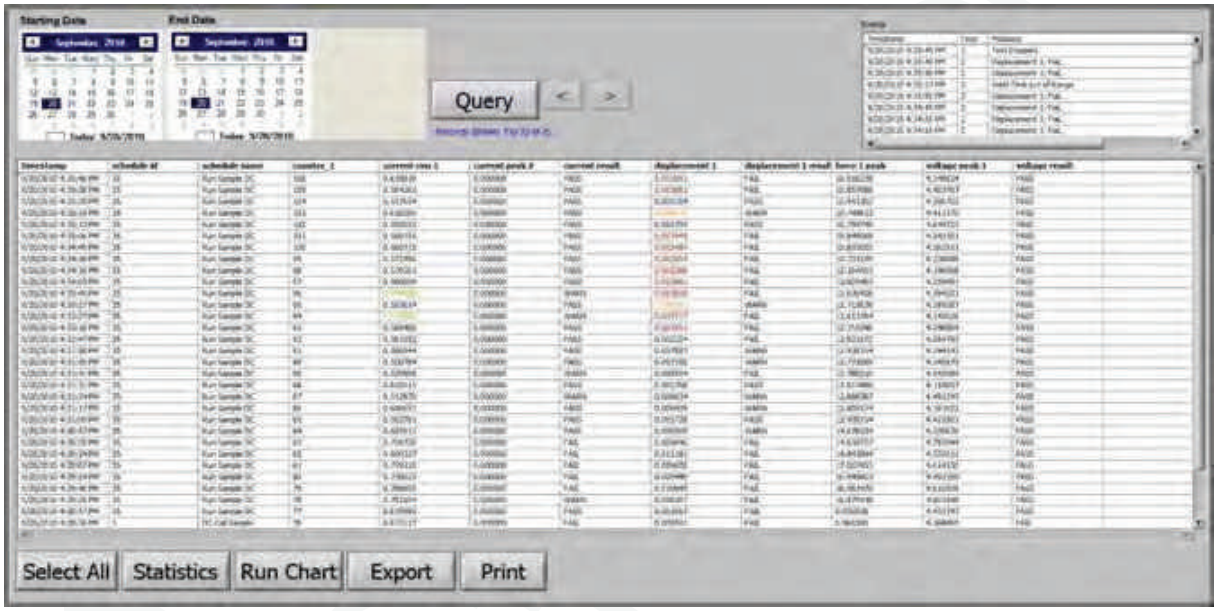


CHAPTER 5. USING THE WM-100A DATABASE

Querying the Database

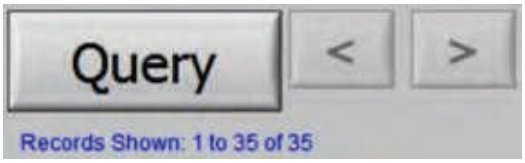
Using the **View Logger** screen, you can retrieve data by selecting a start date and end date on the two calendars in the upper left corner of this screen.

1. Click on the desired **Starting Date** in the calendar on the left.
2. Click on the desired **End Date** in the calendar on the right.
3. When both dates are selected, press the **Query** button. The weld data for the parameters setup in the **Logger Setup** will display in columns.



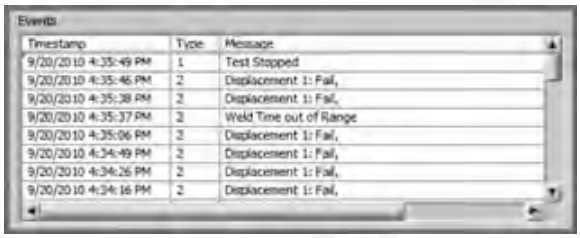
While the data is loading into the **View Logger** screen there will be a message to the left of the **Query** Button, "**Query Data….Please Wait**". The background for this message with change from **red** to **grey** indicating that the Monitor is retrieving information. This message will disappear after the data has finished loading. The loading of the data may take a number of seconds as it loads and updates the color coded weld parameters on the screen. Any weld parameter that is out of limits appears in red font. Any weld parameter that is in limits but out of warnings appears in **yellow** font.

This screen will display up to 200 records. If your query contains more than 200 records, use the **< >** (left and right) arrow buttons that are just to the right of the **Query** button to page through your query.



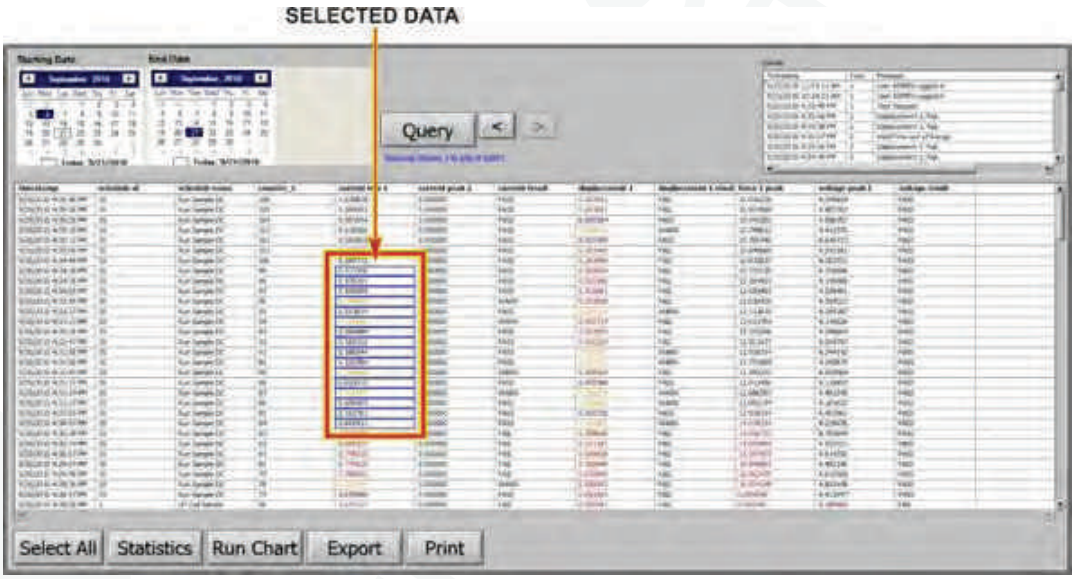
CHAPTER 5. USING THE WM-100A DATABASE

A table, labeled **Events**, listing the events and errors for the query, is displayed in the upper right of the screen. There are vertical and horizontal slider bars which can be used to scroll through the event and error information.



Selecting Data to Export or Print

Data from the query can be printed or exported to a file using the **Export** and **Print** buttons. A range of data must first be selected. To select a portion of the data displayed in the query, use the mouse to highlight a section of the data as shown in the picture below.

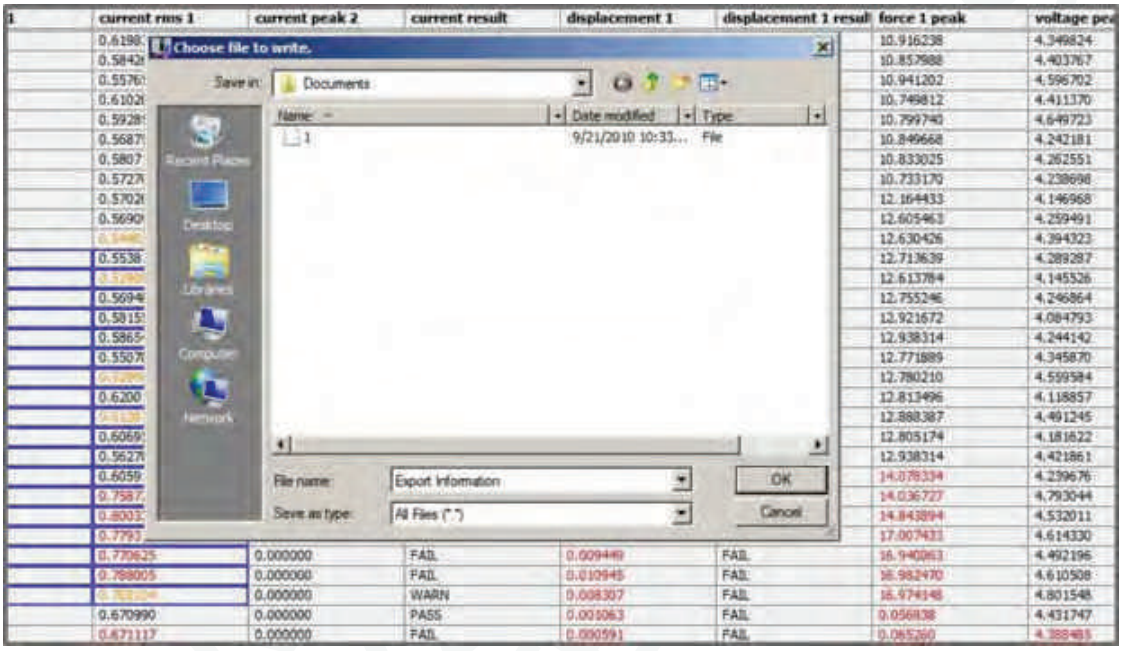


To select all the data in the query, press the **Select** button.

CHAPTER 5. USING THE WM-100A DATABASE

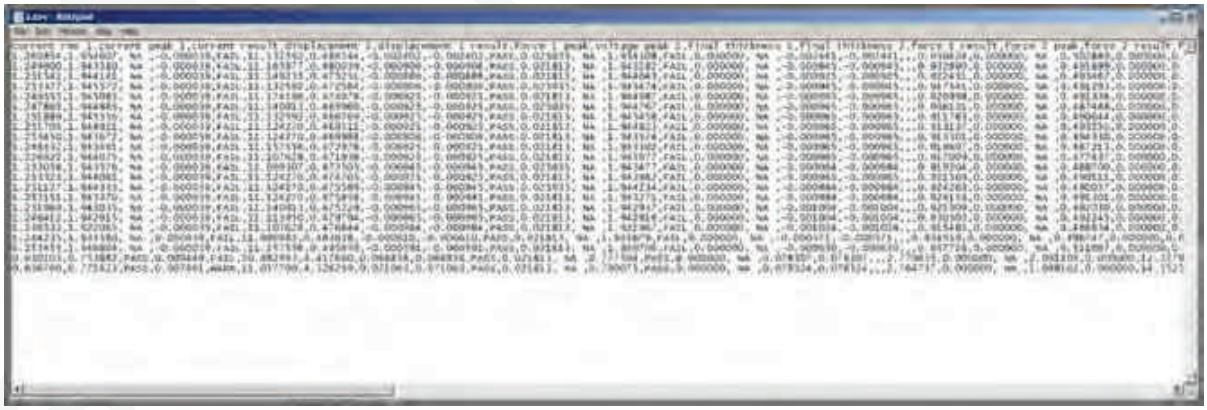
Exporting Data to a File

1. Once the desired data is selected, press the **Export** button to save the data to a file in **.CSV** format.
2. When the window opens, enter a file name and save the file following typical *Windows 7*® procedures.



3. The data will be saved in rows with data separated by commas. Each row will contain data for one weld. The top row of the file will contain the column headings separated by commas.

   The following is an example of a one of the **.CSV** exported files.



CHAPTER 5. USING THE WM-100A DATABASE

Printing Data to a Printer

If a printer is setup in the *Windows 7®* Control Panel, the data can be printed by clicking the **Print** button after the desired data to be printed has been selected. As soon as the **Print** button is clicked, the data will be printed. There will not be any print windows that appear on the screen. This print function will only print to the default printer assigned in the *Windows 7®* Control Panel.

NOTE: This print function within the Monitor program is provided as a convenience feature for printing a small amount of information. Up to eight columns of information will print in a very readable format in landscape mode as shown in the following sample printout. If more than eight columns are selected, the resulting printout format will vary and may not be very readable depending on the type of printer.

current peak 1	current peak 2	current rms 1	current rms 2	alternate maximum	alternate minimum	alternate result	counter_1
0.291761	0.268768	0.241146	0.237733	4.215633	0.348800	392	392
0.291546	0.269301	0.241204	0.238251	4.215633	0.348800	391	391
0.291520	0.269090	0.241254	0.237937	4.215633	0.348800	390	390
0.291544	0.269138	0.240998	0.237771	4.602317	0.155459	389	389
0.291204	0.269213	0.240845	0.238247	4.215633	0.348800	388	388
0.291990	0.269651	0.241051	0.238170	4.602317	0.542142	387	387
0.291574	0.268816	0.241083	0.238213	4.408975	0.348800	386	386
0.291226	0.269066	0.241180	0.238107	5.375683	0.348800	385	385
0.292028	0.269000	0.241196	0.237644	4.408975	0.542142	384	384

Printing Data to a Document Writer

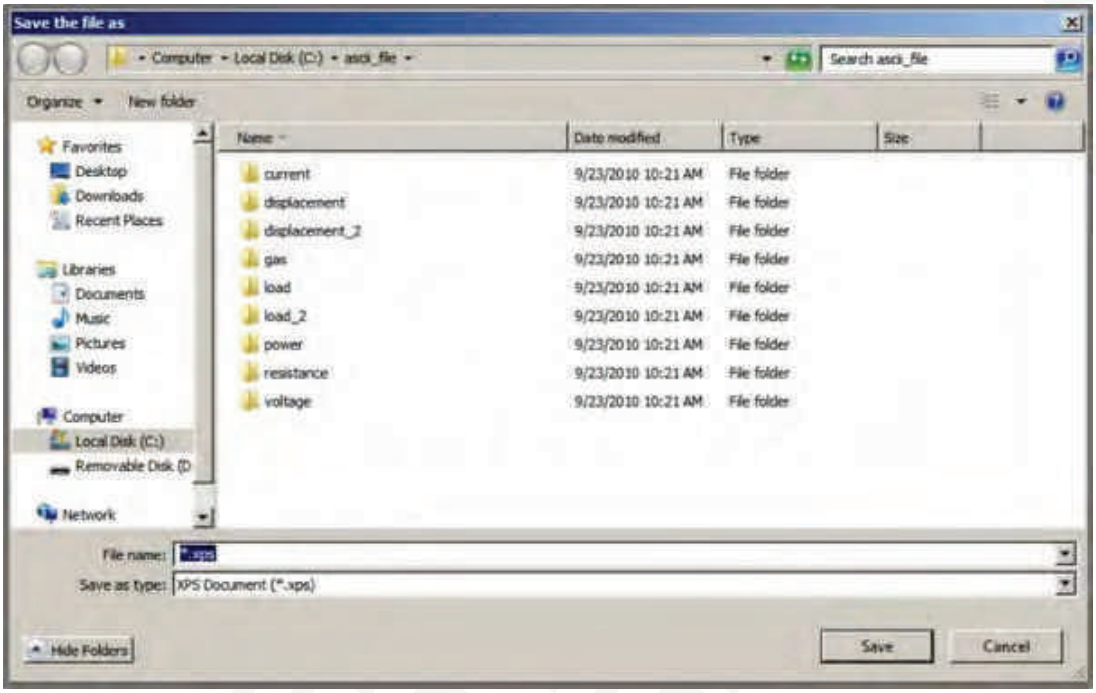
If *Microsoft XPS Document Writer* or another document writer is setup in the *Windows 7®* Control Panel as the default printer, a **Save the file as** window will be displayed as shown below when the **Print** button is clicked. This window may appear on top of the Monitor program or may open behind the Monitor program. If this **Print Manager** window does not appear on top of the Monitor program, go to the Taskbar on the bottom of the Microsoft *Windows 7®* desktop to access the **Save the file as** window.

CAUTION

If the **Save the file as** window opens behind the Monitor program, ***the Monitor program will be frozen*** until you go to the **Save the file as** window and click on either the **Save** or **Cancel** button in that window.

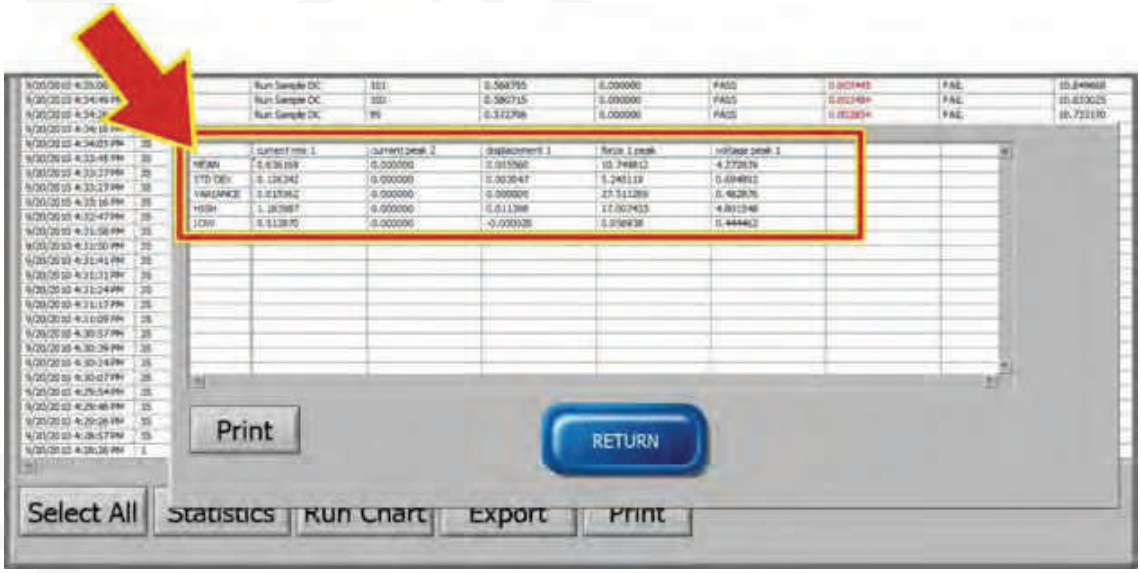
Follow typical *Windows 7®* procedures to print the data to your **.XPS** or document writer file. The information will be printed in rows with data separated by commas. The top row of the file will contain the column headings separated by commas.

CHAPTER 5. USING THE WM-100A DATABASE



Statistics

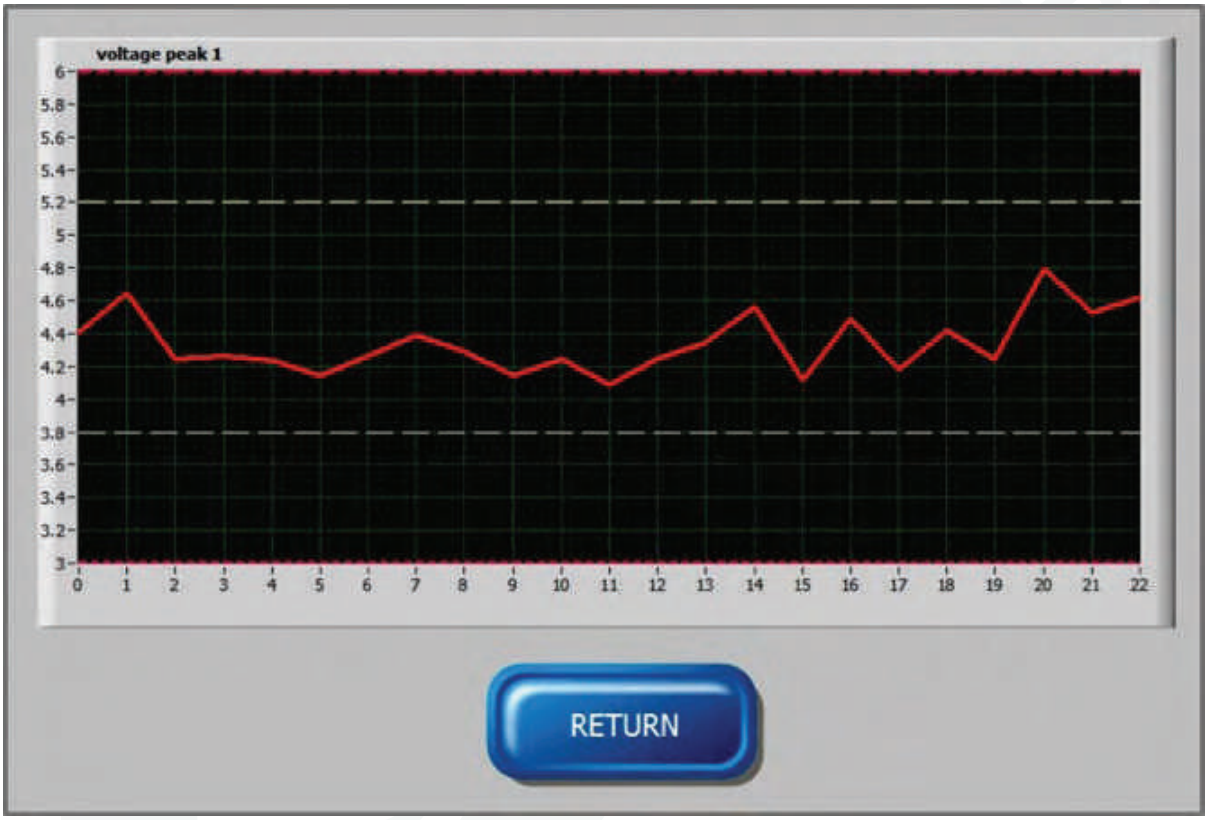
Press the **Statistics** button to calculate statistical information for the 200 data records presently displayed from the query. Once the **Statistics** button is pressed a window that displays the statistical calculations will open.



CHAPTER 5. USING THE WM-100A DATABASE

Run Chart

A **Run** chart can be displayed which graphs data from one column of the query. Use the mouse to select the desired data in a column then Press the **Run Chart** button. The screen below shows a **Run Chart** graphing highlighted **Voltage Peak 1** data. **Limit** and **Warning** lines will be plotted on the **Run Chart.**

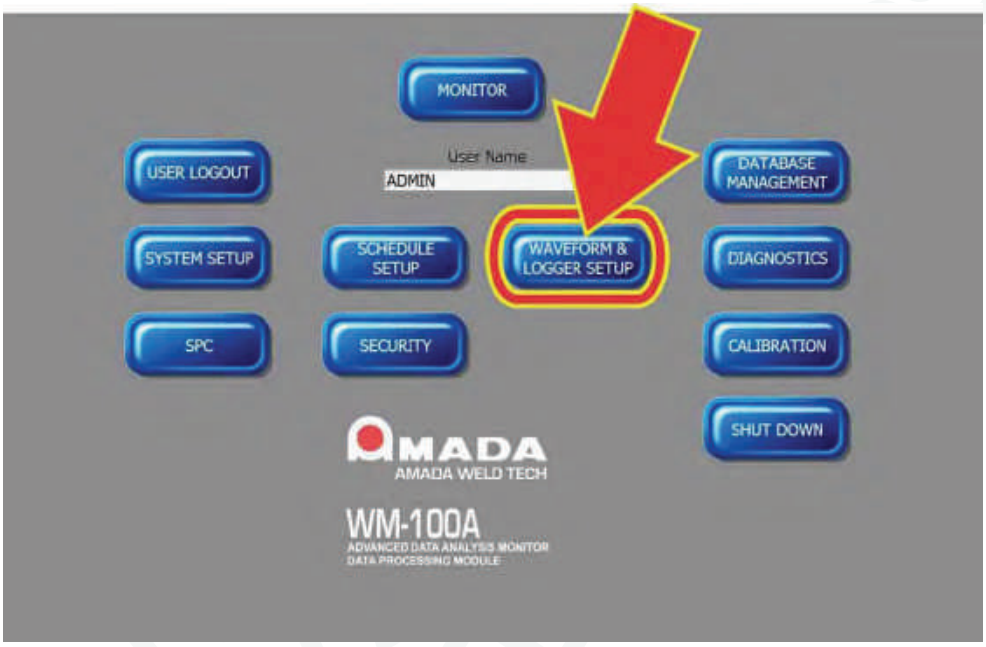


CHAPTER 5. USING THE WM-100A DATABASE

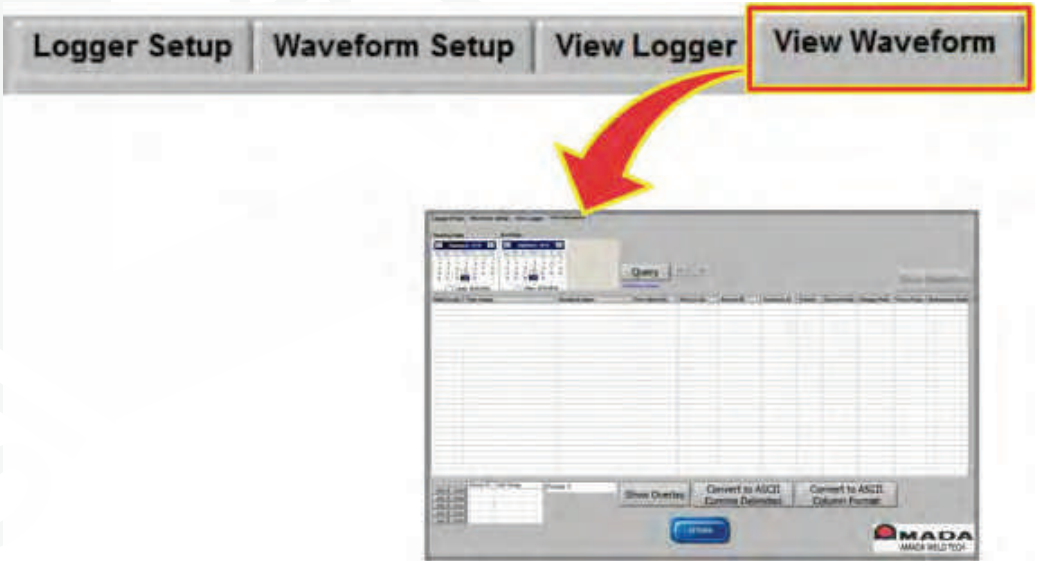
Section III. View Waveforms

To view the waveform information in the database, access the waveform viewing functions behind the **Waveform & Logger Setup** button:

1. Click the **Waveform & Logger Setup** button.



2. The screen for logger and waveform setup and viewing will be displayed. Click on the **View Waveform** tab to access the **View Waveform Screen.**

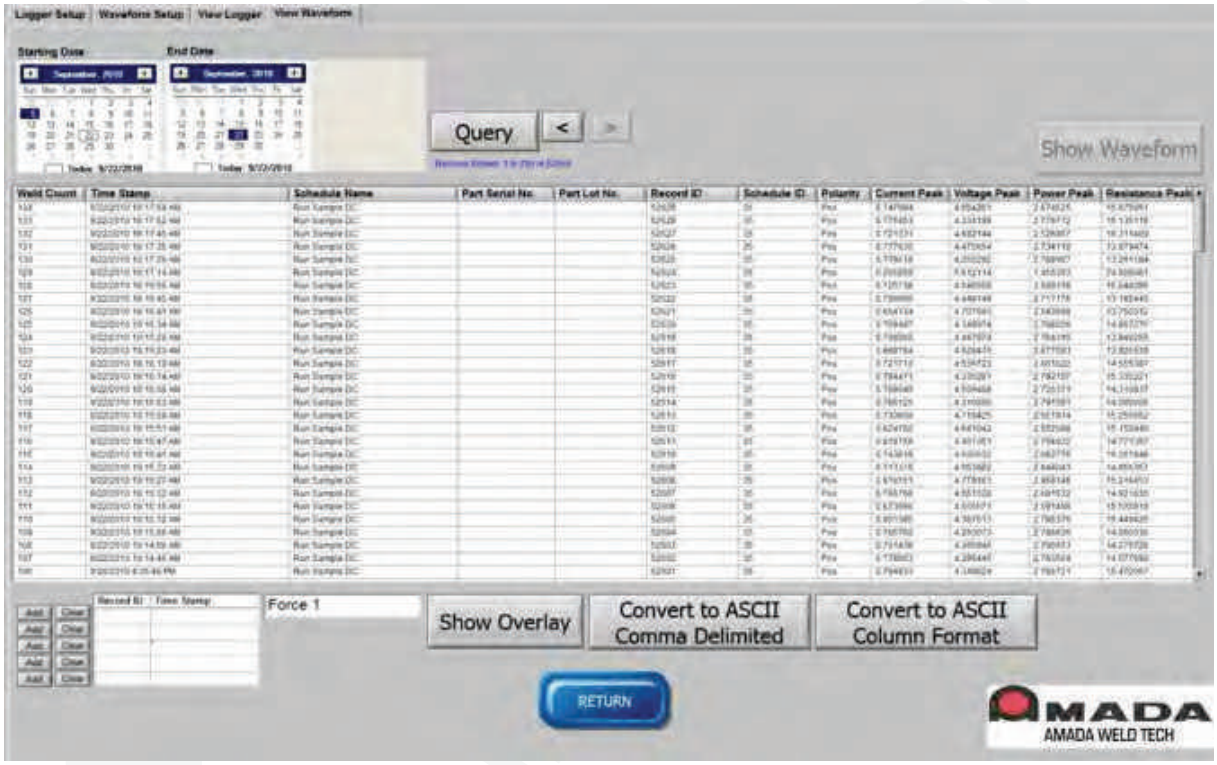


CHAPTER 5. USING THE WM-100A DATABASE

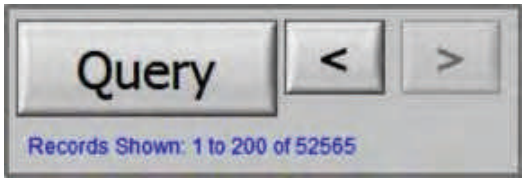
Querying the Database

You can retrieve data by selecting a start date and end date using the two calendars in the upper left corner of this screen.

1. Click on the desired **Starting Date** in the calendar on the left.
2. Click on the desired **End Date** in the calendar on the right.
3. When both dates are selected, press the **Query** button. The welds for the selected data range will be displayed. The columns and their order are fixed and ***cannot*** be configured.



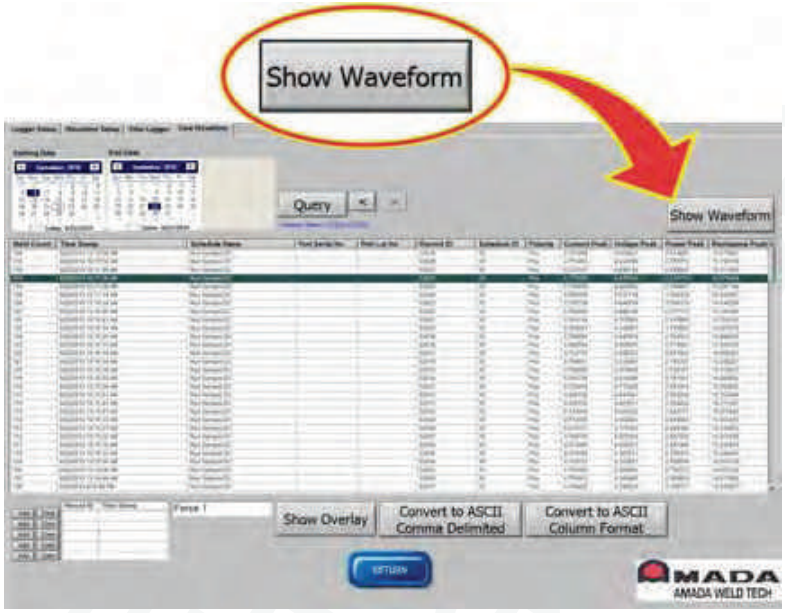
This screen will display up to 200 records. If your Query contains more than 200 records, use the **< >** (left and right) arrow buttons that are just to the right of the **Query** button to page through your query.

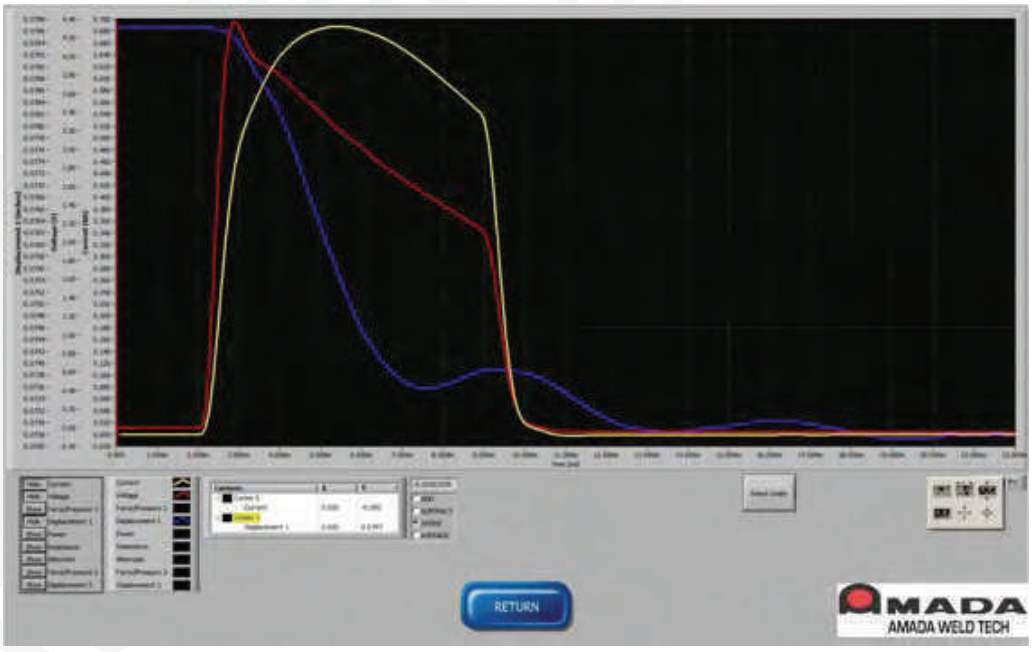


CHAPTER 5. USING THE WM-100A DATABASE

Viewing the Waveforms for a Weld

To view the waveforms for one weld, click on a weld to select the weld, then press the **Show Waveform** button to display the waveform.



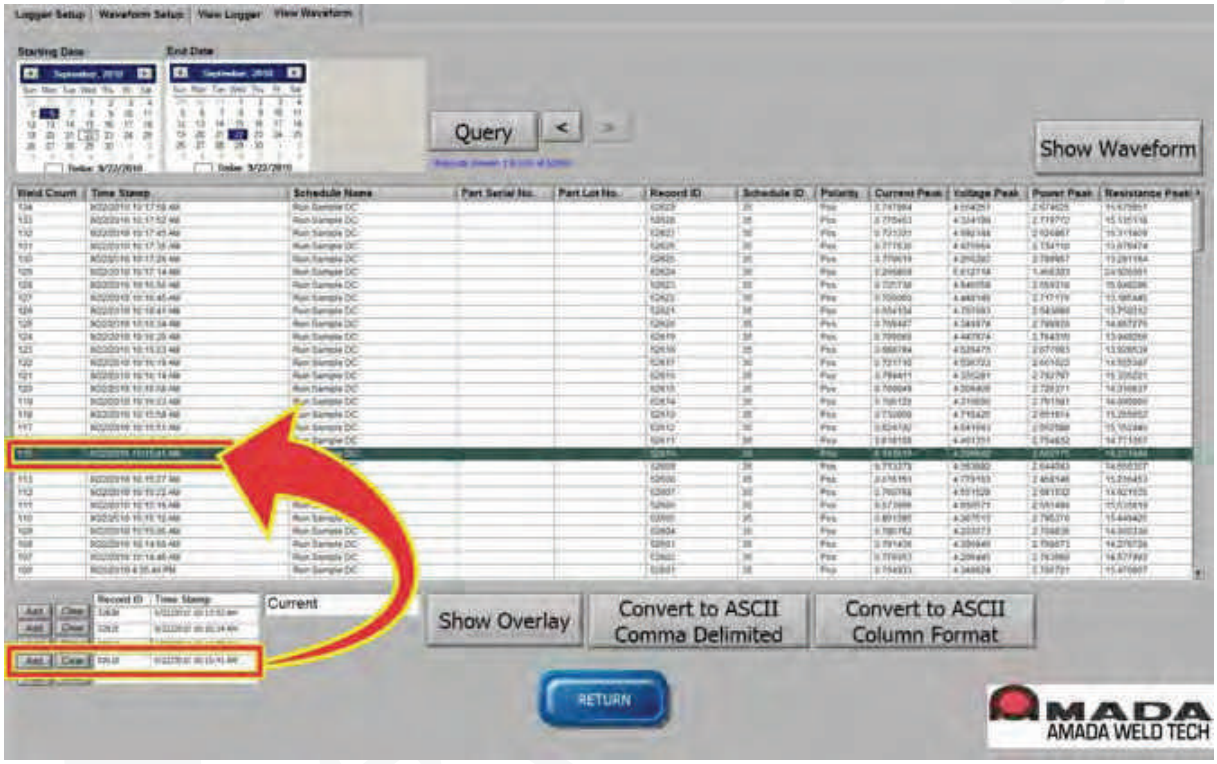


The waveforms can be displayed and expanded using the buttons along the bottom of the screen. Cursors can also be used to obtain values for points along a waveform. See *Chapter 3* for explanations for using these buttons and cursors.

CHAPTER 5. USING THE WM-100A DATABASE

Displaying One Waveform for Multiple Welds

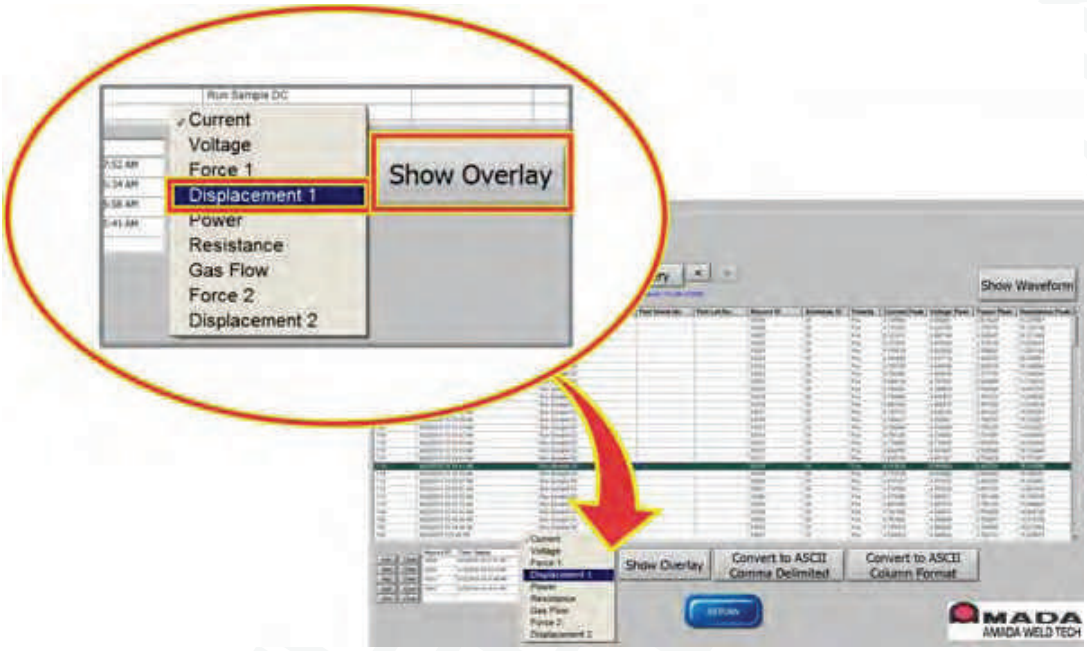
The Monitor can be used to display waveforms for one weld parameter for up to five welds on one graph. The waveforms are selected by clicking on the desired weld to highlight it and then clicking one of the **Add** buttons in the lower left corner of the **View Waveform** screen. You can select up to five welds. The **Clear** button can be clicked to remove a particular weld from the selection.



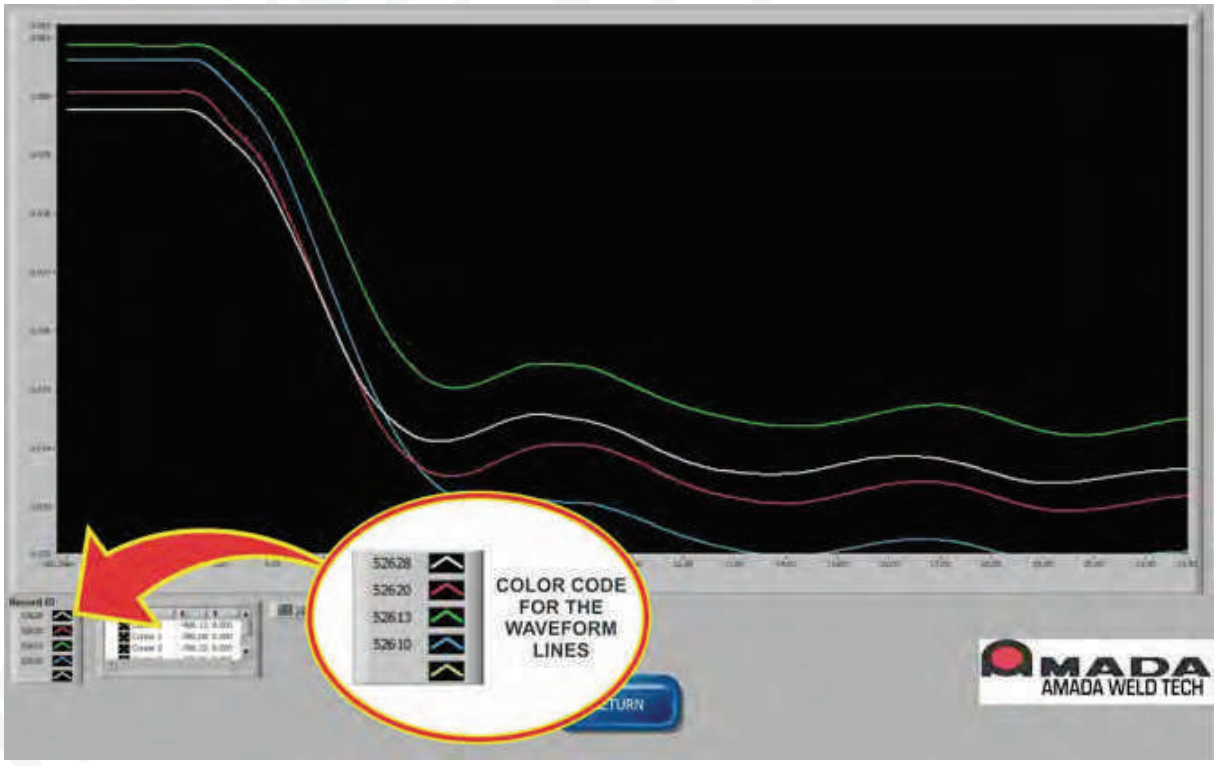
The above screen shows that the **Current** weld parameter is selected for display. To select a different weld parameter:

1. Click on the text box to the left of the **Show Overlay** button and select the desired weld parameter, such as **Displacement 1** shown below.
2. Click on the **Show Overlay** button to show the waveforms listed in the table.

CHAPTER 5. USING THE WM-100A DATABASE



The expanded waveform graph will be displayed as shown below.



CHAPTER 5. USING THE WM-100A DATABASE

Cursors for each line can be used to obtain the X and Y values of points along the waveform. The cursors are positioned at the far left side of the graph. These cursors are color coded to the waveform line colors and can be dragged into the graph with the mouse. The X and Y values for the point at which the cursor intersects their respective waveform are displayed in the **Cursors** table.

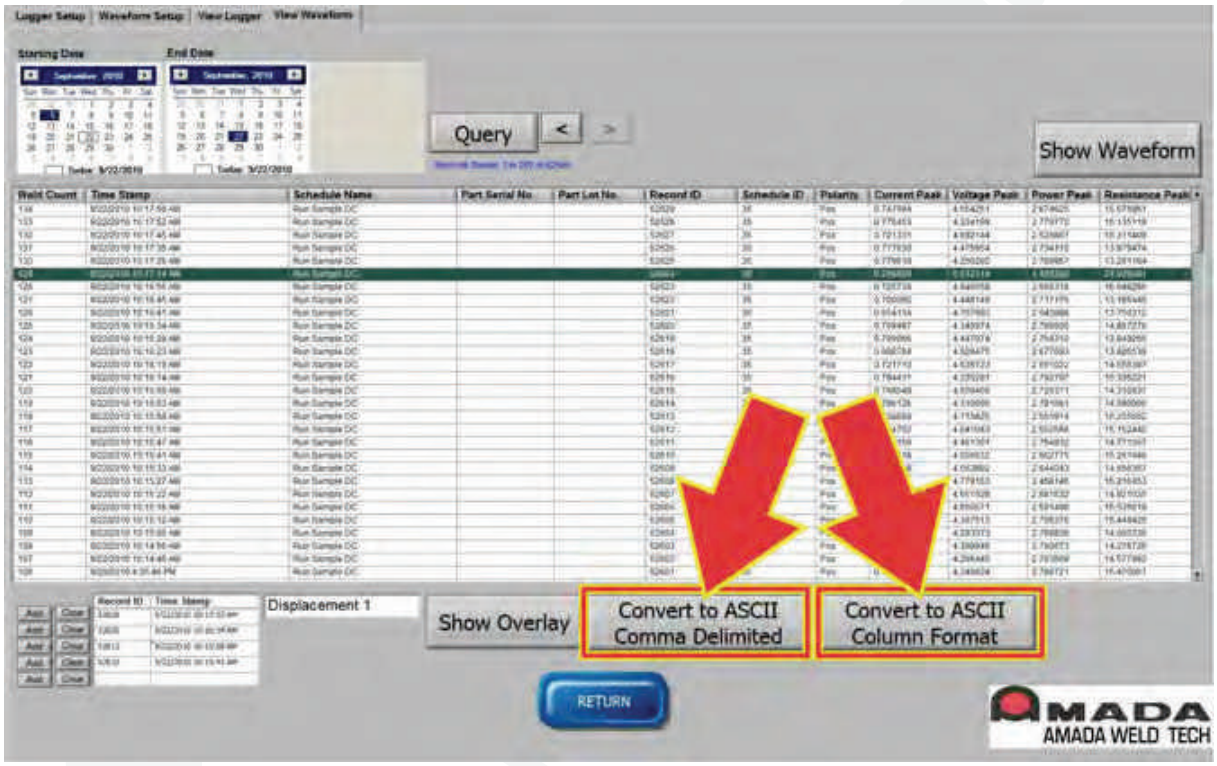
The waveforms can be expanded and manipulated using the buttons just to the right of the Cursors table. See *Chapter 3* for instructions on using these buttons.

CHAPTER 5. USING THE WM-100A DATABASE

Converting Waveforms to ASCII format

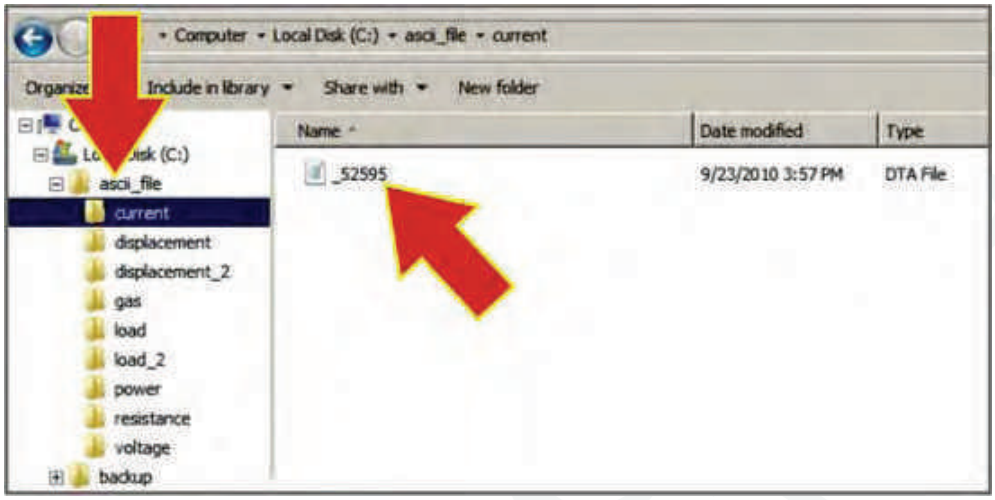
The Monitor saves the waveforms in a binary (Big Endian) file format with a maximum of four digits to the right of the decimal point. Some third-party applications, such as *Excel*®, more easily import ASCII files. The **View Waveform** screen provides two buttons which can be used to convert the Monitor's binary waveform files to ASCII format files.

1. Select a weld with waveforms that are to be converted to ASCII format.
2. Press either the **Convert to ASCII Comma Delimited** button or **Convert to ASCII Column Format** button.

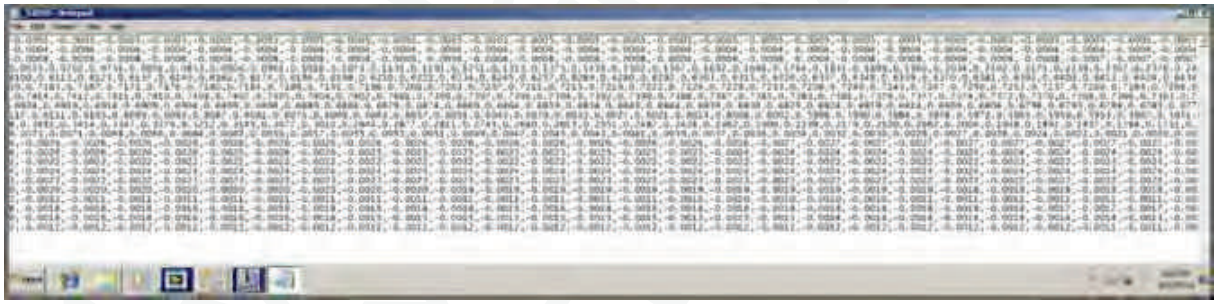


The ASCII format files for the waveforms are saved in the **C:\ASCII_file** directory with subdirectories for each weld parameter. The ASCII file name includes the underline character followed by the Record ID. The file extension is **.DTA**. Refer to the following screen which shows the ASCII waveform file **_52595.dta** for the current waveform for weld with **Record ID 52595**.

CHAPTER 5. USING THE WM-100A DATABASE



The following is an example of an ASCII Comma Delimited format file.



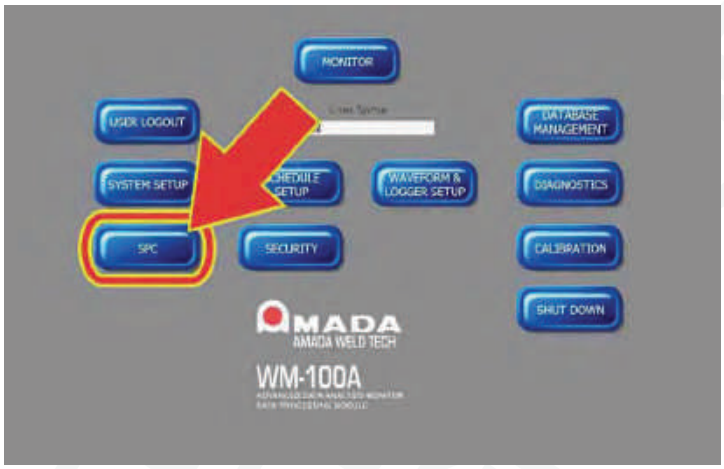
The following is an example of an ASCII Column format file.

CHAPTER 5. USING THE WM-100A DATABASE

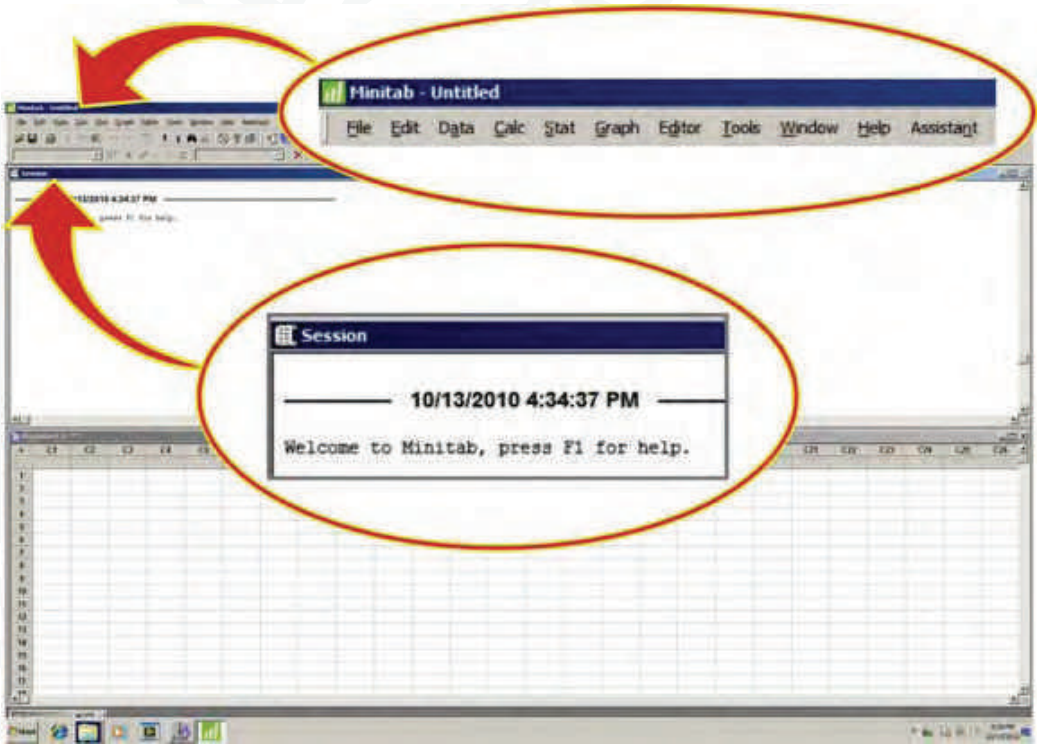
Section IV. SPC and Minitab

To use the integrated *Minitab® 16* statistical analysis software for detailed analysis of the Monitor database:

1. Click the **SPC** button.

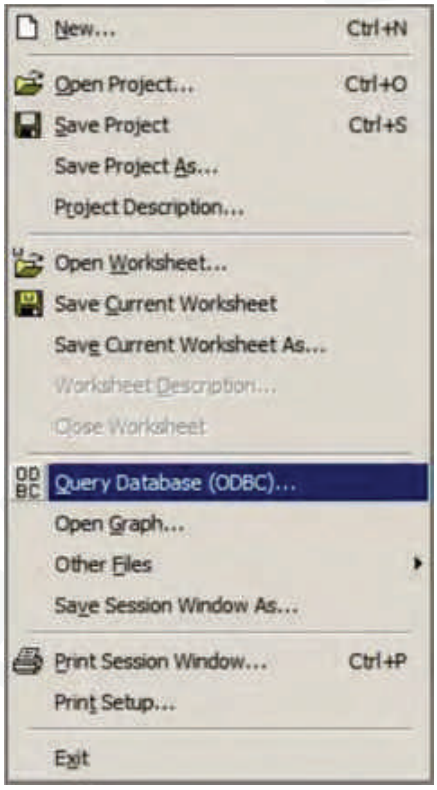


NOTE: When you press the **SPC** button, the *Minitab® 16* application will start and the screen below displays.



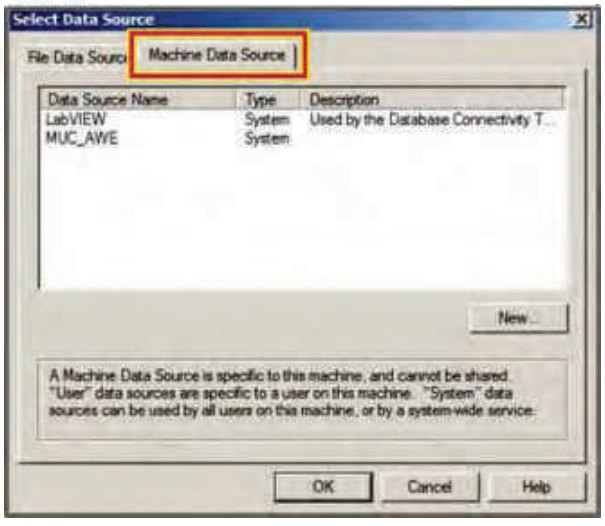
CHAPTER 5. USING THE WM-100A DATABASE

2. Click on **File** on the top toolbar, then click **Query Database (ODBC)**.



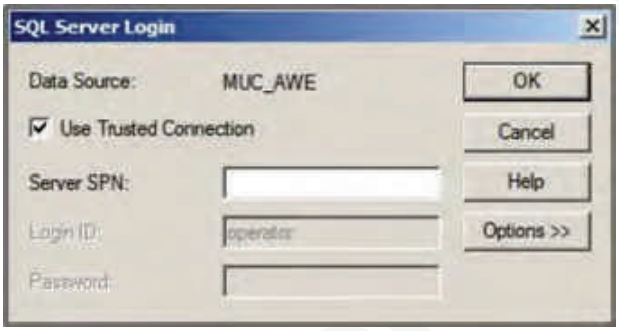
3. On the popup window, select the **Machine Data Source** tab.
4. Click the line for **MUC_AWE** in the **Data Source Name** column to select the Monitor database.
5. Click **OK**.

NOTE: **MUC_AWE** is the name of the Monitor database.

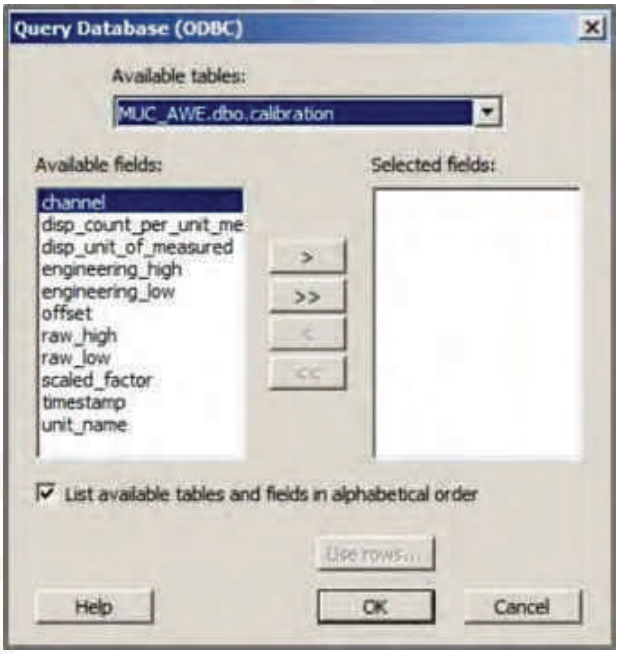


CHAPTER 5. USING THE WM-100A DATABASE

6. On the **SQL Server Login** popup window, click **OK** without making any entries.

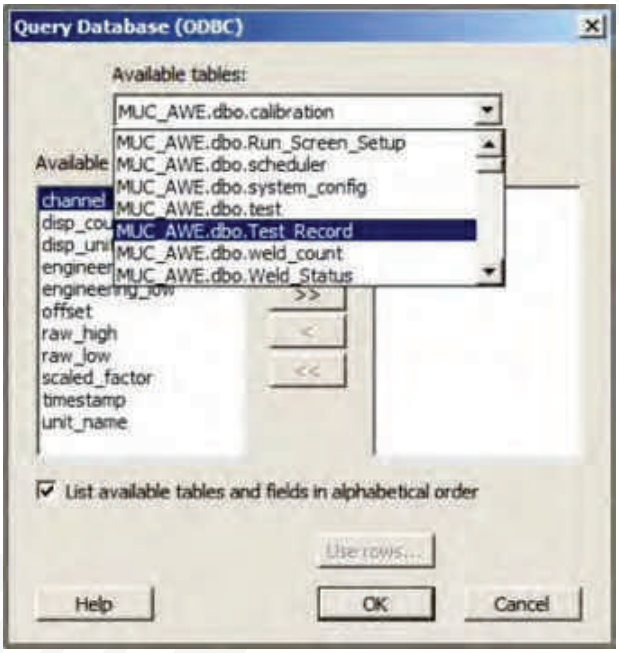


7. The **Query Database** window will open.



CHAPTER 5. USING THE WM-100A DATABASE

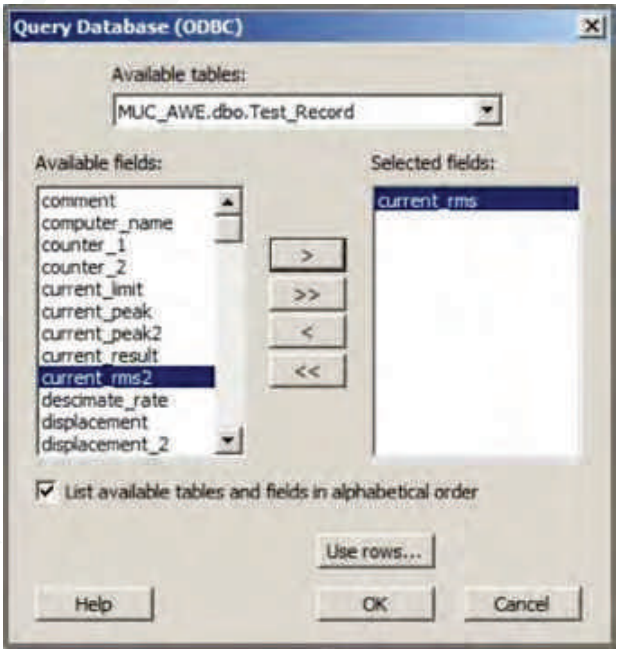
8. Scroll through the **Available tables** and select **MUC_AWE.dboTest Record**. The **Test_Record** table is the ***only*** table that has weld data information. The other tables do not need to be accessed.



9. From the listing of **Available fields,** select the desired fields to analyze using the left or right arrow buttons. Click **OK** to load data from the selected fields.

10. Use the *Minitab®16* functions following *Minitab®16* procedures to analyze your data. The *Minitab®16* documentation can be accessed at:

    http://www.minitab.com.



CHAPTER 5. USING THE WM-100A DATABASE

Section V. Accessing the ODBC Database

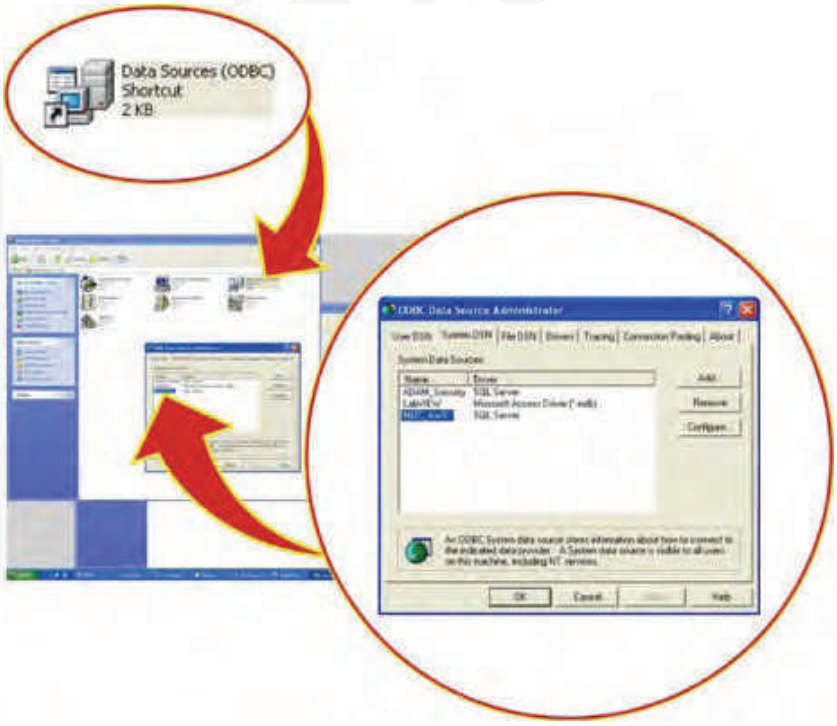
You can access the **Monitor** database with third-party software through the **Data Processing Module**'s Ethernet connection. The database can also be accessed directly from the **Data Processing Module** through the *Windows 7®* Operating System.

CAUTION

The Monitor database should only be accessed directly by experienced database professionals. Users accessing the database must ***not*** change data in the database. ***Improper changes to the database will cause Monitor errors and loss of data.***

To access the **Monitor** database, follow the protocols of the third-party software, *Microsoft SQL ServerExpress 2008* and/or *Windows 7®*. Microsoft SQL Server Express has the capability for up to five simultaneous users. The **Monitor** uses 2 of these users when the SPC or Minitab portion of the **Monitor** is not being used through the **Monitor** screens. The **Monitor** uses 3 of these users when the SPC or Minitab portion of the **Monitor** is being accessed through the **Monitor** screens. Therefore, it is recommended that the number of external users accessing the **Monitor** database outside of the **Monitor** user screens be limited to two to avoid any conflict with the restriction of no more than five simultaneous users.

The name of the Monitor database is **MUC_AWE**.



CHAPTER 5. USING THE WM-100A DATABASE

The Monitor database, **MUC_AWE** is comprised of many tables which contain data, setup information, and information used internally by the Monitor. All of the weld information is contained in one table in the database, called **Test_Record**. You should ***only*** access weld information from the table,**Test_Record**. All other tables do ***not*** contain weld data information. It is recommended that users do ***not*** access any other table besides **Test_Record** to ensure that they do not induce Monitor errors or malfunctions.

The following listing presents the field information for the table, **Test_Record**.

```
[dbo].[Test_Record](
[computer_name] [varchar](20) NULL,
[mac_id] [varchar](20) NOT NULL,
[test_record_id] [int] NOT NULL,
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[spare8] [float] NULL,
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                                   status - for logger data cell
                                   color
[warning_value] [int] NULL,        // to mark the data out of
                                   warning status - for logger
                                   data cell color
```

CHAPTER 5. USING THE WM-100A DATABASE

Section VI. Managing and Deleting Records

As the hard disk is filled with weld records, records must be deleted so the hard disk does not reach capacity. The hard disk also must be managed so there is enough free space available on the hard drive to ensure timely processing of weld information. ***The hard disk should be maintained at 80% capacity or less to ensure good Monitor performance***.

The **Monitor** has functions, one manual and the other automatic, which can be used to maintain the hard disk capacity. The **Monitor** can be setup for either automatic deleting of records or manual deleting of records on the **System Setup** screen. Make a selection for **Yes** or **No** on the **System Setup** screen in the **Automatic File Purge** box. Refer also to *Chapter 4, Configuration*.

When the **Monitor Screen** is displayed and the unit is set to either Yes or No for **Automatic File Purge**, the **Monitor** checks the disk capacity every 15 minutes.

CHAPTER 5. USING THE WM-100A DATABASE

Automatic Record Deleting

If you set up the **Monitor** to automatically maintain the hard drive, the **Monitor** will automatically delete weld records when the hard disk reaches 65% full. This deleting process occurs when the **Monitor** is on the **Monitor Screen** and the **Press to Start** button has not been pressed. It will ***not*** be visible to you when the **Monitor** is automatically deleting records. The **Monitor** will delete enough weld records, deleting the oldest records first, to bring the occupied space from 65% to 55%. If the **Press to Start** button is pressed or the **Monitor Screen** is exited, the **Monitor** will stop deleting records. The **Monitor** will not begin automatically deleting records again until the hard disk has reached 65% full, the **Monitor Screen** is displayed and the **Press to Start** button has not been pressed.

The **Monitor** will automatically delete approximately 1000 records per minute.

If the **Monitor** is set up to automatically delete records, the functionality for **Manual Record Deleting** will also be active. This functionality is described in the following section.

Manual Record Deleting

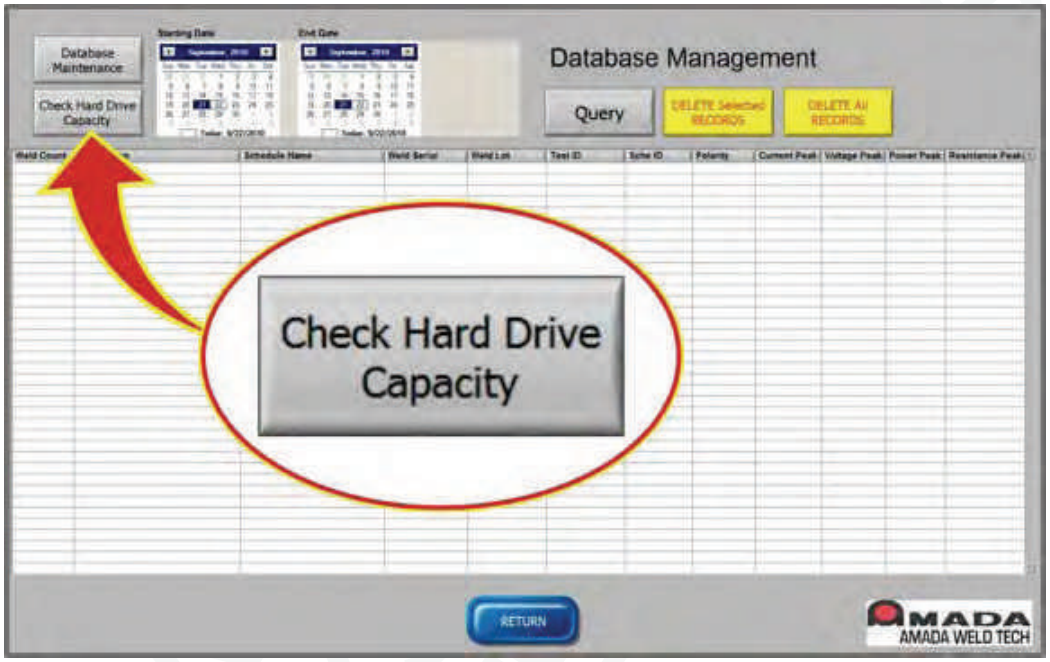
If you elect to maintain the hard disk capacity manually, the **Monitor** will display a warning message window when the hard disk has 30% capacity remaining and then also 25% disk capacity remaining. This message window must be acknowledged with a button click and the event will be logged in the **Event Table**. When the disk capacity has only 20% capacity remaining, the **Monitor** will display a message that the hard disk has 20% capacity remaining. In addition, the **Monitor** will also take the unit out of **Monitor Mode** and the unit can ***not*** be returned **Monitor Mode** until additional hard disk space is made available. An event will also be logged in the Event Table.

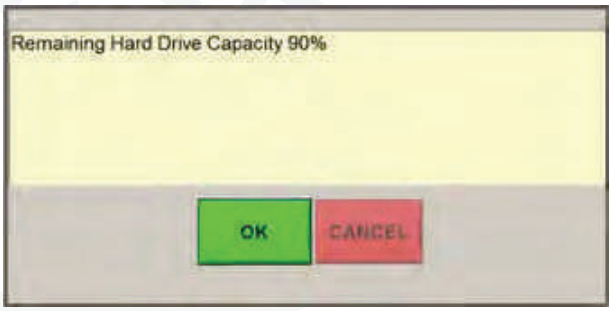
Checking the Available Disk Capacity

To check the amount of available hard disk space, click the **Database Management** button on the **Main Menu** to access the **Database Management** Screen.

CHAPTER 5. USING THE WM-100A DATABASE

The **Database Management** screen provides functions to check the capacity of the C: hard drive, perform database maintenance and to delete records. Click the **Check Hard Drive Capacity** button and the Monitor will measure and then display the available space remaining on the C: hard drive. The D: hard drive contains only the SQL database and has sufficient capacity and does not need to be checked by this function.

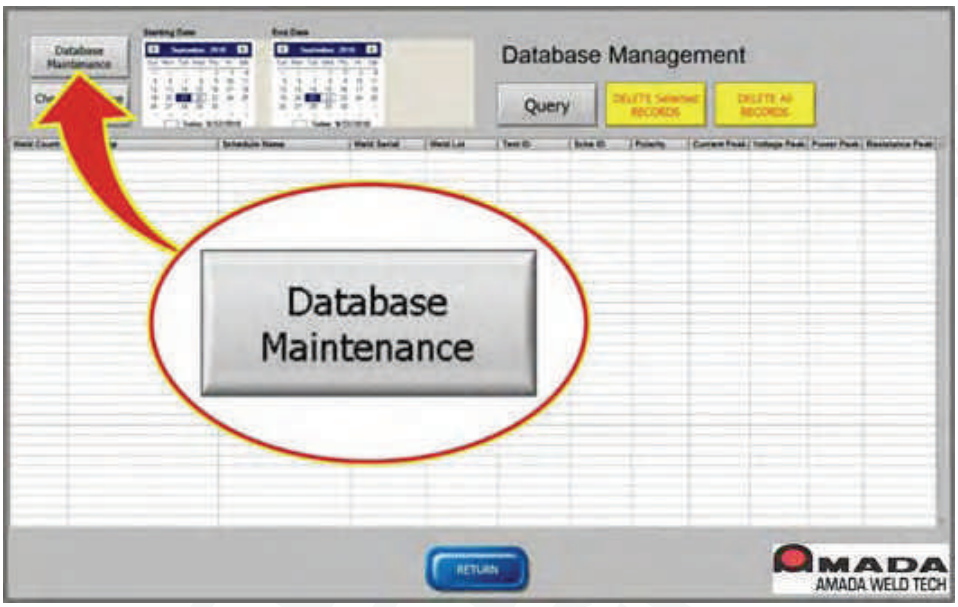




The **Monitor** automatically performs daily and weekly database maintenance tasks as described in Chapter 4 in the section describing **Automatic Maintenance**.

CHAPTER 5. USING THE WM-100A DATABASE

The user can also manually start the daily and weekly maintenance by pressing the **Database Maintenance** button on the **Database Management Screen**.



When the **Database Maintenance** button is pressed, The following message box will be displayed while the **Monitor** performs the maintenance. The maintenance process may take up to a few minutes. When the process is completed, the message box will disappear. The maintenance process ***must*** be allowed to complete. If it is interrupted, data could be lost or the database could be damaged.

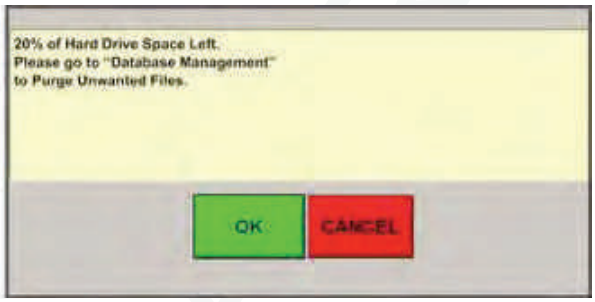
Manual Record Deleting

If the **Automatic File Purge** entry in the **System Setup** is set to either **Yes** or **No, t**he **Monitor** will display message windows when the disk capacity reaches 70, 75 and 80% full. These message windows will state the remaining capacity of the hard drive. These messages should prompt you to delete records.

CHAPTER 5. USING THE WM-100A DATABASE

CAUTION

When the Monitor reaches 80% of capacity, the Monitor will switch out of **Start Measurement** mode and remain in **Stopped Measurement** mode ***until*** you delete records.



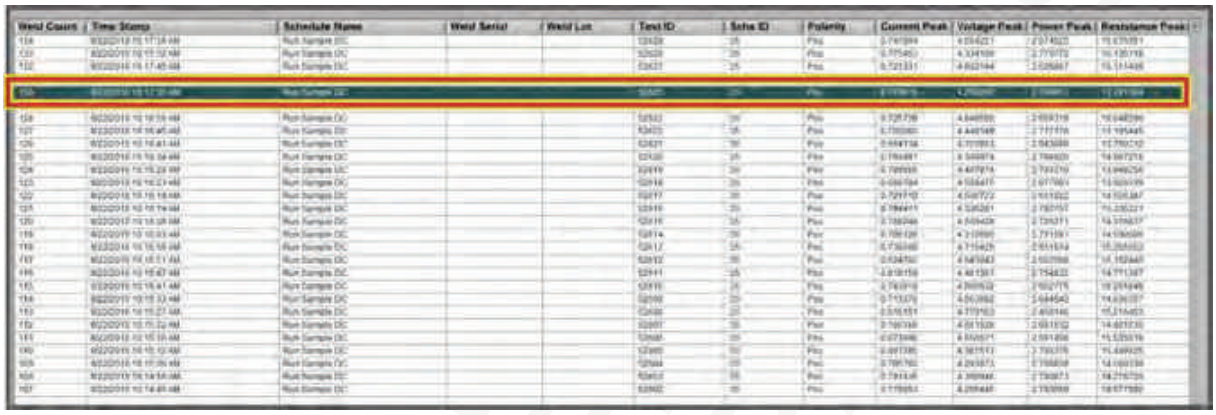
To manually delete records using the **Database Management** screen, the records that are to be deleted must be first queried from the database. The calendars in the upper portion of the screen are used to select the start and end dates for the query.

The query on this screen will only display up to 5000 records. If the user selects a date range that contains more than 5000 records, the Monitor will display only the most recent 5000 records.

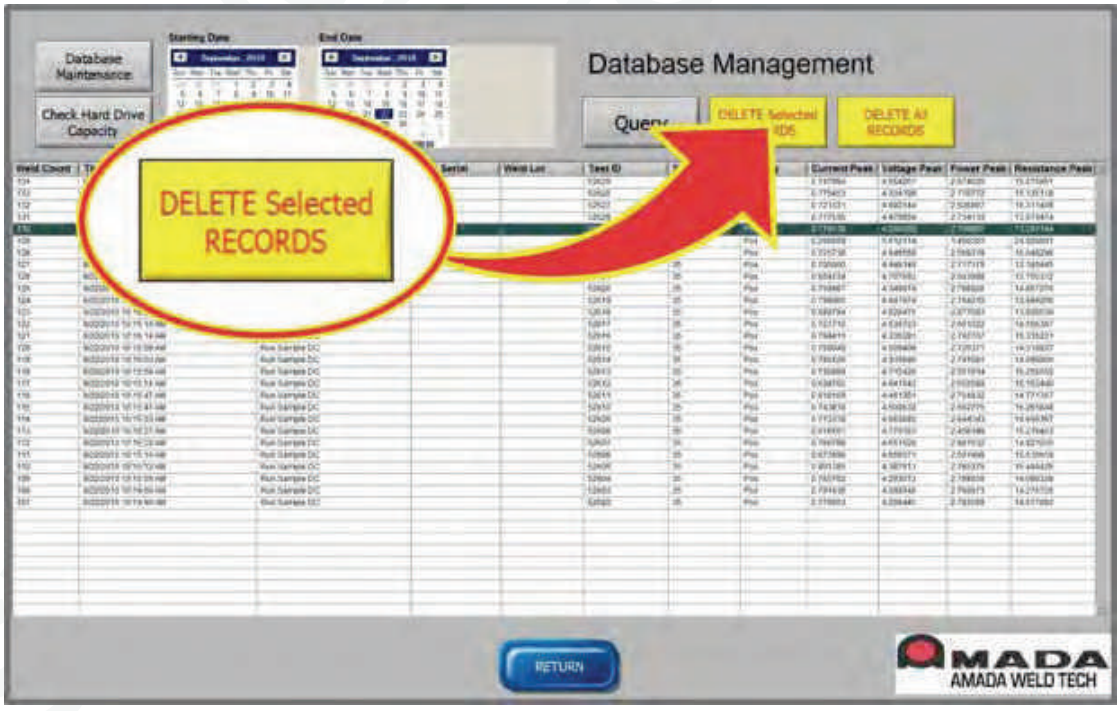
CHAPTER 5. USING THE WM-100A DATABASE

You can delete either selected records displayed from the query or all records in the date range selected in the query.

To delete selected records, highlight the records in the query to be deleted. Use the mouse, **Ctrl** Key or **Shift** key to highlight the records. In the following screen, only ***one*** record is selected.

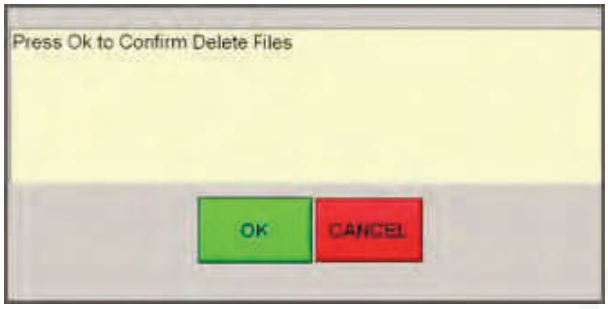


Then press the **Delete Selected Records** button to delete the selected record(s).

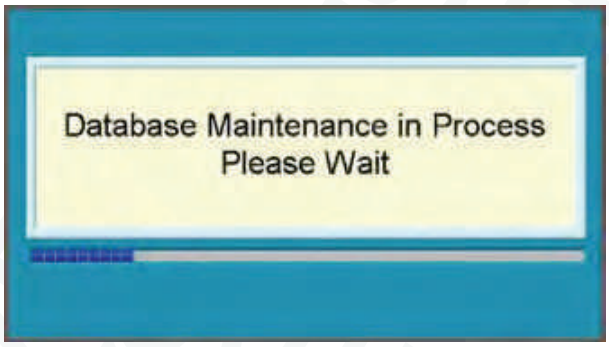


CHAPTER 5. USING THE WM-100A DATABASE

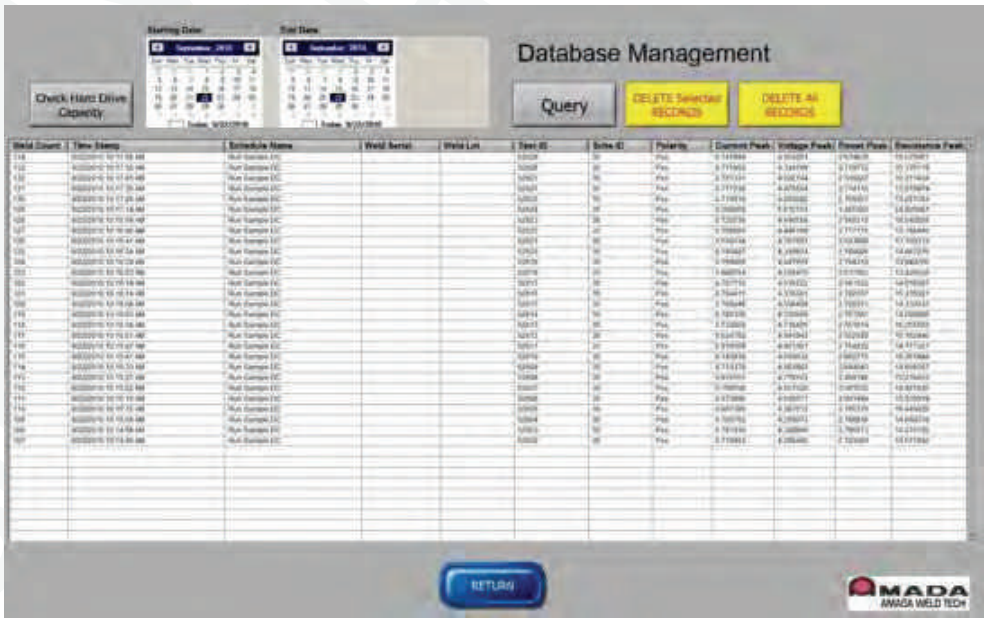
A window will appear asking you to confirm that the records are to be deleted. Select **OK** to delete the records.



NOTE: Deleting records can take several minutes or longer depending on the number of records selected. A **blue** bar will appear on the screen to indicate that the Monitor is processing the request.

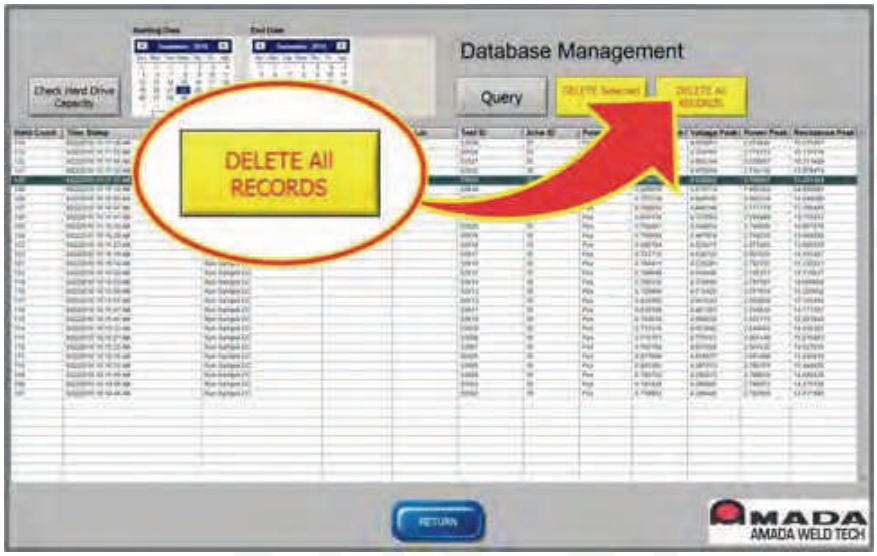


The following picture shows the **Database Management** screen after the record was deleted.



CHAPTER 5. USING THE WM-100A DATABASE

To delete all records for the date range of the query, click the **Delete All Records** button.



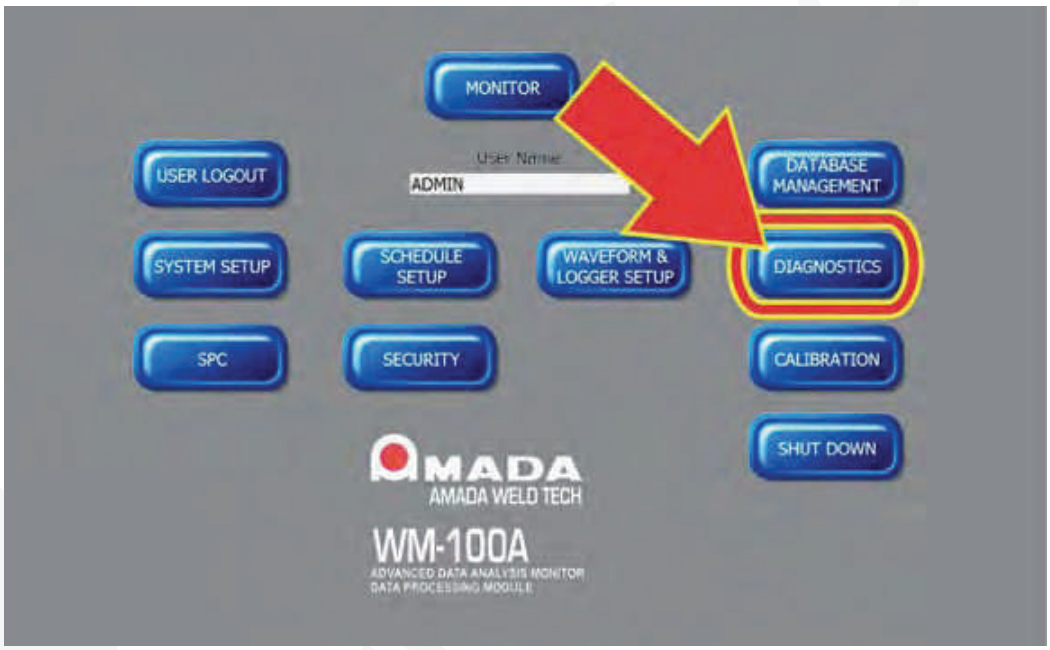
Once this button is pressed, a message will appear and you will be asked to confirm that the records are to be deleted. Select **OK** to delete the records. All the records in the date range of the query will be deleted.

NOTE: Deleting of records can take several minutes or longer depending on the number of records selected. As an approximate guideline for the time it will take to delete records, 85,000 records will take approximately 45 minutes to delete. A **blue** bar will appear on the screen to indicate that the Monitor is processing the request.

Chapter 6
Diagnostics, Calibration, and Maintenance

Section I. Diagnostics

The Monitor provides diagnostic capability to view the present status of the digital inputs and actuate the digital outputs and relay outputs. This provides the user the capability to confirm the I/O channels are functioning correctly. These diagnostics functions are accessed by clicking the **DIAGNOSTICS** button on the main menu.



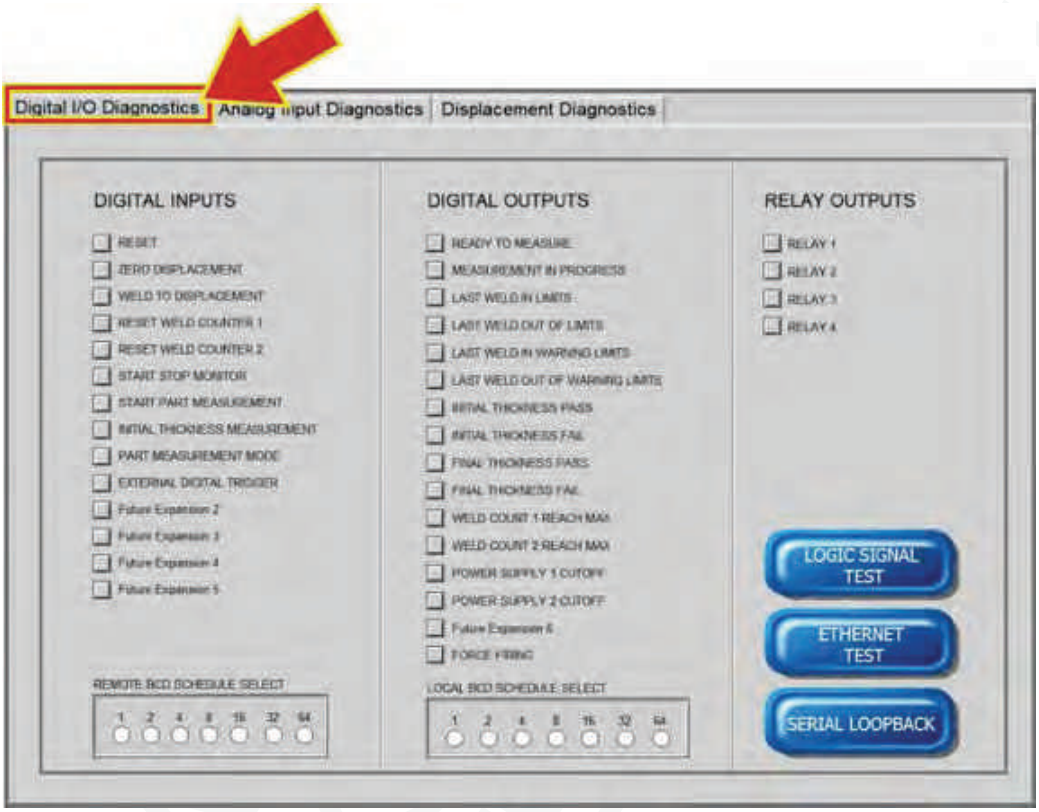
Digital I/O Diagnostics

From the **Main Menu**, select **DIAGNOSTICS** to get the screen below. This screen shows the states of the digital inputs and allows the user to change the states of the digital outputs and relay outputs.

When this screen is accessed, the Monitor changes all the **Digital Outputs** and **Relay Output** states to inactive.

When the **Diagnostics** screens are exited and the user starts the **Monitoring Mode**, the Monitor will return the two **Counter Digital Outputs** to the active state if the counter limit has been reached.

CHAPTER 6: DIAGNOSTICS, CALIBRATION, AND MAINTENANCE



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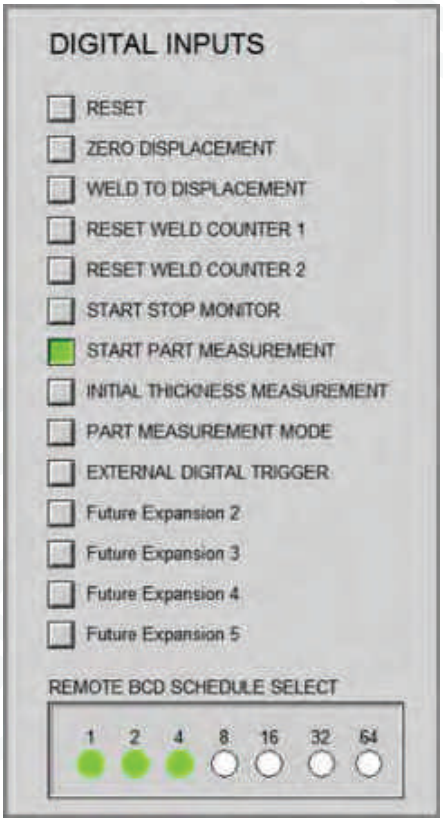
Digital Inputs and Schedule Inputs

This section of the screen displays the states of the Digital Inputs and Schedule Inputs.

The box or circle next to the description of the signal will be **GREEN** when the output is set to active. A **GREY** box or circle indicates the output is set inactive.

The Digital Inputs identified as **Future Expansion** are wired in the **Sensor Interface Module**, but do not have any Monitor functions.



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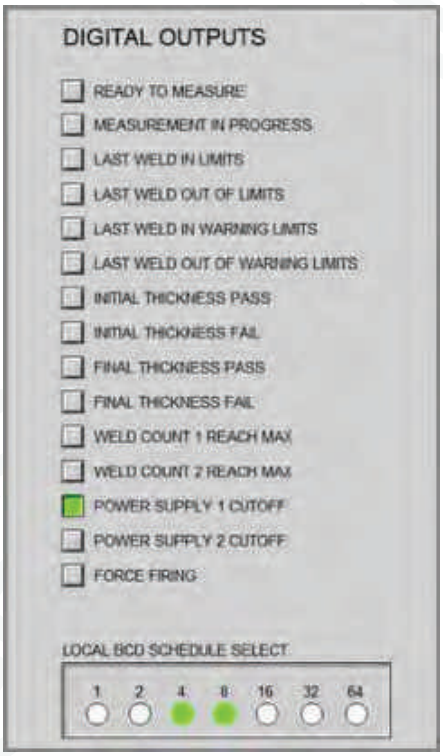
Digital Outputs and Schedule Outputs

The **DIGITAL OUTPUTS** can be set active or inactive by clicking the box to the left of the **DIGITAL OUTPUT** description.

The **Schedule BCD Outputs** can be set active or inactive by clicking the circle below the corresponding BCD bit.

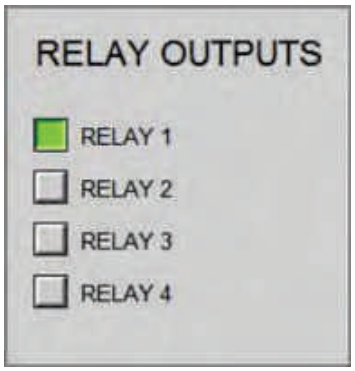
The box or circle will be **GREEN** when the output is set to active. A **GREY** box or circle indicates the output is set inactive.



Relay Outputs

The Relay outputs can be set active or inactive by clicking the box to the left of the **Relay Output** description.

The box will be **GREEN** when the output is set to active. A **GREY** box indicates the output is set inactive.



CHAPTER 6: DIAGNOSTICS, CALIBRATION, AND MAINTENANCE

Serial Port Test (Serial Loopback)

The serial port tests that the serial port on the **Data Processing Module** is functioning and the Monitor software has established a connection with the serial port.

To perform this test, Pins 2 and 3 (Data Transmit and Data Receive) should be jumpered together on the RS-232 Connector on the back of the **Data Processing Module**. Then, click the **Serial Loopback** button. The Monitor will display a message that the serial port test is in progress. After approximately a minute, the Monitor will display a message stating if the serial port test passed or failed.

Ethernet Port Test

The Ethernet port tests that the Ethernet port on the **Data Processing Module** is functioning and the *Windows7*® Operating System can communicate through the Ethernet port to another computer.

To perform this test, the **Data Processing Module** should be connected to a network through the Ethernet connector on the back of the **Data Processing Module**.

1. Click the **Ethernet Test** button.
2. Enter the **IP Address** of one of the computers on the network and click **OK**.

NOTE: The Monitor needs to have security rights to access that computer. It will display a message that the **Ethernet test is in progress**. After approximately a minute, the Monitor will display a message stating if the Ethernet port test passed or failed.

Logic Signal Test

The **Logic Signal Test** checks the communications between the **Sensor Interface Module** and the **Data Processing Module**. Consult the Amada Weld Tech Service Department for further information about this test.

When the **Logic Signal Test** button is pressed, there will not be any messages displayed on the screen Digital Diagnostics screen nor will any new window be displayed. Clicking the **Logic Signal Test** button will not change the Monitor's configuration or calibration. Click the **Return** button to exit the **Diagnostics** screens.

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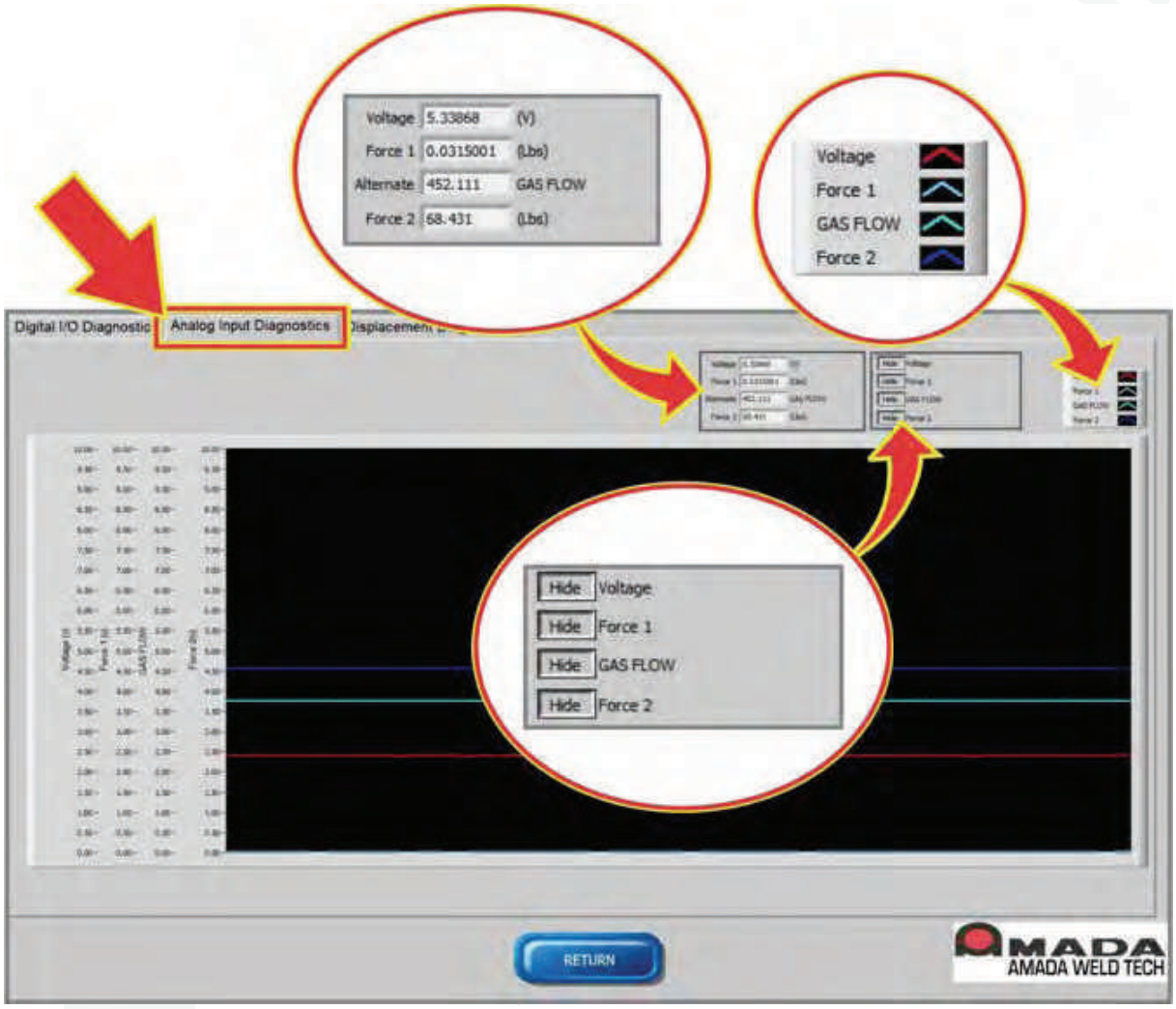
Analog Input Diagnostics



The **Analog Input Diagnostics** screen shows the real time signal values present on the **Voltage, Force 1** and **2**, and **Alternate Sensor** input channels. If the user has entered in text for the label for the **Alternate Sensor** in the **System Setup**, such as "Gas Flow", the user text label will appear on the **Analog Input Diagnostics** screen in place of the standard **Alternate Sensor** text.

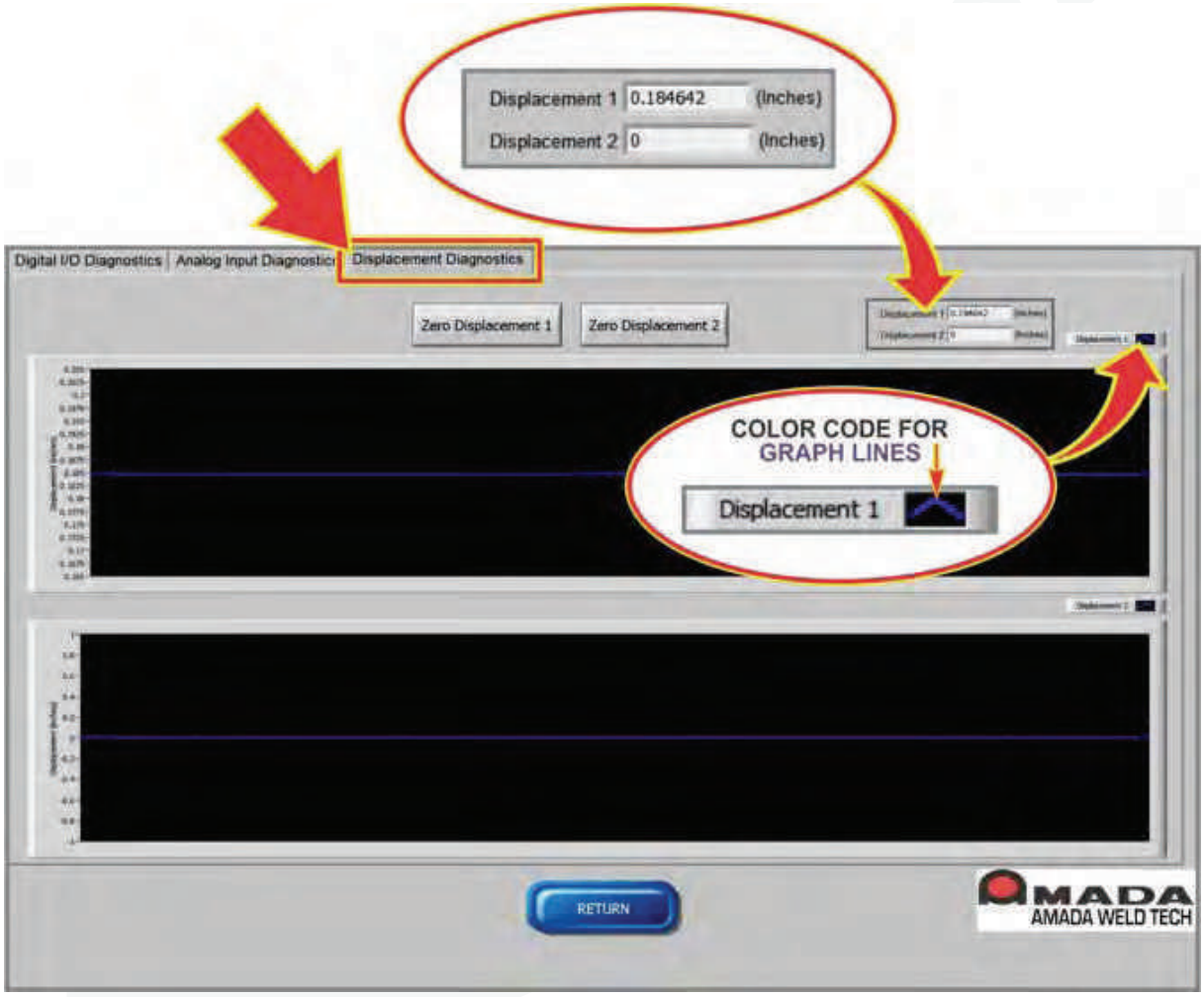
There is a graphical display of these signal values with the Y Axis labeled with the units for each signal. There is also a numeric display of the signal values shown in the table in the upper right portion of the screen. The graph lines are color coded as noted in the color key table in the upper right corner of the screen. The user can click the **Hide/Unhide** buttons located in the upper right portion of the screen to remove a signal from the graphical display.

CHAPTER 6: DIAGNOSTICS, CALIBRATION, AND MAINTENANCE

Displacement Diagnostics

The **Displacement Diagnostics** screen shows the current position measurement of the two displacement channels. There is a graphical display of the positions with the Y Axis labeled with the units. There is also a numeric display shown in the table in the upper right corner of this screen.

The displacement sensors can be zeroed from this screen by clicking the **Zero Displacement 1** or **2** buttons.



CHAPTER 6: DIAGNOSTICS, CALIBRATION, AND MAINTENANCE

Section II. Calibration

The Monitor user interface provides functions to allow an electronics technician to calibrate most of the process measurement inputs on site. The procedures to complete those calibrations are described in this section. The measurement inputs for **Current, Voltage, Force 1, Force 2**, and **Alternate Sensor** can be calibrated by an electronics technician at the user site.

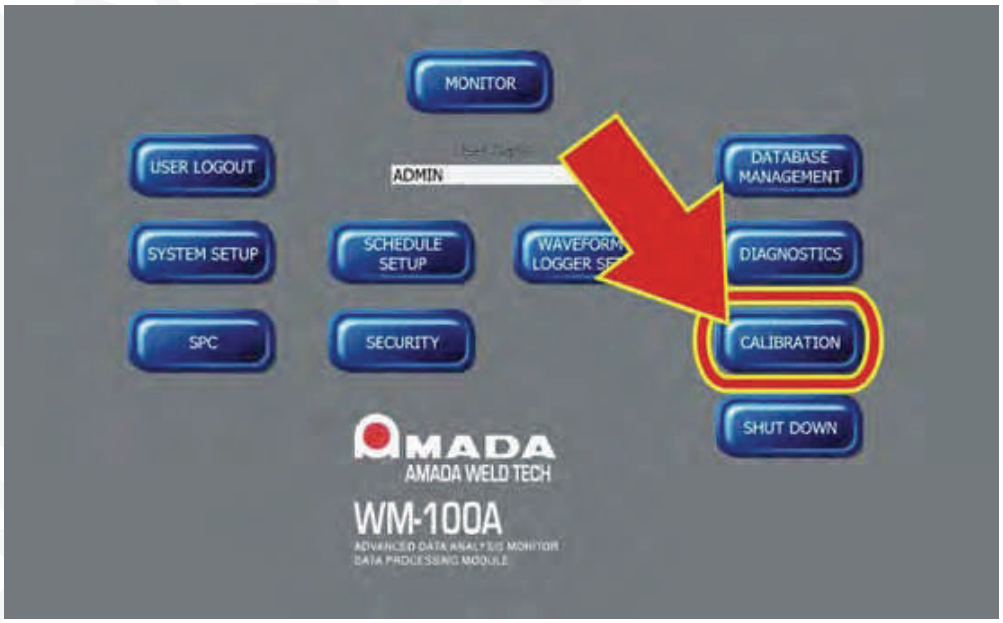
CAUTION

The monitor calibration procedures should ***only*** be performed by a trained electronics technician.

The displacement channel inputs are digital signals and do not have any calibration capabilities within the Monitor. Gage blocks can be used to set an electrode position and the resulting electrode position can be read on the **Displacement Diagnostics** screen to confirm if the Heidenhain linear encoder and **Monitor** are operating correctly. If the Heidenhain linear encoder is ***not*** operating properly, replacement or repair of the Heidenhain linear encoder is required.

To provide for calibrated input channels, the Monitor utilizes a scale factor (slope) and offset (y intercept) that it applies to the raw value read on the input channel. The scale factors and offsets can be entered manually through the keyboard or determined in an automated manner using the Monitor's calibration functions.

From the **Main Menu**, click on **Calibration** button to access the calibration functions.



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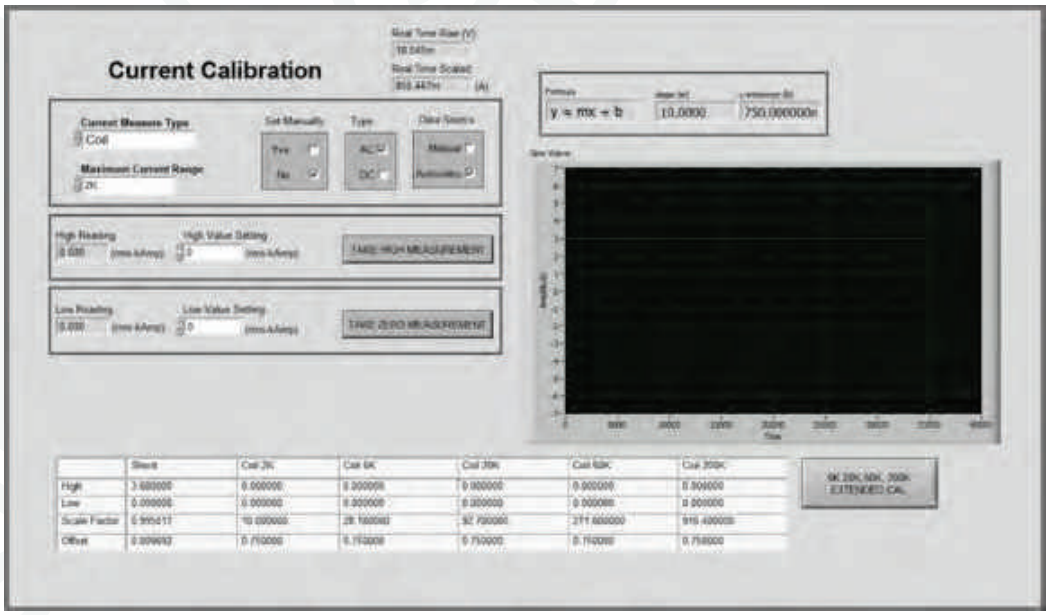
Calibration Menu

The following screen shows the **Calibration Menu**. The button in the upper right corner of the screen is the button for the calibration of the **Alternate Sensor**. In this view of the screen, the button is labeled **Gas Flow**, because **Gas Flow** was the text entered on the **System Setup** menu for the **Alternate Sensor Label**.

Current Calibration

To calibrate the current channel, click the **Current** button on the **Calibration Menu** to access the **Current Calibration** screen.



CHAPTER 6: DIAGNOSTICS, CALIBRATION, AND MAINTENANCE

On this screen the real time voltage on the current input channel is displayed in the upper center part of the screen. The real time current factored with the present calibration factors is displayed below the voltage signal.

The table at the bottom of the screen displays the present calibration factors for the current input channel.

The graph on the right side of the screen is for reference information ***only*** and is not specifically used by the calibration procedure.

The calibration procedure determines a scale factor (slope) and offset (y intercept). The scaling formula is displayed in the upper right corner of the screen.

Calibration Procedure for Current Channel for Shunt

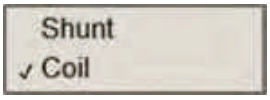
Equipment required:

a. MPJA HY5003 power supply or equivalent

b. shunt cable (**Sensor Interface Module** to HY5003 power supply)

Procedure

1. From the Main menu, click on the **Calibration Button** then click on the **Current Calibration** button.
2. Set **Current Measure Type** to **Shunt**.
3. Set **Set Manually** to **No**.
4. Set **Type** to **DC**.
5. Set **Data Source** to **Automatic**.
6. Connect one end of Shunt cable to HY5003 power supply and the other end to the Sensor Interface Module.
7. Set HY5003 power supply to **0.00 Volts**.
8. Press **Take Zero Measurement**.
9. Enter **0 Volts** in **Low Value Setting**. Press the **Enter** Key.
10. Set HY5003 Power Supply to output approximately 4.00 Volts.
11. Press **Take High Measurement**.
12. Enter the HY5003 output voltage level in **High Value Setting**. Press the **Enter** Key.
13. Click **Save**.



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Calibration Procedure for Current Channel for Current Coil

Equipment required:

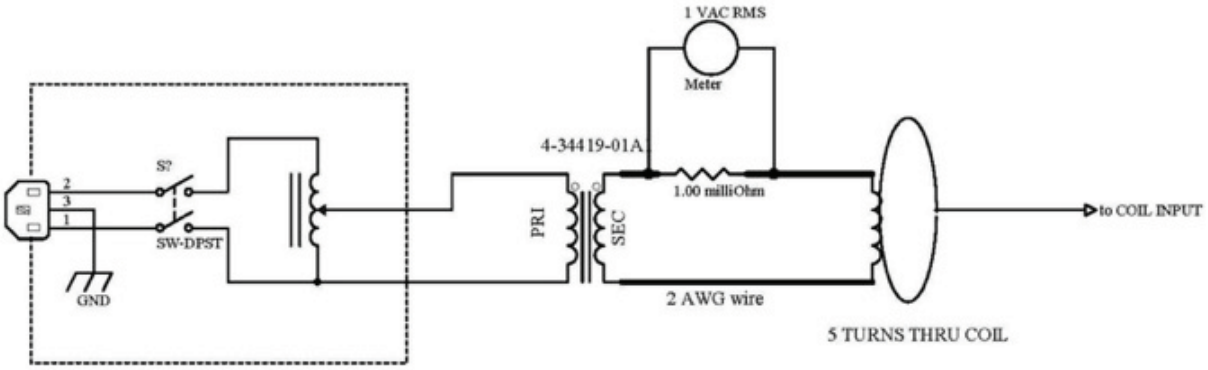
a. Variable transformer with switch capable of 0 to 115 VAC at 10 Amps
b. Five foot piece of 2 AWG insulated wire terminated (between shunt and output of transformer)
c. Calibrated shunt resistor of 1.000 milliohms rated at 40 watts minimum
d. Miyachi Unitek transformer part number 4-34419-01A1 or equivalent
e. True RMS digital voltmeter with a range of zero to one volt RMS

Automated Procedure to Calibrate 2K Coil Range

CAUTION

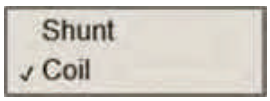
Do ***not*** connect primary of transformer until instructed to do so per this procedure.

1. Connect equipment specified above per the following diagram. Ensure that there are 5 turns passing through the center of the Rowgowski coil.



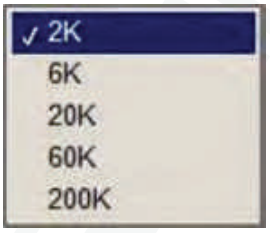
2. Set the voltage to zero on variable transformer, hen increase until the meter reads 200 mV AC. This will simulate a current of 1000 amps.
3. Turn the current OFF with the switch.

   NOTE: If shunt resistor is not 1.000 milliohms, calculate a current to use instead of the above 200 mV AC current based on the resistance value of the shunt.
4. Go to the **Current Calibration** Screen. Set **Current Measure Type** to **Coil**.



CHAPTER 6: DIAGNOSTICS, CALIBRATION, AND MAINTENANCE

5. Select 2K for **Maximum Current Range**.
6. Select **No** for **Set Manually**.
7. Select **AC** for **Type**.
8. Select **Automatic** for **Data Source**.
9. Confirm current is **OFF**.



10. Click **Take Zero Measurement**.
11. Enter **0** in **Low Value Setting**.
12. Turn current ON.
13. Click **Take High Measurement**. After a brief delay a sine wave should appear on the screen. Enter **1.00** in **High Value Setting**.
14. Click **Save**, then click **OK**.
15. Turn the current **OFF**.

Confirm the Current Coil Calibration

1. Create a Schedule for an AC Current with coil on the 2K range, pre-trigger of 0, post-trigger of 500 milliseconds and a current trigger.
2. Go to **Weld Monitoring** Tab on the **Monitor** Screen.
3. Click **Press to Start**.
4. Turn on current for **1** second.
5. Click the **Expand** button for **Current**. Measure peak voltage divided by 1.414. The value should be **1k** amps if the calibration is correct.

Procedure to Calibrate 6K, 20K, 60K, and 200K Coil Ranges

The 6K, 20K, 60K, and 200K ranges can be calibrated following two methods. One method is to click the **6K, 20K, 60K, 200K EXTENDED COIL** button on the **Current Calibration** screen after the 2K range has been calibrated. When this button is clicked the 6K, 20K, 60K, and 200K columns in the table at the bottom of the **Current Calibration** screen will be updated with values based on factors of the 2K calibration results. When the button is clicked and the table updated, there will not be any messages displayed on the screen.

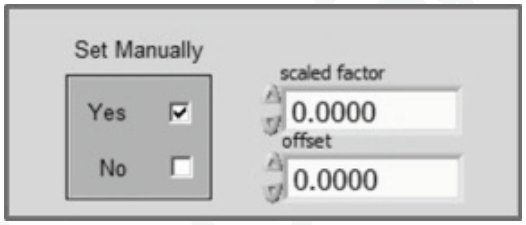
The 6K, 20K, 60K, and 200K ranges can also be calibrated by using a current source that can provide a current suitable to those ranges. Please contact the Amada Weld Tech Service Department for further information.

CHAPTER 6: DIAGNOSTICS, CALIBRATION, AND MAINTENANCE

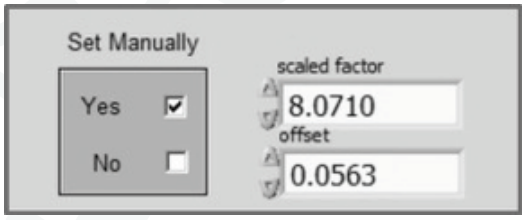
Manual Procedure to Enter Scale Factor and Offset for Current

1. While on the **Current Calibration** Screen, select the desired **Current Measure Type** (shunt or coil). If coil was selected for the **Current Measure Type** then also select the desired **Maximum Current Range** (2K, 6K, 20K, 60K, or 200K).

2. Set **Set Manually** to **Yes**. Scaled Factor and Offset text entry boxes will appear to the right of the **Set Manually** area.



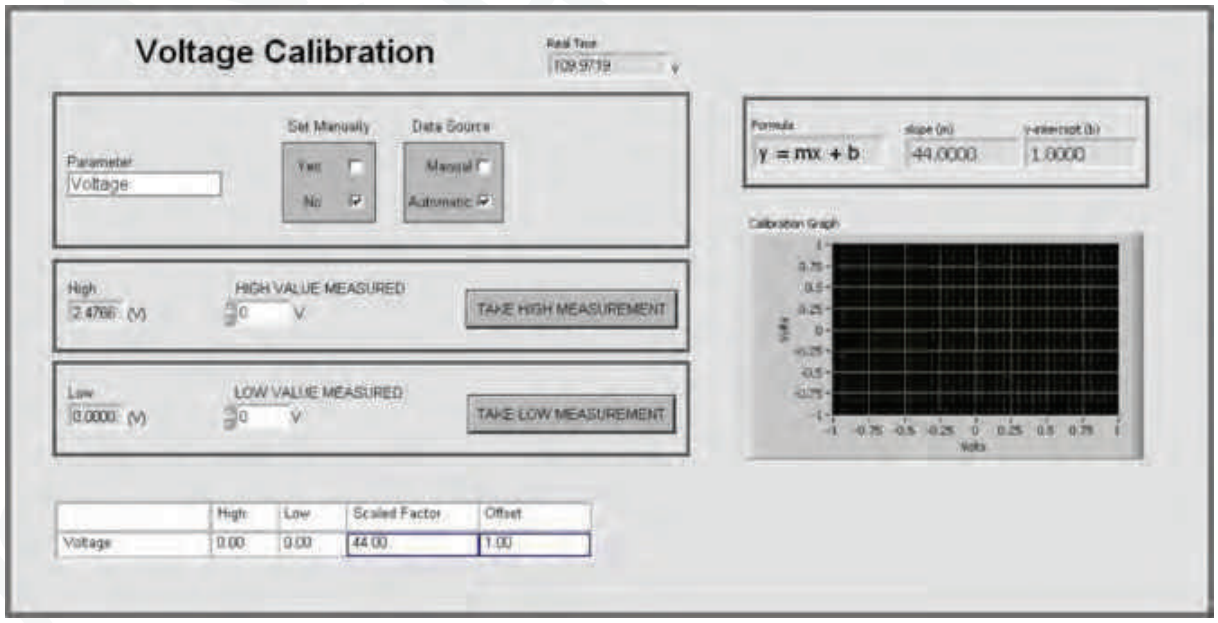
3. Enter your desired scaled factor and offset into the text boxes.
4. Click **Save**.
5. A window will open asking **Are you sure?** Click **OK**.



6. Repeat this procedure for the remaining coil ranges.

Voltage Calibration

To calibrate the voltage channel, click the **Voltage** button on the **Calibration Menu** to access the **Voltage Calibration** screen.



CHAPTER 6: DIAGNOSTICS, CALIBRATION, AND MAINTENANCE

On this screen the real time voltage factored with the present calibration factors is displayed in the upper center part of the screen. The table at the bottom of the screen displays the present calibration factors for the voltage input channel.

The graph on the right side of the screen is for reference information only and is ***not*** specifically used by the calibration procedure. The calibration procedure determines a scale factor (slope) and offset (y intercept). The scaling formula is displayed in the upper right corner of the screen.

Equipment required

a. MPJA HY5003 power supply or equivalent

b. Voltage Calibration cable (**Sensor Interface Module** to HY5003 power supply)

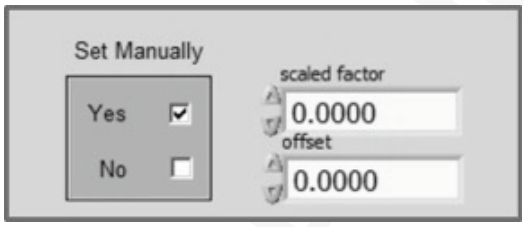
Automated Calibration Procedure for Voltage

1. Go to **Voltage Calibration Screen**.
2. Set **Manually** to **No**.
3. Set **Data Source** to **Automatic**.
4. Disconnect Voltage Lead cable from **Sensor Interface Module**.
5. Set HY5003 Power Supply to **0.00** volts output.
6. Connect the Voltage calibration cable from **Sensor Interface Module** to HY5003 Power Supply.
7. Press **Take Low Measurement**.
8. Set HY5003 Power Supply to approximately **1.00** Volts.
9. Enter the HY5003 output voltage in **Low Value Setting**.
10. Press **Take High Measurement**.
11. Set HY5003 power supply to approximately 4.00 volts.
12. Enter the HY5003 output voltage in **High Value Setting**. Press the **Enter** Key.
13. Click **Save**.
14. Disconnect Voltage Calibration cable from the **Sensor Interface Module**.
15. Reconnect Voltage Lead Cable to the **Sensor Interface Module**.

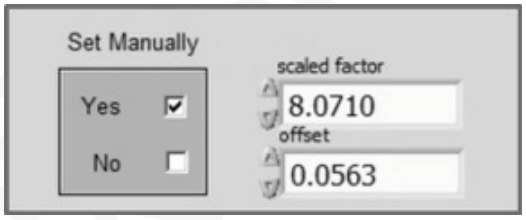
CHAPTER 6: DIAGNOSTICS, CALIBRATION, AND MAINTENANCE

Manual Procedure to Enter Scale Factor and Offset for Voltage

1. While on the **Voltage Calibration** Screen, set **Set Manually** to **Yes**. **Scaled Factor** and **Offset text** entry boxes will appear to the right of the **Set Manually** area.

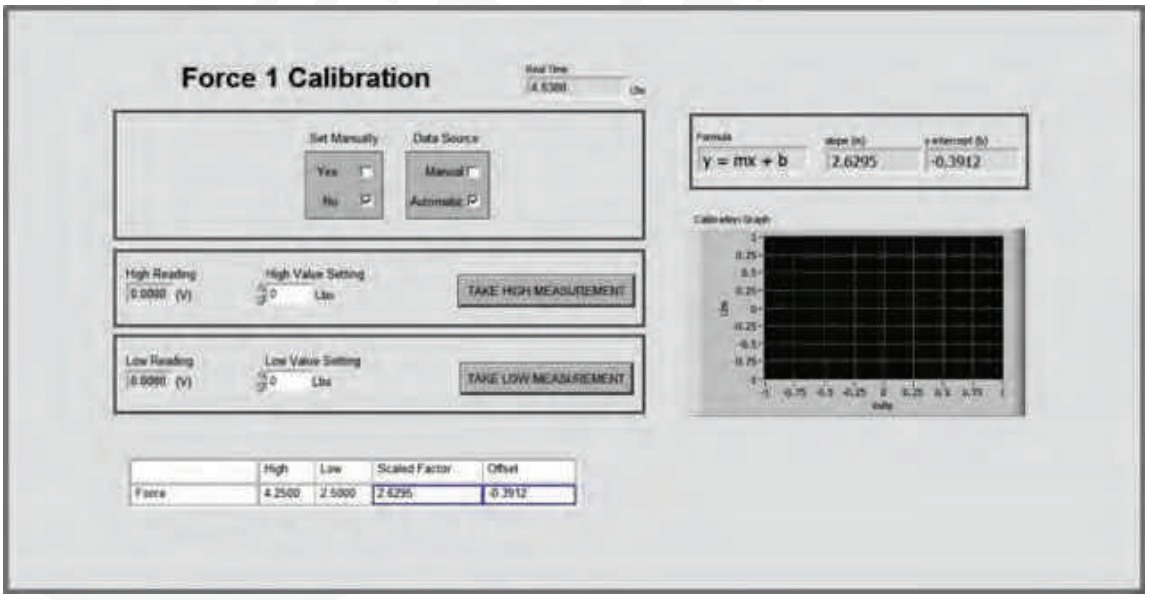


2. Enter your desired scaled factor and offset into the text boxes.
3. Click **Save**.
4. A window will open asking **Are you sure?**
5. Click **OK**.



Force Calibration

The Force 1 and Force 2 input channels are calibrated separately. To calibrate the Force 1 channel, click the **Force1/Pressure** button on the **Calibration Menu** to access the **Force1/Pressure Calibration** screen.



On this screen the real time force value factored with the present calibration factors is displayed in the upper center part of the screen. The table at the bottom of the screen displays the present calibration factors for the force input channel.

The graph on the right side of the screen is for reference information ***only*** and is not specifically used by the calibration procedure.

CHAPTER 6: DIAGNOSTICS, CALIBRATION, AND MAINTENANCE

The calibration procedure determines a scale factor (slope) and offset (y intercept). The scaling formula is displayed in the upper right corner of the screen.

Equipment required

a. MPJA HY5003 power supply or equivalent

b. Force Calibration cable (**Sensor Interface Module** to HY5003 power supply)

Automated Calibration Procedure for Force 1

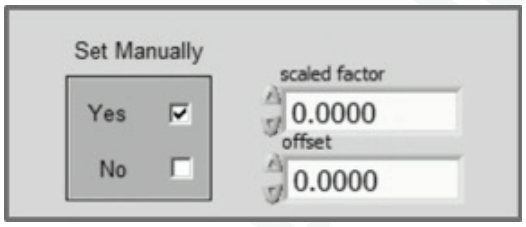
This procedure calibrates the Monitor for an application with forces typically in the 5 to 15 lb range. Select an upper and lower force level to use based on the forces typical for your weld application.

1. Go to **Force 1 Calibration Screen**.
2. Set **Manually** to **No**.
3. Set **Data Source** to Automatic.
4. Set **Weldhead** to approximately 5.00 lbs force.
5. Set **Power Supply** to a **No Weld** condition such that the weldhead can be actuated but the power supply will not apply weld current.
6. Put force gauge between electrodes and use footswitch to apply force.
7. Click **Take Low Measurement**.
8. Enter Force Gauge reading into **Low Value Setting** then release the footswitch.
9. Set Weldhead to approximately 15.00 lbs force.
10. Put force gauge between electrodes and use footswitch to apply force.
11. Click **Take High Measurement**.
12. Enter Force Gauge reading into **High Value** Setting. Click **Save**.
13. Switch **Power Supply** from **No Weld** to **Weld**.

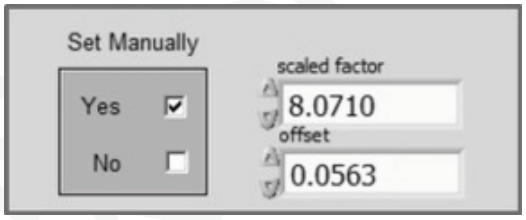
CHAPTER 6: DIAGNOSTICS, CALIBRATION, AND MAINTENANCE

Manual Procedure to Enter Scale Factor and Offset for Force 1

1. While on the **Force 1 Calibration** Screen, set **Set Manually** to **Yes**. **Scaled Factor** and **Offset text** entry boxes will appear to the right of the **Set Manually** area.

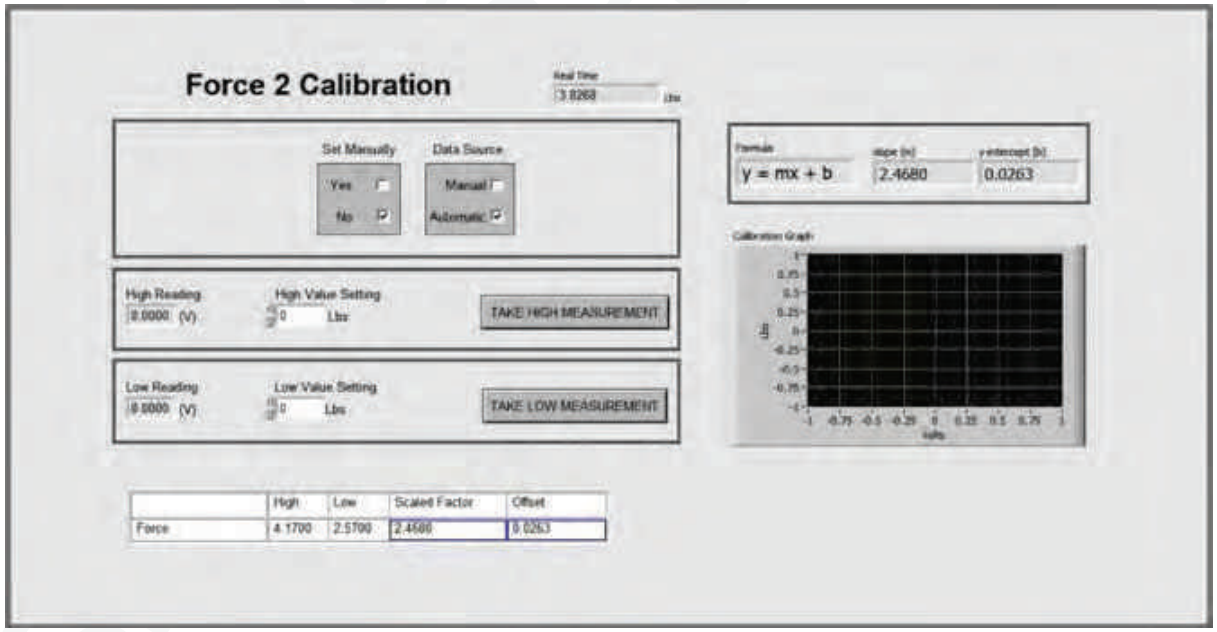


2. Enter your desired scaled factor and offset into the text boxes.
3. Click **Save**.
4. A window will open asking **Are you sure?** Click **OK**.



Calibration Procedures for Force 2

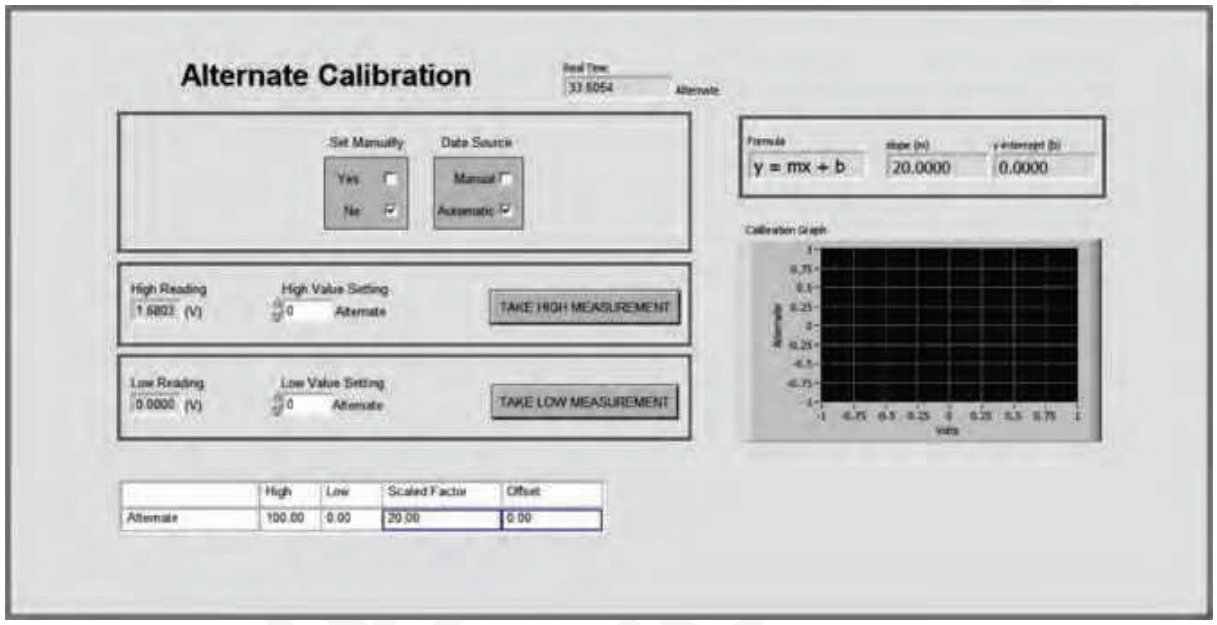
To calibrate the **Force2** channel, click the **Force2/Pressure** button on the **Calibration Menu** to access the **Force2/Pressure Calibration** screen. Follow the calibration procedure for the **Force 1** Channel to calibrate the **Force2** channel.



CHAPTER 6: DIAGNOSTICS, CALIBRATION, AND MAINTENANCE

Alternate Sensor Calibration

To calibrate the Alternate Sensor channel, click the **Alternate** button on the **Calibration Menu** to access the **Alternate Sensor Calibration** screen.



On this screen the real-time alternate sensor value factored with the present calibration factors is displayed in the upper center part of the screen. The table at the bottom of the screen displays the present calibration factors for the alternate sensor input channel.

The graph on the right side of the screen is for reference information ***only*** and is not specifically used by the calibration procedure. The calibration procedure determines a scale factor (slope) and offset (y intercept). The scaling formula is displayed in the upper right corner of the screen.

Equipment required

a. MPJA HY5003 power supply or equivalent

b. Alternate Sensor Calibration cable, Amada Weld Tech Part Number 4-38481-01 (**Sensor Interface Module** to HY5003 power supply)

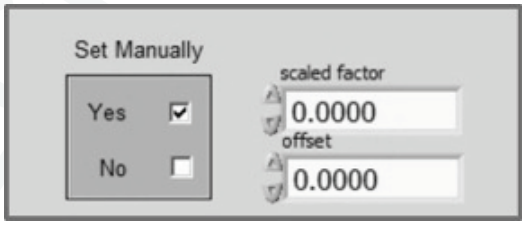
CHAPTER 6: DIAGNOSTICS, CALIBRATION, AND MAINTENANCE

Automated Calibration Procedure for Alternate Sensor

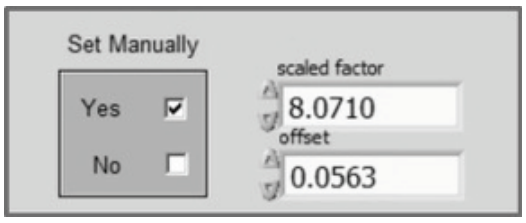
1. Go to the **Alternate Sensor Calibration** screen.
2. Set **Manually** to **No**.
3. Set **Data Source** to **Automatic**.
4. Set the HY5003 Power supply to approximately **0** Volts.
5. Connect the **Alternate Sensor Cable** from **Sensor Interface Module** to HY5003.
6. Set the HY5003 Power Supply to approximately **1.00** Volts.
7. Press **Take Low Measurement**.
8. Enter the HY5003 output voltage into the **Low Value Setting**.
9. Press **Take High Measurement**.
10. Set the HY5003 power supply to approximately **8** Volts.
11. Enter the HY5003 output voltage into the **High Value Setting**.
12. Click **Save**.

Manual Procedure to Enter Scale Factor and Offset for Alternate Sensor

1. While on the **Alternate Sensor Calibration** Screen, set **Set Manually** to **Yes**. **Scaled Factor** and **Offset text** entry boxes will appear to the right of the **Set Manually** area.



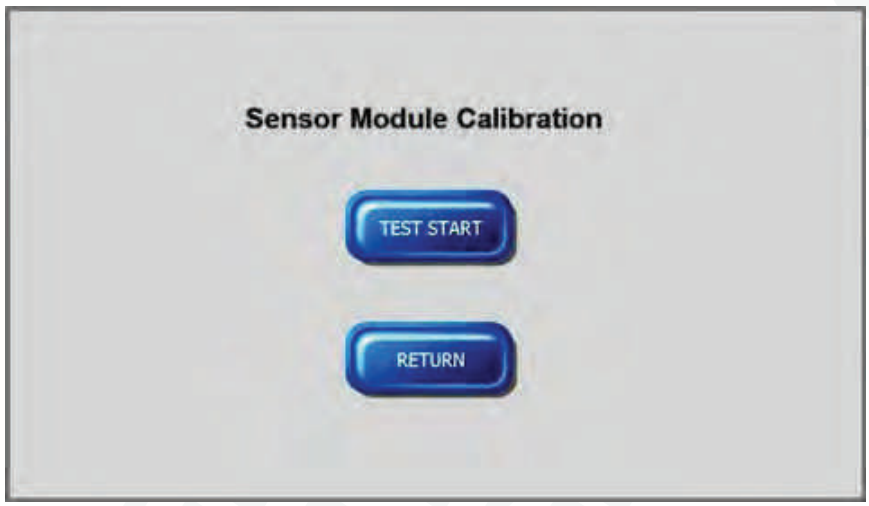
2. Enter your desired scaled factor and offset into the text boxes.
3. Click **Save**.
4. A window will open asking **Are you sure?**
5. Click **OK**.



CHAPTER 6: DIAGNOSTICS, CALIBRATION, AND MAINTENANCE

Sensor Module Calibration

There is a potentiometer in the **Sensor Interface Module** that provides a calibration adjustment for the current channel for a current coil sensor. This calibration is performed by accessing the **Sensor Module** Calibration screen by pressing the **Sensor Module** button on the **Calibration Menu.**



This **Sensor Module** calibration is performed during the factory calibration. Contact the Amada Weld Tech Service Department to schedule Calibration.

If the Sensor Module Calibration Screen is accessed, pressing the **Test Start** button will not affect the **Monitor's** calibration or operation. When the **Test Start** button is pressed, there will not be any messages on the **Sensor Module Calibration** screen nor will any new window be displayed. Click the **Return** button to exit the screen.

CHAPTER 6: DIAGNOSTICS, CALIBRATION, AND MAINTENANCE

Section III. Maintenance & Repair

Repair

There are no user-serviceable parts inside the **Data Processing Module**, **Sensor Interface Module**, computer monitor, keyboard or mouse. If you have problems with any of the WM-100A components that you cannot resolve, please contact our service department at the address, phone number, or e-mail address listed under **Contact Us** in the front of this manual.

Cleaning

Clean the exterior of the **Data Processing Module**, **Sensor Interface Module**, computer monitor, keyboard and mouse with a slightly moistened micro-fiber cloth and mild soap solution. Dry items with an antistatic lint-free cloth.

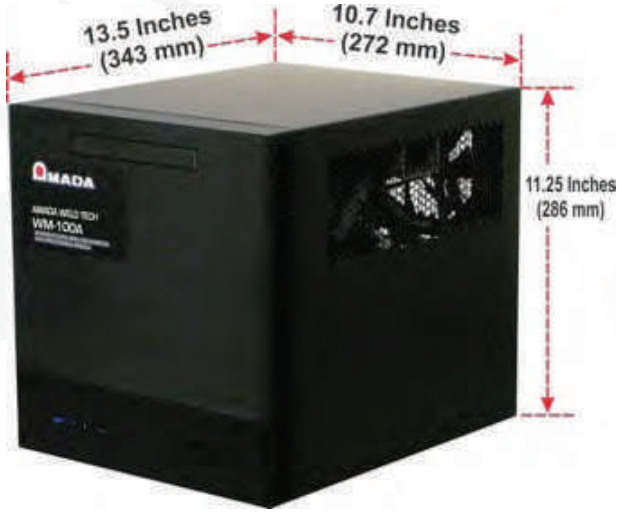
Inspection

Check all electrical connections weekly for damage and confirm proper connections are in place.

Maintenance

Calibrate all input channels yearly. Contact the Amada Weld Tech Service Department to schedule calibration.

Appendix A
Technical Specifications

PARAMETER	SPECIFICATIONS
Monitor Dimensions: Approximately 21" wide x 17" high x 9" deep (530mm x 430mm x 230mm). Size of monitor may vary. **Weight:** 10 lbs (4.5 kg) **Electrical Requirements** 100-240 VAC/1.0 amp/50-60Hz/Single phase	
Data Processing Module Dimensions: **Weight:** 17.5 lbs (8 kg) **Electrical Requirements** 100-240 VAC/9 amps – 4.5 amps/50-60Hz/Single phase	

APPENDIX A. TECHNICAL SPECIFICATIONS

PARAMETER	SPECIFICATIONS
Sensor Interface Module Dimensions: **Weight:** 11.5lbs (5.3 kg) **Electrical Requirements:** 100-240 VAC, 3.2 amps - 1.6amps, 50-60Hz, single phase from external power supply shipped with unit	

Technical Parameters

PARAMETER	SPECIFICATIONS			
	Type	**Range**	**Accuracy**	**Resolution**
Measurement Channels	Current: AC or DC (Coil input channel)	0 – 200,000 amps	1.5% of full scale	Three significant digits
	Current: AC or DC (Shunt input channel)	0 – 10,000 amps with 1 milliohm shunt	+/- 1% of reading +/- 20 amps	Three significant digits
	Voltage	0-15V	+/- 1% of reading +/- 0.020 volts	Three significant digits
	Force 1	0-10V	+/- 1% of reading +/- 0.020 volts	Three significant digits
	Force 2	0-10V	+/- 1% of reading +/- 0.020 volts	Three significant digits
	*Displacement 1 and *Displacement 2	0-12mm, 0-25mm, 0-30mm*	+/- 0.0005” or +/- 0.01mm	0.0001” or 0.01 mm
	Alternate Voltage	0-10V	+/- 1% of reading +/- 0.020 volts	Three significant digits
	*determined by displacement sensor installed			

APPENDIX A. TECHNICAL SPECIFICATIONS

PARAMETER	SPECIFICATIONS
Current Coil Ranges	2, 6, 20, 60, 200 kA
Weld Time	1 to 2,000 milliseconds
Sampling Rate	125 kHz for all channels
Measurement Time	1 to 2,000 milliseconds
Repetition Rate	1 weld per second for a 100 millisecond measurement period
Database	Microsoft SQL Server Express
Counters	2 resettable counters with user assigned messages
Schedules	Unlimited number of schedules can be stored based on available hard drive space. 127 schedules can be selected through schedule inputs.
Minimum Current Rise (Current Coil Applications)	25 amps/millisecond for 1X coil in 2k range 5 amps/millisecond for 10X coil in 2k range Minimum current rise is proportionally greater for higher coil ranges
Monitored Parameters with Upper and Lower Limits	Peak Current Pulse 1 & 2 RMS Current Pulse 1 & 2 Peak Voltage Pulse 1 & 2 RMS Voltage Pulse 1 & 2 Peak Resistance Pulse 1 & 2 RMS Resistance Pulse 1 & 2 Peak Power Pulse 1 & 2 RMS Power Pulse 1 & 2 Initial Thickness 1 & 2 Final Thickness 1 & 2 Thickness Change 1 & 2 Force 1 & 2 Alternate Formula 1 & 2 Weld Time
Monitored Parameters with Upper and Lower Warning Levels	Peak Current Pulse 1 & 2 RMS Current Pulse 1 & 2 Peak Voltage Pulse 1 & 2 RMS Voltage Pulse 1 & 2 Peak Resistance Pulse 1 & 2 RMS Resistance Pulse 1 & 2 Peak Power Pulse 1 & 2 RMS Power Pulse 1 & 2 Initial Thickness 1 & 2 Final Thickness 1 & 2 Thickness Change 1 & 2 Formula 1 & 2

APPENDIX A. TECHNICAL SPECIFICATIONS

PARAMETER	SPECIFICATIONS
Elements Stored in Database	Time Stamp (Time and date) Test Record ID Part serial Part Lot (Lot number) Schedule ID Schedule name Weld Time Weld time result Peak current 1 & 2 RMS current 1 & 2 Current result Peak voltage 1 & 2 RMS voltage 1 & 2 Voltage result Peak power 1 & 2 RMS power 1 & 2 Power result Peak resistance 1 & 2 RMS resistance 1 & 2 Resistance result Peak force / Pressure 1 & 2 Force result 1 & 2 Initial thickness 1 & 2 Displacement (Thickness Change) 1 & 2 Final thickness 1 & 2 Displacement result 1 & 2 Alternate sensor maximum Alternate sensor minimum Alternate Result Weld status Counter 1 & 2 Formula 1 & 2 Formula result 1 & 2
Waveforms	Current, Voltage, Force 1, Force 2, Displacement 1, Displacement 2, Alternate Input, Resistance, Power
Digital Inputs	Refer to Appendix B
Digital Outputs	Refer to Appendix B
Relay Outputs	Refer to Appendix B
Communications	Ethernet TCP/IP to read database, RS-232 for weld data output after each weld
Ambient Temperature	10-40°C
Relative humidity	10% to 80% non-condensing

Appendix B
Electrical & Data Connections

Introduction

This Appendix describes the electrical and data connectors located on the front and rear panel of the Sensor Interface Module and the RS-232 connector located on the **Data Processing Module**.

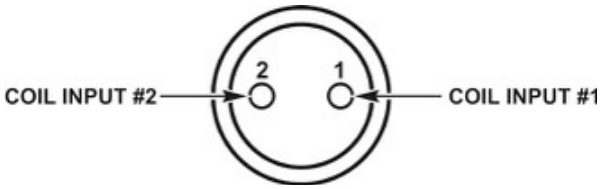
NOTE: The specification listed in this Appendix may be changed without notice.

Current Input Connector (Shunt)

CURRENT INPUT CONNECTOR (SHUNT) SPECIFICATIONS					
PIN #	SIGNAL		MAX VOLTAGE	MAX CURRENT	COMMENTS
	VOLTAGE	I/O			
Center	+V	I	10V	0.2 amps	Signal is differential between Shell V- and Center V+.
Shell	-V	I	10V	0.2 amps	

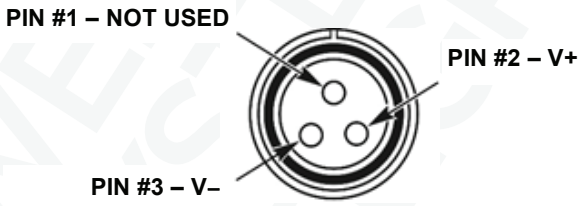
APPENDIX B. ELECTRICAL AND DATA CONNECTIONS

Current Input Connector (Coil)



CURRENT INPUT CONNECTOR (COIL) SPECIFICATIONS		
PIN #	**SIGNAL NAME**	**I/O**
1	Coil Input #1	I
2	Coil Input #2	I

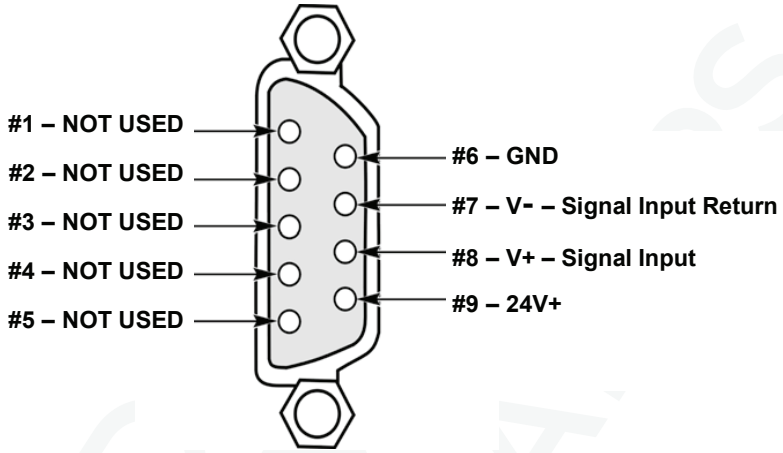
Voltage Sense Input Connector



VOLTAGE SENSE INPUT CONNECTOR SPECIFICATIONS						
PIN #	**SIGNAL**		**MAX VOLTAGE**	**MAX CURRENT**	**I/O**	**COMMENTS**
	NAME	**TYPE**				
1	Not Used					Not Used
2	Input #1 V+	Pulse	15V	0.1A	I	Signal is differential between Input #1 and Input #2
3	Input #2 V-	Pulse	15V	0.1A	I	

APPENDIX B. ELECTRICAL AND DATA CONNECTIONS

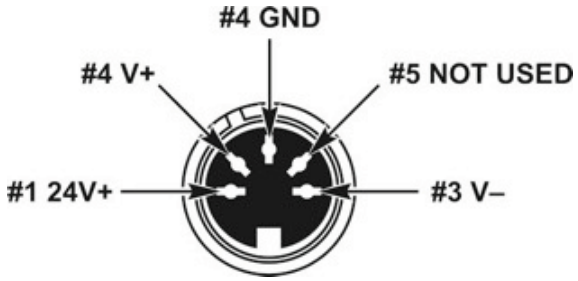
Force 1, and 2 Input Connectors



FORCE1 and FORCE 2 INPUT CONNECTOR SPECIFICATIONS				
PIN #	SIGNAL		MAX VOLTAGE	MAX CURRENT
	NAME	TYPE		
1	Not used			
2	Not used			
3	Not used			
4	Not used			
5	Not used			
6	Ground	Ground	N/A	
7	V-	Signal Input return	10 V	0.1 amps
8	V+	Signal Input		
9	+24 Volts	Power	N/A	

APPENDIX B. ELECTRICAL AND DATA CONNECTIONS

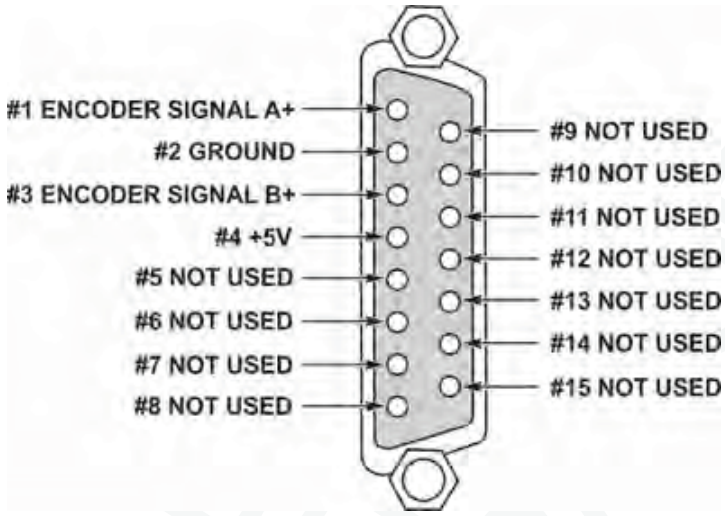
Alternate Sensor Input Connector



ALTERNATE SENSOR INPUT CONNECTOR SPECIFICATIONS				
PIN #	SIGNAL		MAX VOLTAGE	MAX CURRENT
	NAME	TYPE		
1	+24 Volts	Power	N/A	
2	Ground	Ground	N/A	
3	Signal Return	Signal Input Return	10V	0.1 amps
4	Signal	Signal Input		
5	Not used			

APPENDIX B. ELECTRICAL AND DATA CONNECTIONS

Displacement 1 and 2 Input Connectors



PIN #	SIGNAL	
	NAME	TYPE
1	Encoder Signal A+	Signal
2	Ground	Ground
3	Encoder Signal B+	Signal
4	+5V	Power
5-15	Not Used	

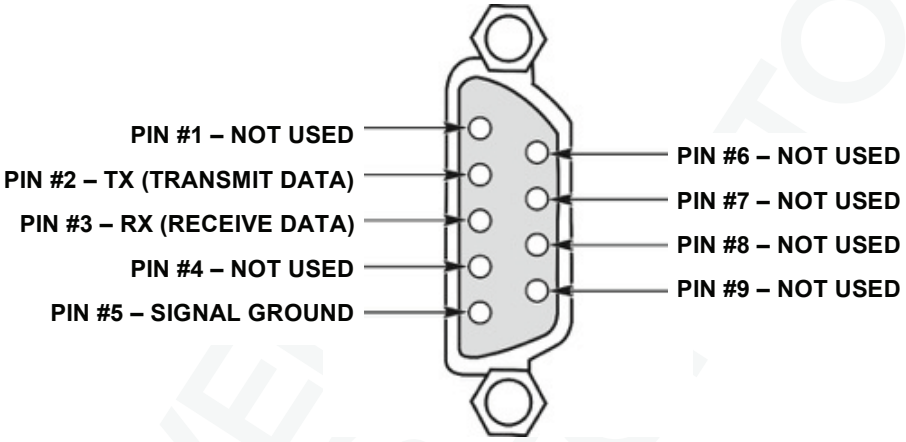
APPENDIX B. ELECTRICAL AND DATA CONNECTIONS

RS 232 Connector

The RS-232 Connector is located on the back of the **Data Processing Module.**

The Monitor has only one RS-232 function. The Monitor automatically outputs weld results after the weld data has been processed for a weld. The weld results are output as one comma delimited ASCII string. The Monitor acts as Master and there is not any handshaking.

The Monitor will output the weld results that are selected in the Logger Setup. The individual weld result variables, will appear in the string in the order that the variables are listed in the logger.



RS 232 CONNECTOR SPECIFICATIONS		
PIN #	**DESCRIPTION**	**PIN TYPE**
1	Not Used	
2	TX (Transmit Data)	RS-232 Driver
3	RX (Receive Data)	RS-232 Receiver
4	Not Used	
5	Signal Ground	Analog Ground (ISOGND1)
6	Not Used	
7	Not Used	
8	Not Used	
9	Not Used	

APPENDIX B. ELECTRICAL AND DATA CONNECTIONS

The comma delimited ASCII string will contain the following:

- Unit ID Number (three characters)
- Schedule Number (the number of characters of the schedule number)
- Weld Result (0 if there were not any limits exceeded, 1 if one or more limits were exceeded)
- Date / Time Stamp
- Data items selected in the Logger Setup (these items will be listed in the order that they appear in the Logger)
- Carriage Return [0x0D]
- Line Feed [0x0A]
- Line Feed [0x0A]

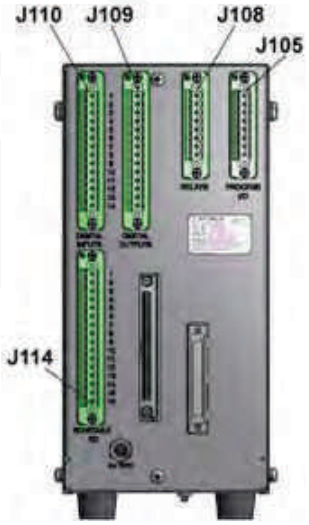
Sample String for Schedule number 124 with weld data for Peak Current, Peak Power, Peak Resistance, and Weld Time:

001,124,1,9/16/2010 9:30:47 AM,15.251331,11.020274,1.290020,86.632004,[0x0D][0x0A][0x0A]

Current Power Resistance Weld Time

The Unit ID Number, which must be three characters in length, and Baud Rate must be set in the **System Setup Screen**.

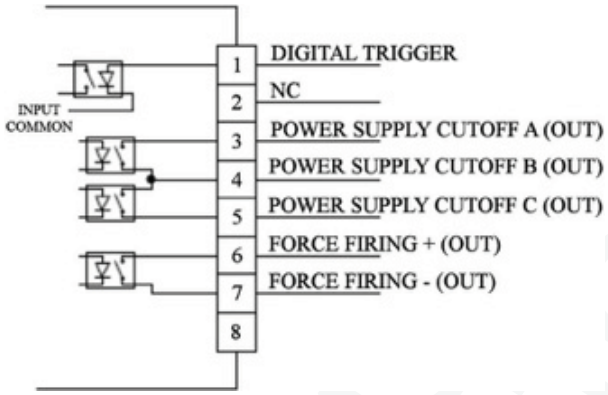
Input / Output Signal Connectors



APPENDIX B. ELECTRICAL AND DATA CONNECTIONS

Input / Output Signal Configurations

J105 – Process Digital Inputs and Outputs



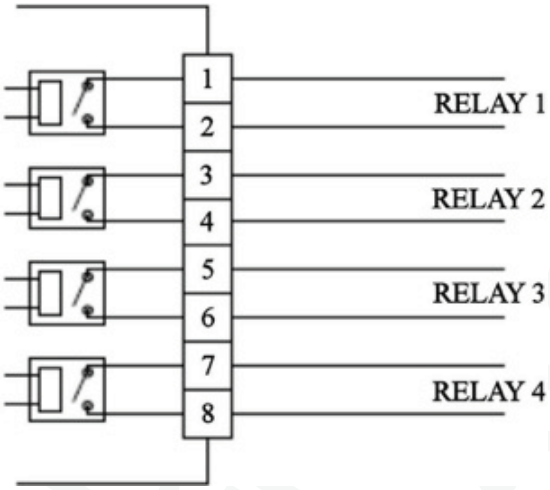
J105 Process Inputs and Outputs

PIN #	NAME	DESCRIPTION	MINIMUM ACTIVE TIME
J105-1	Digital Trigger + (INPUT)	Bidirectional Input Referenced to Input Common at Pin 12 of J110	125ms
J105-2	Not Used		
J105-3	Power Supply Cutoff A (OUTPUT)	The Power Supply Cutoff outputs will switch active when the weld to displacement values are reached for the two displacement channels. The user should connect to two of the three output terminals per the following selections: Pins 3 and 4: For displacement channel 1 Pins 4 and 5: For displacement channel 2 Pins 3 and 5: For the OR of displacement channels 1 & 2	The outputs will be active as long as the displacement sensor output exceeds the weld value. When the weldhead retracts the electrode past the weld value, these outputs will switch low.
J105-4	Power Supply Cutoff B (OUTPUT)		
J105-5	Power Supply Cutoff C (OUTPUT)		
J105-6	Force Fire (OUTPUT)	Signal	When the Monitor is in the **Monitor Mode**, this output will switch active when the force channel reading is higher than the user set force fire level and will switch inactive when the force reading drops below the user set force fire level. When the Monitor is ***not*** in **Monitor Mode**, this output will remain inactive.
J105-7	Force Fire (OUTPUT)	Ground	
J105-8	Not Used		

Digital Output Rating: Up to 28VDC, up to 120 milliamp
Digital Input Rating: Internal load resistor of 5k ohms. Maximum input voltage of 28VDC. Minimum detectable voltage of 5 VDC.

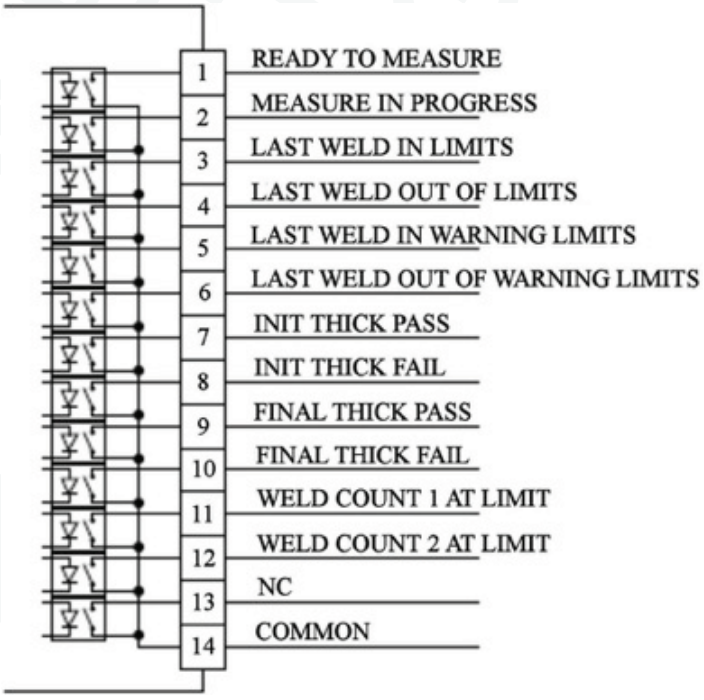
APPENDIX B. ELECTRICAL AND DATA CONNECTIONS

J108 – Relay Outputs



Relay Rating: Up to 30VDC, up to 1 Amp.

J109 – Digital Outputs



APPENDIX B. ELECTRICAL AND DATA CONNECTIONS

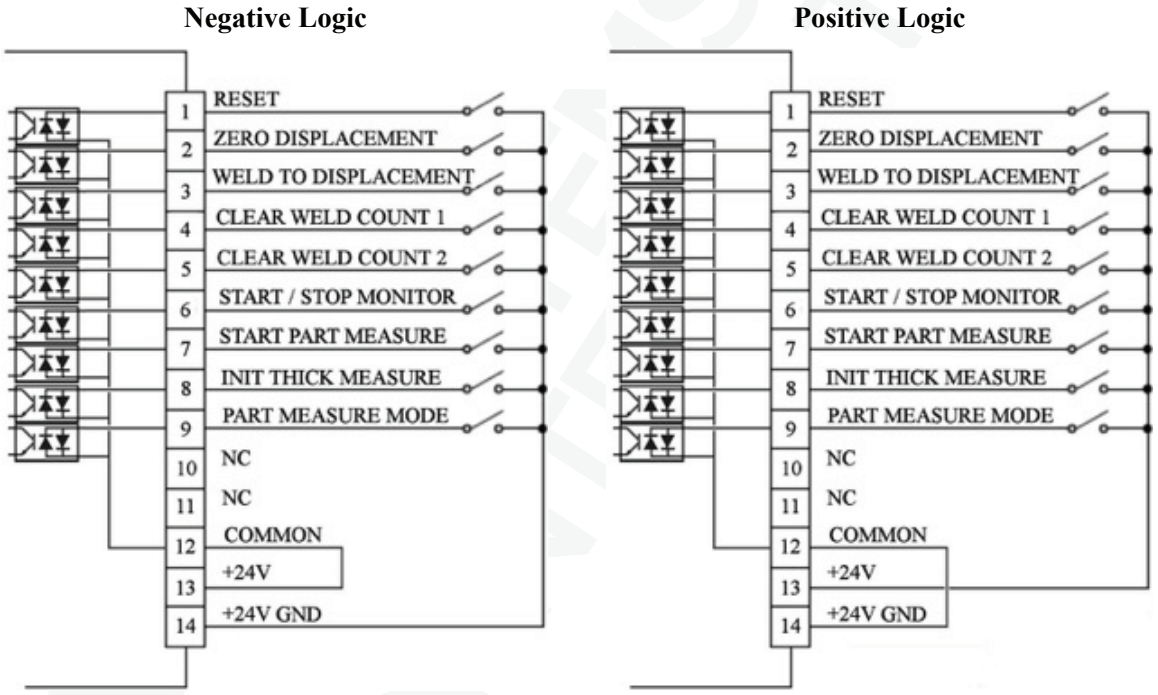
PIN #	NAME	DESCRIPTION
J109-1	Ready to Measure	This output will be active when the Monitor is ready to receive trigger
J109-2	Measurement in Progress	Used during the Part Measurement Mode as an acknowledgement that the input, Start Part Measurement was received and Monitor is ready to continue process. This output will be set active as acknowledgement
J109-3	Last Weld In Limits	This output will be set active after processing of weld data has been completed if weld was in all limits that are being monitored. It will remain active until the Reset input is switched active or another weld is completed.
J109-4	Last Weld Out of Limits	This output will be set active after processing of weld data has been completed if weld was out of any limit that is being monitored. It will remain active until the Reset input is switched active or another weld is completed.
J109-5	Last Weld In Warning	This output will be set active after processing of weld data has been completed if weld was in all limits that are being monitored. It will remain active until the Reset input is switched active or another weld is completed.
J109-6	Last Weld Out of Warning	This output will be set active after processing of weld data has been completed if weld was out of any limit that is being monitored. It will remain active until the Reset input is switched active or another weld is completed.
J109-7	Initial Thickness Pass	This output will be set active after processing of weld data has been completed if weld was within the upper and lower limits for Initial Thickness if this limit is being monitored. It will remain active until the Reset input is switched active or another weld is completed.
J109-8	Initial Thickness Fail	This output will be set active after processing of weld data has been completed if weld was out of either the upper or lower limits for Initial Thickness if these limits are being monitored. It will remain active until the Reset input is switched active or another weld is completed.
J109-9	Final Thickness Pass	This output will be set active after processing of weld data has been completed if weld was within the upper and lower limits for Final Thickness if this limit is being monitored. It will remain active until the Reset input is switched active or another weld is completed.
J109-10	Final Thickness Fail	This output will be set active after processing of weld data has been completed if weld was out of either the upper or lower limit for Final Thickness if it is being monitored. It will remain active until the Reset input is switched active or another weld is completed.
J109-11	Weld Counter 1 Reached Limit	This output will be set active when weld counter 1 has reached the limit set in the schedule. It will remain active until the Clear Weld Counter 1 is switched to active.

APPENDIX B. ELECTRICAL AND DATA CONNECTIONS

PIN #	NAME	DESCRIPTION
J109-12	Weld Counter 2 Reached Limit	This output will be set active when weld counter 1 has reached the limit set in the schedule. It will remain active until the Clear Weld Counter 1 is switched to active.
J109-13	Not used	
J109-14	Common	Bidirectional Common for Pins 1-12. This is internally connected to J114 Pin 16.

Digital Output Rating: Up to 28VDC, up to 120ma.

J110 – Digital Inputs



J110 Digital Inputs

PIN #	NAME	DESCRIPTION	MINIMUM ACTIVE TIME
J110-1	Reset	When switched to active, the Monitor will set the eight weld result outputs, Last Weld In/Out of Limits, Last Weld In/Out of Warning, Initial Thickness Pass/Fail, Final Thickness Pass/Fail, to inactive.	20ms

APPENDIX B. ELECTRICAL AND DATA CONNECTIONS

J110 Digital Inputs (cont)

PIN #	NAME	DESCRIPTION	MINIMUM ACTIVE TIME
J110-2	Zero Displacement	If WM-100A is in not Ready to Measure state, this input will reset current position of both displacement channels to 0 Note: a total of 500 milliseconds from when this input is set active must transpire before electrodes can be moved otherwise the zero positions set may be inaccurate.	20ms
J110-3	Weld to Displacement	If this input is active, the Power Supply Cutoff Outputs will be operational and will switch based on position of displacement sensors. If this input is inactive, the Power Supply Cutoff Outputs will not operate.	Continuously active for as long as power supply cutoff outputs should be operational
J110-4	Clear Weld Counter 1	Resets Counter 1 to 0	50ms
J110-5	Clear Weld Counter 2	Resets Counter 2 to 0	50ms
J110-6	Start/Stop Monitor	Monitor will be in Weld Monitoring Mode when this input is active.	Continuously as long as MONITOR should be in monitoring mode
J110-7	Start Part Measurement	Used during weld to displacement sequence. Set to active at start of process. WM-100A responds with Measurement in Progress output	Switches active when at the start of each weld and switches inactive after Monitor completes processing of weld information and Monitor has set Measurement in progress to inactive
J110-8	Initial Thickness Measurement	When this input is set to active, the Monitor will compare the present displacement position with Initial Thickness Error Min/Max setting in the schedule and then set the Initial Thickness Pass/Fail outputs to active or inactive based on comparison results. The Monitor will also set the current positions of the electrodes as the starting point for the weld to displacement measurement	20ms
J110-9	Part Measurement Mode	When set to active, the Monitor will operate in the Part Measurement Mode. When this input is switched from inactive to active, the Monitor will set the Schedule Outputs to the states of the Schedule Inputs	Continuously on for as long as the Monitor is to remain in Part Measurement Mode If the weld application is not using Part Measurement Mode and this input is only used to update the Schedule Outputs, this Part Measurement Mode Input should remain active for 50ms

APPENDIX B. ELECTRICAL AND DATA CONNECTIONS

J110 Digital Inputs (cont)

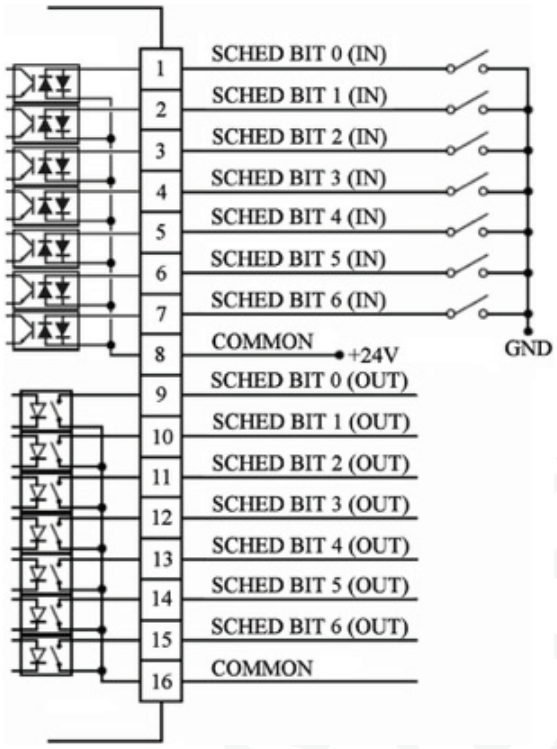
PIN #	NAME	DESCRIPTION	MINIMUM ACTIVE TIME
J110-10	Not used		
J110-11	Not used		
J110-12	Common	Bidirectional common for Pins 1-11. This is internally connected to J114 Pin 8.	---
J110-13	+24V	Internal +24V supply 0.2 Amp maximum.	---
J110-14	24V GND	Internal 24V ground, 0.2 Amp maximum.	---

Digital Input Rating: Bidirectional input. Internal load resistor of 5k ohms. Maximum input voltage of 28VDC. Minimum detectable voltage of 3VDC.

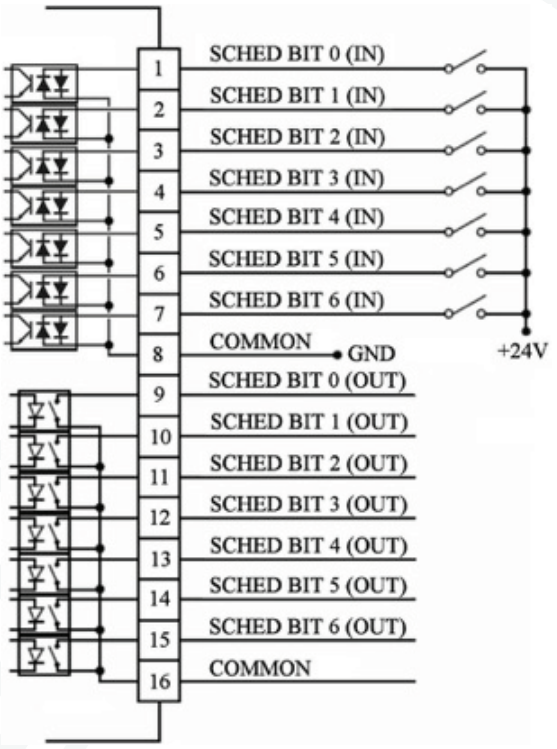
APPENDIX B. ELECTRICAL AND DATA CONNECTIONS

J114 – Schedule Selection Digital Inputs and Outputs

Negative Logic



Positive Logic



The Monitor sets the Schedule Output Bits 0 through 6 and changes the loaded Schedule to the levels set on the Schedule Input Bits 0 through 6 when the Monitor is not in **Monitor Mode** and the **Part Measurement Mode** input is switched from inactive to active. The Schedule Output Bits will only be updated to the Input Bits' status when the **Part Measurement Mode** input is switched from inactive to active. If the Schedule Input Bits are switched while the **Part Measurement Mode** input remains continuously active or inactive, the Schedule Output Bits and the loaded Schedule will not be changed. Refer to the Timing Diagrams in Appendix C for additional information

Digital Output Rating:	Up to 28VDC, up to 120 milliamp
Digital Input Rating:	Internal load resistor of 5k ohms. Maximum input voltage of 28VDC. Minimum detectable voltage of 3 VDC.

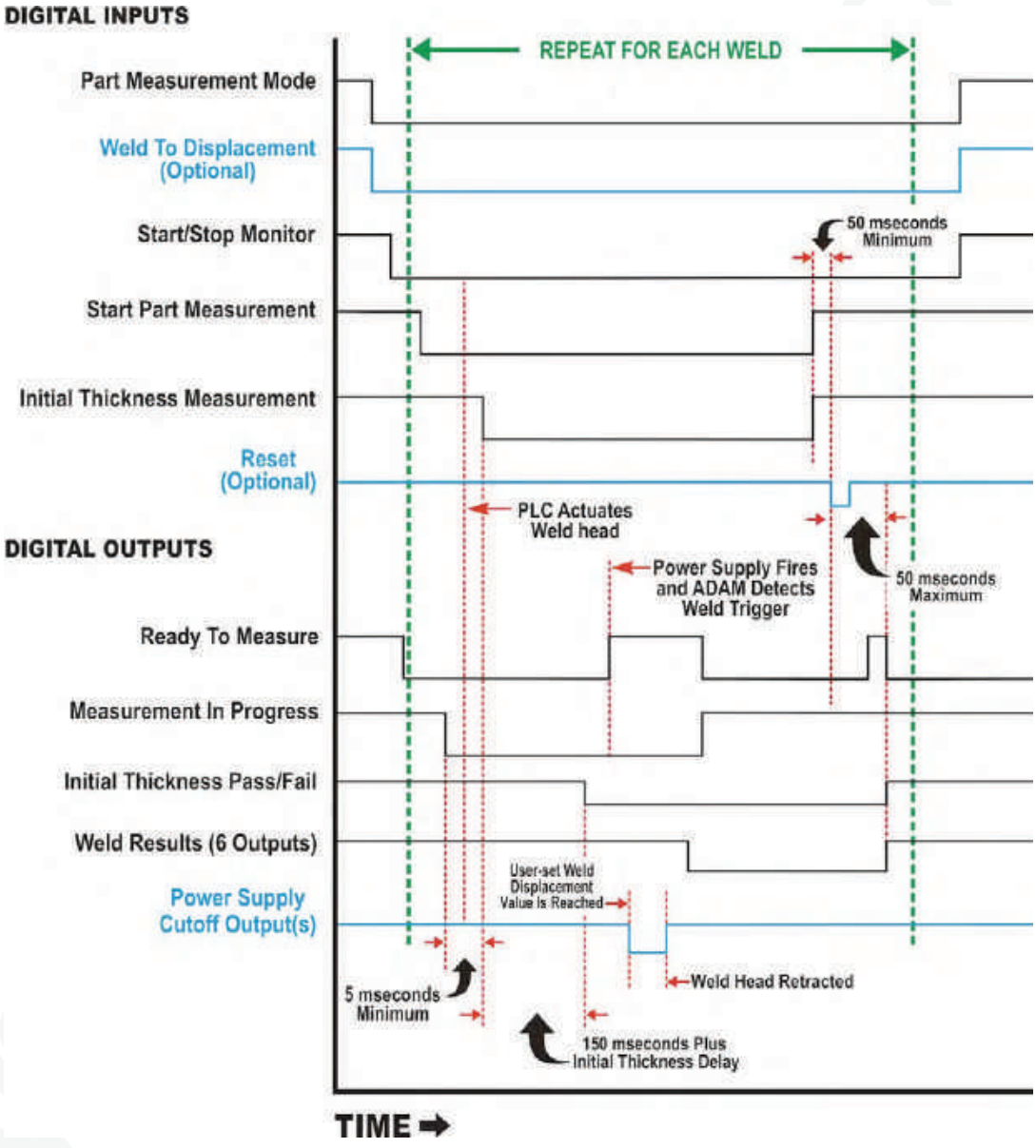
Appendix C
Timing Diagrams

Digital Inputs and Outputs

The Monitor digital inputs and outputs are configured as **Active Low** and **Inactive High**.

Timing For Part Measurement Mode With Optional Weld to Displacement

For **Part Measurement Mode** to function properly, the **Initial Thickness** limit parameters must be set on the **Schedule Setup Page 2** screen. The **Initial Thickness Delay** must also be entered on the **Schedule Weld Setup** screen. If **Weld to Displacement** is required, the Weld Value(s) must also be entered on the **Schedule Setup Page 2** screen.



APPENDIX C. TIMING DIAGRAMS

NOTE: Power supply cutoff outputs will remain active until the weld head is retracted past the user set weld displacement value.

The **Weld Result** Outputs that are set in the above timing diagram are:

Last Weld In Limits
Last Weld Out of Limits
Last Weld In Warning Limits
Last Weld Out of Warning Limits
Final Thickness Pass
Final Thickness Fail

The **Weld to Displacement** input is optional for Part Measurement Mode. It only needs to be set to active if the **Power Supply Cutoff** outputs are to function during the weld process. If the **Weld to Displacement** input remains inactive, the **Power Supply Cutoffs** output will remain inactive.

I/O Sequence for **Part Measurement Mode** (same above timing diagram):

A) PLC sets "**Part Measurement Mode**" active.

B) PLC sets **"Weld to Displacement"** active (this step is optional and only needed if the process requires weld to displacement)

C) PLC sets "**Start/stop Monitor**" active.

D) Monitor sets "**Ready to Measure**" to active (if not already active).

The above steps A through D are completed once at the start of repetitive production. Once the above steps are completed, then go to Step 1 below.

1. PLC sets **Start part Measurement** to active.
2. Monitor sets **Measurement in Progress** to active.
3. PLC (brings head down).
4. PLC sets **Initial Thickness Measurement** to active at least 5 mseconds after the Monitor has set **Measurement in Progress** to active
5. Monitor (compares initial thickness to limits) sets **Initial Thickness Pass** or **Initial Thickness Fail** to active or inactive based on comparison results. This step may take up to a time equal to 150 mseconds plus the **Initial Thickness Delay** set in the schedule.
6. PLC (fires power supply).
7. Monitor (Monitor detects trigger) then sets **Ready to Measure** to inactive.
8. Monitor (Monitor processes weld data) then sets **Measurement in Progress** to inactive.
9. Monitor (Monitor resets its internal states) then sets the six weld result digital outputs to their corresponding active or inactive states and then sets **Ready to Measure** to active.
10. PLC sets **Start Part Measurement** and **Initial Thickness Measurement** to inactive.
11. PLC sets **Reset** to active at least 50 mseconds after setting **Start Part Measurement** and **Initial Thickness Measurement** to inactive.

APPENDIX C. TIMING DIAGRAMS

12. Monitor (Monitor detects **Reset) then sets Ready to Measure to inactive**
13. Monitor sets **Initial Thickness Pass/Fail** Outputs and the six weld result outputs to inactive
14. Monitor sets **Ready to Measure** to active. It may take up to 50 mseconds for the Monitor to set **Ready to Measure** after the PLC sets **Reset** to active.

Once the Monitor has set **Ready to Measure** to active, the process can start again at Step 1. Steps 1 through 14 will be repeated for repetitive production.

If the optional **Reset** input is not used, the **Initial Thickness Pass/Fail** and the six weld result outputs will remain in the state set by the Monitor unit these outputs are set again during the next weld.

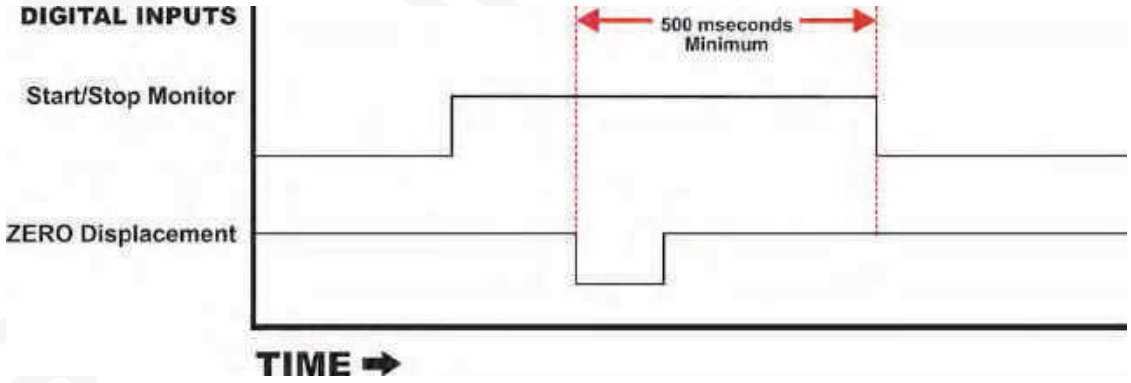
During welding processes that do not use the initial thickness measurement digital input, the **Monitor** stores the initial thickness measurement value taken at the point of weld trigger in the database. The **Monitor** also determines and saves the **Initial Thickness** pass/fail result based on the initial thickness value taken at the point of weld trigger. For weld processes that do use the initial thickness measurement digital input, the **Monitor** stores the initial thickness measurement value and its corresponding pass/fail result in the database. The **Monitor** does not take a second initial thickness measurement at the point of weld trigger when the initial thickness measurement digital input is used.

If the PLC executes any of the **Part Measurement Mode** steps out of sequence or without the proper timing, the Monitor behavior will vary based on the situation. The Monitor may not recognize the weld trigger, the monitor may recognize the weld trigger and process the weld results but not continue in the **Part Measurement Mode** sequence, or some other result may occur.

Timing For Using Digital Inputs To ZERO Displacement

In order for the **Zero Displacement** input to register, the **Monitor** must ***not*** be in **MONITOR Mode**. If the **Monitor** is presently in **MONITOR Mode**, set the **Start/Stop Monitor** to inactive before setting the **ZERO Displacement** active. The Monitor can then be returned to **Monitor** mode by setting the **Start/Stop Monitor** input active at least 500 milliseconds after the **ZERO Displacement** input was set active.

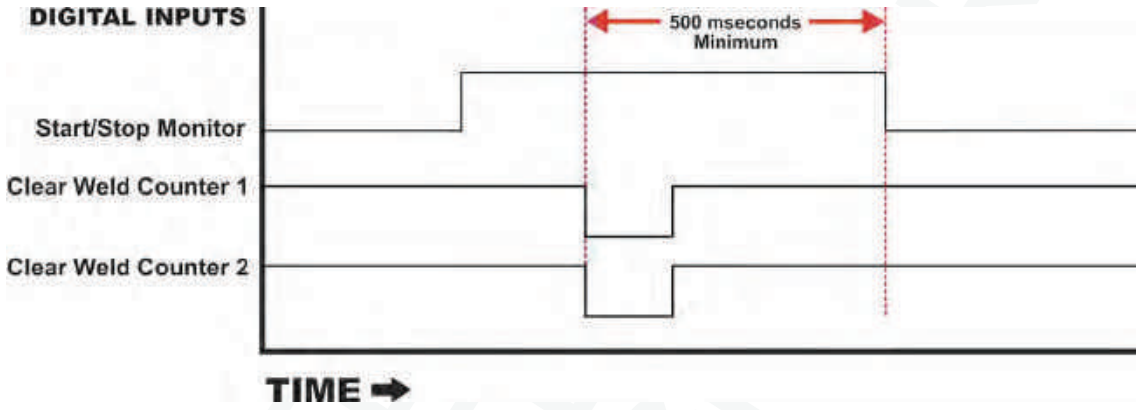
ZERO Displacement input will set the position of both Displacement channels to zero.



APPENDIX C. TIMING DIAGRAMS

Timing For Using Digital Inputs To Clear Weld Counters

In order for the **Clear Counter** digital input to register, the **Monitor** must ***not*** be in **MONITOR Mode**. If the **Monitor** is presently in **MONITOR Mode**, set the **Start/Stop Monitor** to inactive before setting one or both of the **Clear Counter** inputs to active. The Monitor can then be returned to Monitor mode by setting the **Start/Stop Monitor** input active at least 500 milliseconds after the **Clear Counter** input(s) were set active.

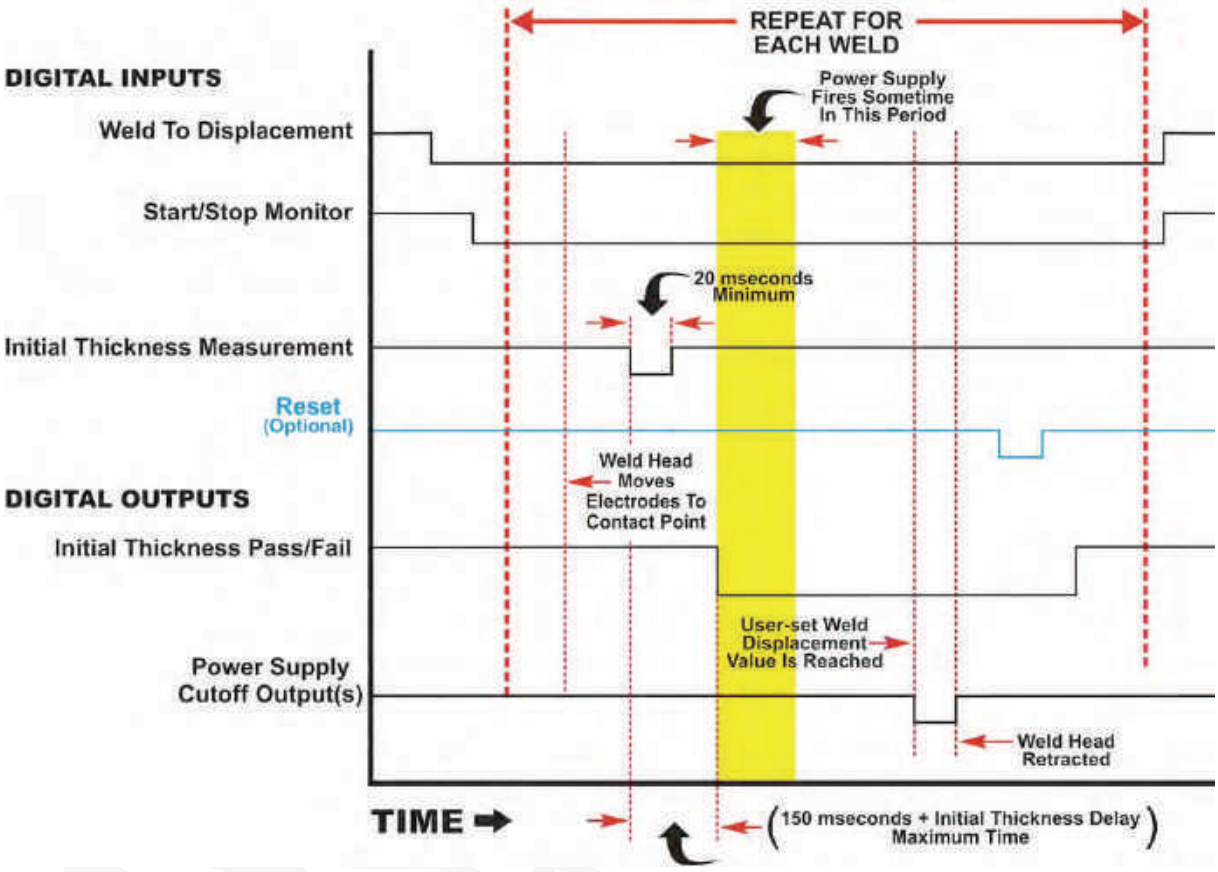


Timing For Weld to Displacement Without Part Measurement Mode

For Weld to Displacement, the Weld Value(s) must be entered on the **Schedule Setup Page 2** screen. The **Initial Thickness Delay** must also be entered on the **Schedule Weld Setup** screen.

If the user wants valid results of the initial thickness measurement, the **Initial thickness** limit parameters must be set on the **Schedule Setup Page 2** screen.

APPENDIX C. TIMING DIAGRAMS



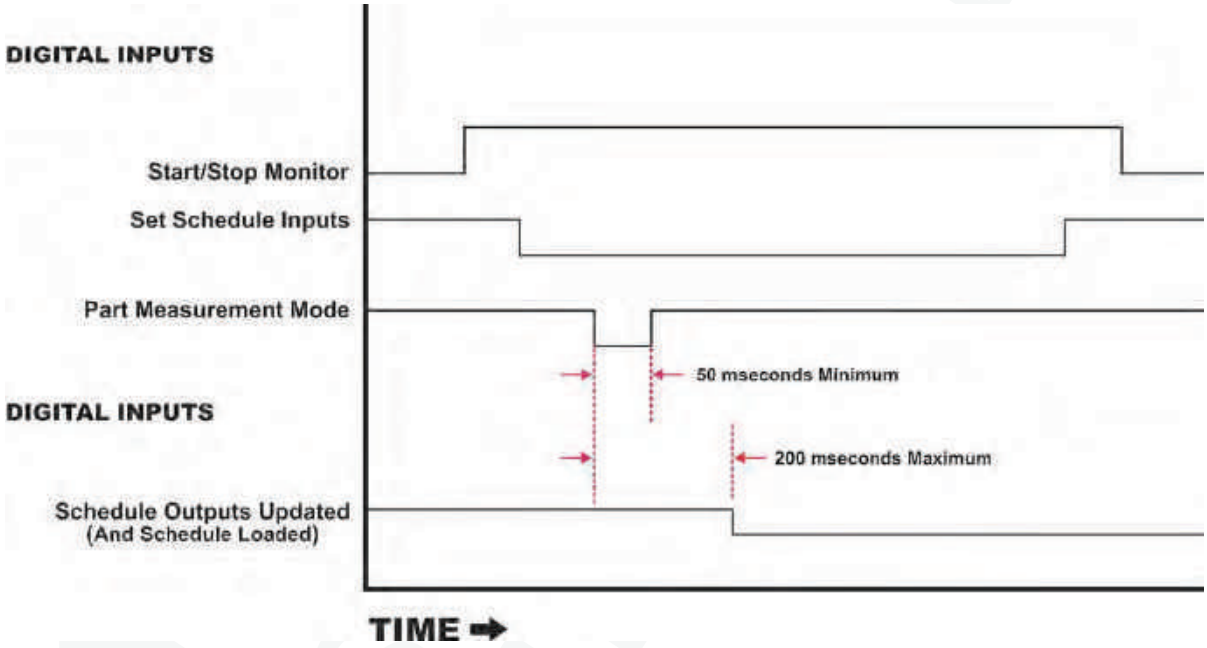
NOTE: Power supply cutoff outputs will remain active until the weld head is retracted past the user set weld displacement value.

APPENDIX C. TIMING DIAGRAMS

Timing for Schedule Change Using Schedule Digital Inputs

When the Schedule Digital Inputs are set for a schedule, the loaded Schedule is changed and the Schedule Output Bits 0 through 6 are updated only when the **Part Measurement Mode** input is switched from inactive to active and the Monitor is not in **MONITOR Mode**. If the **Monitor** is presently in **MONITOR Mode**, any changes to the **Schedule Inputs** will not be updated to the **Schedule Outputs** and the loaded schedule will not be changed.

The **Part Measurement Mode** input ***must*** remain active for at least 50 milliseconds.



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