Network Resistance Welding Monitor System

WM-200A

USER MANUAL

AMADA®

WM-200A Network Resistance Welding Monitor System

990-562

Printed in the United States of America

Revision Record

Revision	EO	Date	Basis of Revision
A-Draft 2	46049	06/2021	None. Development only, not released.
B	46609	5/2022	Product Release
C	46780	11/2023	• Add Quick Start Guide • Update Rear Panel connector call-outs • Update Displacement Sensor Cable image • Add how to "Connect Central Server PC Network Port" • Change Chapter 3 Title • Restructure Chapter 3 • Add Chapter 5 Ethernet I/P Communications • Update Displacement Connector image • Add Ethernet/IP and Central Server REST PI sections.

Model Numbers

MODEL NUMBER	DESCRIPTION			
3-200-AA-AAA-AA	STD/NO BUS/COIL/VLT/DSPL/SPC	918	RW	RWE
3-200-AA-BBA-AA	WM-200A WELD MONITOR	918	RW	RWE
3-200-BB-CBA-AA	WM-200A WELD MONITOR	819	RW	RWE
3-200-AB-BBA-AA	WM-200A WELD MONITOR	819	RW	RWE
3-200-AB-CBA-AA	WM-200A WELD MONITOR	918	RW	RWE
3-200-AC-AAA-AA	WELD MONITOR	819	RW	RWE
3-200-AC-BBA-AA	WM-200A WELD MONITOR	918	RW	RWE

Each configuration also includes Ship Kit # 4-81250-01 containing the following parts.

AMADA WELD TECH PART NUMBER	DESCRIPTION	QUANTITY
205-129	CORD, CE, #18-3, 7.5 FT., IEC 320	1 Each
205-313	CABLE, CROSSOVER, CAT5	1 Each
4-41665-01	USB DRIVE MANUAL NRWM (Includes the 990-562 NRWM Manual)	1 Each
520-010	PLUG, FEMALE MINI XLR 3 POS	3 Each
520-139	MALE CABLE END 10 PIN	1 Each
251-221	CONNECTOR XLR, STR MALE 4 PIN	2 Each
520-212	CIRCULAR CONN. 6 PIN MALE	2 Each
250-409	D-SUB 37POS	1 Each
245-150	D-SB 37 POS HOOD	1 Each
520-120	PLUG, MALE 4 POS HRS	1 Each
253-071	MALE PINS	4 Each

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Contact Us

Thank you for purchasing the AMADA WELD TECH WM-200A Networked Resistance Weld Monitor System.

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

AMADA WELD TECH INC.

1820 South Myrtle Avenue

Monrovia, California 91016-7133

Phone:	**(626) 303-5676**
FAX:	**(626) 358-8048**
E-mail:	**info@amadaweldtech.com**

The purpose of this manual is to provide the information required for the proper and safe operation and maintenance of the AMADA WELD TECH WM-200A Networked Resistance Welding Monitor System.

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 address 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 manual describes how to operate, maintain and service the WM-200A, and provides instructions relating to its safe use. Procedures described in this manual must be performed as detailed by qualified and trained personnel.

For safety and to effectively take advantage of the equipment's full capability, please read this manual before attempting to operate weld heads and power supplies.

Procedures other than those described in this manual, or not performed as prescribed herein, may expose personnel to electrical shock or burn hazards.

Read this manual and keep it 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, reverse assemble, decompile, or otherwise attempt to derive source code from the Software. Buyer shall not transfer possession of the Software except as part of, or with, the Goods, and each such transfer shall be subject to the restrictions contained herein. Buyer may not sublicense, rent, loan, assign or otherwise transfer the Software or documentation, and Buyer shall retain on all copies of the Software and documentation all copyright and other proprietary notices or legends appearing therein or thereon. Seller may terminate this license upon written notice for any violation of any of the terms of this license or any material breach of any provision of this Agreement. Buyer shall immediately discontinue use of the Software upon any termination of this license or Agreement. This license shall terminate upon any termination of the Agreement.

(c) All patents, trademarks, copyrights or other intellectual property rights embodied in the Goods, including without limitation the Software, are owned by Seller and its licensors. Seller and its licensors retain all right, title and interest in such intellectual property rights. Except as expressly set forth herein, no license rights or ownership in or to any of the foregoing is granted or transferred hereunder, either directly or by implication. ALL RIGHTS RESERVED.

(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).

Quick Start Guide

Overview

This chapter provides a high-level operational overview for those working with the WM-200A Monitor and WM-Inspect software, outlining the most common tasks and providing links to more detailed information within the manual.

This section assumes that the NRWM hardware and WM-Inspect software are already installed and accessible through the user's PC.

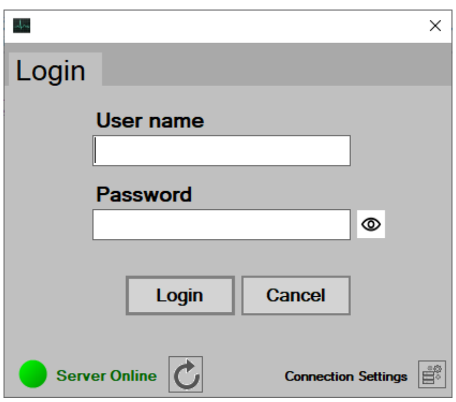
- **For instructions on installing NRWM hardware, click here.**
- **For instructions on installing WM-Inspect on a PC, click here.**

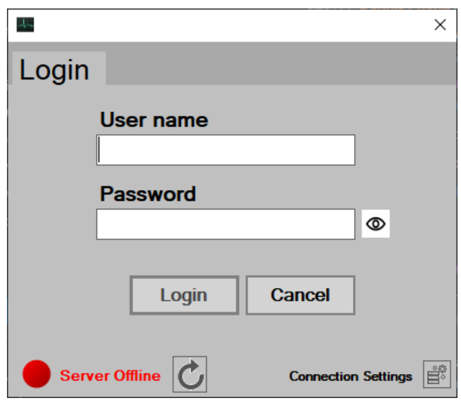
Basic tasks for all users

Launch the Software

1. Click the Network RW Monitor Software button to launch the software.

- The Login screen displays.





- If the Server is online, the Server Online alert displays in the lower left corner of the logon interface and the user can proceed to login. If the Server is offline, an alert displays and the user cannot login until the Server is online.

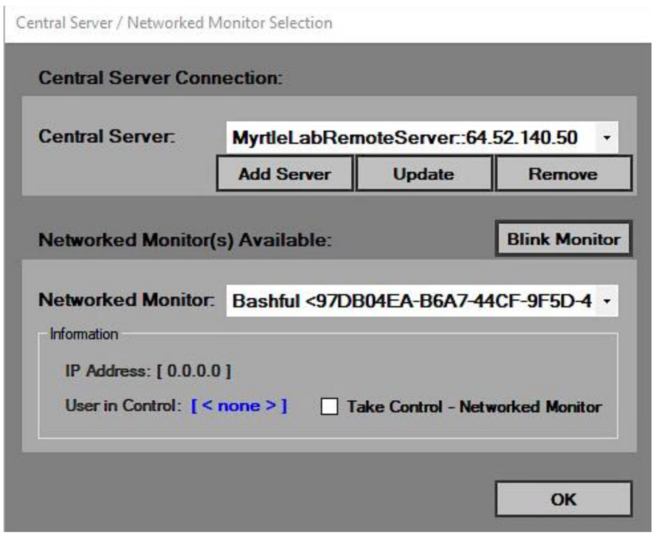
2. Enter your username and password and click Login. (If you do not have a username, an administrator can provide you with one.) If you're an operator, the default Run or Monitor

Screen displays. If you're an engineer or an administrator, the default Developer Screen displays.

Note: The user must login each time they use WM-Inspect. If the user logs of and fails to log on again, it can cause the Central Server connection to fail. See Connect Central Server PC Network Port for more information.

Accept or Change the Server/Monitor configuration

WM-Inspect launches with the Central Server/Networked Monitor Selection window open, showing the server and networked monitor currently being accessed by the application. This will generally be the server and monitor last accessed by the user. The dropdown list of networked monitor shows only those monitors associated with the selected server.



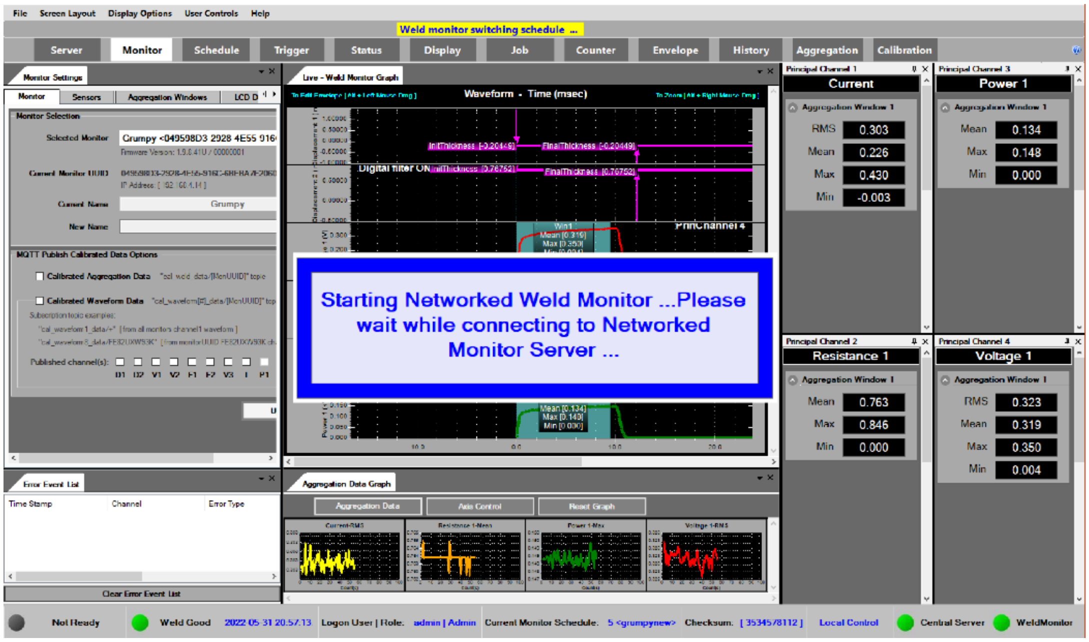
If the server and monitor displayed are right for the new monitoring session, click OK.

Note: The fields and windows in the Screen Docker do not populate until a device and schedule have been selected.

To access a different monitor, you must first select the server associated with that monitor from the Central Server dropdown list, and then select the monitor from the Networked Monitor dropdown list. Once the server and monitor are selected, click OK.

Note: Add Server, Update and Remove are used to add a new server or update or remove an existing server. In the normal course of operations, an operator would not need to use these functions.

The Starting message displays while data populates the Screen Docker.



You are now ready to begin working with WM- Inspect.

Working with WM-Inspect: Operators

Run Screen versus Monitor Screen

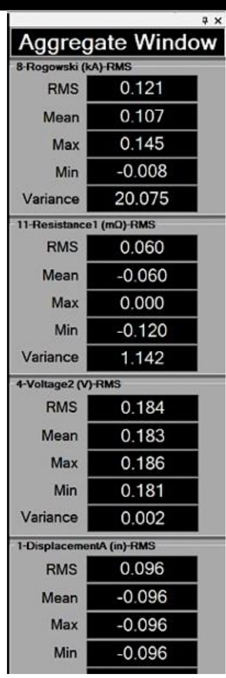
Operators use either the Run screen or the Monitor screen. Both screens provide continuously updated information for the active weld schedule. The two types of screens differ largely in the data they each highlight. (Select Screen Layout in the Menu Bar to choose either screen**.)**

The Run Screen highlights Aggregation Data – displaying selected types of data for a specific point during each weld. This data is continuously updated in the Aggregation Data Window and graphed over time in the Aggregation Data Graph.

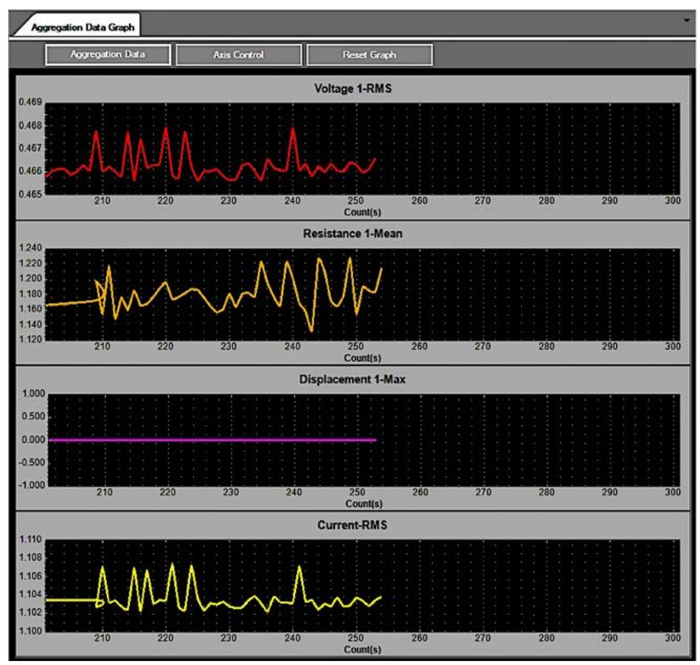
Operators can make changes to how aggregation data is configured.

Click here for a detailed description of the Aggregation Data Window.

<table>
<tr><th>Aggregation Data Window</th><th>Aggregation Data Graph</th></tr>
<tr><td>



</td><td>

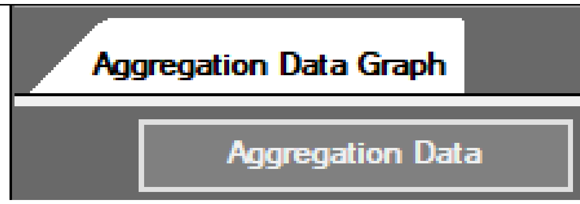


</td></tr>
</table>

Configure Aggregation Data (Run Screen)

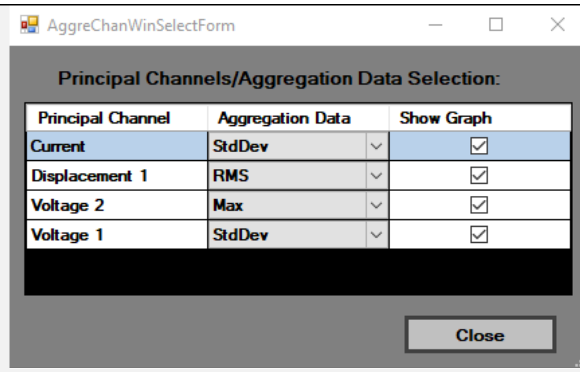
<table>
<tr><td>

1. On the Run Screen, **Click the Aggregation Data button at the top of the Aggregation Data Graph**

</td><td>


</td></tr>
<tr><td>

2. Select Principal Channel(s) and Aggregation Data to be graphed.
3. Check to have the data graphed
4. Click Close.

</td><td>


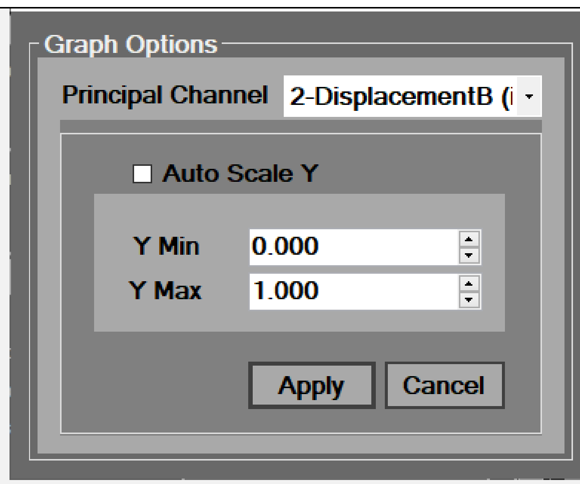
</td></tr>
<tr><td>

5. Select **Axis Control**

</td><td>


</td></tr>
<tr><td>

6. Select **Principal Channel**
7. Set Y scale minimum and maximum values.
8. Click Apply.

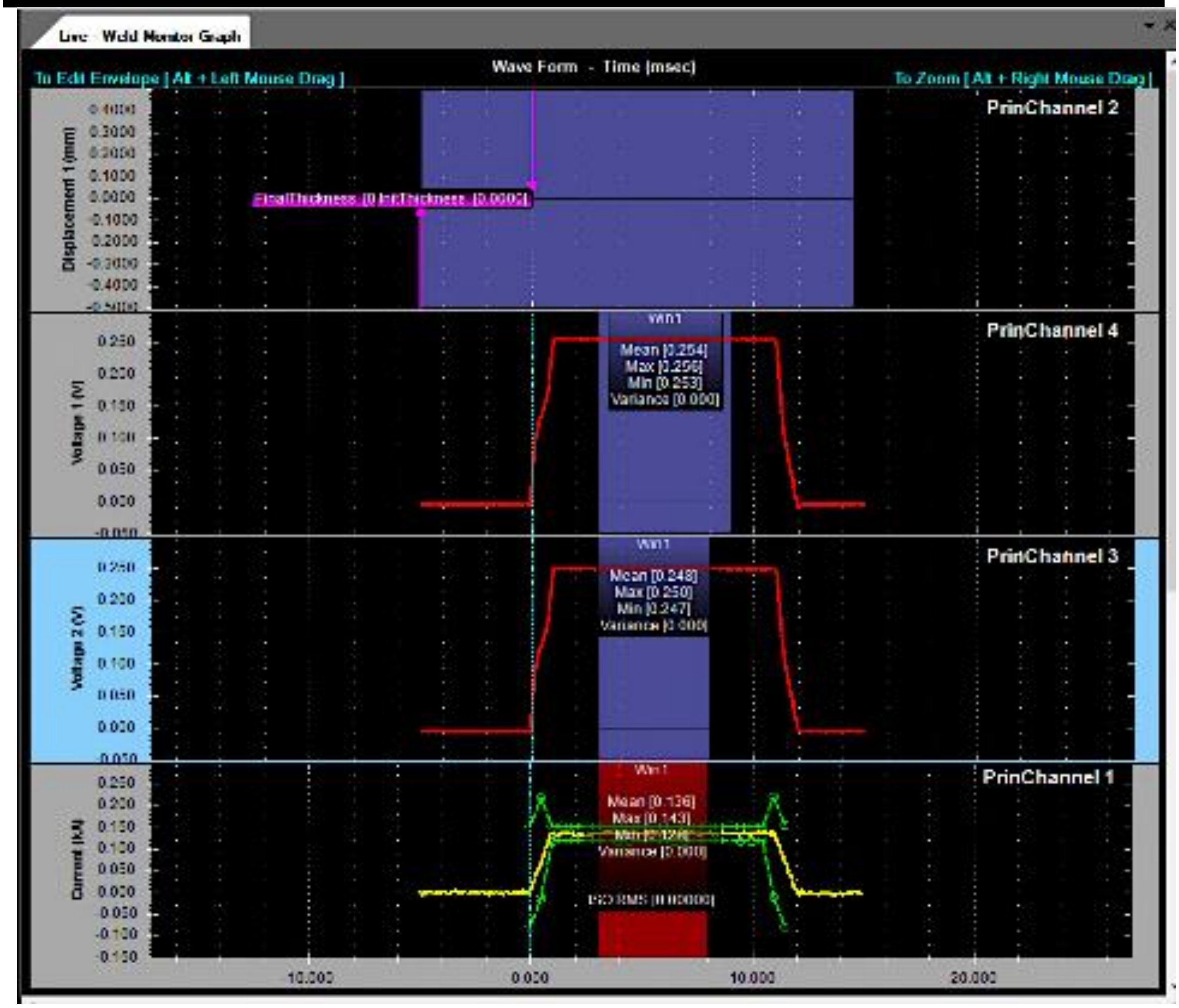
</td><td>


</td></tr>
</table>

The Monitor Screen highlights the Live-Weld Data Graph – a continuously updated graphic representation of selected data (e.g., Voltage, Displacement, Force, Current, Power) for each weld event.

Click here for a detailed description of the Live – Weld Graph.

Live – Weld Monitor Graph

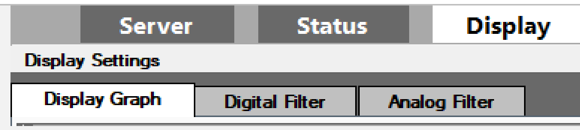


Configure Live-Weld Display Settings (Monitor Screen)

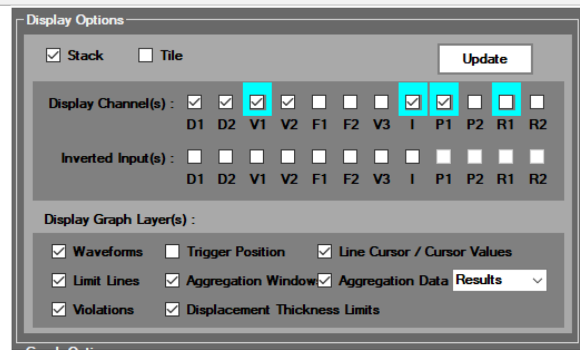
[Click here for more information on display settings.]

1. On the Monitor Screen, Click **Display** in the Tool Bar to launch the Display Settings window

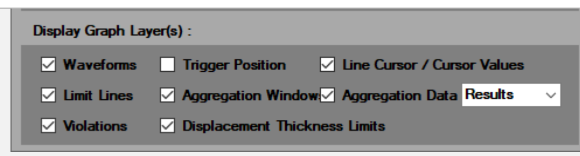
2. Select the **Display Graph** Tab



3. Select **Channels** to be displayed (Principal Channels are highlighted in blue)

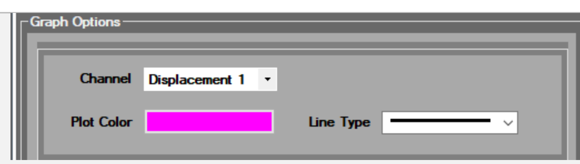


4. Select **Graph Layers**

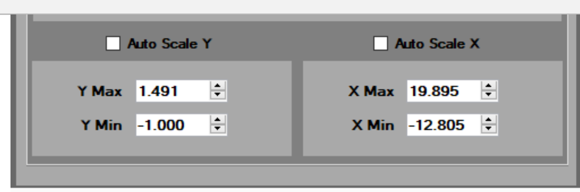


5. Indicate any inverted inputs

6. Select a channel from the dropdown menu and select a color and line type



7. Choose Auto Scale for the X and Y Axes or set the minimum and maximum vales for each axis.



Working with WM-Inspect: Engineers

The Developer Screen provides engineers with the tools necessary to develop, test, and modify weld monitor schedules. Select Screen Layout in the Menu Bar to choose the Developer Screen.

Engineers develop and modify weld monitor schedules to

1) Define the data to be captured and how that data is displayed
2) Establish limits on the data displayed which will signal variance
3) Modifying the way the data displays for clarity and ease of use
4) Comparing the current weld monitor schedule with previous schedules
5) System administration tasks

(The following assumes that the Central Server and Network Monitor have already been selected, as described in the Overview to this section. If you need to change these connections, select Server from the Tool Bar and change the server and/or monitor and click OK.)

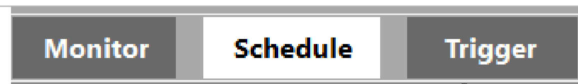
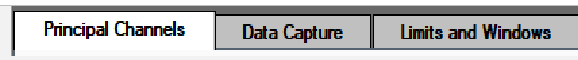
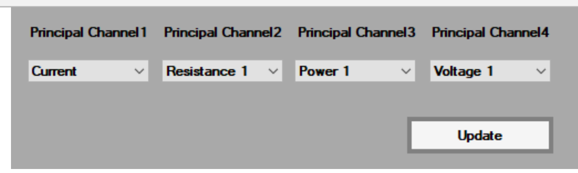
Define Data

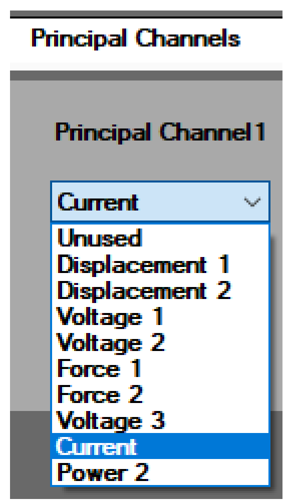
The WM-200A Monitor has the capacity to send twelve types of data for each weld event to the WM-Inspect software on the user's PC – eight channels for each of the data source inputs on the Monitor and four channels of data derived from that input data.

Designate up to four channels as principal channels. The system will gather and display additional data, known as Aggregation Data, for these sources.

Assign sources to principal channels

Click here for more information about setting principal channels.

<table>
<tr><td>1. Click Schedule button in Tool Bar.</td><td>
</td></tr>
<tr><td>2. Select the Principal Channels Tab</td><td>
</td></tr>
<tr><td>3. Use the dropdown menus for each channel to assign sources to channels. (It is not necessary to assign all four channels.)
4. Click Update.</td><td>


</td></tr>
</table>

Select data to be displayed for each channel

The Live – Weld Monitor Graph displays a graphical representation of the source data for each channel. Select the channels to be graphed and additional data to be displayed.

Click here for more information about display graph options.

<table>
<tr>
<td>

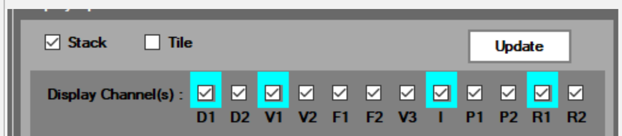
1. Click the Display button in the Tool Bar

</td>
<td>

</td>
</tr>
<tr>
<td>

2. Click on the channels to be displayed in the Live – Weld Monitor Graph
   - Principal channels are highlighted in blue
   - D = Displacement
   - V = Voltage
   - F = Force
   - I = Current
   - P = Power
   - R = Resistance

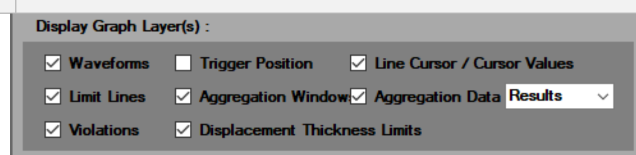
</td>
<td>



</td>
</tr>
<tr>
<td>

3. Use the Display Graph Layer(s) field to select the data to be displayed on Live – Weld Monitor Graph for the selected channels. (Data is channel-specific (e.g., Displacement Thickness Limits are shown in the Displacement channels, etc.))
4. Click Update.

</td>
<td>



</td>
</tr>
</table>

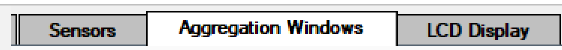
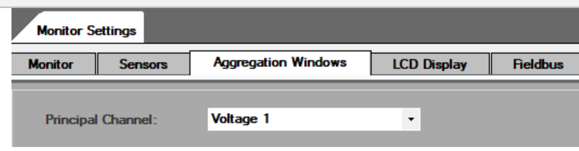
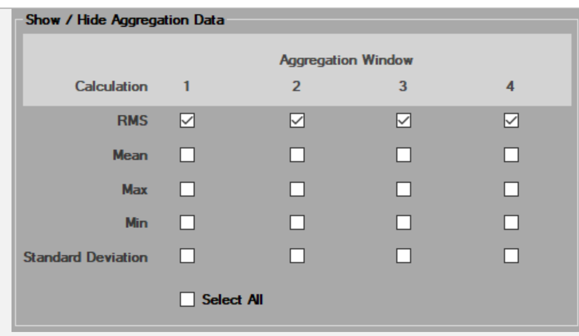
Setting Aggregation Data

The NRWM system calculates five aggregation data values for specified windows of time for each principal channel for each weld (RMS, Mean, Minimum, Maximum, and Standard Deviation) The Engineer can specify up to four such windows of time for each principal channel.

This involves designating the aggregation data to be displayed, defining the time when aggregation data is gathered, and setting limits on the aggregation data which, if exceeded, will prompt an alert.

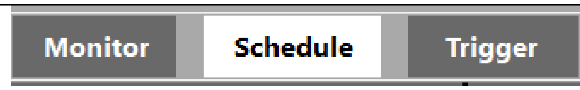
Define Aggregation Data

[Click here for more information on defining aggregation data.]

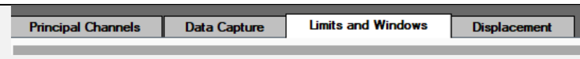
1. Click the Monitor button in the Tool Bar	
2. Select the Aggregation Windows Tab	
3. Select a Principal channel from the dropdown menu.	
4. Check the type(s) of data to be aggregated and displayed in the Aggregation Window and Aggregation Data Graph. 5. Set data types for up to four windows of time for one or more of the selected principal channels. a. Not all data types are available for all data sources. (E.g., RMS and Standard Deviation are disabled for Resistance.) b. The Select All option selects all data types for all windows for a given source.	
6. Click Update.	

Define Start and End Times for Aggregation Data Windows

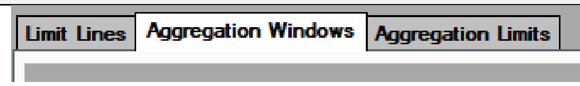
1. Click the Schedule button on the Tool Bar



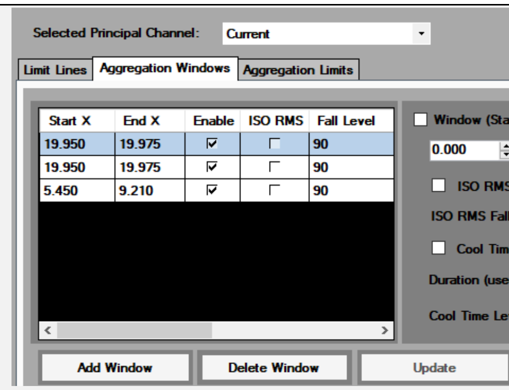
2. Select Limits and Windows tab



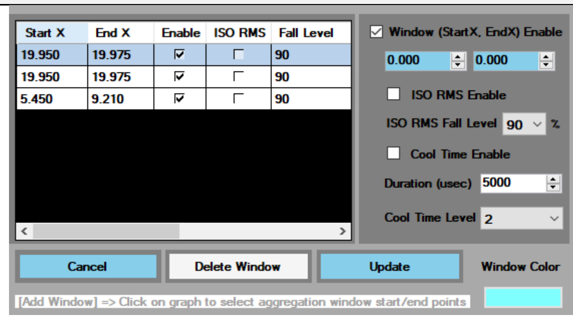
3. Select Aggregation Windows tab



4. Select a principal channel from the drop down menu.
5. Click Add Window.

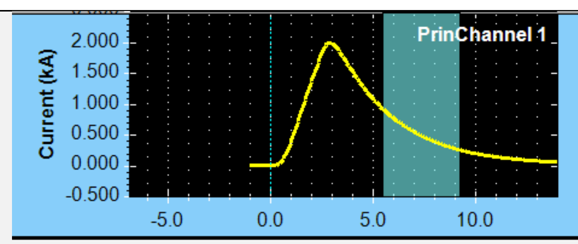


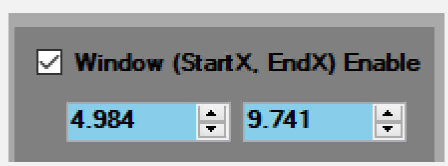
6. The Add Window button changes to Cancel, The Update button and the Window (StartX, EndX) Enable highlighted in the chosen Window Color (blue in this example).

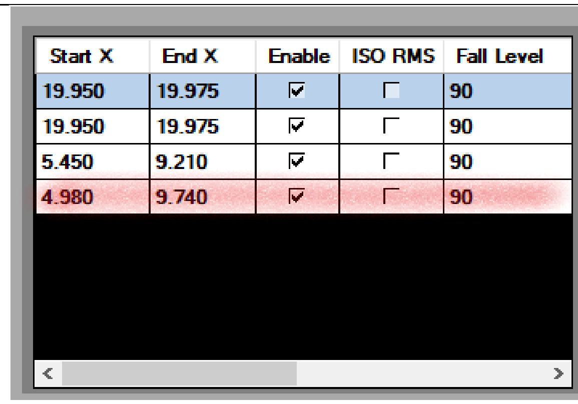
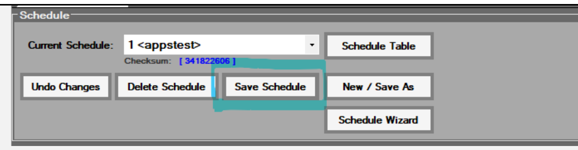


7. Click on two points along the X axis on the Live - Weld graph.

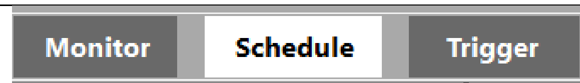
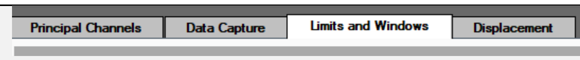
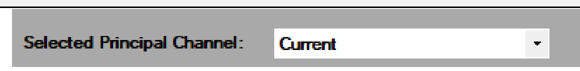
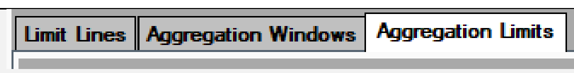
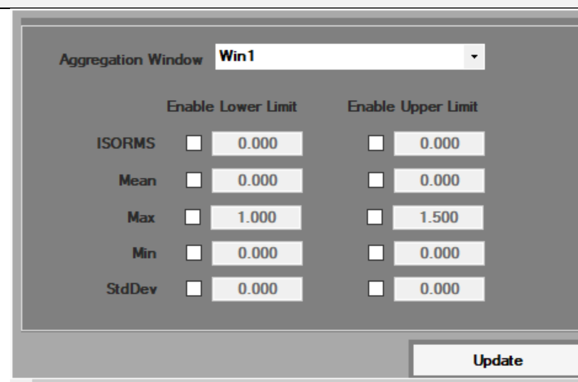
a. The selected area is highlighted and the selected points appear in the Window (StartX, EndX) Enable fields.

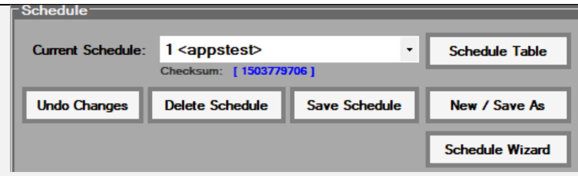
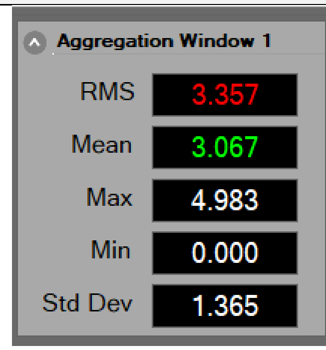


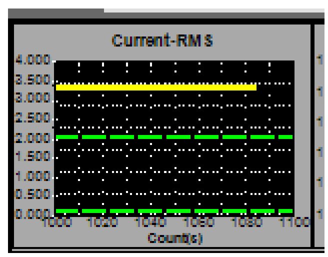


<table>
<tr><td>8. Click Update. The selected points are added to the list of aggregation windows.</td><td>
</td></tr>
<tr><td>9. Click Save Schedule in the top (Schedule) portion of the Schedule Settings window.</td><td>
</td></tr>
</table>

Define Limits of Aggregation Values

<table>
<tr><td>1. Click the Schedule button on the Tool Bar</td><td>
</td></tr>
<tr><td>2. Select Limits and Windows tab</td><td>
</td></tr>
<tr><td>3. Select a principal channel.</td><td>
</td></tr>
<tr><td>4. Select Aggregation Windows tab</td><td>
</td></tr>
<tr><td>5. Select an Aggregation Window from the dropdown list.
6. Click Update.</td><td>
</td></tr>
</table>

<table>
<tr>
<td>7. Click Save Schedule to Save</td>
<td>
</td>
</tr>
<tr>
<td>8. If limits are exceeded, they will display in red. Values within the limits display in green. If no limits are set, the values will display in white.
9. Limit lines will display in the Aggregation Data graph.</td>
<td>

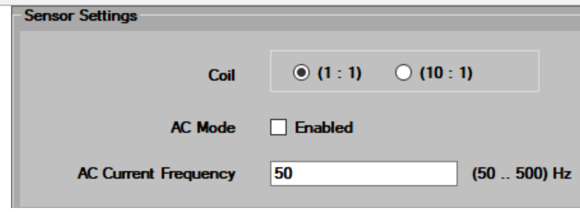
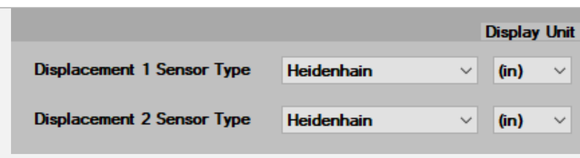
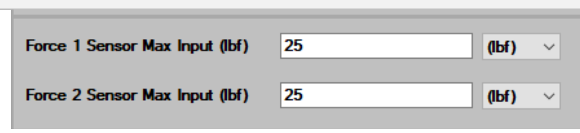

</td>
</tr>
</table>

Define Input Sources and Filters

In the process of developing a weld monitoring schedule, it may be necessary to change the input settings to match the equipment being used, to refine the data being captured in relation to the trigger.

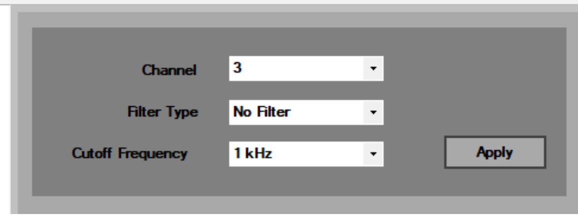
Set Sensors

Set sensors to define the type of Rogowski coil being used, the type of displacement sensors being used, and the maximum input for the force sensors.

1) Select Monitor from the Tool Bar	
2) Select the Sensors tab	
3) Select the ratio of the Rogowski coil being used 4) Indicate whether AC Mode in enabled. 5) If AC Mode is enabled, set the AC Current frequency within the range specified.	
6) Set the sensor type for each displacement sensor (Heidenhain or Onosokki) 7) Set the units (inches or millimeters)	
8) Set the maximum input for each of the two force sensors. 9) Set the display unit (lbf, N, or kgf) 10) Click Update.	

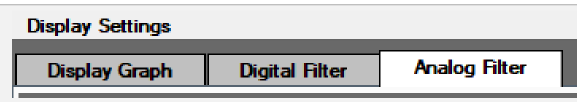
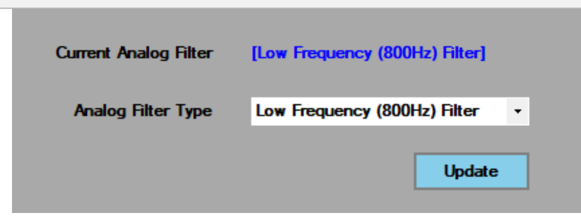
Set Digital Filter

Click here for more information about the Digital Filter.

1. **Click Display button in Tool Bar**	
2. **Select Digital Filter Tab**	
3. **Set Channel, Filter Type and Cutoff Frequency** 4. **Click Apply**	

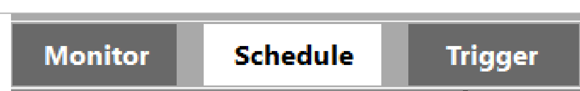
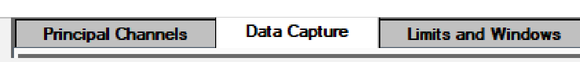
Set Analog Filter

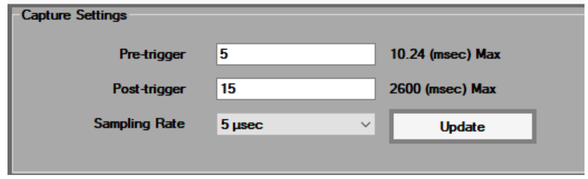
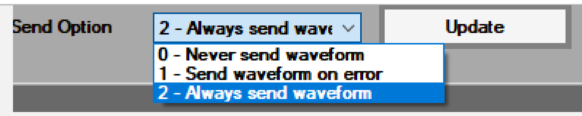
Click here for more information about the Analog Filter.

1. **Click Display button in Tool Bar**	
2. **Select Analog Filter Tab**	
3. **Set Analog Filter Type** 4. **Click Update**	

Define Capture Settings

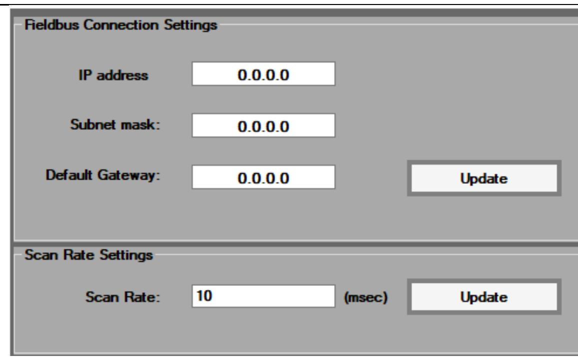
Define the capture interval by setting pre- and post-trigger intervals in milliseconds.

a) Select Schedule from the Tool Bar	
b) Select Capture Settings Tab	

c) Enter values in the Pre- and Post-Trigger time fields (≤ the Max limit shown) d) Use the dropdown menu to select the data capture sampling rate. e) Click Update.	
f) Select a waveform send option g) Click Update.	

Set Fieldbus Connections

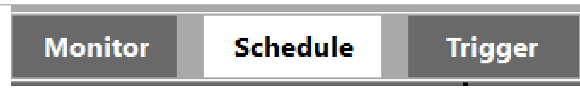
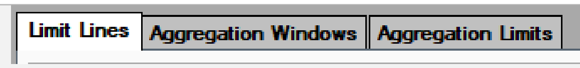
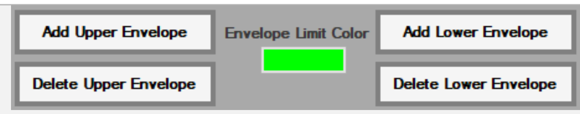
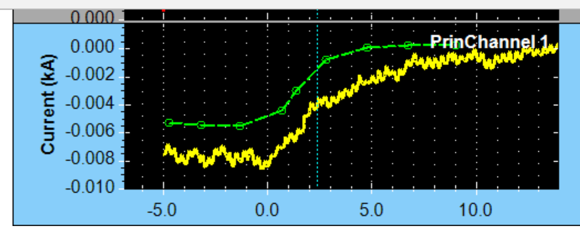
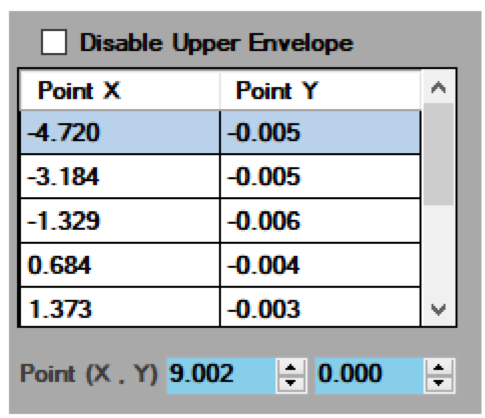
Use the Fieldbus tab to define the fieldbus connections settings.

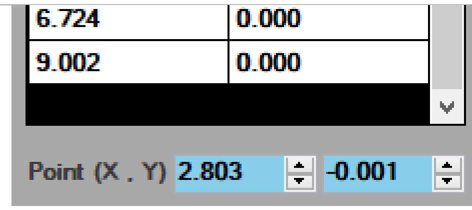
1) Select Monitor in Tool Bar	
1) Select the Fieldbus tab	
2) Set the IP address, subnet mask and default gateway for the fieldbus. 3) Click Update 4) Set the scan rate in milliseconds 5) Click Update.	

Set Limits

Further define the source and aggregate data by setting limits which will cause an alert to be displayed each time a value for a weld falls outside those limits.

Set Limit Lines for channels

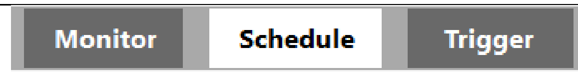
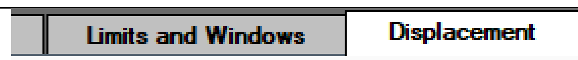
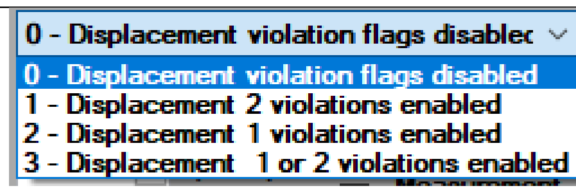
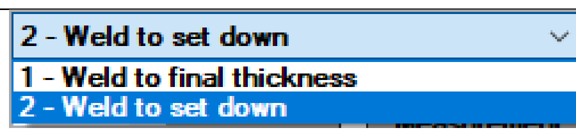
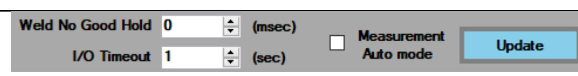
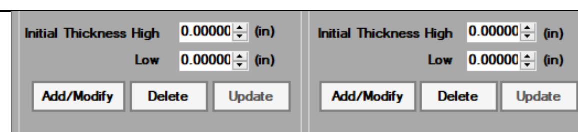
1. Select Schedule from the Tool Bar	
2. Select the Limit Lines tab	
3. Deselect Disable Upper (or Lower) Envelope. (These are selected by default and must be deselected.)	
4. Click Add (Upper or Lower) Envelope (change the Envelope Limit Color, if required, by clicking on the color and selecting a new color from the pop-up menu.	
5. Click on multiple points on the graph for the selected channel. A limit line connecting the selected points will appear on the graph while the points selected will appear on a table on the Limit Lines tab.	
6. Click Update.	

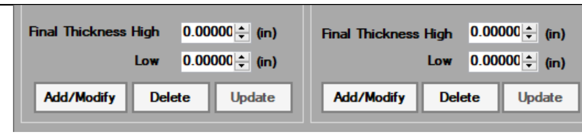
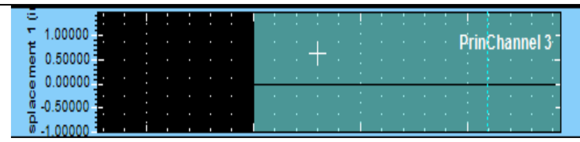
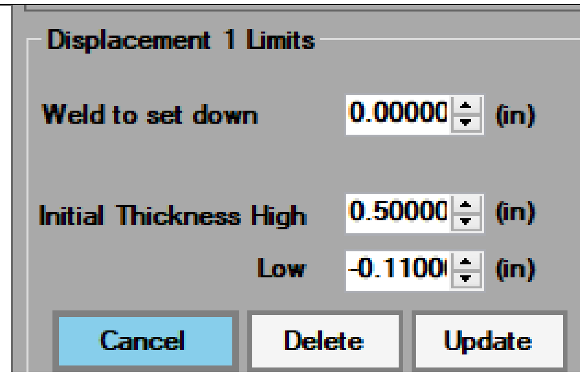
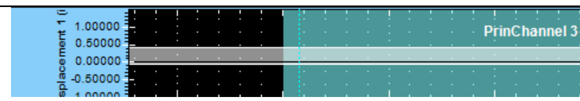
7. To modify a limit line, select the coordinates for a given point in the table and change the point coordinates in the fields below the table.	

Set Displacement Limits

The Displacement Limits tab allows the user to cause the system to flag violations when the displacement thickness is too high or too low in relation to either the Weld to Set Down value or the Weld to Final Thickness value.

[Click here for more information about setting displacement limits]()

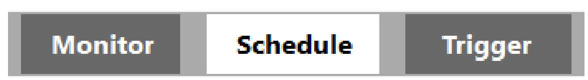
1. Select Schedule Button	
2. Select a Schedule (Defaults to Current Schedule)	
3. Select Displacement Tab	
4. Determine whether to enable displacement violations on one or both displacement channels	
5. Set Placement Reference – either Weld to final thickness or Weld to set down.	
6. Set WNG hold time, Set I/O Timeout time, Select Measurement Auto mode, if required	
7. Click Add/Modify button for either **Initial** Thickness or **Final** Thickness	

<table>
<tr><td></td><td>
</td></tr>
<tr><td>8. Move cursor to the selected displacement channel. The cursor changes to a cross.</td><td>
</td></tr>
<tr><td>9. Click on the displacement graph at two points to select high and low displacement limits for the selected thickness value.
10. The selected values appear in the displacement window.</td><td>
</td></tr>
<tr><td>11. Click Update. The selected range values display on the displacement graph in the Live – Weld Graph.</td><td>
</td></tr>
<tr><td>12. Click Update</td><td></td></tr>
</table>

Set Limits Lines

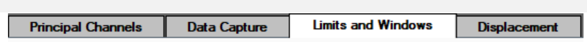
[Click here for more information on setting limit lines.]

1. Select Schedule Button

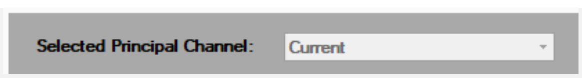


2. Select a Schedule
(Defaults to Current Schedule)

3. Select Limits and Windows Tab

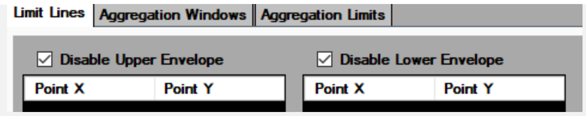


4. Select Principal Channel

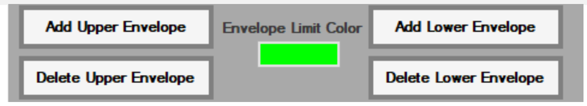


5. Select Limit Lines Tab

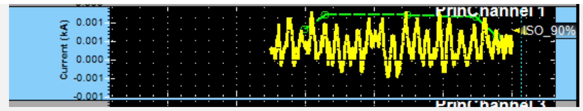
6. Uncheck Disable Button



7. Click Add Upper/Lower Envelope



8. Click limit line points on selected channel on Live-Weld graph



Set Envelope Limits

Envelope Limit is a method of quality control which employs statistical methods to monitor and control a process. The system graphs a selected number of the most recent welds, creating an envelope which sets upper and lower limits within the standard deviation established through the Envelope Limit Wizard. This makes it possible for the user to monitor the efficiency of the weld schedule beyond the scope of the individual welds reflected in the Live – Weld Graph, helping to ensure that the process operates efficiently, producing more specification-conforming products with less waste.

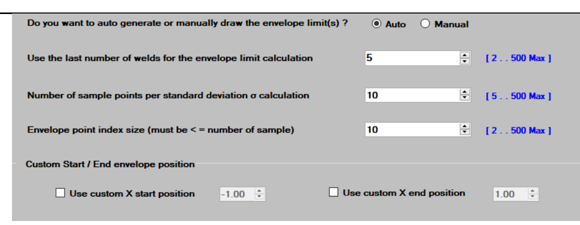
- The Envelope Limit Wizard only works with Principal Channels.
- The Envelope Limit Wizard allows the user to choose to create the envelope manually or to define key parameters for the system to automatically generate an SPC envelope.
- We do not recommend using the Envelope Limit Wizard for resistance channels, given the variability of resistance.

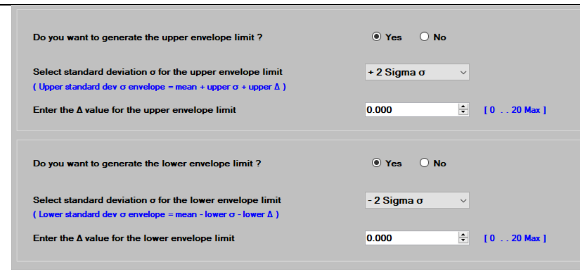
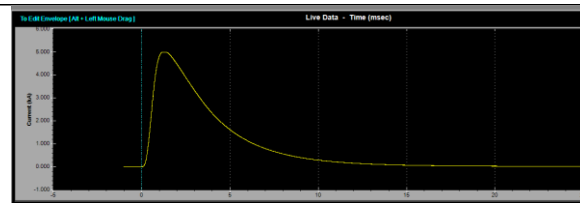
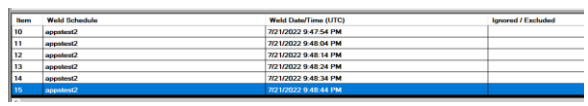
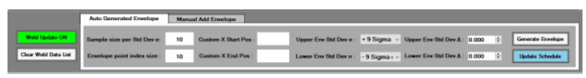
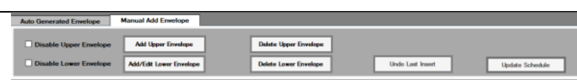
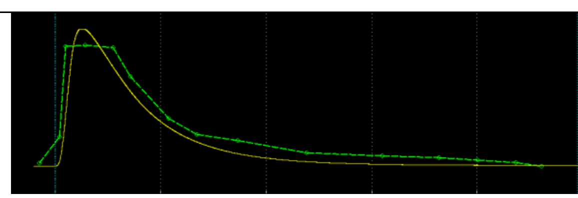
To create an envelope, begin by clicking the Envelope Link in the Tool Bar or by answering Yes to the final question in the Schedule Wizard or.

Click here for more information on setting envelope limits

1. Select Envelope on the Tool Bar to launch the Envelope Wizard

2. Indicate whether you intend to have the envelope limits generated automatically or to draw the limits manually.
3. If you select Manual, all choices other than **Envelope point index size** on this window are disabled.



4. If you select Auto, set the number of welds, sample points, and point index size. You can also choose to set custom start and end positions for the x axis.	
5. If Auto is selected, indicate whether to generate upper and/or lower envelope limits. 6. Click Next	
7. **If Auto is selected**, 8. The Envelope Limit View will display the envelope automatically generate each time the selected number of welds as occurred 9. The Weld Data list will display the date and time of each weld 10. The Auto Generated Envelope options displays, allowing the user to change the options selected on the first page of the Envelope Wizard. 11. If options are changed, click Generate Envelope to display the new envelope, click Update Schedule to save the new envelope configuration. 12. Click Finish when done.	 Envelope Limit View  Weld Data List  Auto Generate Envelope Options
13. **If Manual is selected**, the Manual Add Envelope options display.	
14. Select Add/Edit Upper Envelope or Add/Edit Lower Envelope. 15. Click along points in the Live Data graph window to manually build the envelope. 16. Click Update Schedule. 17. Click Finish when done.	

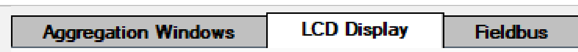
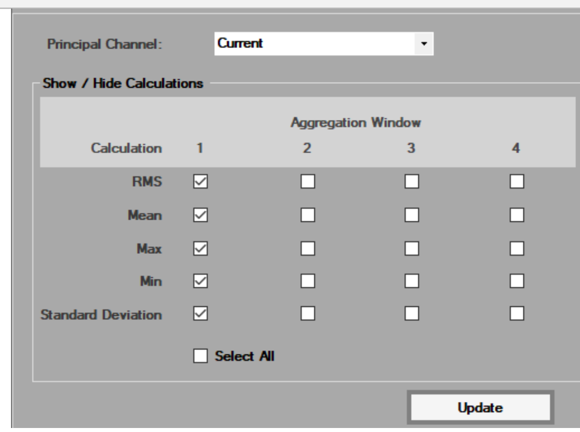
Appearance

Set LCD Display

Set the LCD to define the data which appears on the data screen on the front of the WM-200A monitor.

Click here to learn more about the LCD Display.

LCD Aggregate Screen

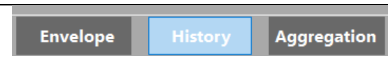
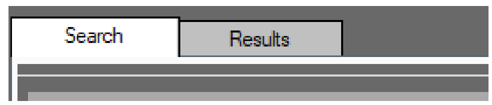
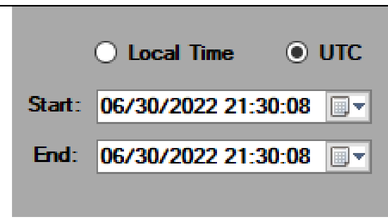
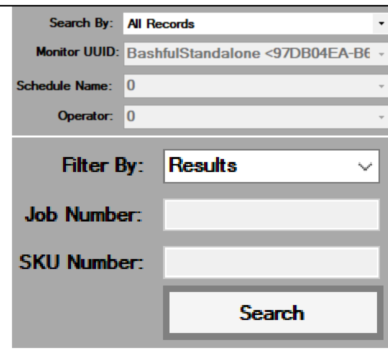
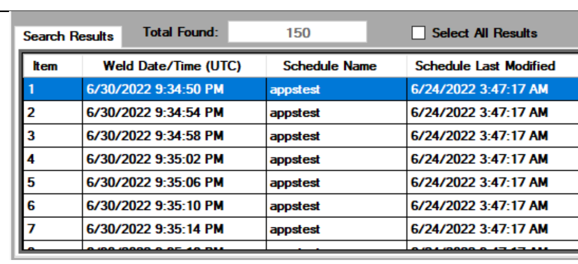
<table>
<tr><td>1) Select Monitor in Tool Bar</td><td>
</td></tr>
<tr><td>2) Select the LCD Display tab</td><td>
</td></tr>
<tr><td>3) Select a Principal Channel
4) Select which calculations for each aggregation window for that channel.
5) Click Update.</td><td>
</td></tr>
</table>

Historical Search

Developing tools for comparing new weld data to existing data (Historical Data)

The Historical Data Search tool allows engineers to review data from previously-run welds as a tool for refining new weld monitor schedules.

[Click here for more information on searching for historical data.]

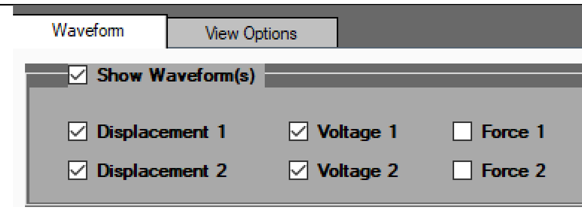
<table>
<tr><th colspan="2">Search for prior welds that meet user defined parameters.</th></tr>
<tr><td>1) Click the History button in the Tool Bar</td><td>
</td></tr>
<tr><td>2) Click Search Tab</td><td>
</td></tr>
<tr><td>3) Define the time period to be search for previous welds.
a. Chose Local Time or Universal Time Code
b. Define the start and end times for the search.</td><td>
</td></tr>
<tr><td>4) Define the search.
5) Click Search.</td><td>
</td></tr>
<tr><td>6) If there is data that matches your parameters, it will display in the Search Results table.
7) If there are no matches, widen your search. If there are too many, narrow your search.
8) Click on an item from the list to select it.</td><td>
</td></tr>
</table>

<table>
<tr>
<td>

9) Select Show Waveform for waveforms in the results graph,

10) Select the channels to be displayed.

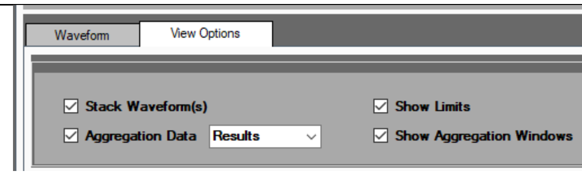
</td>
<td>



</td>
</tr>
<tr>
<td>

11) Select options on the View Options tab.

</td>
<td>



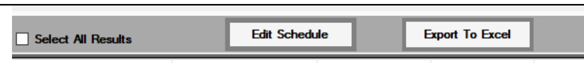
</td>
</tr>
<tr>
<td colspan="2">

Adjust the limit lines and aggregation data for past welds to facilitate comparison to the new weld.

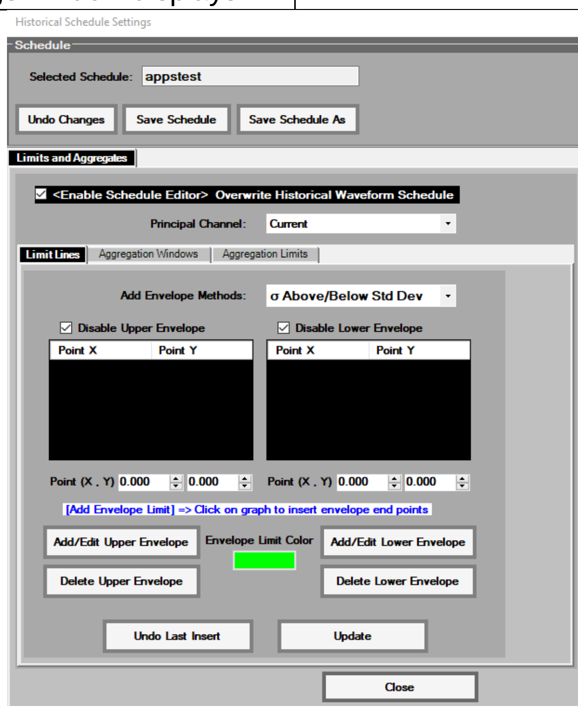
</td>
</tr>
<tr>
<td>

12) Click Edit Schedule on the Search Results window to modify the limit lines and aggregation data for the selected data. The Historical Schedule Settings window displays.

</td>
<td>



</td>
</tr>
<tr>
<td colspan="2">

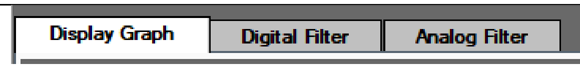
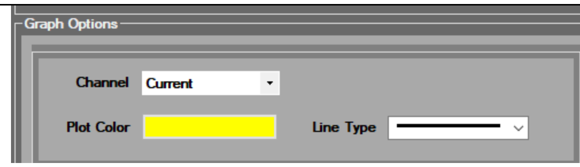
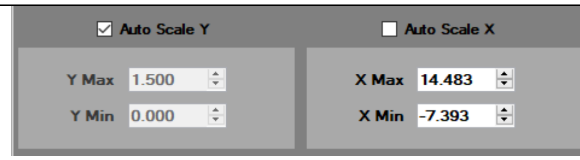


Historical Schedule Settings

</td>
</tr>
</table>

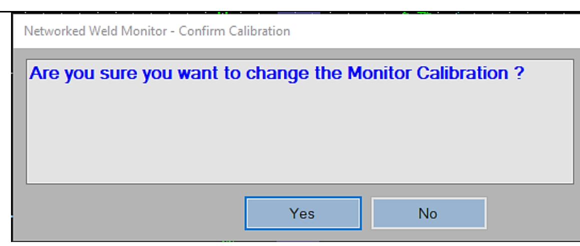
Sys Admin

Select Display Graph Options

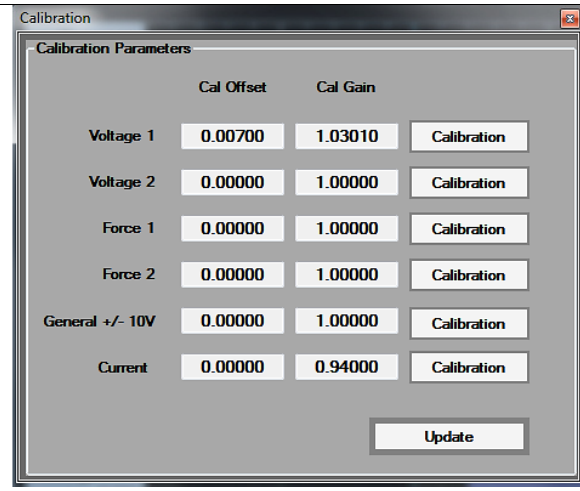
Click Display button in Tool Bar	
Select Display Graph tab	
Select channel, plot color and line type	
Select auto scale for X, Y axes or set minimum and maximum limits for each axis	
Click Update.	

Set Calibration

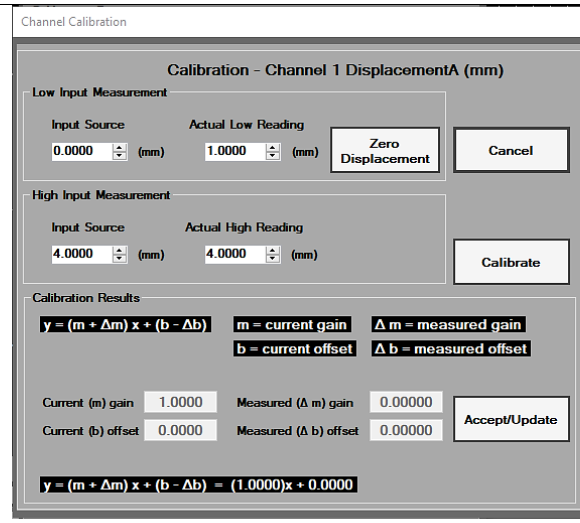
[Click here for more information on monitor calibration]

1. Click on Calibration button in the Tool Bar	
2. Click Yes on prompt to continue.	

3. Click the Calibration button for the channel to be calibrated.
4. Click Update.

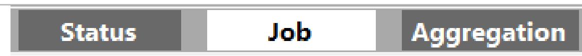
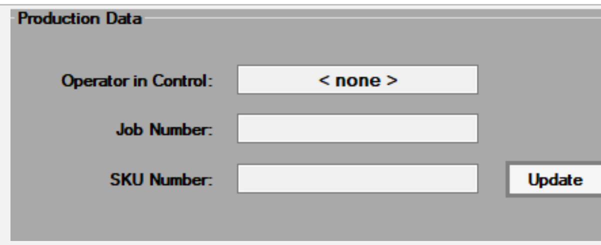


5. Enter the input source and actual reading for the low and high input measurements for the channel to be calibrated.
6. Click Calibrate. The calibration results display, using the formulae shown.
7. Click Accept/Update. Take low and high measurements again, and if the results are satisfactory, the calibration is complete.
8. Otherwise, repeat the calibration again by entering the new measured low and high values, and clicking calibrate and Accept/Update.
9. Repeat as necessary until the low and high measurements are satisfactory.
10. It is helpful to take a screenshot of the calibration values in case they need to be re-entered.
11. Repeat as necessary until the low and high measurements are satisfactory.
12. It is helpful to take a screenshot of the calibration values in case they need to be re-entered.



Change Job or SKU number

[Click here for more information about the Job Window](#)

1. Click Job button in Tool Bar	
2. Enter Operator name, Job number, SKU number (as required) 3. Click Update	

Chapter 1 DESCRIPTION

Overview

AMADA WELD TECH monitors provide an invaluable resource in both the development of weld schedules and the application of those schedules in production.

Operating independently of the weld power supply, weld monitors provide accurate measurements of the weld process which help an engineer to optimize weld schedules. When used in production, monitors help reduce scrap, destructive testing, and down time.

AMADA WELD TECH's Networked RW Monitor System (NRWM) allows the user to develop and/or perform weld schedule monitoring for any connected resistance welding device from any networked computer. The system consists of the **AMADA WELD TECH WM-200A,** a monitoring device that connects a resistance welding device to a network, and **WM-Inspect**, software designed to help users develop, monitor, and run weld schedules.

The WM-200A provides real time weld data through a server to any networked computer running WM-Inspect. The application displays and stores weld data both in graphic form and as alphanumeric data, allowing the user to program or monitor multiple weld schedules in real time.

Together the monitoring device and software offer an unprecedented level of control and ready access to real-time weld data, providing users with greater accuracy and flexibility in developing and monitoring weld schedules running anywhere in the world from anywhere in the world.

Features

- Develop and perform resistance weld schedule monitoring on any networked device from any networked computer
- Analyze current and historical weld data instantly
- A highly configurable layout offers accuracy and flexibility

Major Components

WM-200A Resistance Weld Monitor

The WM-200A can monitor any AMADA WELD TECH resistance welder and transmit welding data through a server to a networked computer running WM-Inspect. The device can be operated through a networked computer or through an external device such as a programmable logic controller (PLC).

Up to 128 weld schedules can be stored on the device at one time. Additional weld schedules can be stored on the connected server and accessed through WM-Inspect.

Figure 1: WM-200A Monitor Front

WM-200A Front Panel

The front panel of the WM-200A includes an LCD screen that displays three selectable screens which show the current state of the device, system data about the device and the most recent aggregate data for selected principal channels. All screens also display the most recent weld count. Touch each screen to cycle through all three.

System Status Screen

The System Status screens shows:

- **Weld Count** – Displays the most recent weld count and the date and time of the most recent weld.
- **Power** - Shows that the device is turned on.
- **Server Connected** - Indicates the device is connected, has successfully reported its online status, and is available to be controlled through the network (e.g., from a networked PC).
- **Ready**
    - Green light and **Ready** indicates the device is ready for trigger.
    - Red light and **Weld Fault** indicates there is a fault in the most recent weld.
    - No light indicates **Not Ready**.
  - Yellow light and **Waiting for EOW** indicates that the unit is waiting for End of Weld signal after a weld has triggered the system.
    - (Note: This space displays Waiting on EOW whenever the system is waiting for End of Weld to be asserted or for Weld Time to be de-asserted.)
    - Yellow and **Busy** indicates that the device has been triggered.
- External Control - Indicates that the device is being controlled by an external device such as a PLC.
    - Not lit when in **Local Mode**

<table>
<tr><td>

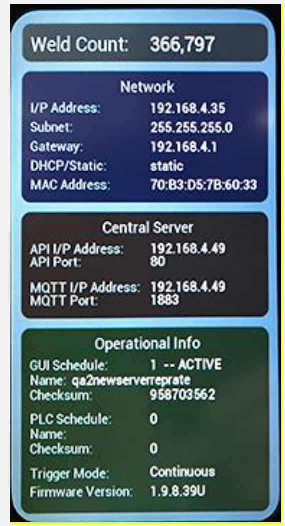
- Yellow and **I/O Panel** indicates that an external PLC has taken control
- Blue and **Field Bus** when in field bus mode

</td><td></td></tr>
<tr><td>

LCD System Information Screen

The second LCD screen displays the most recent weld count and a summary of the Monitor’s profile in the system, including network status, central server ID and operational information.

</td><td>



</td></tr>
<tr><td>

LCD Aggregate Screen

The Aggregate Screen displays the most recent weld count and the aggregation values for the first window of each principal channel for which aggregate windows have been enabled.

An engineer determines which aggregation is displayed through the LCD Display window in LCD Display Tab.

</td><td>

</td></tr>
</table>

Connectors and Channels

The back panel of the Monitor allows the user to connect the device to the resistance welder, the power supply, the server, and a PLC controller.

Eight connectors carry data from the welder. These include three voltage connectors, two force connectors, two displacement connectors and one Rogowski coil connector.

Input from these connectors is represented in the software as channels, up to four of which are designated by the engineer as principal channels. The NRWM system displays data for each of the principal channels. See **Appendix B: Electrical and Data Connections** below for technical specifications.

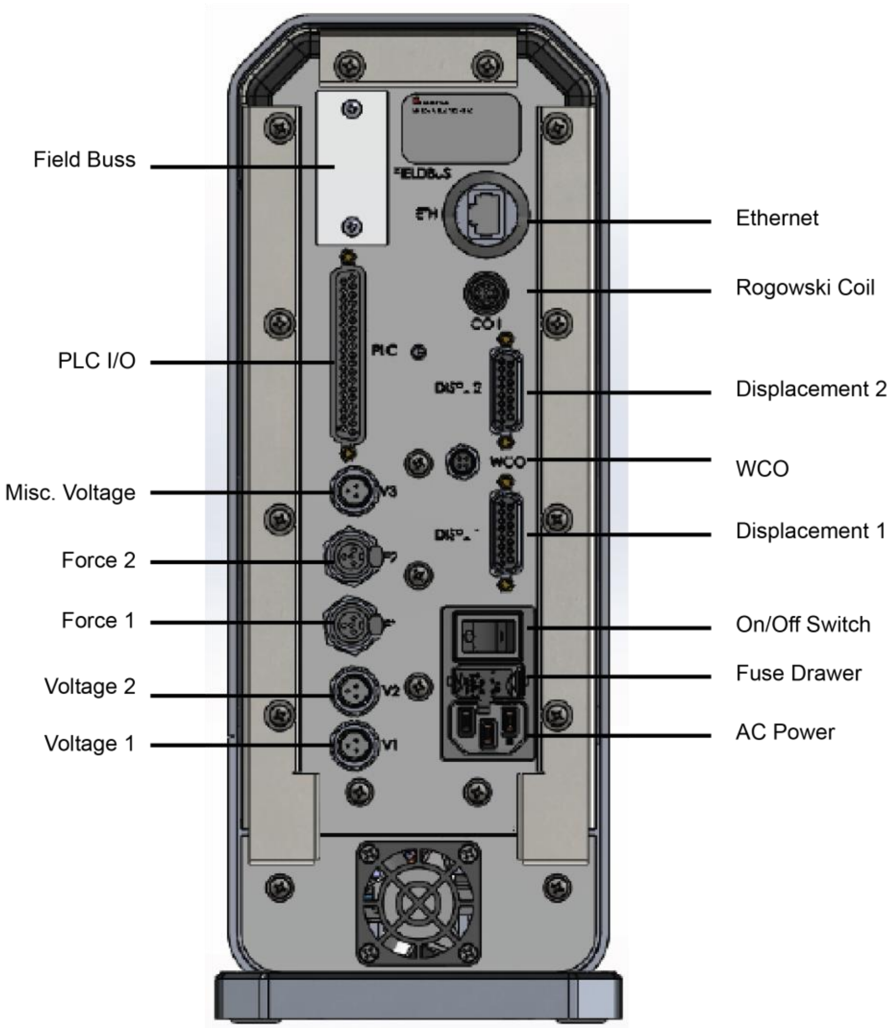


Figure 2: WM-200A Back

Server

The system required a server PC running Win10 PRO 64 bits with a minimum Ethernet data transfer rate of 10/100 Mbps.

Computer

The system requires a laptop or desktop PC connected to the network and running WM-Inspect.

System Connectivity

The illustration below provides an overview of system connectivity, in this case, the connection between a resistance welder, a power supply, a networked monitor, a remote server and a personal computer.

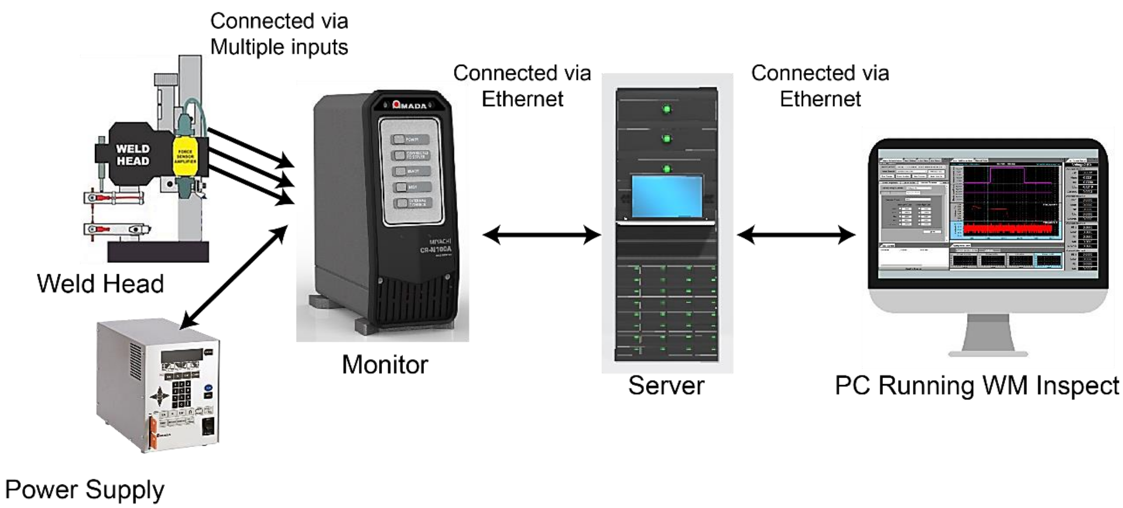


Figure 3: WM-200A System Connectivity

Software

Overview

WM-Inspect allows users to develop and/or use weld monitoring schedules.

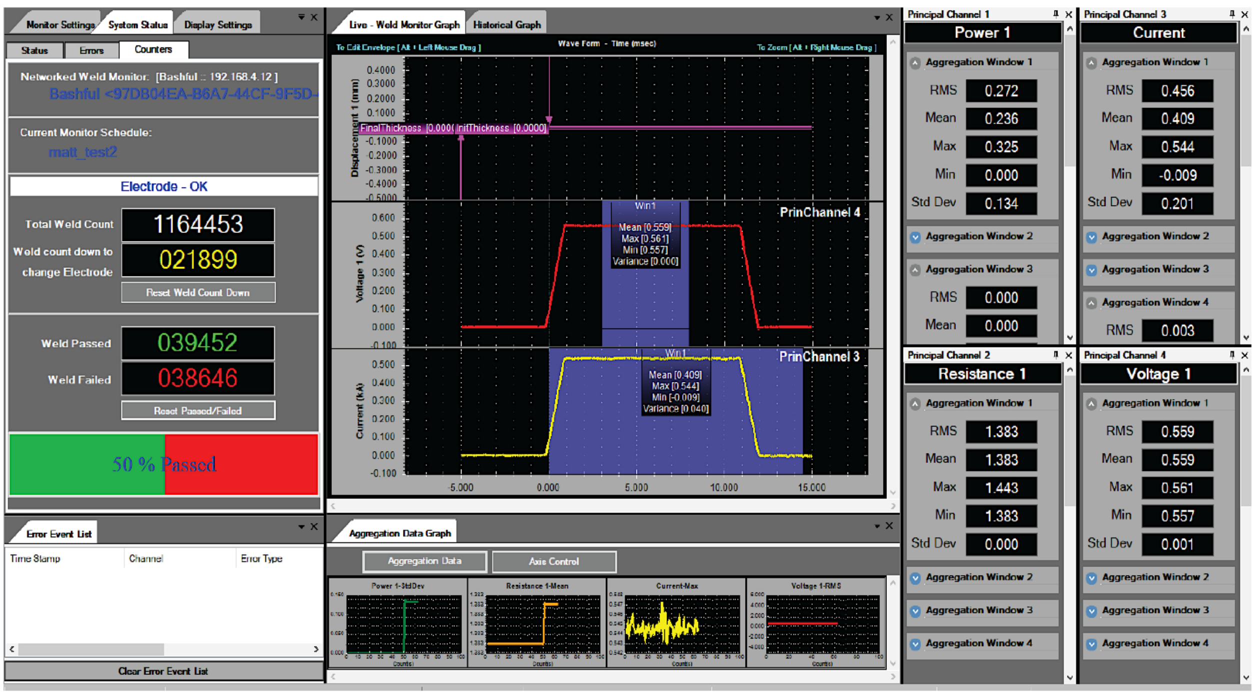
In creating weld monitoring schedules, an engineer designates which channels are to be monitored and defines the data to be captured. Operators use those weld monitor schedules to run or monitor active weld schedules running on any resistance welding device connected to the system through a WM-200A Monitor.

Each time a weld is triggered on a monitored device, the system gathers Principal Channel data and Aggregation Data.

Process Data

Live - Weld Monitor Graph

Aggregation Data Windows



Aggregation Data Graphs

Figure 4: WM-Inspect (Developer Screen)

Principal Channel Data

WM-Inspect displays each type of data gathered through the Monitor (voltage, force, displacement, etc.) as a distinct channel. There are twelve channels in all, eight channels for each of the inputs on the Monitor and four channels of data derived from that input data.

In creating a weld monitor schedule, an engineer will designate up to four channels as principal channels. Channel data appears in the Live – Weld Monitor Graph.

Aggregation Data

The system is designed to calculate up to five values (RMS, Mean, Minimum, Maximum, and Standard Deviation) known as aggregation data, for each principal channel for each weld. An engineer will configure the system to calculate these values for each of the four principal channels and for up to four time periods over the course of a welding operation.

These calculated values display in the Aggregation Data Window, and are graphed over time in the Aggregation Data Graph.

Process Data

The system also provides real time data on the welding process, such as the number of welds performed, the number and proportion of passed and failed welds, and an error log.

The left side of the software's default screen provides access to additional windows that allow the user to develop weld monitoring schedules, change the data being monitored, or change the layout and appearance of the monitored data, depending on the user's role.

User Roles

The application provides for three user roles – Operator, Engineer, and Administrator, and three screen layouts – Run Screen, Monitor Screen, and Developer Screen. A user's role determines which screen(s) they will use and which tasks they can perform.

Operator

An Operator uses the Run or Monitor screen to run or monitor a weld monitoring schedule. They can see run data in real time and customize the way that data is displayed. They cannot create or modify weld schedules or assign roles.

Engineer

An Engineer has full access to the system and can create or modify weld monitoring schedules for any device connected to the system. An Engineer cannot assign roles to other users.

An Engineer can select any resistance welding device to which they have access on the system network and program a new weld monitoring schedule for that device. Also, they can assign to that device any one of up to 128 monitoring schedules stored on the monitor or import a schedule into the monitor from a connected server. They can also set the parameters for weld schedules, including monitor schedule settings, networked device settings, and graphic settings.

Administrator

An Administrator has full access to the system and to all three screen layouts. They can assign engineer or operator roles to other users, determine the devices to which those users have access, and choose the weld schedules to be stored on the monitor device. An Administrator can also perform any of the tasks associated with the Operator or Engineer roles.

Screen Layouts

WM-Inspect's three screen layouts, Run Screen, Monitor Screen, and Developer Screen, are each optimized for their respective uses. They differ in the data and graphs displayed and the tools and windows accessible to the user.

Each screen layout includes a Screen Docker containing the graphs, windows, and tools best suited to each type of use. Users can customize the Screen Docker layout.

There is a Menu Bar, a Tool Bar and a Status Bar in all three layouts. The Tool Bar is different for each layout; the Menu and Status Bars remain the same.

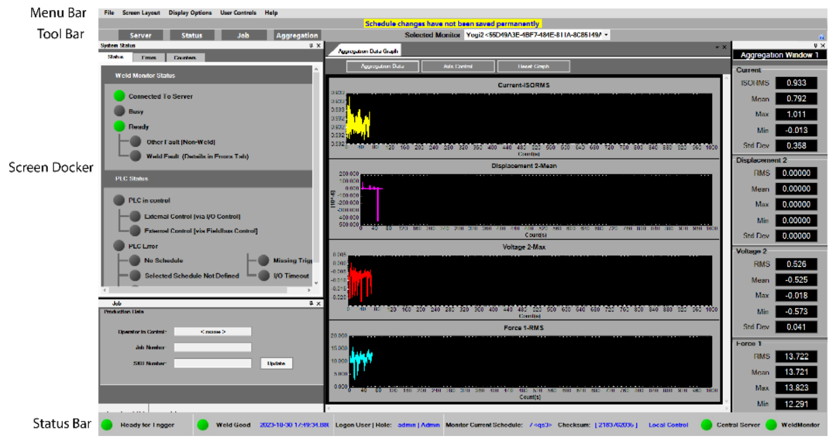


Figure 5: Default Run Screen

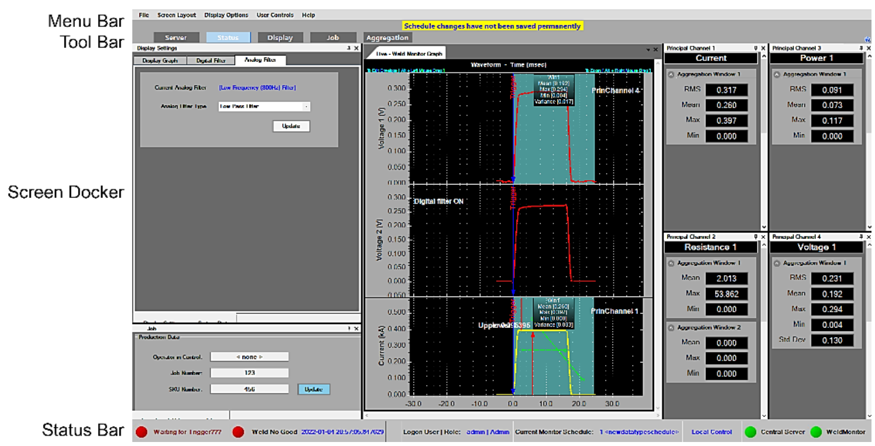


Figure 6: Default Monitor Screen

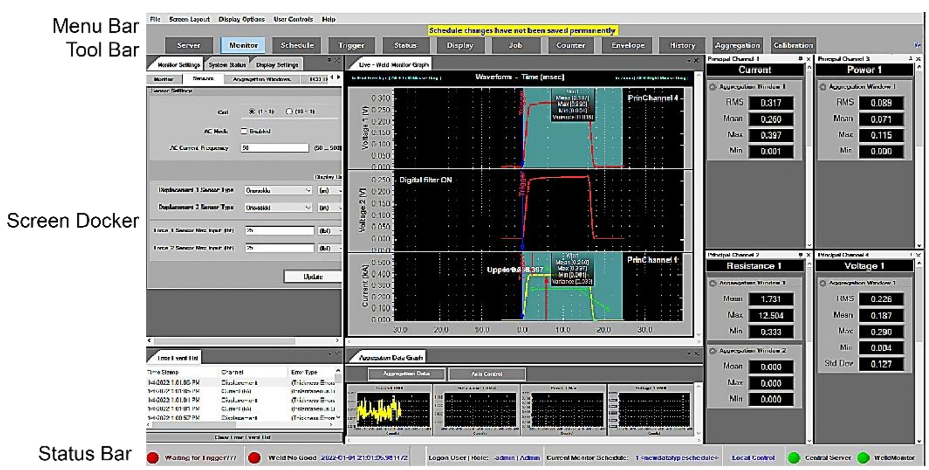


Figure 7: Default Developer Screen

User roles and layouts are described in more detail below in Operation Instructions.

Chapter 2 INSTALLATION AND SETUP

Note: This section includes information provided in an abbreviated form in the Getting Started guide shipped with the NRWM system.

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 components listed on page **ii** of this manual.

Verify that no components show any signs of damage. Please contact the carrier if there are any signs of damage. Also, contact AMADA WELD TECH AMERICA Customer Service immediately at the address and/or telephone or FAX number listed in the Foreword of this manual.

Available Configurations

The WM-200A System requires a server to connect the WM-200A to a network and a Windows client PC to run WM-Inspect. The system is available in three configurations:

- WM-200A and WM-Inspect software.
- WM-200A and WM-Inspect software installed on a client PC.
- WM-200A and WM-Inspect software installed on a server PC.

Hardware Specifications

WM-200A Resistance Weld Monitor

Input power requirement: 90 - 264 VAC. The monitor includes an input power cord with a three-prong plug (phase, neutral, ground).

Server

The system requires a server PC running Win10 PRO 64 bits with an Ethernet data transfer rate of 10/100 mbps. The server should be connected to an Uninterruptable Power Supply (UPS) to preserve data in case of power outage.

Desktop or Laptop Computer

The system requires a PC running WM-Inspect.

System Connections

Hardware Installation

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

- Allow sufficient clearance around all sides for power and signal cable runs.
- Allow ample workspace around the WM-200A 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 WM-200A must be far enough from the weld head to avoid contact with weld splash.
- Ensure that there are no sources of high-frequency energy close by.

Space Requirements

The WM-200A monitor device requires a footprint at least 6 inches (152 mm) wide and 13 inches (330 mm) deep, and a vertical clearance of at least 14 inches (356 mm).

The device should be positioned so that a user has easy access to the rear of the device to be able to connect or disconnect various cables as required (See Connecting the Monitor to a Welding System below for more information.)

Figure 8: WM-200A Dimensions

With the power turned off, connect the device to power and connect any required inputs between the weld head, the power supply, and the monitor.

Connect the Ethernet cable and PLC I/O connector, if required. (See Connecting the Monitor to a Welding System, below, for more information.)

WM-200A Sensor Inputs and Connectors

The rear panel of the WM-200A includes eight physical channels, each dedicated to receiving a different type of sensor data, an Ethernet connector, a PLC I/O connector, an AC power connector, and a power switch.

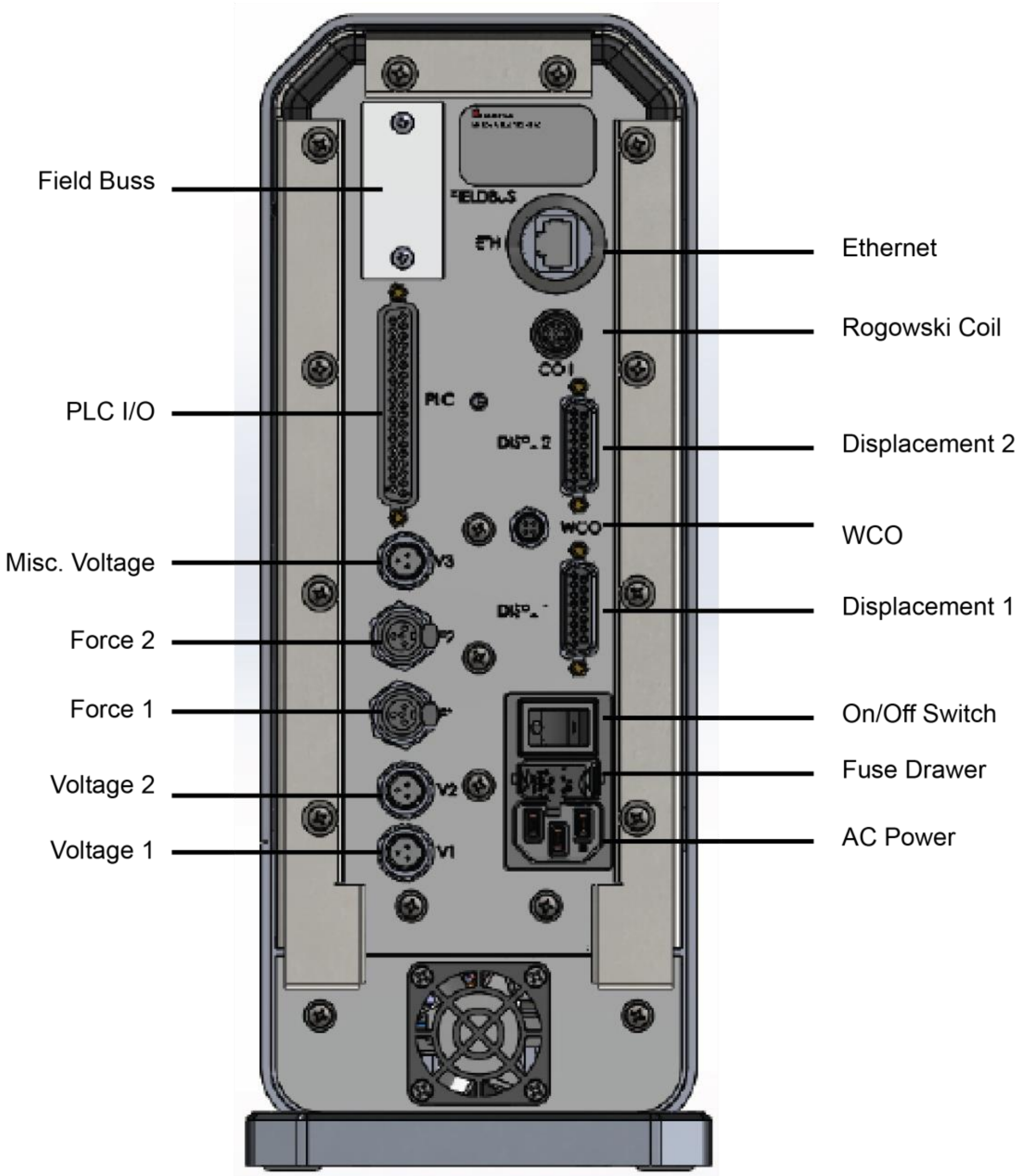


Figure 9: Monitor Connectors

Channel Input Overview

Each of the eight sensor input channels on the back of the WM-200A corresponds to a channel in the software. The software also includes four virtual channels which display calculated values derived from the sensor input data.

Channel	Sensor Data Input
1 and 2	**Displacement**. These channels are interchangeable. The input from each is defined through the software.
3 and 4	**Voltage** (+/- 20 Volts)
5 and 6	**Force** (+/- 10 Volts)
7	**Flexible Voltage** (+/- 10 Volts)
8	**Current** (Rogowski Coil)
9 and 10	Calculated power derived from input values for voltage and current (P = VI).
11 and 12	Calculated resistance values derived from input values for voltage and current (R = V/I).
WCO	**Weld Cutoff**. Signals power supply to stop outputting current when the weld cutoff point is reached. (Weld to Set Down value sets the threshold at which the WCO output goes active. See Set Displacement Limits.)

Connecting the Monitor to a Welding System

AWT provides the various sensor cables required to connect the WM-200A monitor to a welding system. Depending on the configuration of the welding system being used, the customer may need to use an adaptor or connector to attach a sensor cable to a welder or power supply.

Three common configurations for connecting the monitor to a weld head and power supply are described below. The Sensor Cables table describes the types of cables used. Please contact your AWT representative with any questions or concerns before connecting the monitor to your system.

Opposed Weld (Single Head) Connectivity

The diagram below illustrates a basic configuration - connecting the monitor to a single weld head.

1. The voltage sensor cable is connected to both electrodes and to one of the monitor’s voltage sensor connections.
2. The displacement sensor connects to one of the monitor’s displacement sensor connections.
3. The force sensor connects to one of the monitor’s force sensors connections.
4. The current from the power supply connects to the electrodes. A Rogowski coil surrounds one of the power cables and connects to the Coil connector on the monitor.

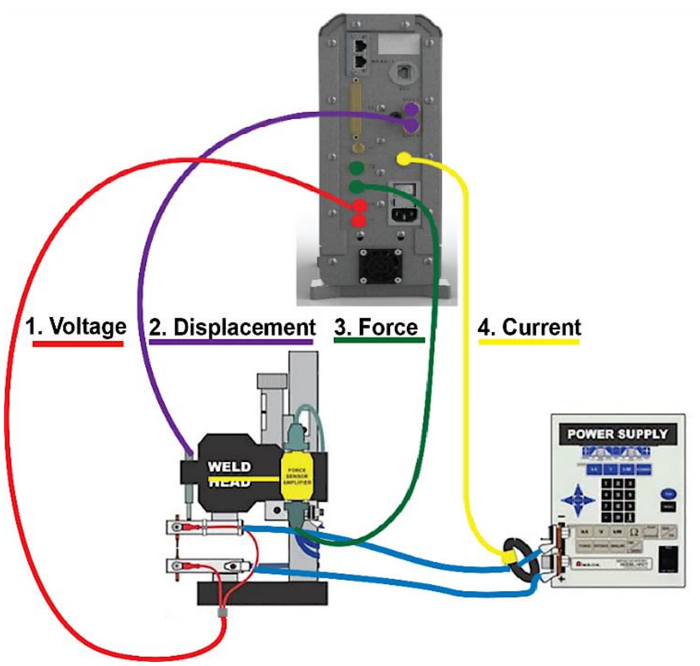


Figure 10: Single Head, Opposed Weld Connectivity

Parallel Weld (Dual Head) Connectivity

The diagram below illustrates connecting the monitor to parallel weld heads.

1. The voltage sensor cable is connected to both electrodes and to one of the monitor's voltage sensor connections.
2. The two displacement sensors connect to the monitor's two displacement sensor connections.
3. The two force sensors connect to the monitor's two force sensor connections.
4. The current from the power supply connects to the electrodes. A Rogowski coil surrounds one of the power cables and connects to the Coil connector on the monitor.

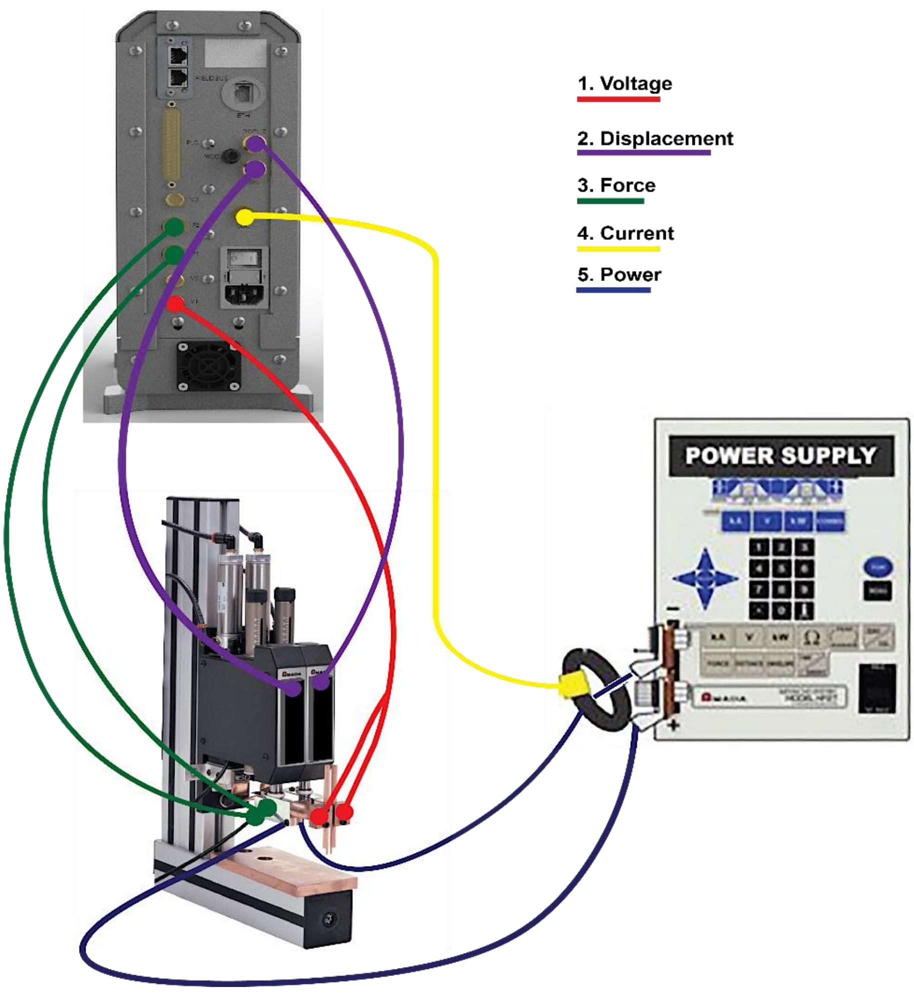


Figure 11: Parallel Weld (Dual Head) Connectivity

Step (Indirect) Welding Connectivity

Step (Indirect) Welding is often used when the workpieces are configured in such a way that only one side of the workpiece is accessible with an electrode or there is a large thermal imbalance. The welding current flows from the first electrode, through the workpiece, through the area of the weld, through the other workpiece and into the other electrode. In this configuration:

- One voltage sensor cable is connected to one of the electrodes and to one of the workpieces and connects to one of the voltage connections on the monitor (e.g., V1). A second sensor cable connects to the other electrode and the other workpiece and to another voltage connection on the monitor (e.g., V2).
- Other sensors (e.g., displacement, force, current, etc.) connect as described in the Parallel Weld configuration above.

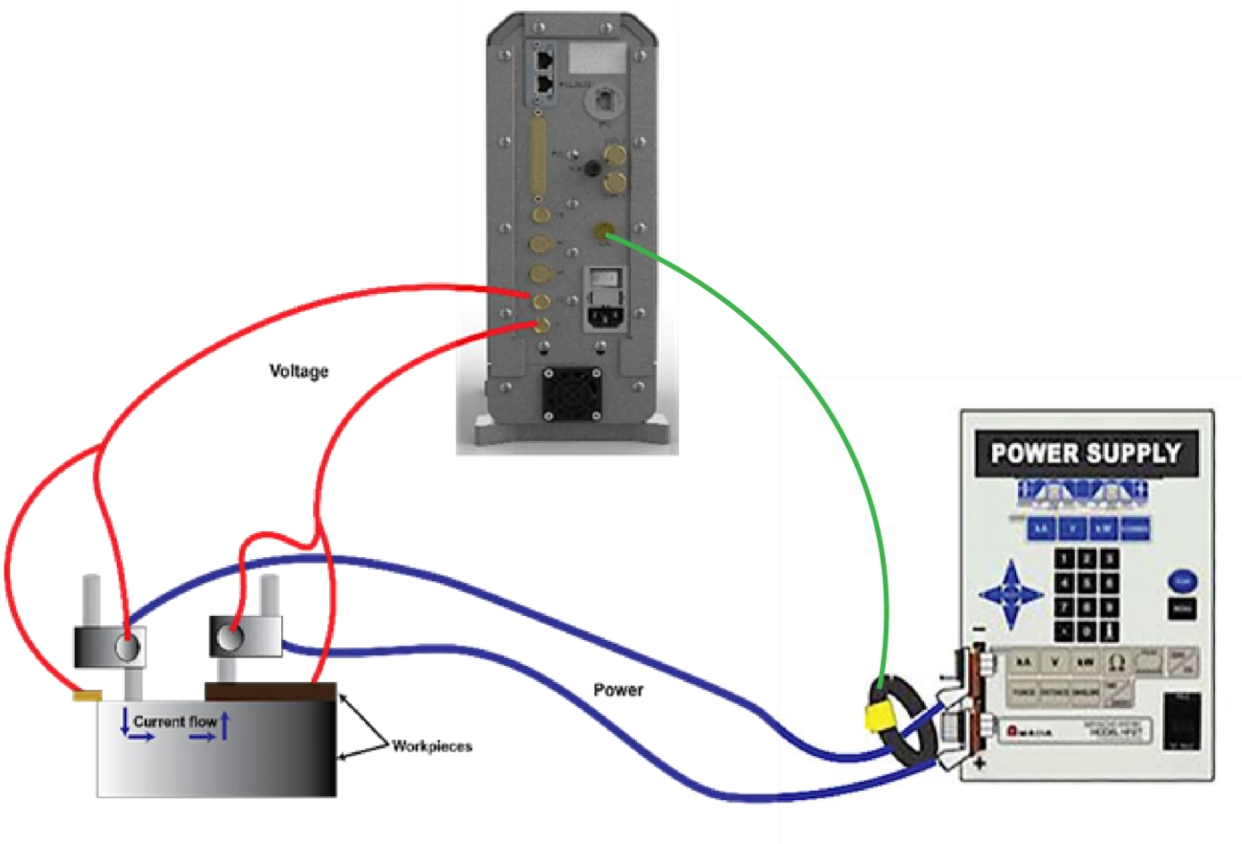
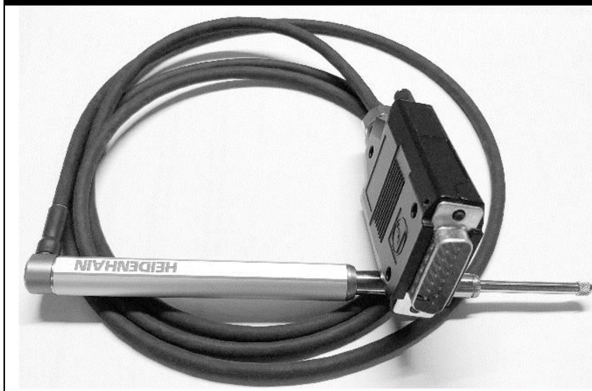


Figure 12: Step (Indirect) Welding Connectivity

Sensor Cables

Displacement Sensors	
 [Shown: Part No. 311-017 (short), 311-022 (long): Heidenhain sensor with 15-pin connector]	**Output (from welder)** The NRWM system accepts displacement input from a Heidenhain sensor. **Input (to Monitor)** The fifteen-pin male connector on the cable connects to the female connectors (labeled DISPL1 and 2) on the back of the monitor. See Displacement Connectors in Appendix B, below, for more information.

Force Sensors	
	**Output (from welder)** The force sensor cable includes four bare wires (Sig+, Sig-, Power, and Ground) to allow the customer to attach the type of connector required for their equipment. **Input (to monitor)** Four pin male connector to attach to four-pin female input on the monitor (labeled F1 and F2). **Note: Cables to Force Sensor (Load Cell)** • Use a PN 4-41347-01 cable when using a Futek Model IA100 amplifier as an interface between the monitor and the force sensor. • If using a different interface, use a PN 4-41598-01 cable between the monitor and the force sensor.

<table>
<tr><th colspan="2">Current Sensor (Rogowski Coil)</th></tr>
<tr>
<td>



SK-1193305 Adapter cable
</td>
<td>
Output (from welder)

The arrow on the Rogowski coil should always be pointing in the direction of conventional current flow, from positive to negative.

• Place the coil around the current cable running from the welder to the positive terminal on the power supply with the arrow on the cable pointing AWAY from the power supply.
• If the coil is placed on the power supply’s negative terminal, place the cable with the arrow pointing TOWARD the power supply.

Input (to monitor)

Insert the 10 pin male connection into 10 pin female connector (labeled ‘Coil’) on the back of the WM-200A monitor.

If an MB-45F (10X) Rogowski Coil is used, then part number SK-1193305 adapter cable will be needed to adapt to the WM-200A system.
</td>
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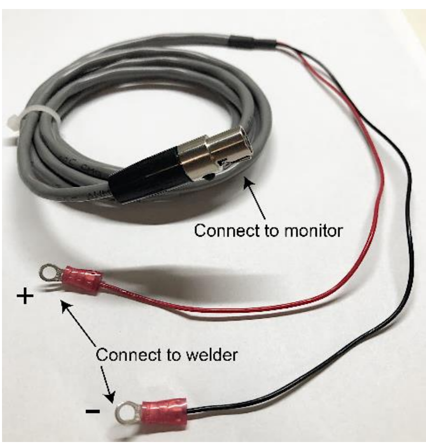
</table>

<table>
<tr><th colspan="2">Weld Cutoff Cable</th></tr>
<tr><td>
[Shown: Part No. 4-41605-01: Weld cutoff cable]</td><td>Input (to welder)

The cable provided to the customer has bare wire connectors, allowing the user to configure the input to the power supply to cut off the weld current when the displacement cutoff position is reached during a weld.

Output (from monitor)

Two-pin (signal and ground) male connector connects to two pin female connector on the Monitor (labeled WCO).</td></tr>
</table>

<table>
<tr><th colspan="2">Voltage Sensors</th></tr>
<tr><td>

[Shown: Part No. 4-41610-01: Voltage sensor cable]</td><td>Output (from welder)

Matching the path of the current from the power supply, attach the red wire to the positive side coming from the power supply and the black wire to the negative side coming from the power supply.

Voltage cables are available with ring connectors but can also be connected to a weld monitor with bare wires or alligator clips, as required.

Input (to Monitor)

The three pin female connector on the cable connects to the three pin male connectors (labeled V1, V2 and V3) on the back of the monitor.</td></tr>
</table>

Software Installation

Note: These instructions apply to those installing software on customer-supplied PCs. If your purchase system includes a PC (e.g., Model No. 3-200-AA-AAA-AA), it comes with both the server software and WM-Inspect software already installed. Skip to Basic Functions below, unless you need to install software on another client PC or move a NFWM monitor to another network or server.

System Requirements

Client PC Minimum Requirements: 64 Bit Windows 10 OS with Ethernet and USB ports, monitor, mouse, and keyboard.

Server Suggested Minimum Configuration: PC running Windows 10 64 Bit Pro with a minimum of 8GB RAM, 1TB hard drive, minimum 100Mbs, Network, Ethernet, and USB ports, monitor, mouse, and keyboard. Actual server requirements will depend on number of monitor units, desired depth of storage, and frequency of database inquires.

Important:

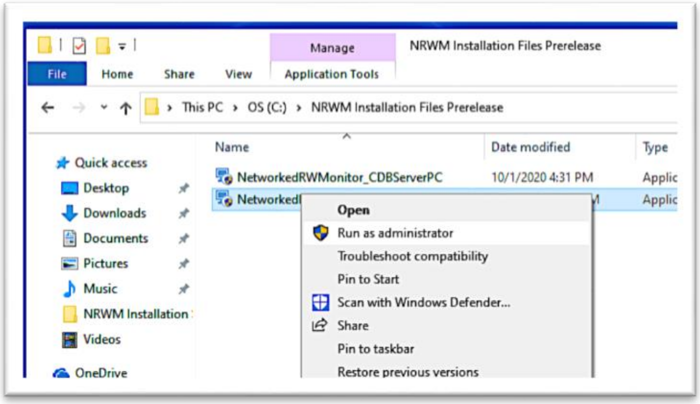
- **WM-Inspect requires that the Central Server Software be installed and setup first.**
- **To ensure continuous operation, power saving must be disabled on both the server PC and the PC running WM-Inspect. For more information, see, in this section.**

Installing WM-Inspect

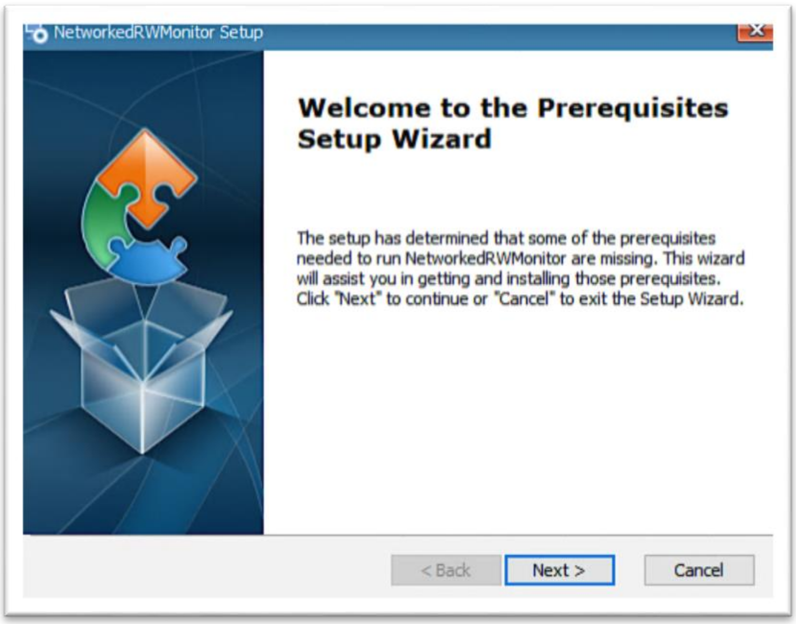
Installing WM-Inspect on a PC requires installing both prerequisite software and the WM-Inspect program.

Before Installing WM-Inspect: The PC must be connected to the Internet and Windows must be updated before the software in installed.

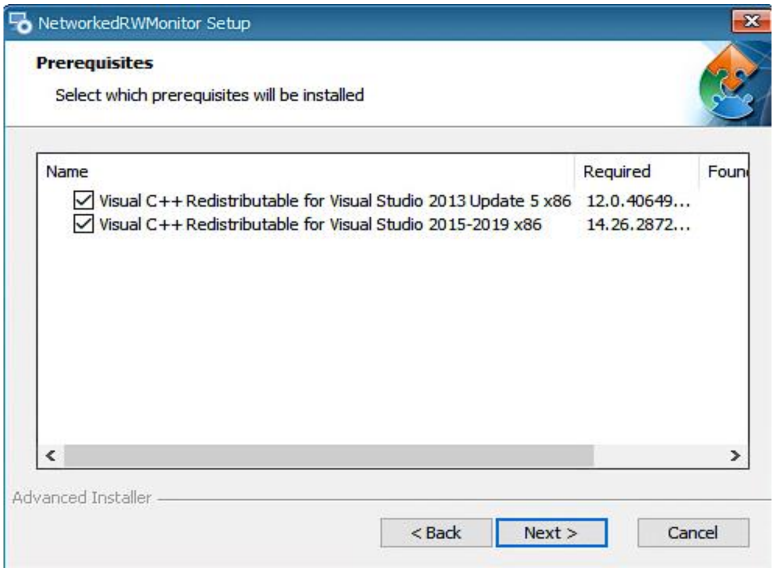
Begin by right-clicking on the WM-Inspect.exe file provided and select Run as Administrator.



This will launch the Prerequisites Setup Wizard.

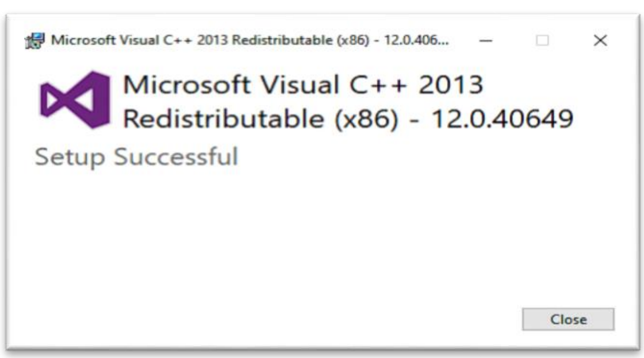


Click Next. Two Visual C++ prerequisite files are listed.

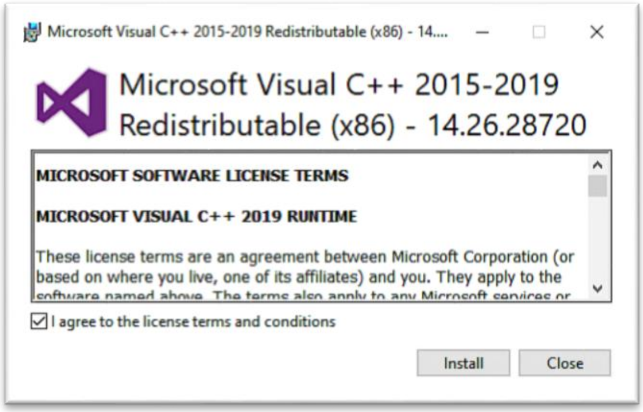


Select both prerequisites and click Next. A license agreement displays.

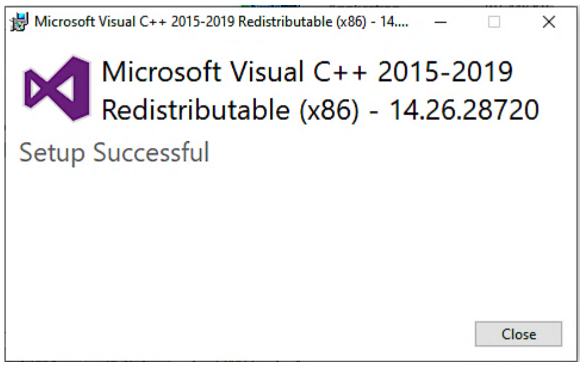
Click to agree to the license terms and click Install. Once the setup is successful, a window displays.



A license agreement for the second prerequisite displays.



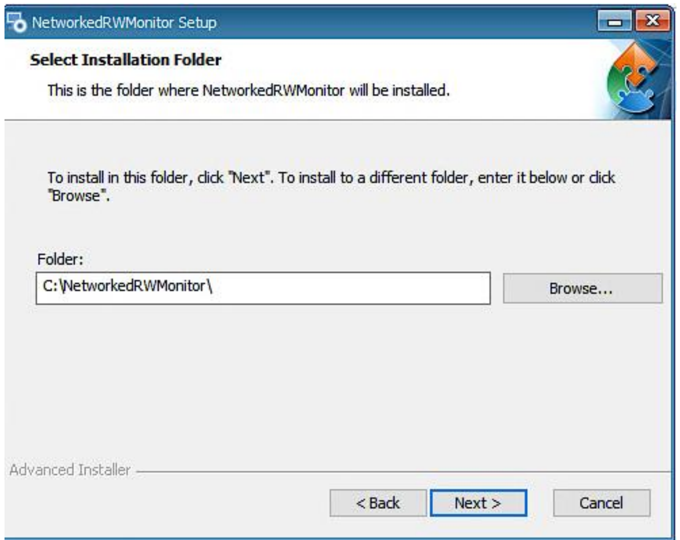
Agree to the terms and click Install. Once the setup is successful, a window displays.



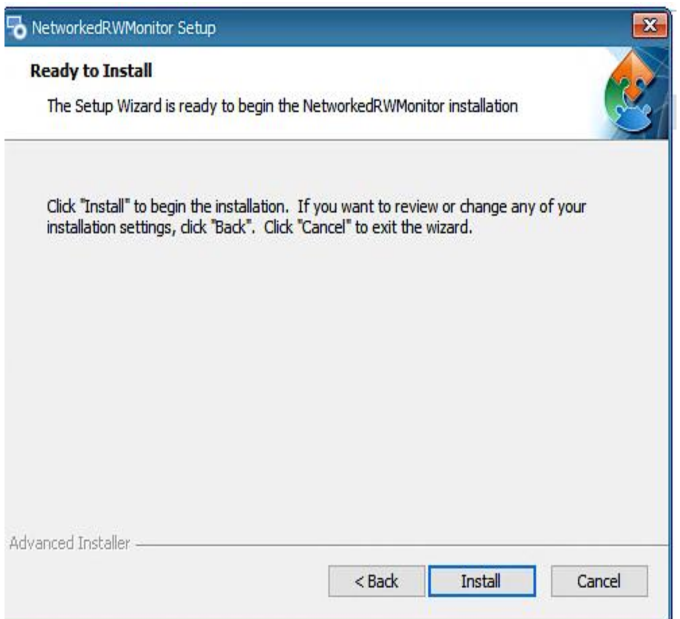
Click close after setup is successful. The system is now ready to install WM-Inspect.

Click Next.

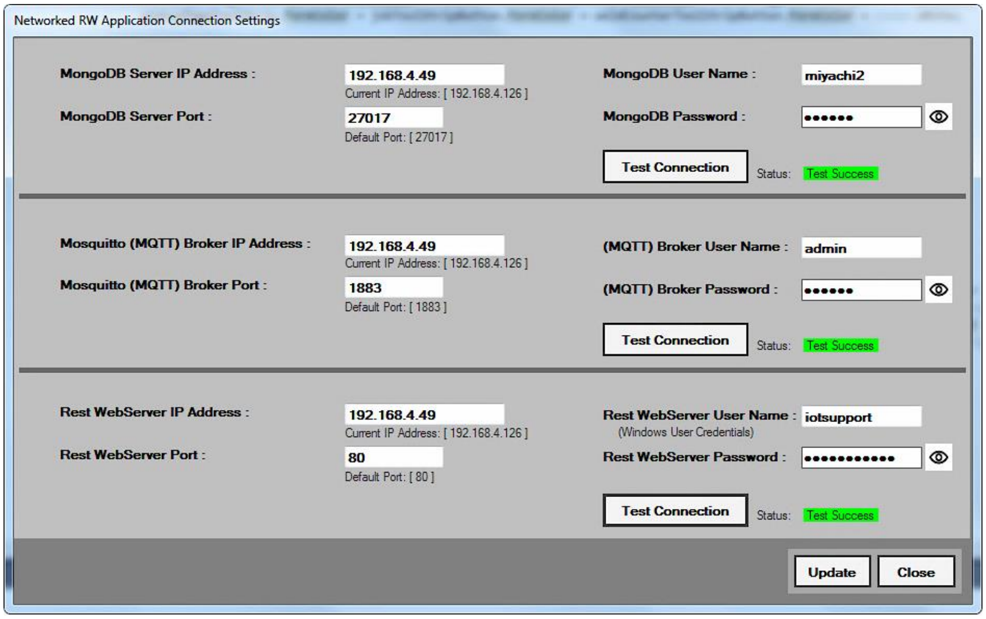
The default installation folder displays.



Click Next to use the default folder. The Install window displays.



Click Install. The IP Address Settings window displays.

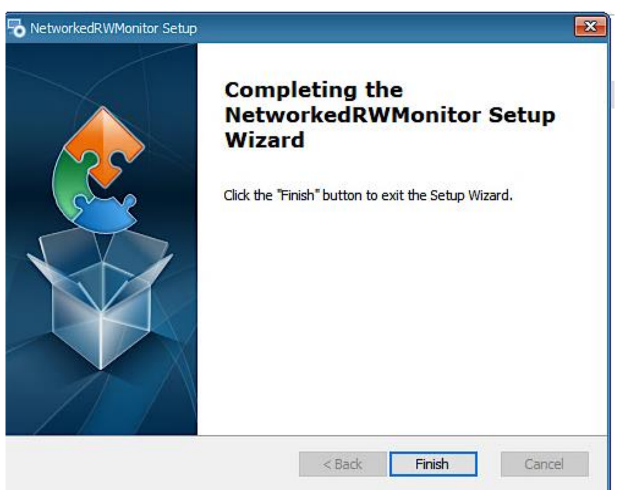


Enter the IP address of the Server PC in the fields for MongoDB, Mosquitto, and Rest WebServer.

> **Note:** This is the Server PC address, **not** the IP address of the client PC where you are installing the Client software.

Enter the login credentials of the client PC into the fields for Rest WebServer, User Name and Rest WebServer Password. (This is the same username and password used to access the server PC.)

Click Update then Finish. The completion window displays.



Click Finish to complete setup of WM-Inspect on your PC.

After Installing WM-Inspect: After WM-Inspect is installed, the PC's TCP/IP 4 settings should be changed to a static IP (i.e., IP 192.168.4.100, subnet mask 255.255.255.0, and default gateway 192.168.4.1).

Restart the PC.

Connect Central Server PC Network Port

It the Monitor and Central Server are being set up as a standalone system, the network port on the WM-200A Central Server PC must be connected to a Weld Monitor that has been powered on.

If the Central Server is to be connected to a live/active network domain, the network port must be connected to that network before the Central Server is powered on.

If the Central Server is not connected to a monitor or network, the network port becomes inactive after the PC is powered up. An inactive port is automatically configured to the default IP address 127.0.0.1. This invalid address causes the Central server services (MongoDB, Mosquitto MQTT Broker, and RestAPI services) to fail to connect or startup correctly. This would appear on the Networked Central Server Settings Window as **IP – No Response** for each of the services.

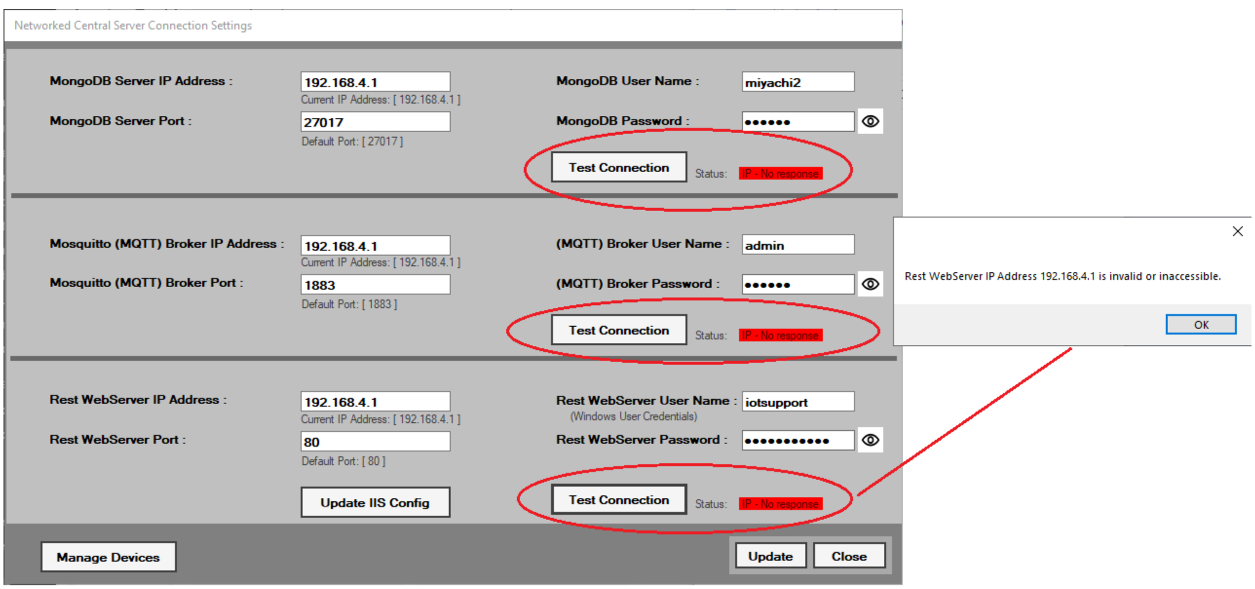


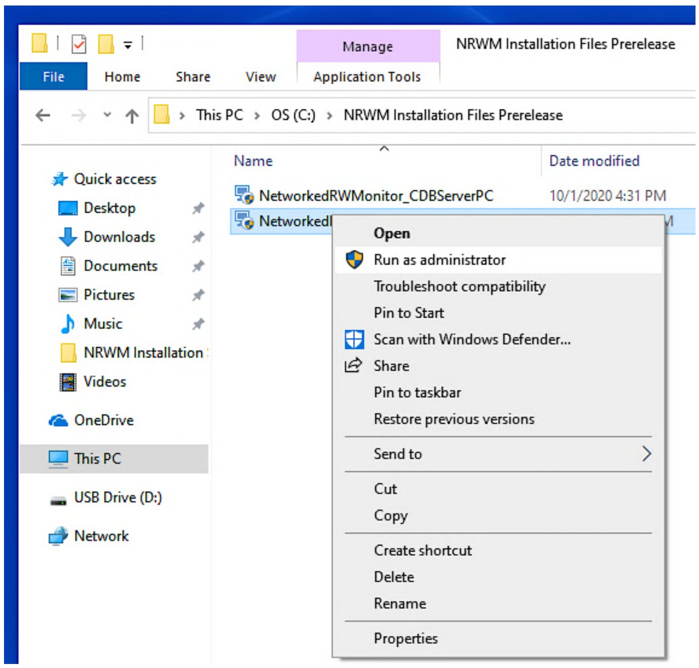
Figure 13 - IP No Response message

Installing WM-Inspect Server Software Using the Installation Wizard

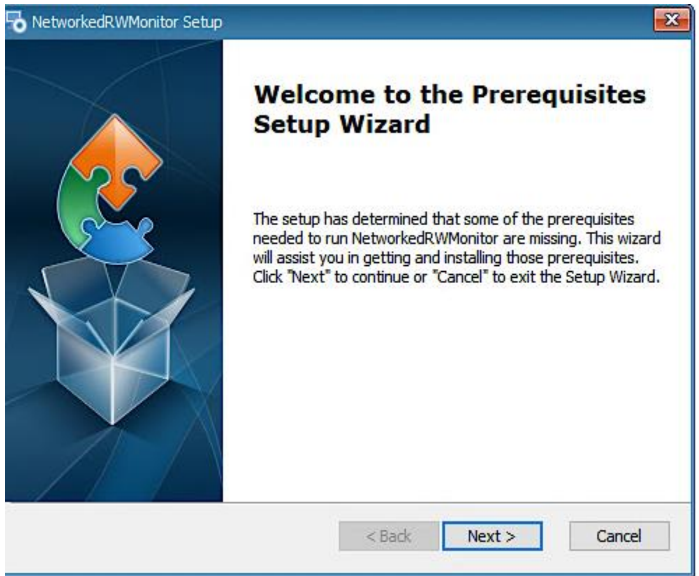
Installing the WM-Inspect Server Software includes installing prerequisite files (possibly including Open SSL) and the WM-Inspect Server software. Begin by right-clicking on the NetworkedRWMonitor_CDBServerPC.exe file provided.

Note: If you are upgrading the server software, use the Server Upgrade procedure instead.

Select Run as administrator.

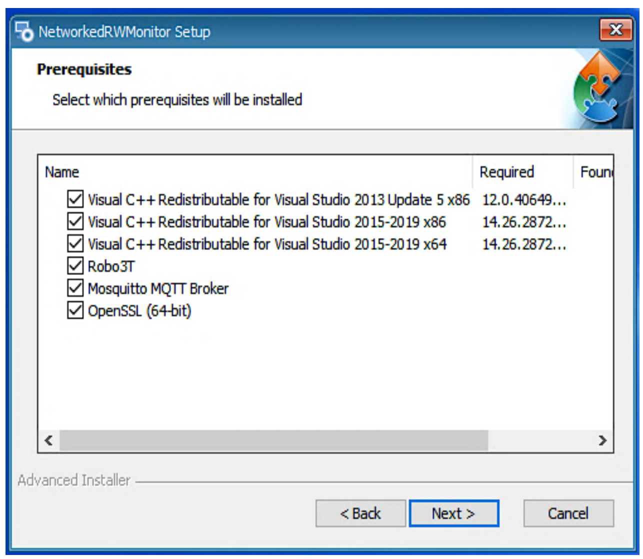


The Prerequisites Setup Wizard displays.



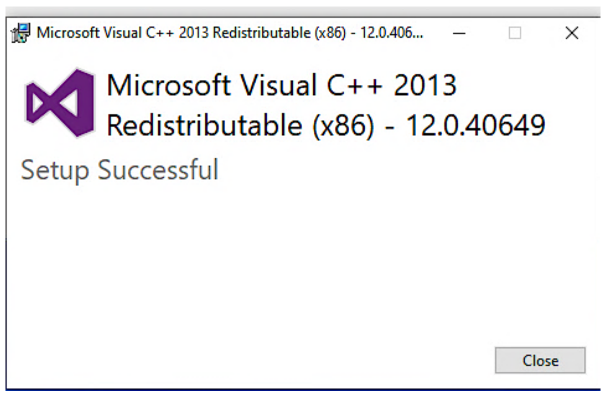
Click Next.

The list of prerequisites displays.



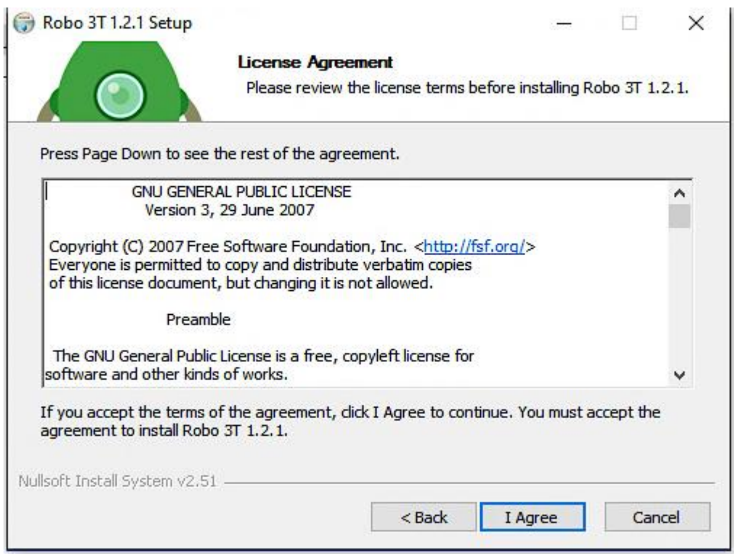
Ensure that all items listed are checked. Click Next. The first licensing agreement displays.

Agree to the terms and click Install. Once the setup is successful, a window displays.



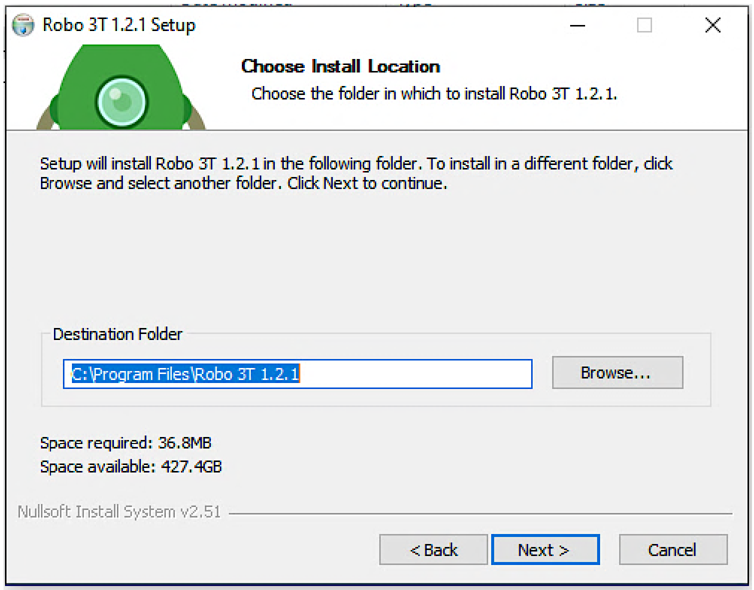
This licensing procedure will repeat for other items in the installation package. Agree, install, and close for each item. The Robo 3T Setup Wizard launches once all items have been installed.

Click Next to start the Robo 3T installation. The license agreement displays.

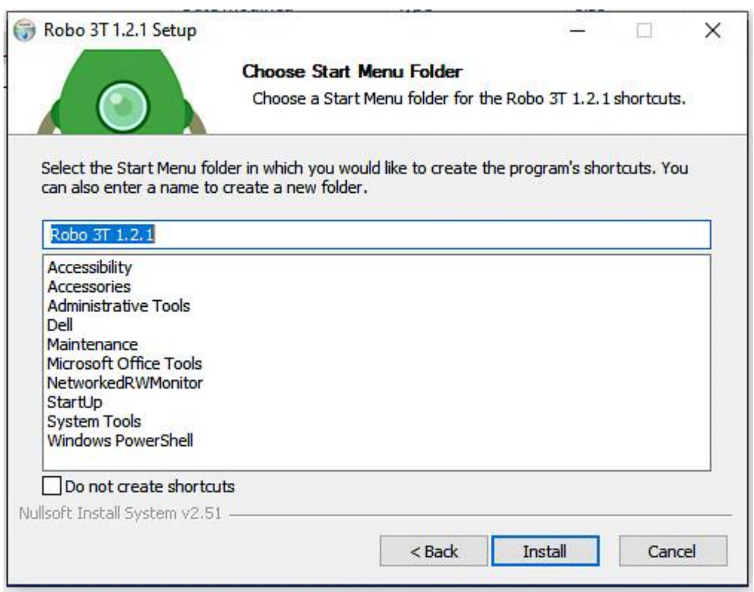


Click I Agree.

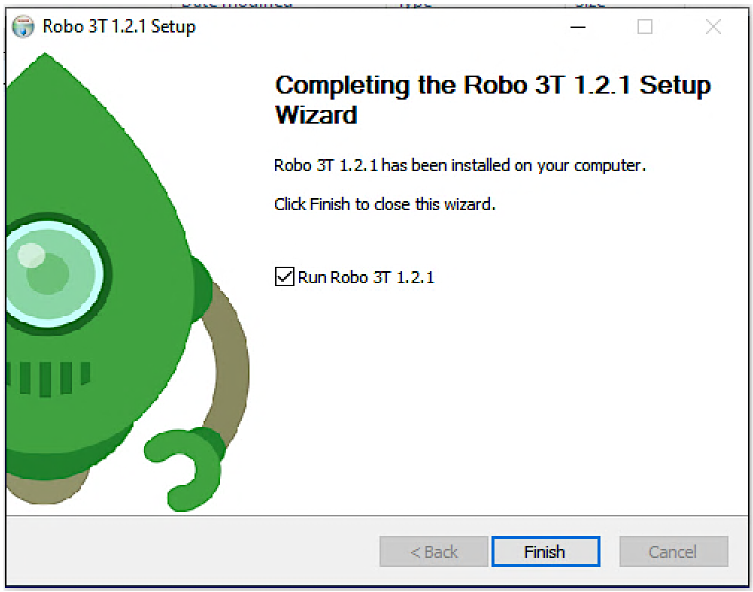
The Installation Location window displays.



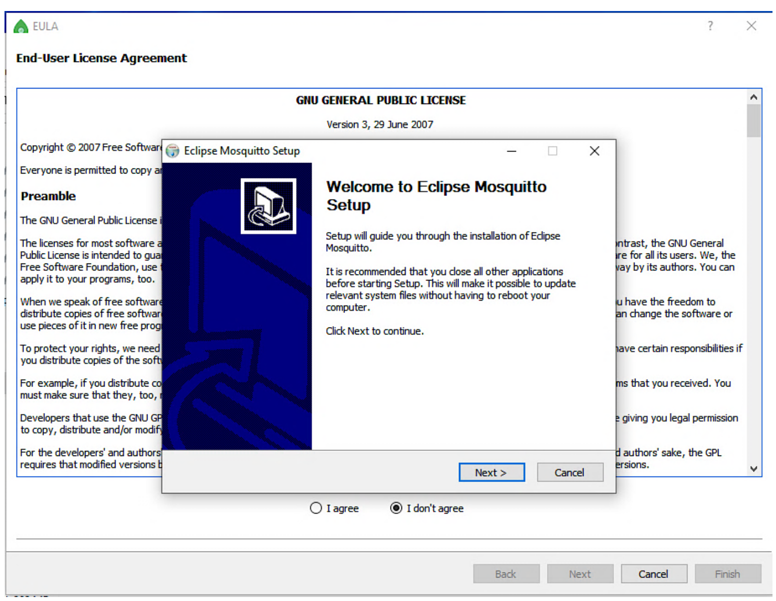
Click Next to accept the default folder location. The Start Menu window displays.



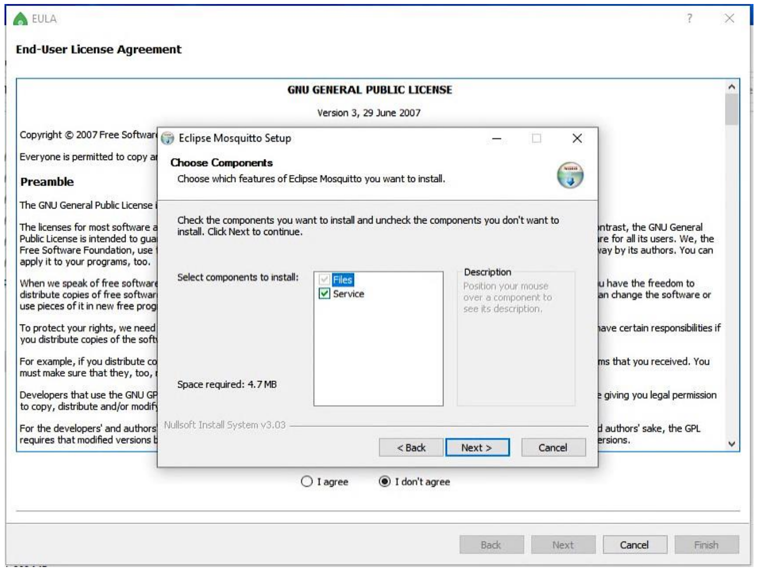
Leave the **Do not create shortcuts** box unchecked and click Install. The completion window displays.



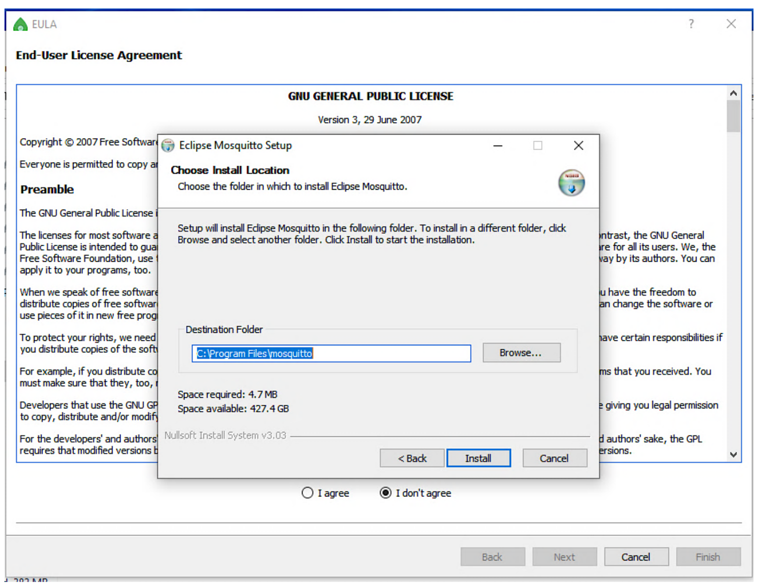
Uncheck the box Run Robo 3T, and click Finish. (If this box is checked, the Robo 3T application will start. If it does start, close it out.) The Eclipse Mosquitto Setup window displays.



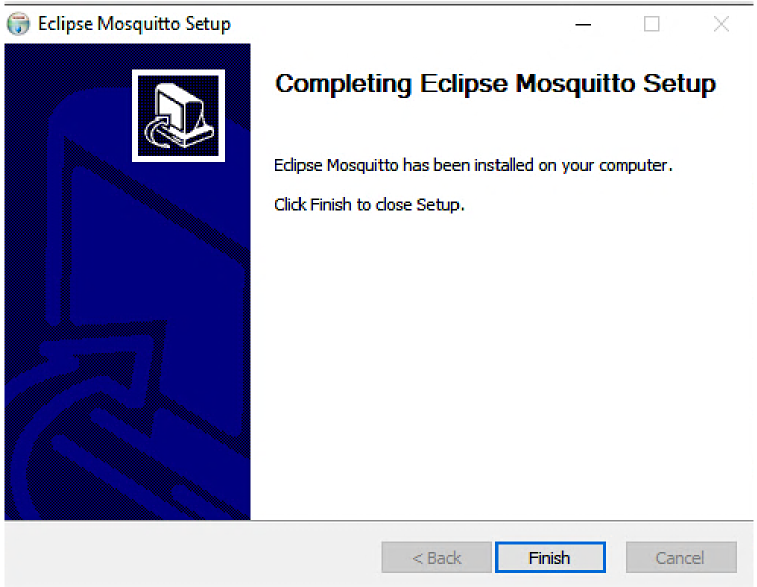
Click Next to start the Eclipse Mosquitto setup.



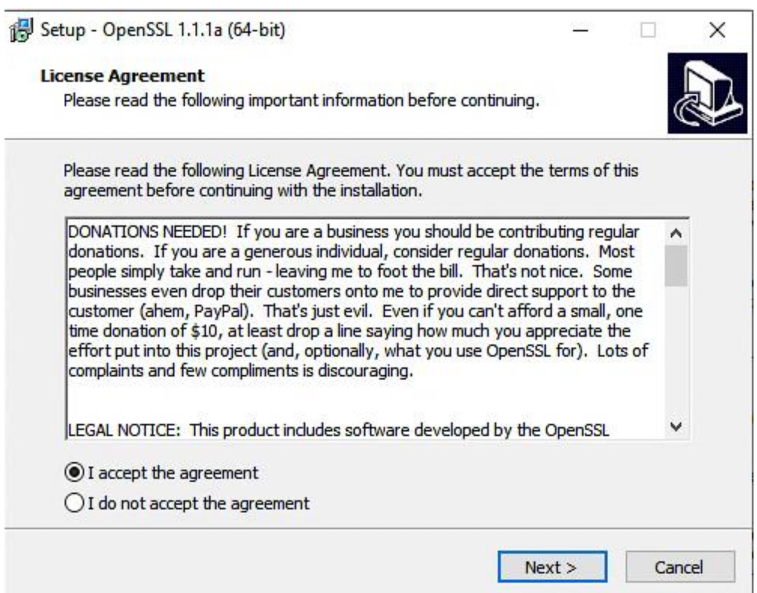
Make sure the Service component is checked and click Next.



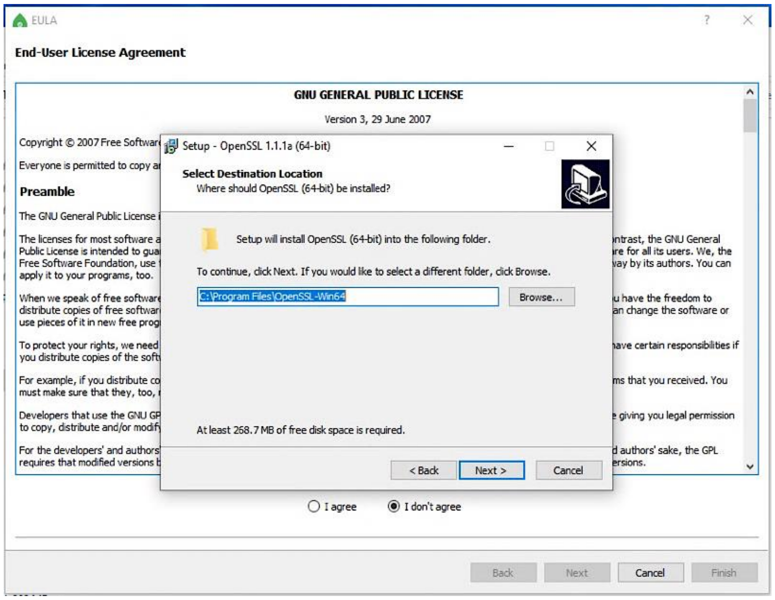
Keep the default folder path and click Install.



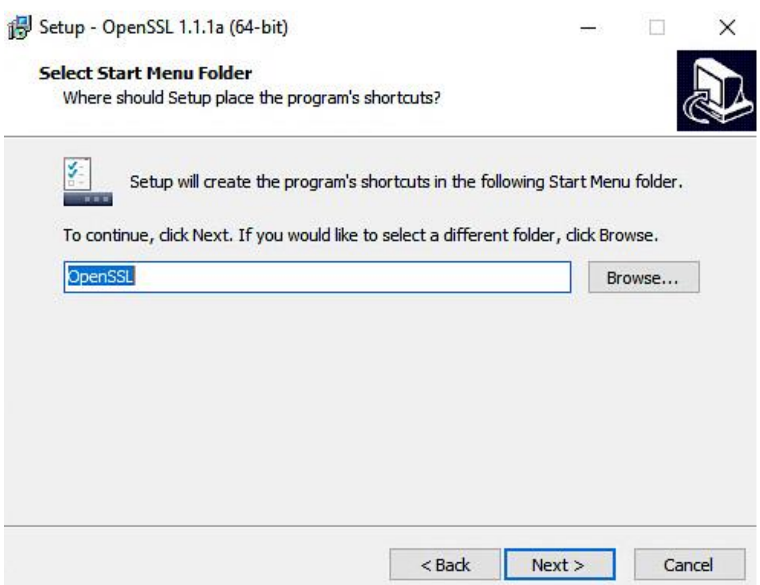
Click Finish to complete the Eclipse Mosquitto Setup.



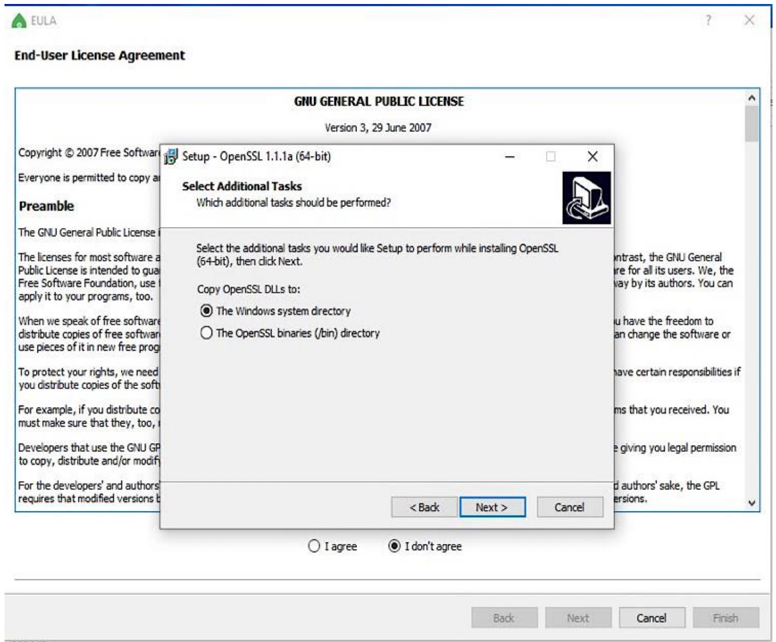
Accept the agreement and click Next to start the OpenSSL install process.



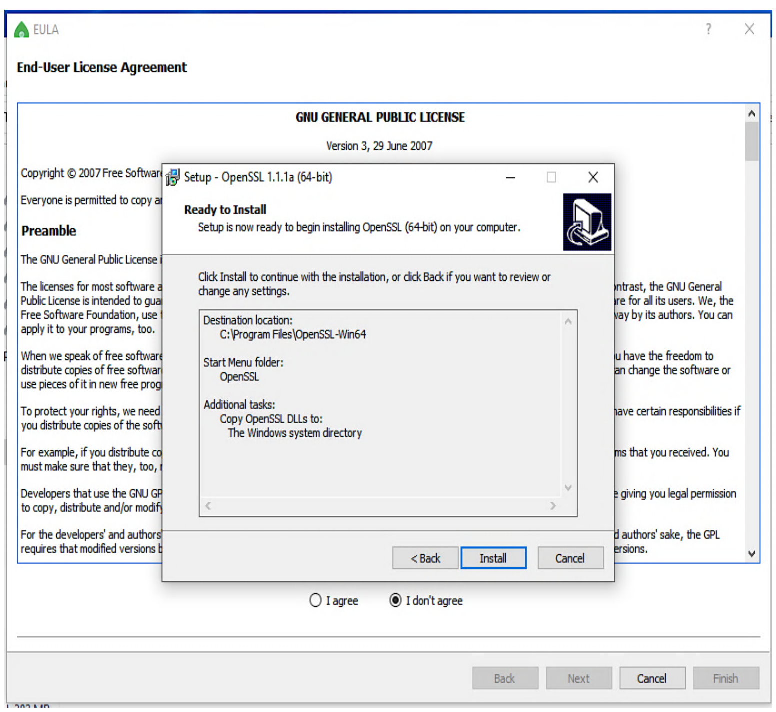
Keep the default location and click Next.



Keep the default folder name and click Next.

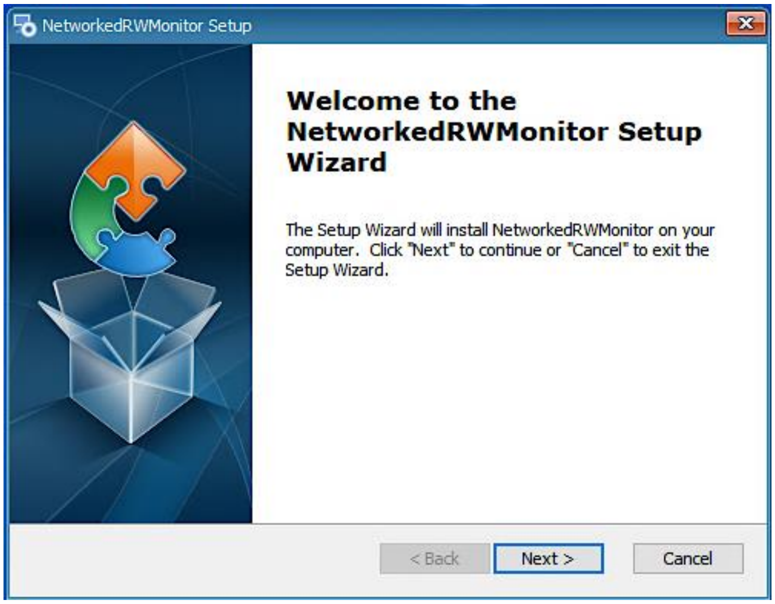


Make sure the above selected option for the Windows system directory is selected. Click Next.

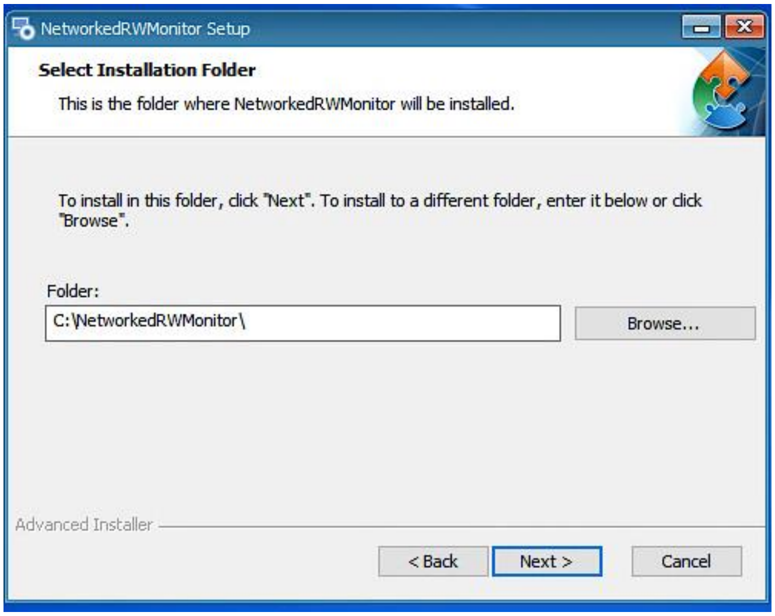


Click Install.

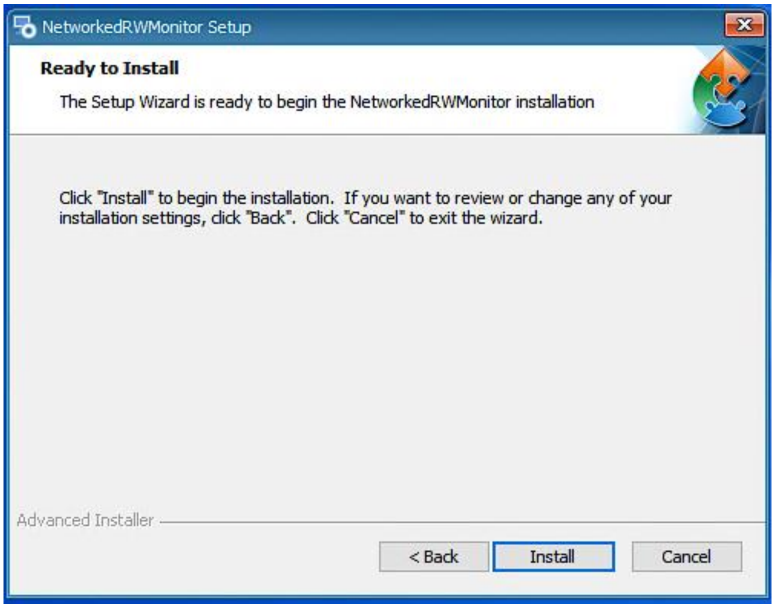
Make sure all boxes are unchecked then click Finish to complete the Open SSL setup.



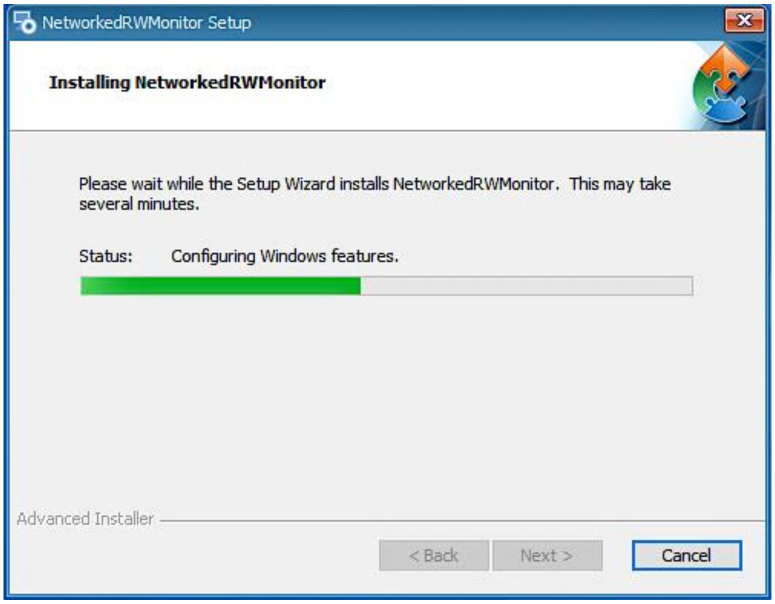
Click Next to start the NetworkedRWMonitor Setup Wizard.



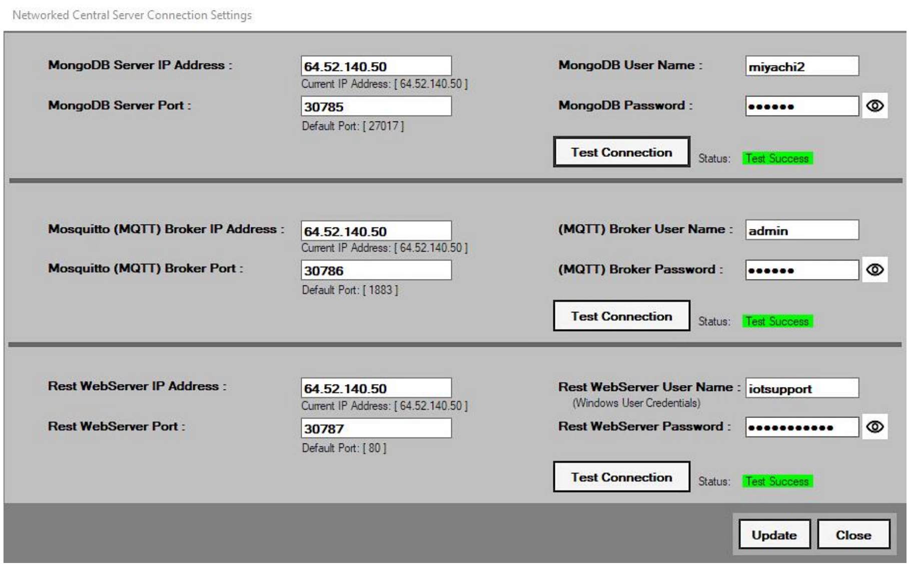
Keep the default folder path then click Next.



Click Install to begin the installation process.



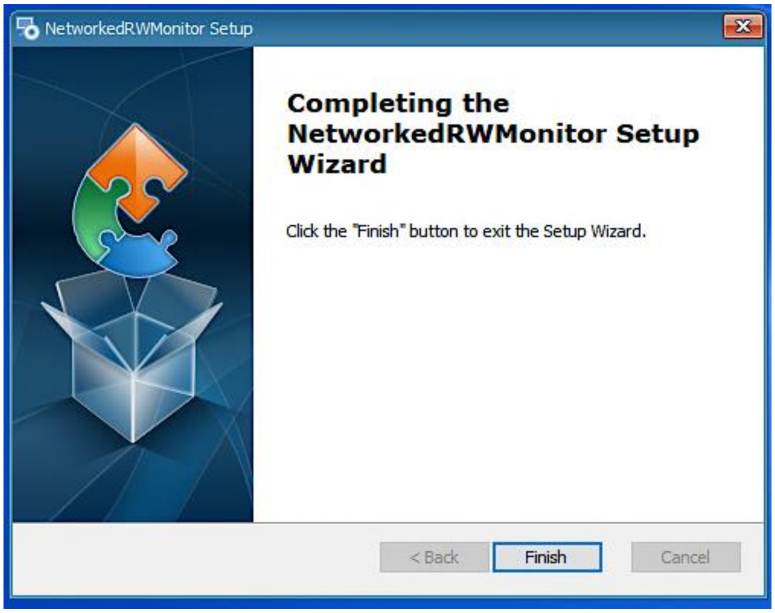
A status window will pop up showing the progress of the installation.



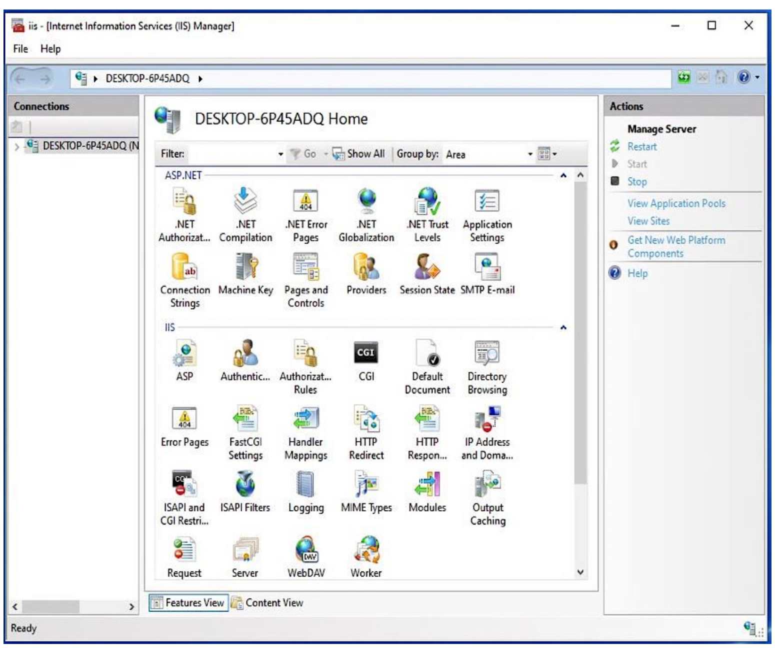
Enter the IP address of the server PC in the fields for MongoDB, Mosquitto, and Rest WebServer. This is the IP address of the PC where you are installing the Server software.

Enter the login credentials of the server PC into the fields for Rest WebServer Use Name and Rest WebServer Password. (This is the same username and password used to access the server PC.)

Click Update and Finish.

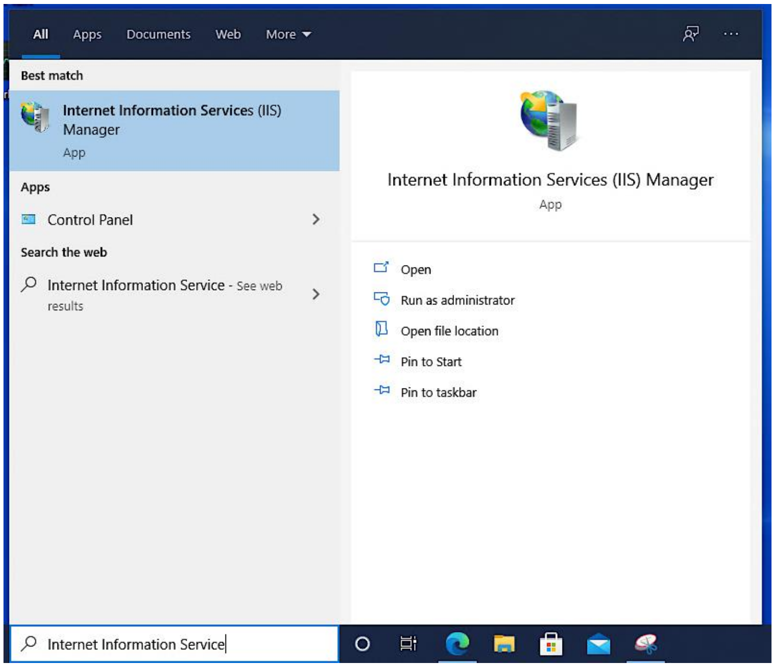


Click Finish to complete the NetworkedRWMonitor Setup.

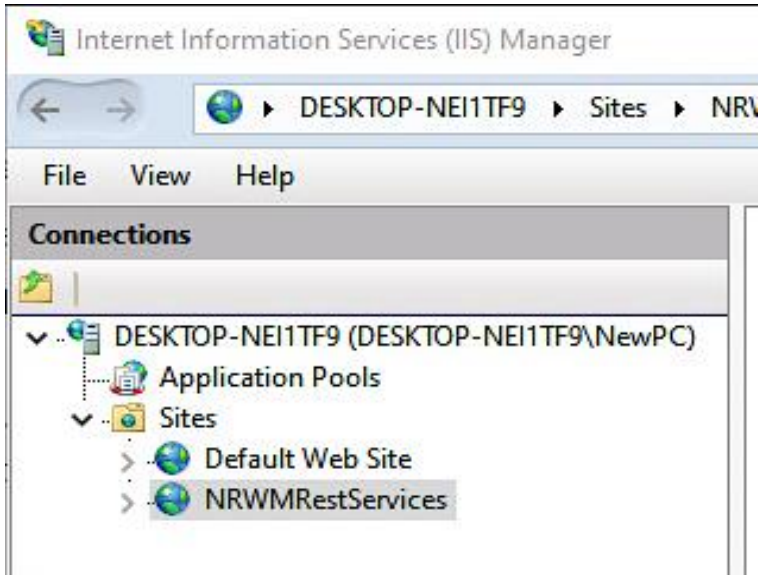


Once the software installation is complete, the Internet Information Services (IIS) window displays. This window allows you to enter the login credentials for the server PC.

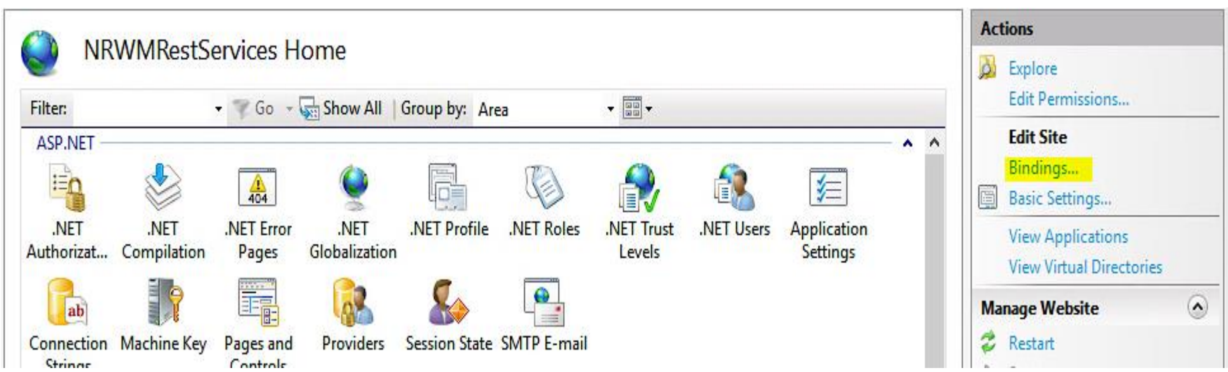
If the IIS window does not launch, go to the Windows search bar and type "Internet Information Service" and press Enter to launch the IIS window.



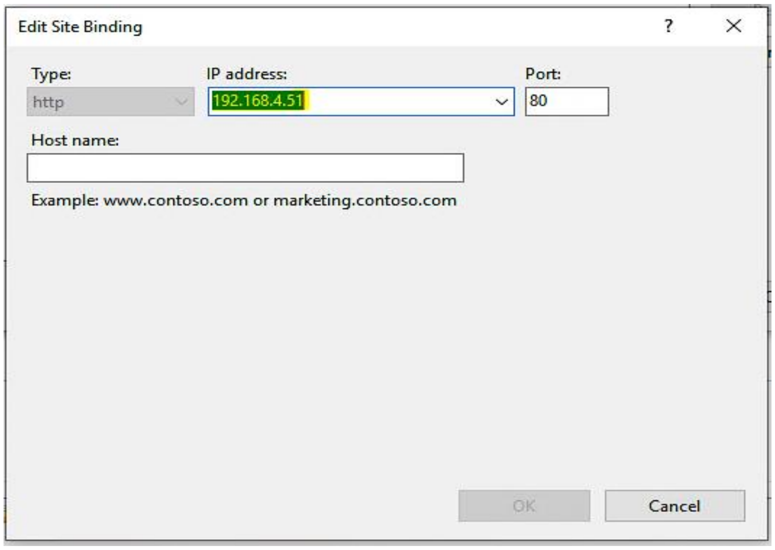
Expand the tree on the left and click on NRWMRestServices.



Click on Bindings under Edit Site in the Actions window.

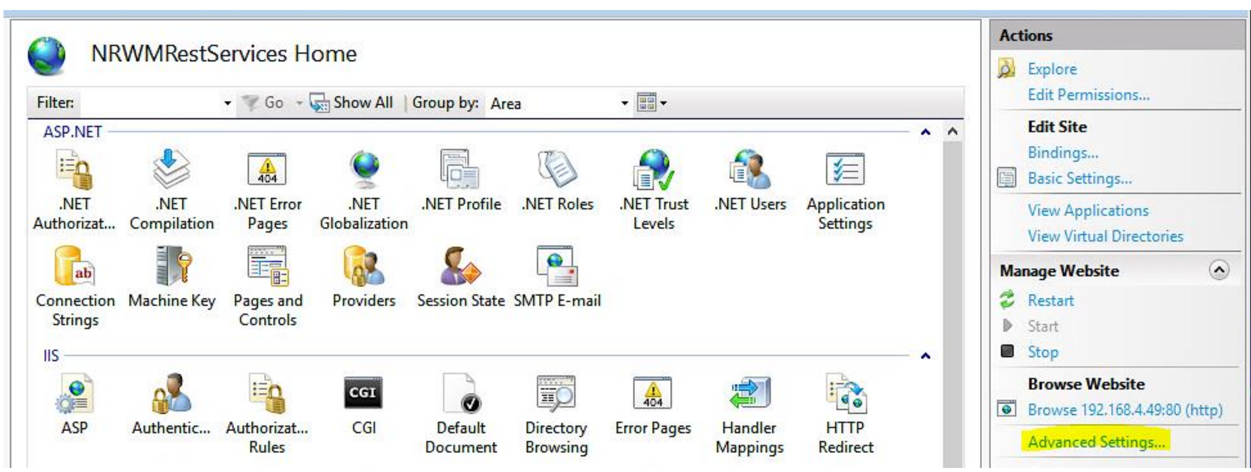


The Edit Site Binding window displays.

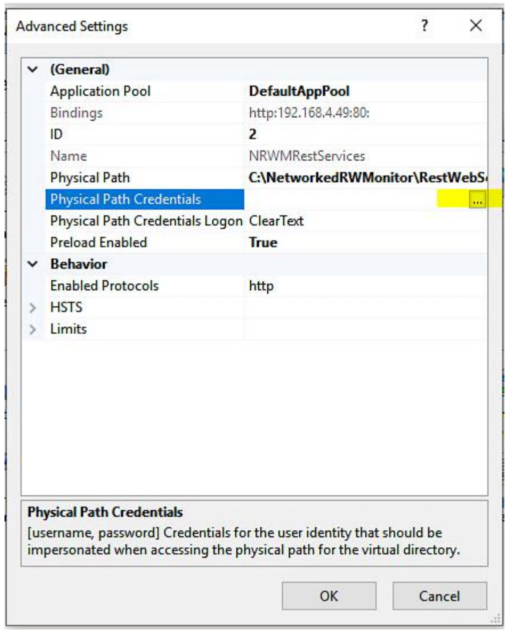


Enter the IP address of the Server PC in the IP address field. Click OK.

Click on **Advanced Settings** under Browse Website in the Actions window.



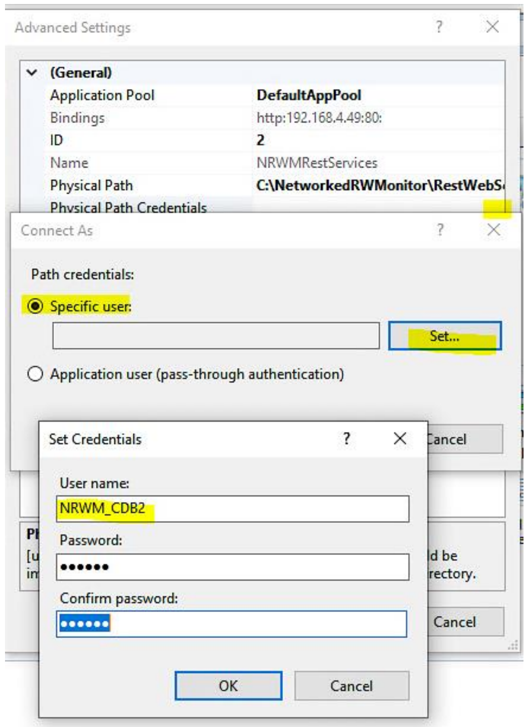
The Advances Settings window launches.



Click on the ellipsis to the right of Physical Path Credentials to set the name and password for a specific user. The Connect As window launches.

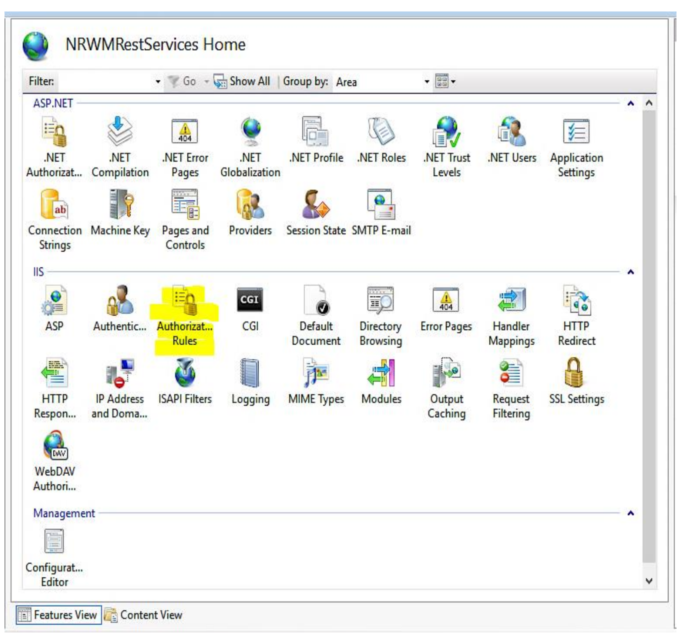
Select Specific user and click Set.

The Set Credentials window launches.

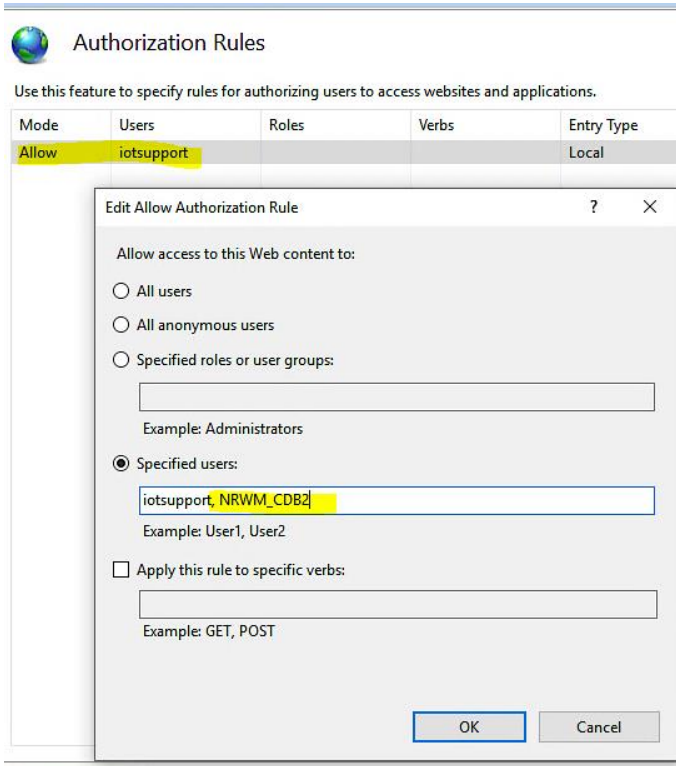


Enter the login credentials of the server PC for the User Name and Password. Click OK.

Double click Authorization Rules in the NRWMRestServices Home window.



The Authorization Rules window launches.



Select iotsupport and click Edit. The Edit Allow Authorization Rules window launches.

Enter the name of the server PC *after* “iotsupport,” (including the comma) for the specified user.

Click OK.

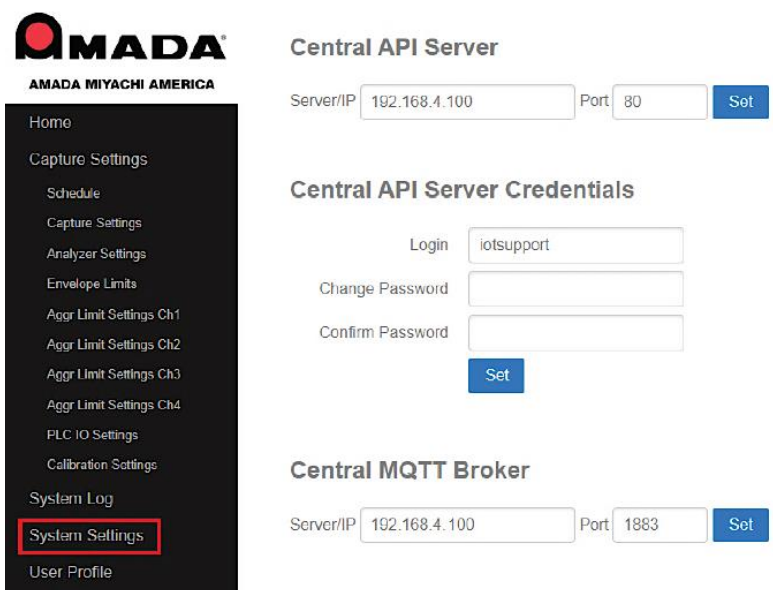
Configuring the Monitor to Point to the Central Server

Before WM-Inspect can communicate with the WM-200A monitor, the monitor must be configured to point to the central server. To do so, you will need:

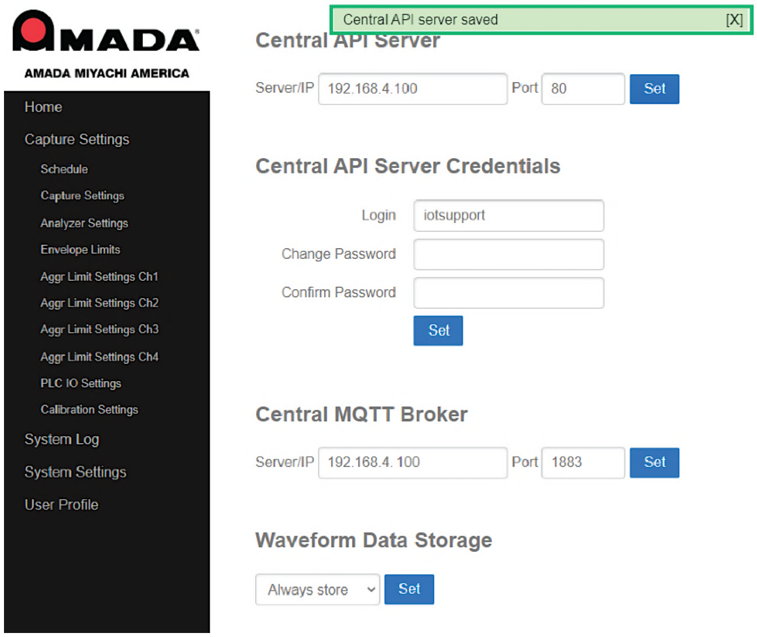
- The Monitor's IP address
- Your Central API Server IP address and port
- Your Central API Server credentials
- Your Central MQTT Broker IP address and port

Contact your AWT representative if you have any difficulties in configuring the Monitor.

1. Begin by entering the Monitor's IP address in your web browser.
2. A login dialog will appear. Login as administrator
    - Enter **admin** as the username and **admin1** as the password.



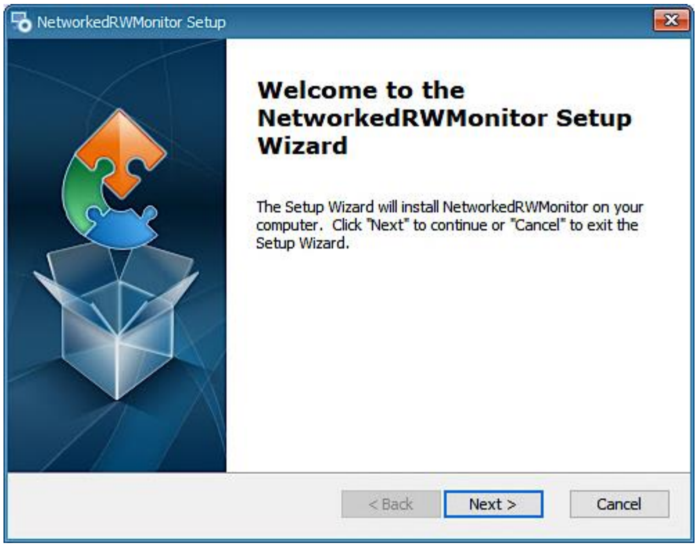
3. Click on System Settings in the sidebar and scroll down until you see the three central server settings: Central API Server, Central API Server Credentials and Central MQTT Broker.
4. Input the correct addresses and click Set for each of these three items.
5. A green/success or red/error status message will display.



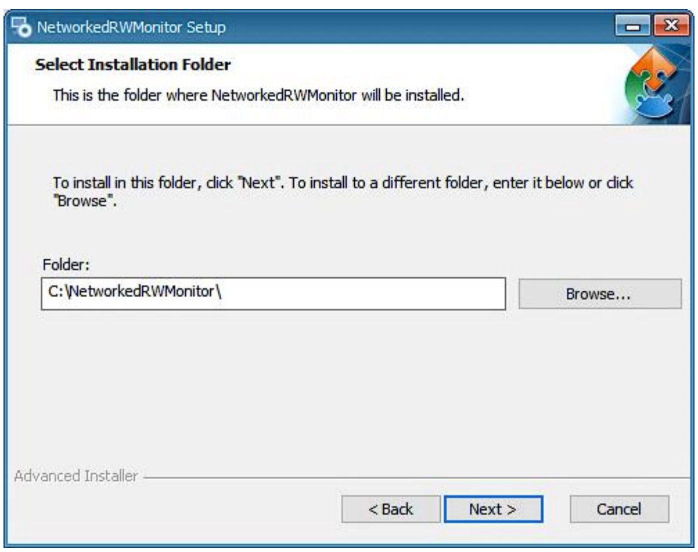
6. Power cycle the Monitor unit to allow the unit to start communications with the designated Central Server.

Upgrading the Central Server Software

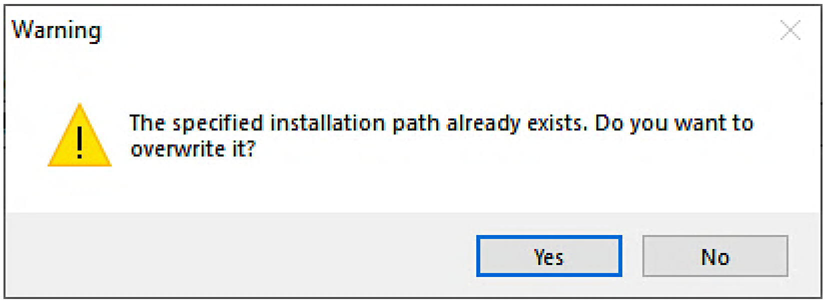
It may be necessary to upgrade the central server software from time to time. This can be done without running a complete build by launching **NetworkedRWMonitor_CDBServerPCUpgrade.exe**.



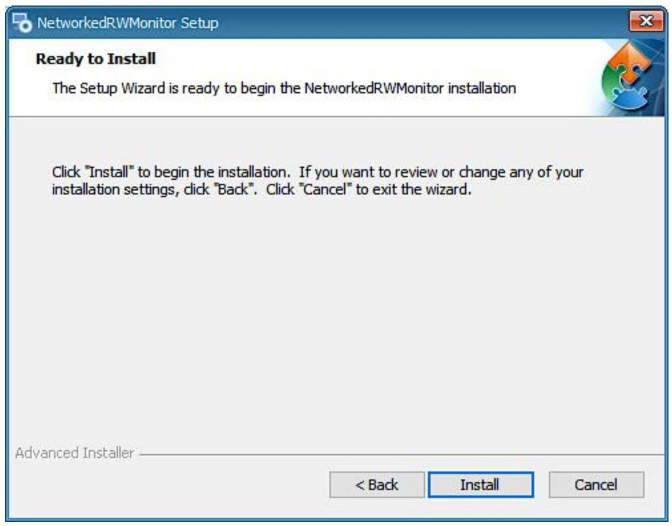
Click Next.



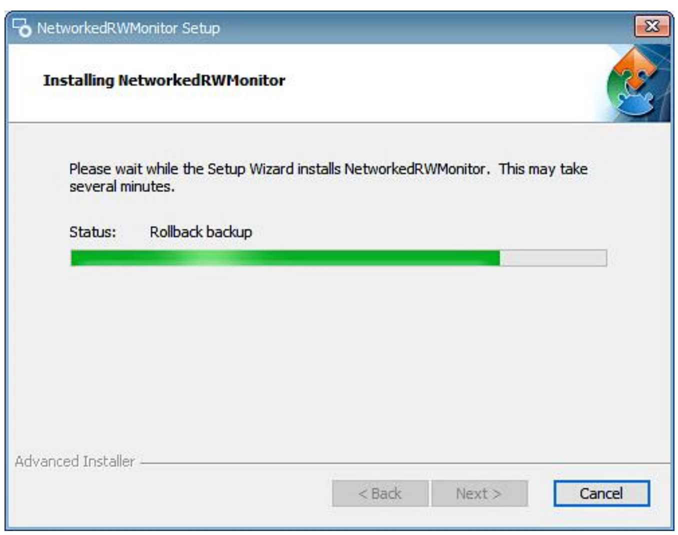
Click Next.



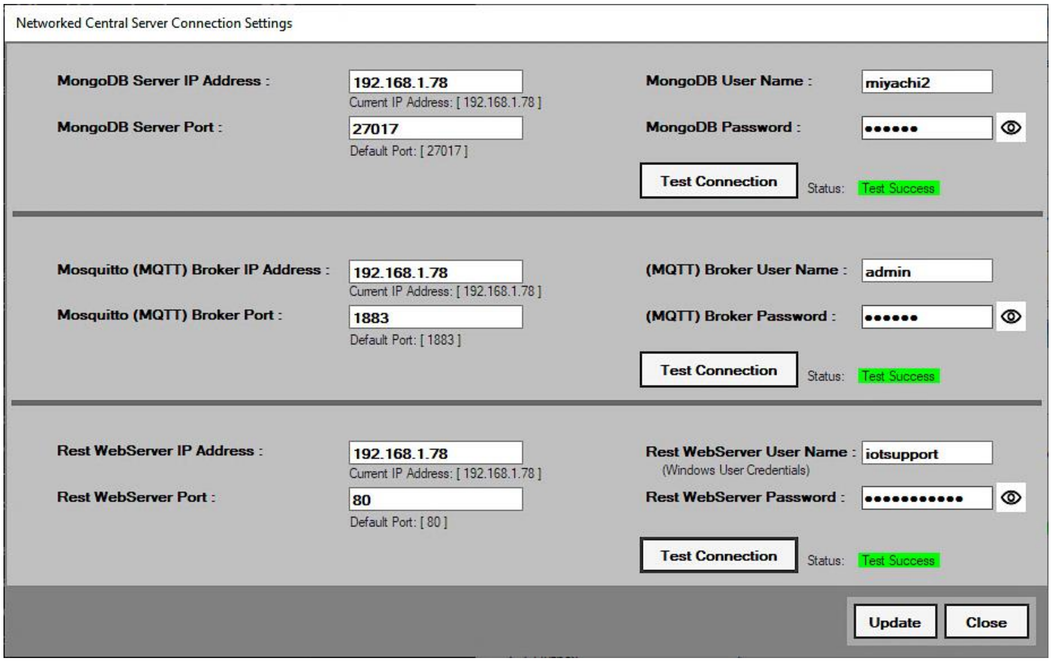
Click YES to overwrite and upgrade the previous installation.



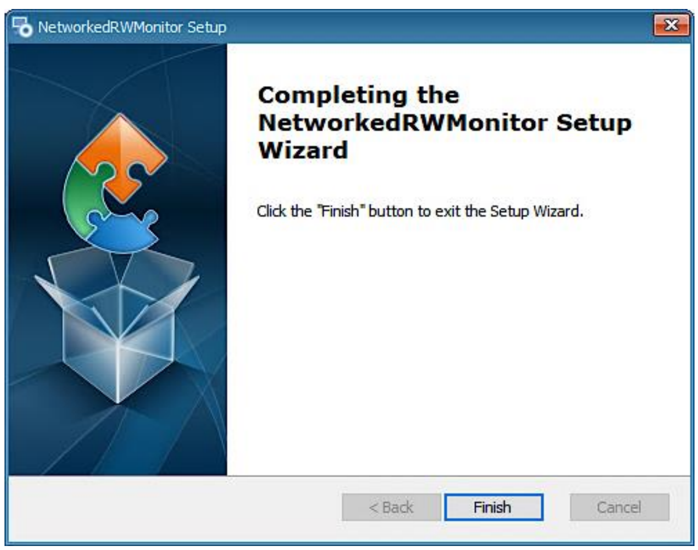
Click Install.



The Central Server Connection Settings verification window launches.



Click Update.



Click Finish.

Moving an NRWM Monitor to another Network or Server

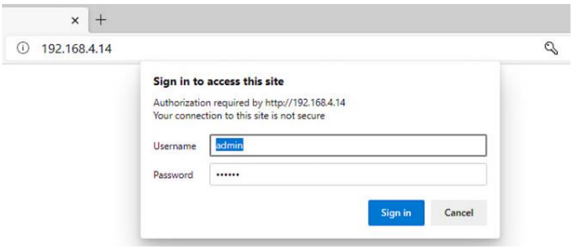
After an NRWM monitor has been setup on one network, it may be necessary to move it to another IP network, range or central server. This task can only be performed by the Administrator for the installed NRWM system.

Changing the IP network or range requires that the IP address for the monitor be changed for the Central API Server, Central MQTT Broker and the Ethernet Settings and for the MongoDB, MQTT, and Rest Webserver connections.

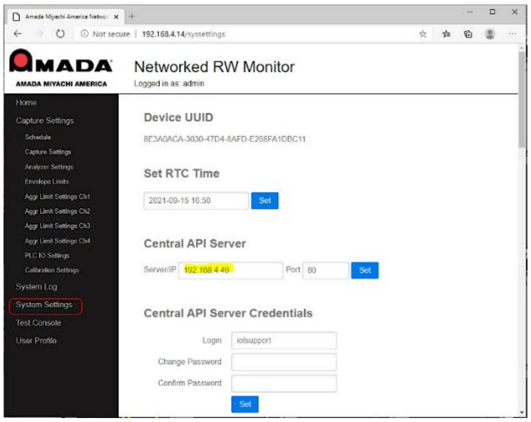
Changing the server to which the monitor is connected requires changing the server address when the network range is changed.

Change the IP network or range

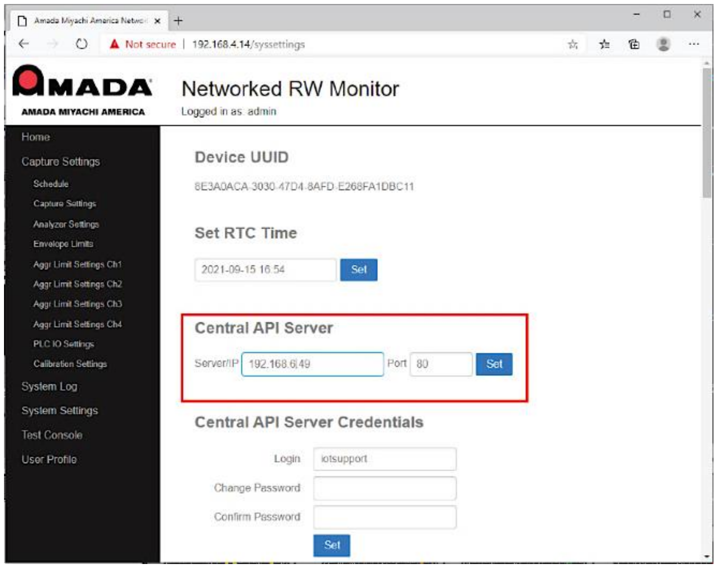
1. On a PC on the same network as the weld monitor, open a web browser and enter the weld monitor's IP address. You will be prompted to sign in to access the site using your administrator username and password. Enter **admin** as the username and **admin1** as the password.
2.



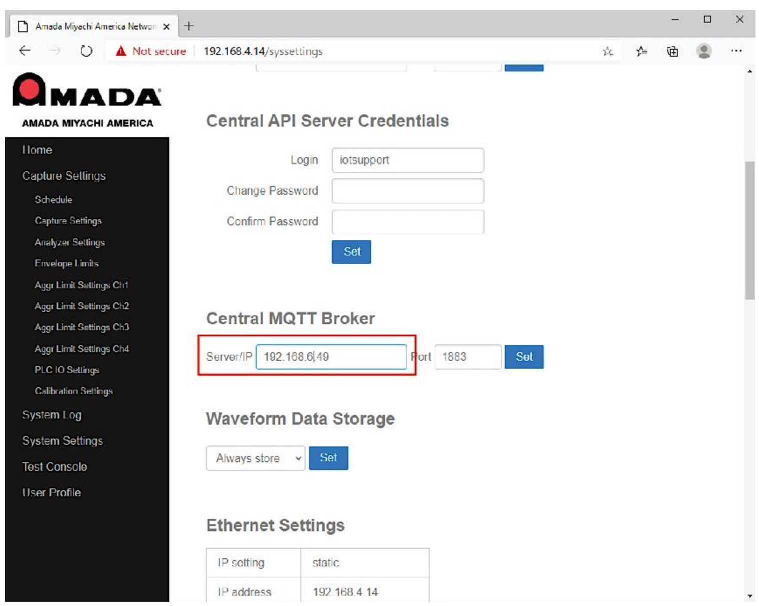
3. The device settings window displays. Select System Settings from the menu on the left side of the window.



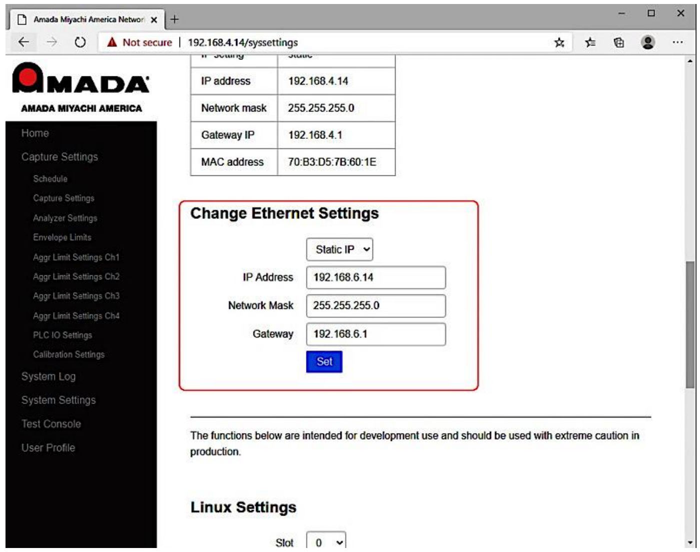
4. Enter in the new IP address for the Central API Server. If changing to a different server, update the server credentials as well. Click Set.



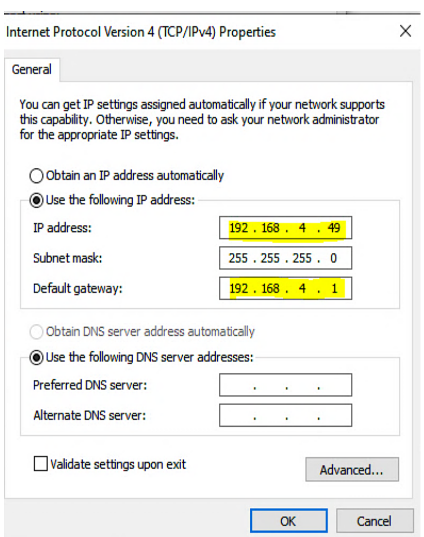
5. In the same window, scroll down to the Central MQTT Broker field and change the IP address there as well. Click Set.

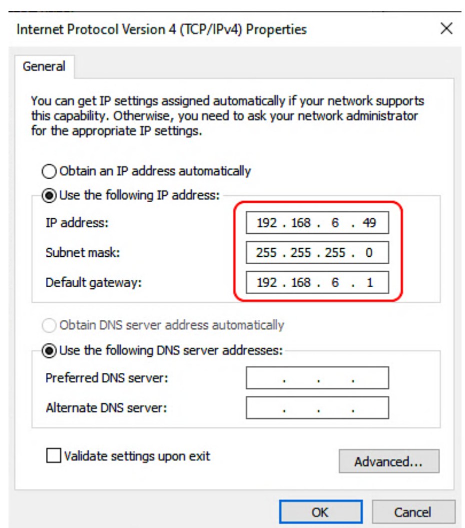


6. Scroll down to do the same in the Change Ethernet Settings field. Also change the Gateway (in this example, the Gateway was changed to 192.168.6.1). Click Set.

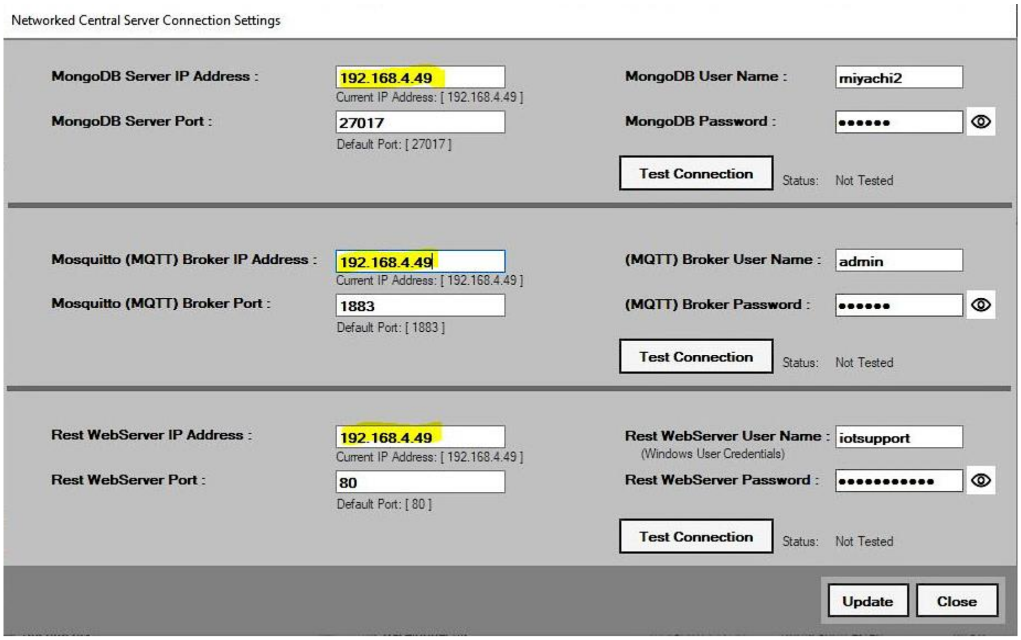


7. Navigate to the TCP-IP settings for the server PC and set the IP address in the same range as the new network. (In this example, the IP address would be changed from 192.168.**4.**49 to 192.168.**6.**49, and the Default gateway would be changed from 192.168.**4.**1 to 192.168.**6.**1.)

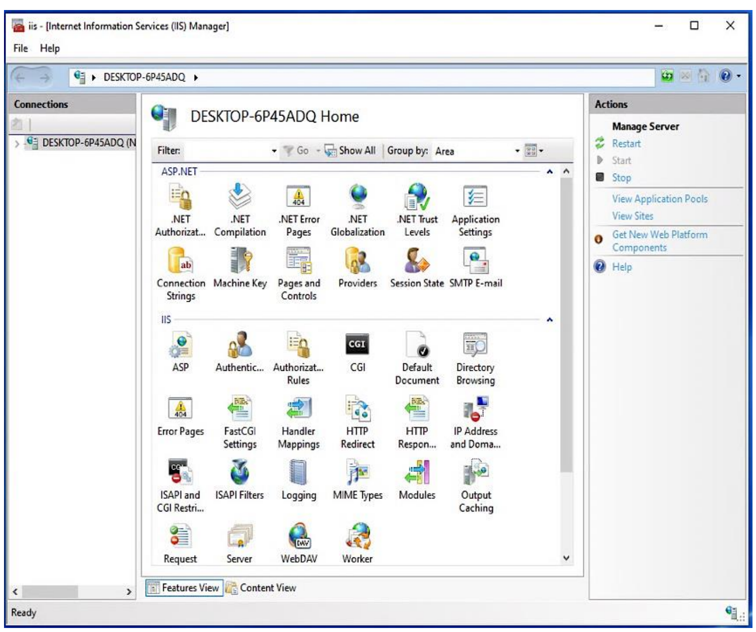




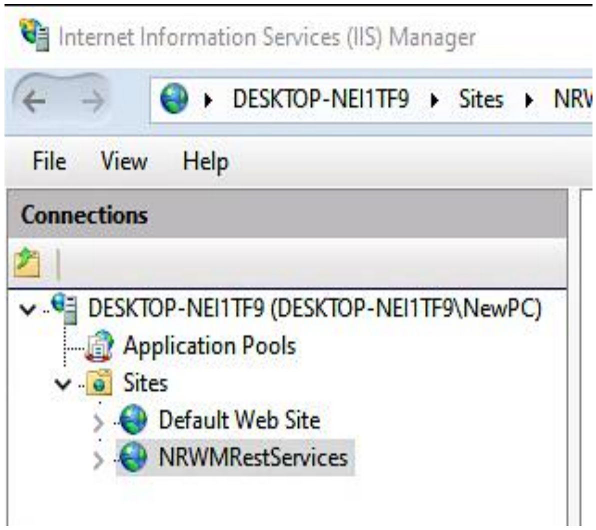
8. Run the c:\NeworkedRWMonitor\ClientSysConfigUpdater.exe to launch the Networked Central Server Connections Settings window.



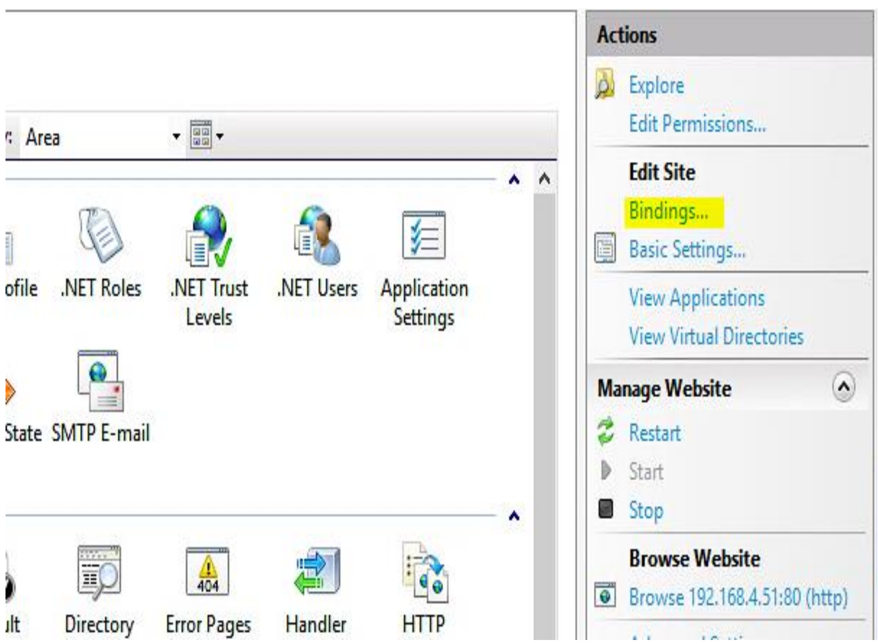
9. Re-assign the central server IP addresses for MongoDB, MQTT, and Rest Webserver. The usernames and passwords would remain the same – only the IP addresses are being changed.
10. Type “Internet Information Service” (IIS) in the Windows search bar on the server PC Go to the Windows search bar and type and press to launch the IIS window.



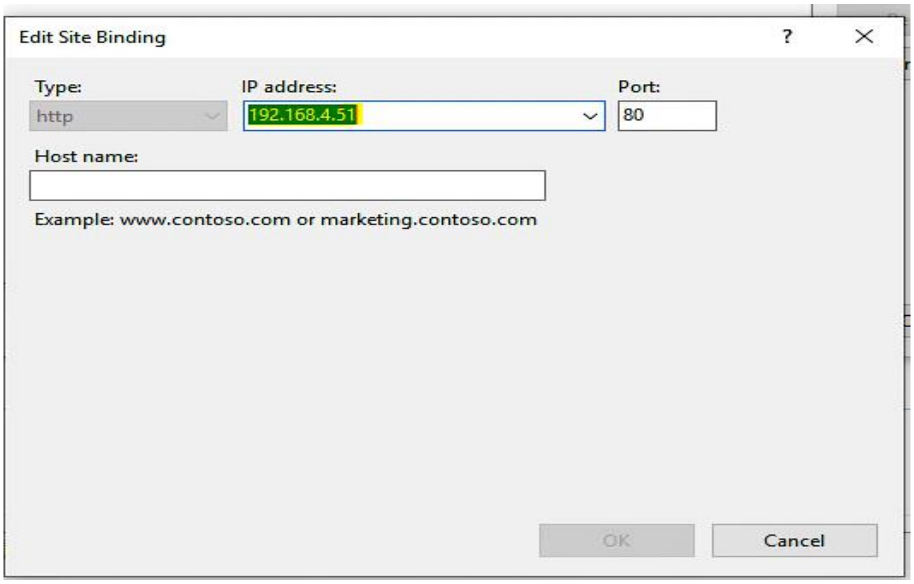
11. Expand the tree on the left hand side and select NRWMRestServices.



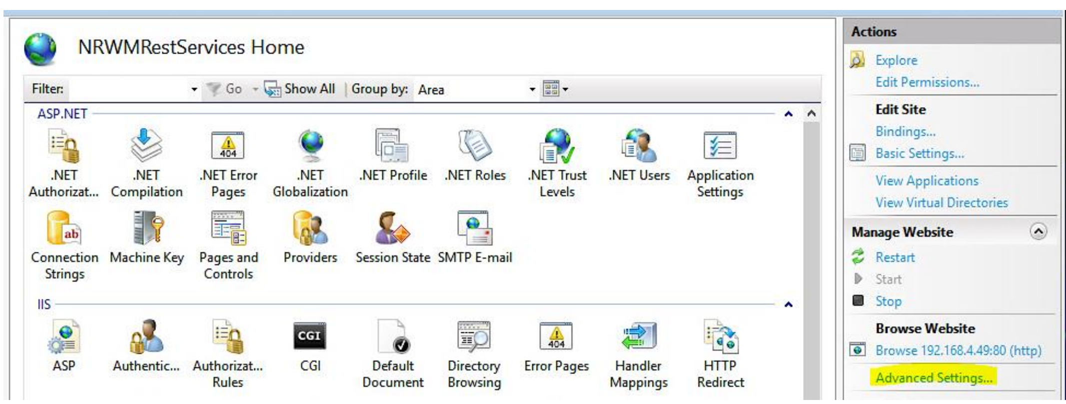
12. Click on Bindings under Edit Site in the Actions window.



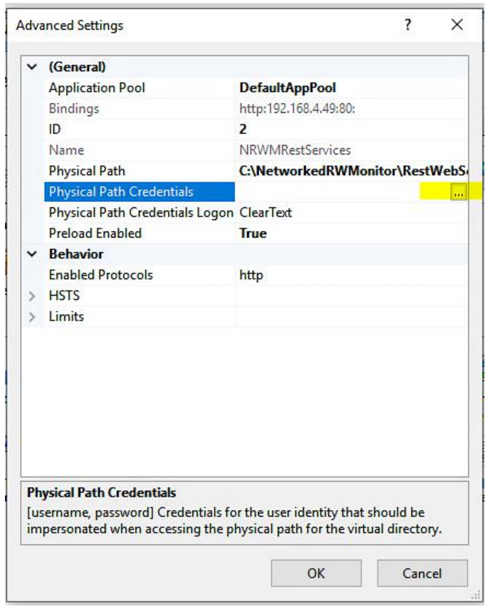
The Edit Site Binding window displays.



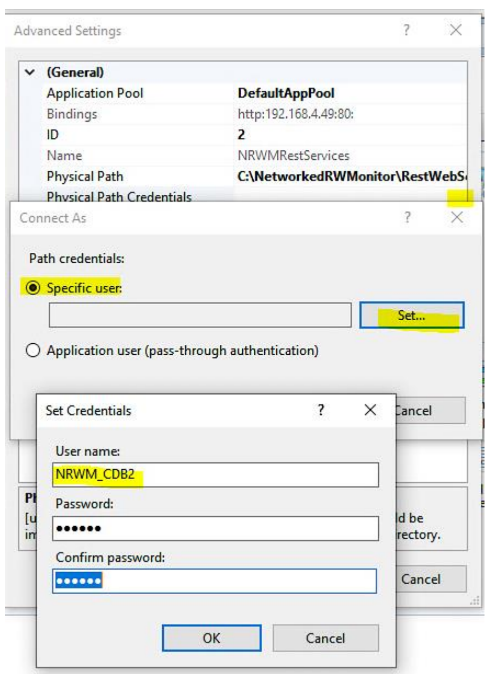
13. Enter the new IP address of the Server PC in the IP address field. Click OK.



14. Click on Advanced Settings under Browse Website in the Actions window. The Advanced Settings window displays.



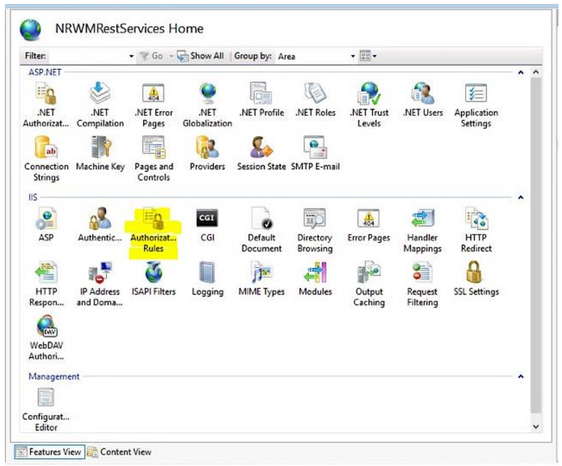
15. Click on the ellipsis to the right of Physical Path Credentials to set the name and password for a specific user. The Connect As window launches.



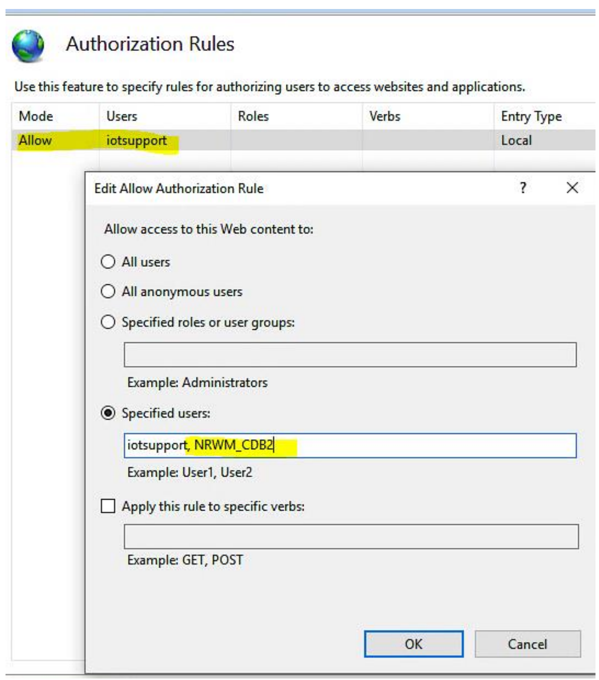
16. Select Specific user and click Set. The Set Credentials window launches.

Enter the login credentials of the server PC for the User Name and Password. This should be the same since it is the same central server.   Click OK.

17. Double click Authorization Rules in the NRWMRestServices Home window.



The Authorization Rules window launches.

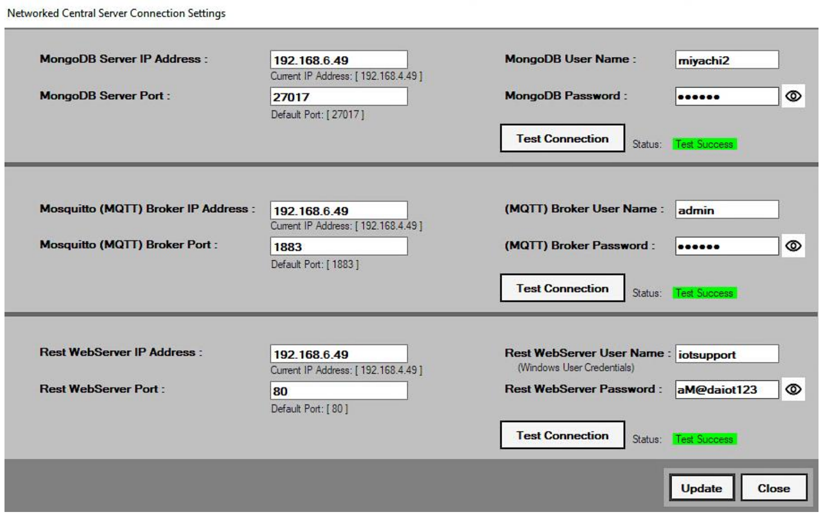


18. Select **iotsupport**, and click Edit. The Edit Allow Authorization Rules window launches.

Enter the name of the server PC *after* “iotsupport,” (including the comma) for the specified user.

Click OK. This should be the same since it is the same central server.

19. After the changes have been made to the IP addresses, click Test Connection for MongoDB, MQTT Broker, and Rest WebServer, as shown below, and verify that Test Success displays for each address.



20. If all three tests are successful, the change to the new network or range is complete.

Note: If all three tests report the Status as "IP – No response" it is possible that the network port on the Central Server PC was not connect to a monitor or active domain. See Connect Central Server PC Network Port for more information.

Change IP range and central server

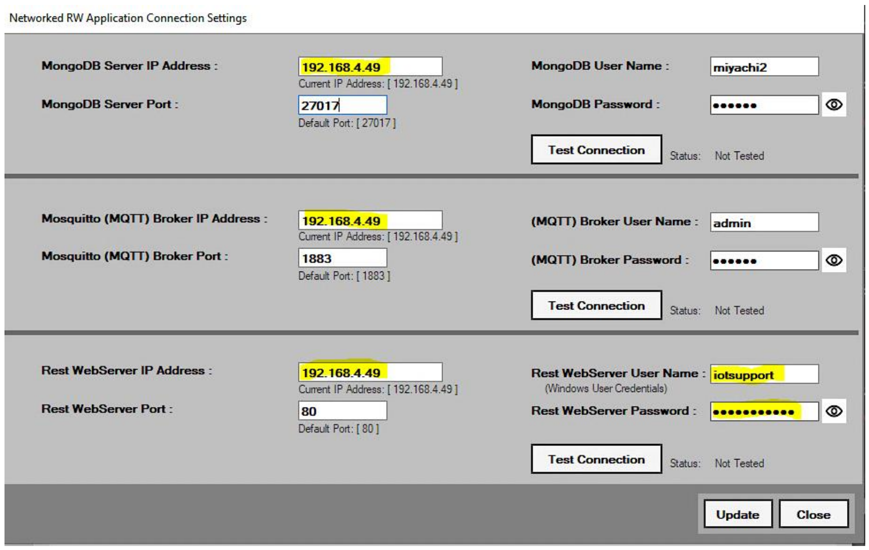
To move a monitor to a different IP range with a different central server, follow steps 1 through 5, listed above. There is no need to change anything on the server PC.

Change IP range on same server

To move a PC running WM-Inspect to another IP range on the same central server, repeat steps 1 through 19 listed above.

Change IP range for PC running WM-Inspect on a different central server

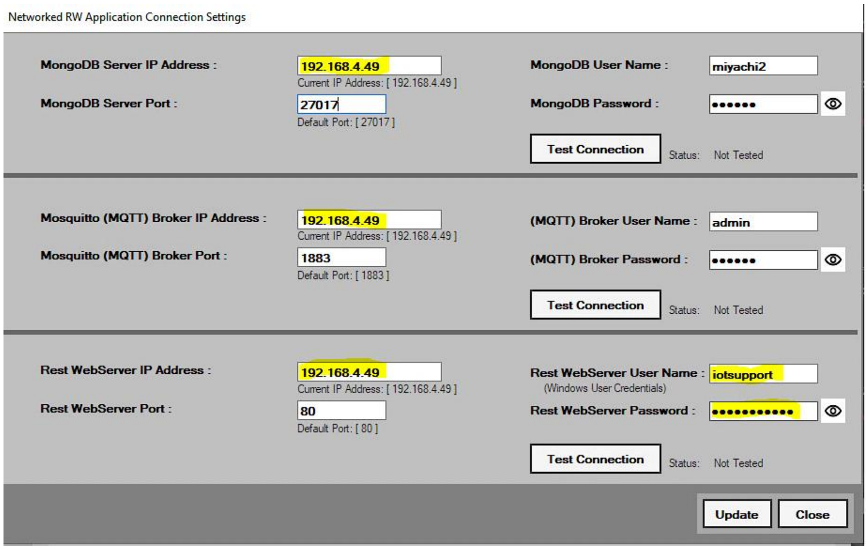
1. Run the program at C:\NetworkedRWMonitor\ClientSysConfigUpdater.exe and change the IP settings for the MongoDB Server, MQTT Broker, and Rest WebServer to the same IP as the central server.
    1. Changing the last two sets of numbers (.4 and .49 in the example below) would change the range and central server, respectively.
2. Change the Username and Password to the credentials for the new central server, and click update.



3. After the changes have been made to the IP addresses and the login credentials, click update. Restart the PC, then run the program again and click Test Connection for the MongoDB Server, MQTT Broker, and Rest WebServer; they should all show “Test Success.”

Changing central server for PC running WM-Inspect with the same IP range

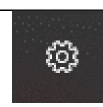
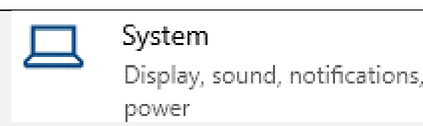
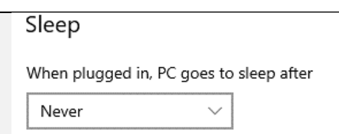
1. Run the program at C:\NetworkedRWMonitor\ClientSysConfigUpdater.exe and change the IP settings for the MongoDB Server, MQTT Broker, and Rest WebServer to the same IP as the central server.
    1. Changing the last set of numbers (.49 in the example below) changes the central server.
2. Change the Username and Password to the credentials for the new central server, and click Update.

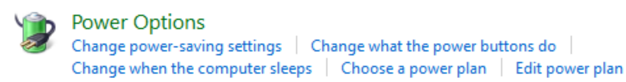
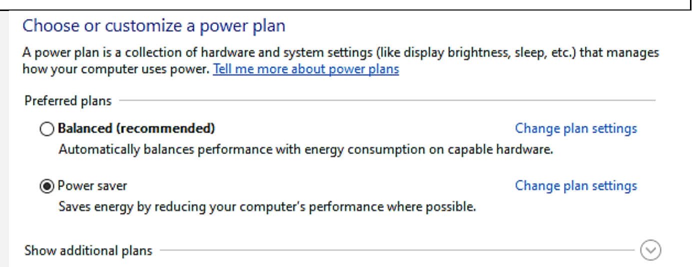
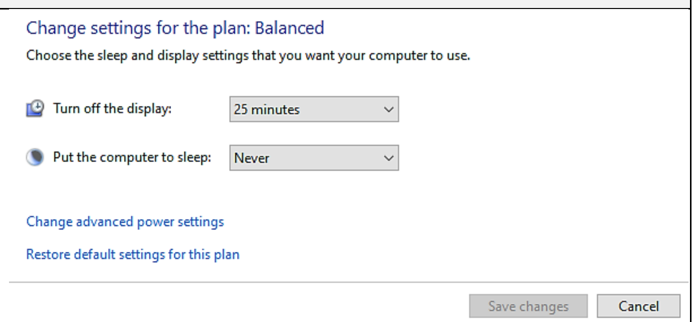


3. After the changes have been made to the IP addresses and the login credentials, click Update. Restart the PC, then run the program again and click Test Connection for the MongoDB Server, MQTT Broker, and Rest WebServer; they should all show "Test Success."

Disable Power Saving in Windows 10

For the system to operate properly, the power saving option must be disabled on the server PC and the PC running WM-Inspect. There are two ways to do this.

1. Open Settings	
2. Click on the System icon	
3. Select Power & Sleep option from the left side column	
4. Make changes to the sleep option- Select Never	

1. Launch the Control Panel App (you may need to search for it).	
2. Click on Hardware and Sound	
3. Under Power Options, choose Change when the computer sleeps	
4. Choose a Balance or Power Saver plan (Either will work) 5. Click on Change plan settings	
6. Select Never from the dropdown list for the option "Put the computer to sleep." 7. Click Save Changes.	

Disable power saving for other versions of Windows

In some versions of Windows, the hard drive may still turn off after a set period of time (20 minutes by default), even if sleep mode has been set to Never. Check Advanced Power Settings (under Change Power Saving Settings then Change Plan settings) to make sure that the hard drive is set to turn off at zero minutes or Never.

Basic Functions

Once all the connections described above have been made and the software has been installed, the system is ready to be powered up.

Note: Ensure that the server is running before powering up the monitor. Failure to do so may cause the system to fail to load a list of available welds.

Power Up

Use the power switch positioned just above the AC power cable on the back of the WM-200A to turn on the device. The Power indicator on the front of device should be blue.

Power Down

Leave the WM-200A running for ten seconds after an operations session before turning off the device.

Note: When cycling the power on the WM-200A please wait 5 seconds after turning the power off before the unit is turned back on.

Log in

Whether the user is an Administrator, Engineer or Operator, the next step after powering up the WM-200A is to launch WM-Inspect on a PC attached to the system. The login procedure is described below in Starting a Session.

The layout and functionality of the screen that displays on login depends on the user status and the screen being used.

Once the user has logged in, activity in the Status Bar, Weld Counter Window, or the Error Event List provide a quick indication that the system is connected and functioning.

Shutdown

To shut down WM-Inspect, select Exit from the File menu. This applies only to the software application and will not affect the Monitor itself.

Since the Monitor is a networked device, it is neither necessary nor advisable to shut down the device other than for maintenance or reconfiguration. Given the potential number of users connected to the device, we advise that there be a process for communicating to users when the device is about to go offline.

Updating Software and Firmware

From time to time, it may be necessary to upgrade any one of the WM-200A system's three software and firmware components, WM-Inspect, WM-Server, and WM-Firmware, to provide new or customized features. This can be done via remote access or using AWT-supplied installation files.

Upgrade via Remote Access

Upgrading via remote access is the best and simplest method for upgrading software. The software upgrade will be performed by key staff members of the product support team at AWT and additional training and operational recommendations can be provided at the same time.

To ensure security, we recommend remote connection of the device through Imprivata (https:/www.imprivata.com) Contact your AWT service representative for guidance on setting up a secure connection through Imprivata with AWT. The PC hosting the server is the only device that needs to be accessed and the user is in full control of the remote connection.

Upgrade using AWT-Supplied Files

If accessing the PC remotely is not possible, AWT can supply installation files for WM-Inspect and WM-server software. The customer can install the software updates in a manner similar to installing any other Windows software.

WM-Firmware is installed in the micro SD card inside the WM-200 monitor unit. If it needs to be upgraded, AWT can provide micro SD cards with the updated firmware. One card is required for each WM-200A monitor. Please consult the factory for instructions on how to replace SD cards.

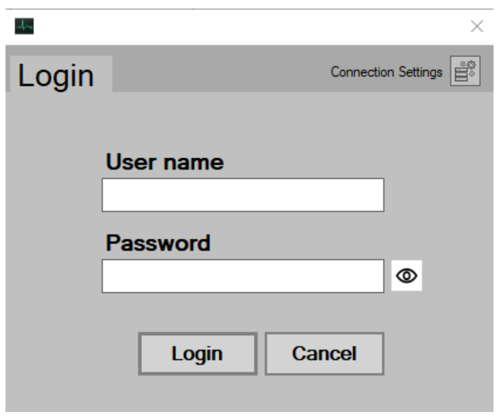
Chapter 3 OPERATIONS

Starting a Session

Launch the Software

- Click the Network RW Monitor Software button to launch the software.

- The Login screen displays.

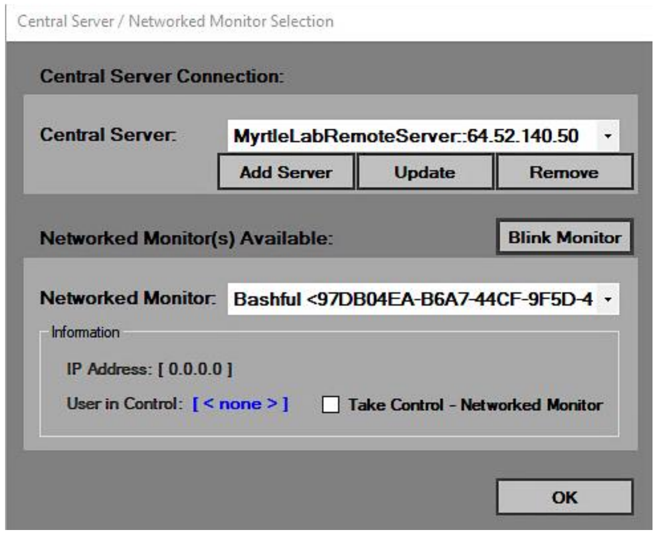


- Enter your username and password and click Login. (If you do not have a username, an administrator can provide you with one.) If you're an operator, the default Run or Monitor Screen displays. If you're an engineer or an administrator, the default Developer Screen displays.

Note: The fields and windows in the Screen Docker do not populate until a device and schedule have been selected.

Accept or Change the Server/Monitor configuration

WM-Inspect launches with the Central Server/Networked Monitor Selection window open, showing the server and networked monitor currently being accessed by the application. This will generally be the server and monitor last accessed by the user. The dropdown list of networked monitor shows only those monitors associated with the selected server.



If the server and monitor displayed are right for the monitoring session, click OK.

To change the configuration, use the two dropdown menus on the Central Server/Networked Monitor Selection window to select the appropriate server and networked monitor and click OK.

- **Add Server:** If the required server is not on the dropdown list, click to add a server.
    - Input the IP address and name for the server to be added.
    - Click Update.
- **Remove:** Click to remove a server.
    - Input the IP address and name for the server to be removed from the list of available servers.
    - Click Update.

- **Networked Monitor(s) Available:** Select a monitor device from the dropdown menu.
    - Click **Blink Monitor** to check the connection.

- When Blink Monitor is activated, the LCD background will flash a few times indicating that a connection has been made.

- **Take Control – Networked Monitor**
  - Allows the user to take control of the WM-200A monitor, allowing their operator name tagged to be tagged onto the weld data and with a SKU number. This in turn allows a user to search past welds by Operator in History.
  - The User in Control field indicates whether a user is currently in control of the monitor. When a user checks this box, their Username will display in this field.
  - When one user has taken control, no other user can tag the same weld data. However, other users could still make changes to schedules or other features in WM-Inspect.
  - Control is relinquished when the user in control unchecks this box or logs out of WM-Inspect.

- **Click OK**

The fields in the Screen Docker will populate and the monitor's IP address will display in the Central Server window. The monitoring session can begin.

The Starting message displays while data populates the Screen Docker.

You are now ready to begin working with WM- Inspect.

Note: The button in the upper right-hand corner of the Login screen launches the Networked RW Application Connection Settings screen. This screen allows the user to update and test the server connections, as needed. It is not necessary to access this screen at each login – only when the server connections need to be updated and/or tested.

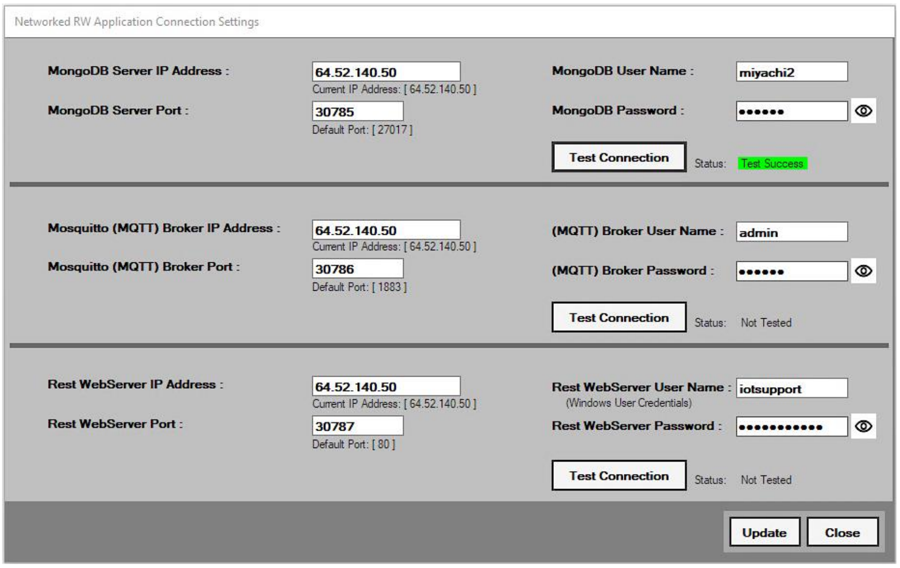


Figure 14: Networked RW Application Connection Settings

If the connection for a given IP address and port has not been tested, “Not Tested” will display in the lower right corner of the field. Click the Test Connection button to test that connection. If the connection is successful, “Test Success” will display, highlighted in green.

Make any updates, as needed, and click Update. Return to the Login screen and log in. The Central Server/Networked Monitor Selection window displays.

Navigating the WM-Inspect Interface

Menu Bar, Tool Bars, Status Bar

All screen layouts include a Menu Bar, a Tool Bar and a Status Bar, positioned above and below the Screen Docker.

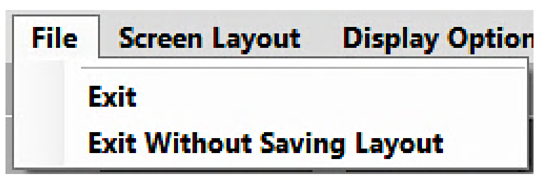
Menu Bar

Figure 15: WM-Inspect Menu Bar

The Menu Bar is a standard set of dropdown menus that provide access to the tools and windows needed to program, modify, run, or monitor weld schedules.

User access to these menus is determined by the user's role and what is being accessed or modified. This means that some tools may be non-functional (grayed out) for some users or in some use cases. The following list provides an overview of the functions available through the Menu Bar. .

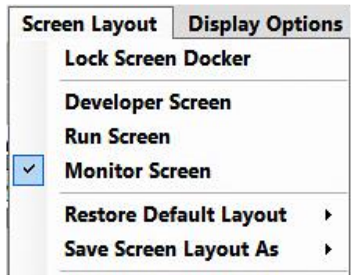
File Menu



- **Exit**: Click to exit the application.
- **Exit Without Saving Layout**: Click to exit the program without saving changes made to the layout.

Screen Layout Menu

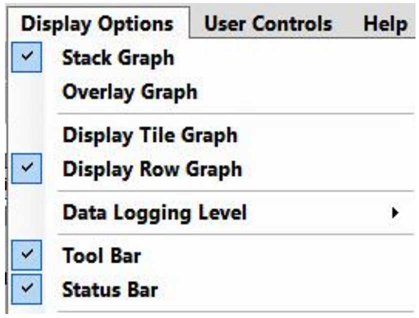
The Screen Layout menu allows the user to choose between the three configurations of the Screen Docker, select the default version of a given configuration, or create a customized version of that configuration. The currently selected option is checked in blue.



- **Lock Screen Docker:** Locks the Screen Docker in its current layout. Windows cannot be moved or unpinned when this option is selected, but the user can select between overlapping windows or close a window.
- **Developer Screen - Run Screen - Monitor Screen:** Allows the user to choose a screen layout, depending on their user level.
- **Restore Default Layout:** Allows the user to revert to the default layout for the current screen. Use the sub-menu to select a default screen.
- **Save Screen Layout As:** Allows the user to save a modified version of a screen as the new version of the Developer, Run or Monitor Screen.
    - A modified screen must be saved as the same type of screen as the original. An error message displays if the user attempts to save one type of screen as another (e.g., save a modified Run screen as a Developer screen).

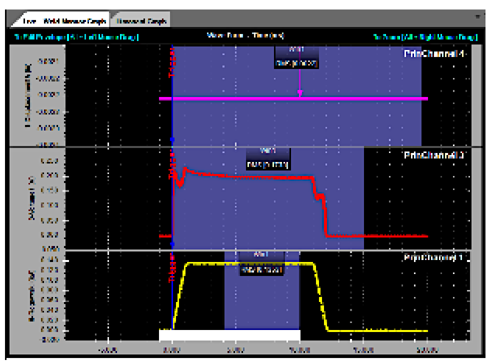
Display Options Menu

The Display Options menu allows the user to select the way graphed data and data lists appear in the Screen Docker and determine essential aspects of how that data is represented. It works in conjunction with the Screen Layout menu to determine the basic screen layout, including the Screen Docker, Tool Bar and Status Bar.

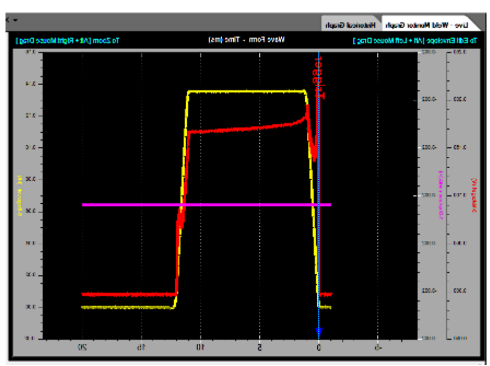


Stack Graph/Overlay Graph

This pair of options applies to the Live – Weld Monitor Graph. They allow the user to choose between displaying the graphs from all channels as a column of different graphs stacked together and displaying them all on one graph. These options are only available in the Developer and Monitor screens.



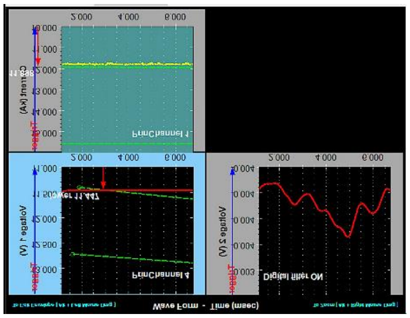
Stacked Graph



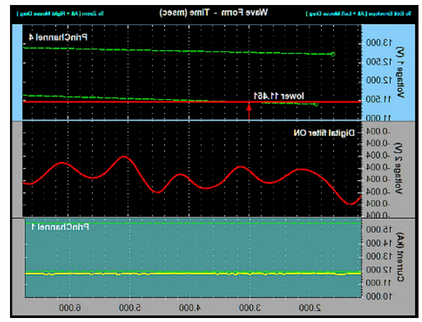
Overlay Graph

Display Tile Graph/Display Row Graph

This pair of options applies to the Live – Weld Monitor Graph. They allow the user to choose between displaying graphs in a column the width of the window or in a row which tiles across and down the window. These options are only available in Developer and Monitor mode.



Tile Graph



Row Graph

Data Logging Level

Allows the user to determine the type(s) of data to be logged. Data Logging Errors are caused by limit violations, aggregate limit violations, and displacement violations. Go to the sub-menu to select the type of data to be logged – Log All Details, Log Warnings and Errors, or Log Errors only. This option is available in all user modes.

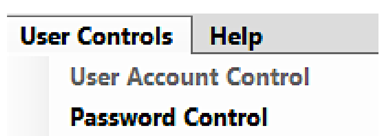
Data log files are stored in the directory **– c:\NetworkedRWMonitor\Log\folder**.

Tool Bar/Status Bar

This pair of options allows the user to choose between showing and hiding the Tool Bar and/or Status Bar.

User Controls

This menu allows an Administrator to add a new user and allows the user to change their password.



User Account Control

Displays the User Account Control window where an administrator can add or remove a user. (See Add/Remove a User below for more information.)

Password Control

Displays the Password Control window where a user can change their password.

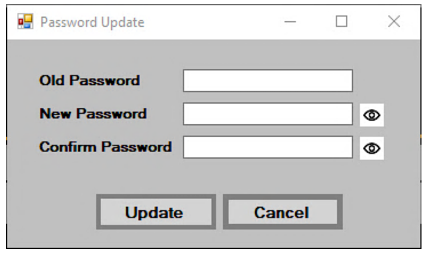
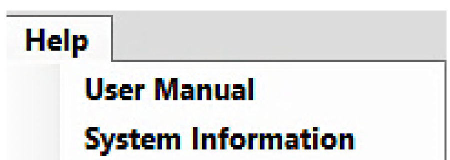


Figure 16: Password control window

- Enter the old password.
- Enter the new password.
- Re-enter the new password.

Help

This menu includes a User Manual link which allows the user to open a digital version of this manual through a variety of applications, and a System Information link which displays current system information for the WM-Inspect application and the Central Server Service.



Tool Bars

The three screens reflect three use modes -- running, monitoring, or developing a weld monitoring schedule.

Accordingly, each of the three types of screens include a Tool Bar that provides the user with quick access to important windows and layouts appropriate to that screen.

Use these links to reopen any closed window.

Run Mode Tool Bar

Monitor Mode Tool Bar

Developer Mode Tool Bar

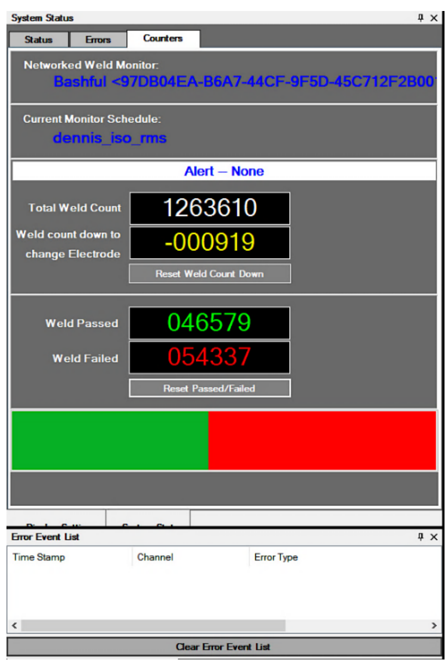
Four basic tools, **Server**, **Status**, **Job** and **Aggregation,** are available on all three types of screen.

Server Tool

The Server tool surfaces the Central Server/Network Monitor Selection window, described above.

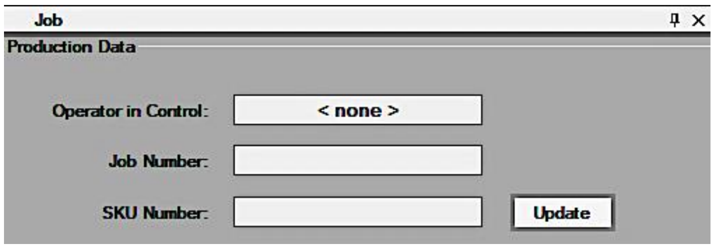
Status Tool

The Status tool surfaces three window tabs – Status, Errors and Counters – providing a quick overview of the current status of the weld system being monitored – weld count, pass/fail count, error count, system connections, etc.



Job Tool

The Job Tool surfaces the Production Data window, showing Operator, Job Number and SKU Number.



Aggregation Tool

The Aggregation tool surfaces the Aggregation Data Graph and Aggregation Data Window in the Developer and Run screens, and the Aggregation Data Window in the Monitor screen.

Selected Monitor

The Selected Monitor tool is found in both Run Mode and Monitor Mode and allows the use to select a monitor from the list of available monitors on the dropdown menu.

Display Tool

The Display tool appears on Monitor and Developer screens. It surfaces the Live – Weld Monitor Graph and the Display Settings window in the Developer and Monitor screens.

Other Tools

The remaining Tools (Monitor, Schedule, Trigger, etc.) are only available on the Developer Screen. See Developer Screen, below for more information.

Status Bar

The Status Bar provides real time updates on the most recent weld and basic information about the user's role and the active layout. The Status Bar appears in all user modes.

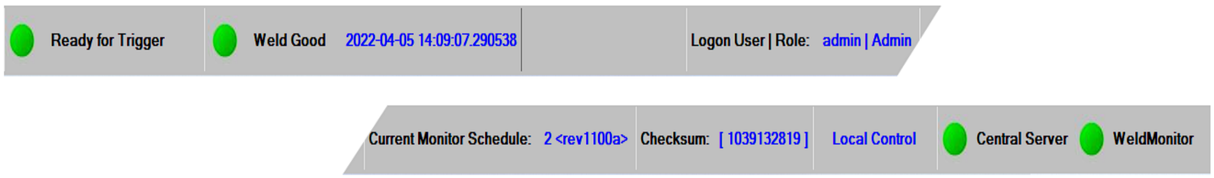
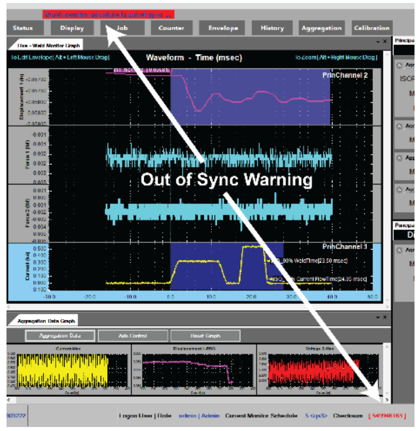


Figure 17: WM-Inspect Status Bar

The Status Bar displays the following information:

- **Ready for Trigger/Busy/Not Ready**
    - **Ready for Trigger/Green Dot**: Indicates the system is ready for a trigger before or after a weld is complete.
    - **Busy/Yellow Dot**: Displays while the system processes weld data after a weld.
    - **Not Ready/Gray Dot**: The system is either off or the trigger was set for a single trigger.
- **Weld [No] Good:** Green if the most recent weld was good; red if it failed. Also indicates the date and time of the weld.
- **Logon User | Role:** Shows the ID and status of the user currently logged on.
- **Current Monitor Schedule:** Shows the ID of the weld schedule currently running.
- **Checksum:** The schedule checksum allows the user to verify that the schedule is in sync with the server and the weld monitor. It appears in three places, here in the Status Bar, under the current schedule in the Schedule Window header, and on the LCD Information Screen.
    - All three checksum numbers must match for everything to be in sync. If the numbers do not match, they will usually do so on the next weld. If the numbers do not match on the next weld, AWT recommends that the user updates the schedule so that they do match.
    - If the NRWM devise reports back the current selected schedule with a checksum that is different than the central server schedule checksum, the message "Weld monitor schedule is out of sync" appears at the top of the screen and in the Status Bar.



18 - Out of Sync Warnings

- If the NRWM devise reports back the current selected schedule with a checksum that is different than the central server schedule checksum, the message “Weld monitor schedule is out of sync” appears at the top of the screen and in the Status Bar.
- Update the current schedule. The Out of Sync message will close and the checksum value will display in blue in the Status Bar.
-

- **PLC in Control/Local Control:** Indicates whether the monitor is being controlled with a PLC or through the network.
- Central Server: Green if WM-200A Central Server services are active or online, and red if one of the WM-200A Central Server services is offline.
- **Weld Monitor:** Green if the Monitor is attached through the network, red if it is not.

Screen Dockers

The Screen Docker for each type of user layout contains the primary windows and tools for that layout. This section describes those elements all three types of layout have in common.

Overview of Screen Docker Windows

Depending on the type of user and the use mode, the default Screen Docker is divided into three or four sections, each of which includes one or more windows or tools focused on a specific type of data, input or configuration. These are:

- **Live-Weld Graph Window:** Graphs the most recent weld in real time.

- **Aggregation Data Window**: Displays constantly updated aggregation data for the most recent weld.
- **Aggregation Data Graph**: Graphs select aggregation data over time.
- **Monitor / System Status / Display Settings Window:** This set of windows provides the user with the tools appropriate to the current use mode.

Live – Weld Monitor Graph Window

The Live – Weld Monitor Graph charts values over time for selected channels for each trigger event. A trigger event can be the start of current, a voltage, a displacement or force signal, or an external trigger from a PLC or a PC running this program**.** The Live – Weld Monitor Graph window appears on the Developer Screen and the Monitor Screen.

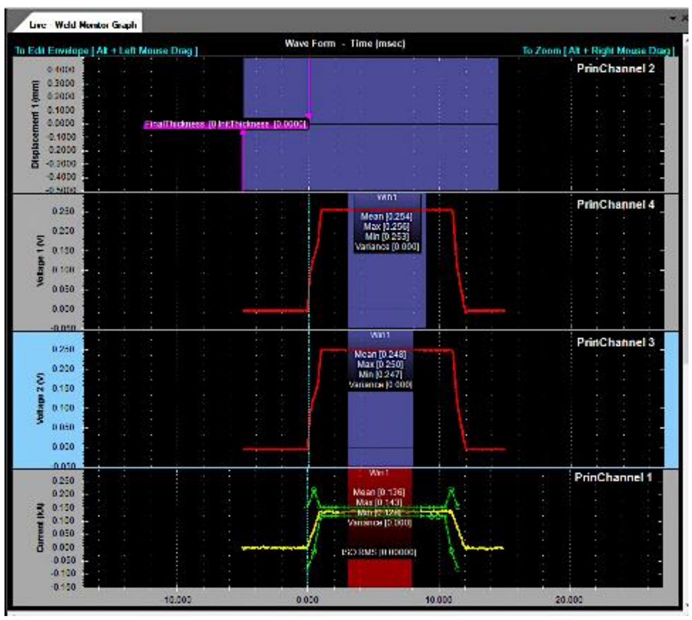


Figure 19: Live - Weld Monitor Graph (showing input from four principal channels)

Live – Weld Graph on the Developer Screen

As part of developing a weld monitor schedule, an engineer will determine which channels will be displayed in the Live – Weld Monitor Graph, which channels are the principal channels, and how input from those channels is graphed.

Live – Weld Graph on the Monitor Screen

When monitoring a weld schedule, an operator can change which channels are displayed in the Live – Weld Monitor Graph and certain aspects of how input from those channels is displayed. They cannot change the principal channels.

See Developer Screen and Monitor Screen below, for more information.

Aggregation Data Window

In creating a weld schedule, an engineer will designate up to four principal channels. The system will calculate five aggregation data values for each principal channel for each weld - RMS, Mean, Minimum, Maximum, and Standard Deviation - for a specified window of time.

The Aggregate Status Windows continuously update the aggregate values for the principle channels.

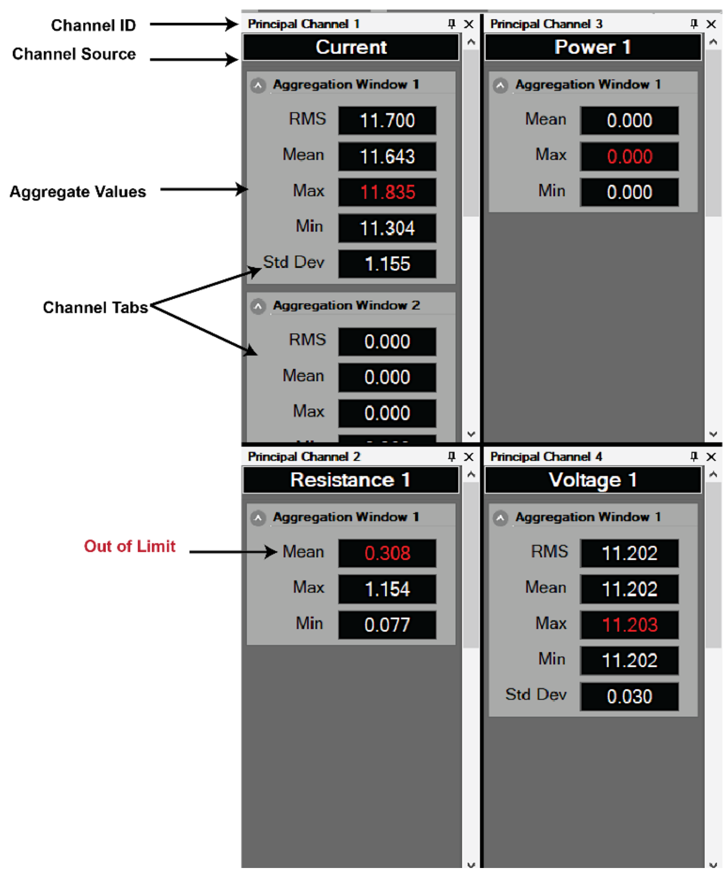


Figure 20: Aggregation Data Status Window

Channel ID: Shows the number of the principal channel.

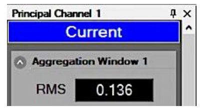
Channel Source: Shows the type of data being recorded by that channel.

Aggregate Values: Shows the aggregate values for the most recent weld.

> **Note:** Values within limits display in green; out of limit values display in red.

Channel Tabs: Allow the user to display or hide each of the (up to) four time windows assigned to the principal channels (in Developer and Monitor modes, but not in Run Mode.)

The name of the channel source is highlighted in blue when the graph for that channel is selected in the Live – Weld Graph window.



In Run Mode, the Aggregation Data Window shows Aggregation Window 1 for each of the four principal channels. (Note: Std Dev and RMS aggregate values do not display for resistance or power since they are not supported in this mode for those channels.)

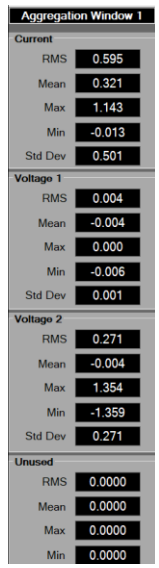


Figure 21: Aggregation Data Window, Run Mode

In Monitor and Developer Mode, the Aggregation Data Window includes a separate window for each channel. In either of these two modes, an engineer can designate up to four windows for each principal channel, displaying data for each channel over different periods of time (designated as Window 1, Window 2, etc.).

Figure 22: Aggregation Data Window in Developer or Monitor Mode

Aggregation Data Graph

The Aggregation Data Graph window, found in Developer and Run modes, graphs values for selected aggregation data over time. In Developer mode, an engineer can set upper or lower limits for each type of data in the Limits and Windows tab. (See Limits and Windows Tab.)

Notes:

- Limit lines in the Aggregation Data Graph only pertain to Aggregate Window 1 for each channel.
- The Aggregation Data Graph is the central window in Run Mode and defaults to fill the Screen Docker from top to bottom whereas in Developer Mode, it defaults to a smaller row of graphs at the bottom of the Screen Docker if the Live-Weld graph is present.

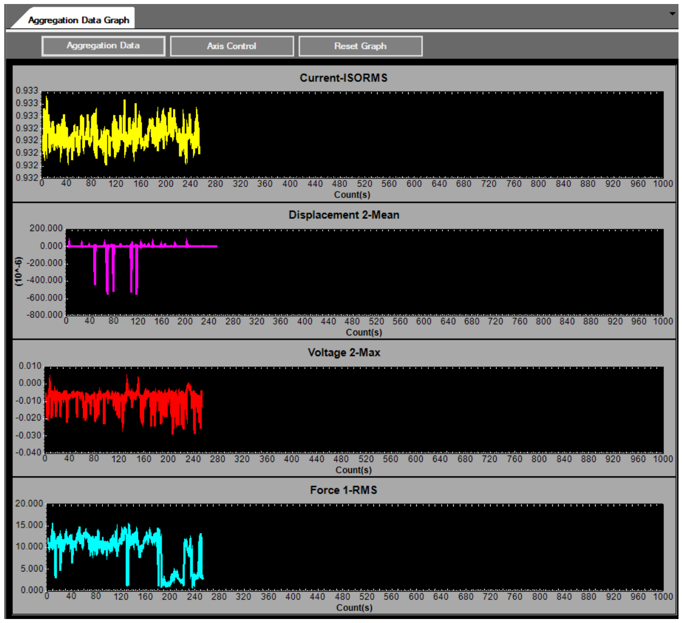


Figure 23: Aggregation Data Graph Window in Run Mode

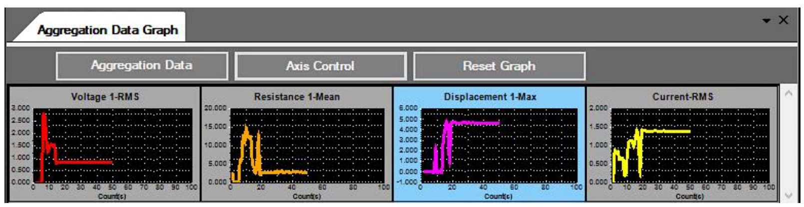


Figure 24: Aggregation Data Graph in Developer Mode

Configuring the Aggregation Data Graph

The Aggregate Data Graph includes three buttons, Aggregate Data Selection, Axis Control, and Reset Graph, which allow the user to quickly change the aggregate data source being monitored, the scale at which that data is represented or to reset the graph after settings have been changed.

Aggregation Data

The Aggregation Data tool allows the user to select which of the four principal channels will be graphed and which value (RMS, Mean, Min(imum), Max(imum), or Standard Deviation (StdDev)) will be graphed in the Aggregate Data Graph.

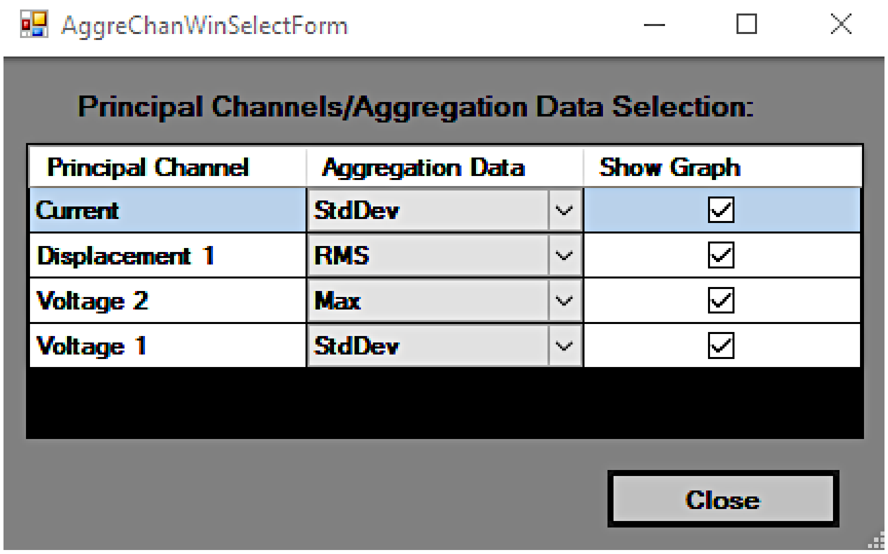
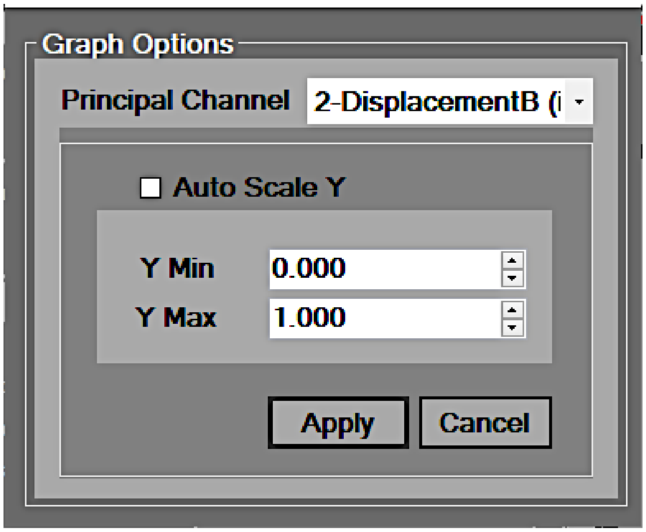


Figure 25: Aggregation Data Graph Selection Tool

- Click on the Aggregation Data Tool
- Use the dropdown menu in the Aggregation Data column for each channel to select the data to be graphed.
- Check the box in the Show Graph column to select the channel(s) to be graphed.
- Click Close. The graph window updates immediately and the channel title updates to show the type of aggregation data being monitored.

Axis Control

The Axis Control function allows the user to set the scope of the Y axis for each of the channels displayed in the Aggregate Data Graph. (The X axis is time.) You can also choose to have the Y axis scale automatically by checking the Auto Scale Y box.



- Click on Axis Control
- Select a channel from the Principal Channel dropdown menu.
- Set the minimum and maximum values for the selected channel or choose Auto Scale.
- Click Apply.
- The window updates immediately.

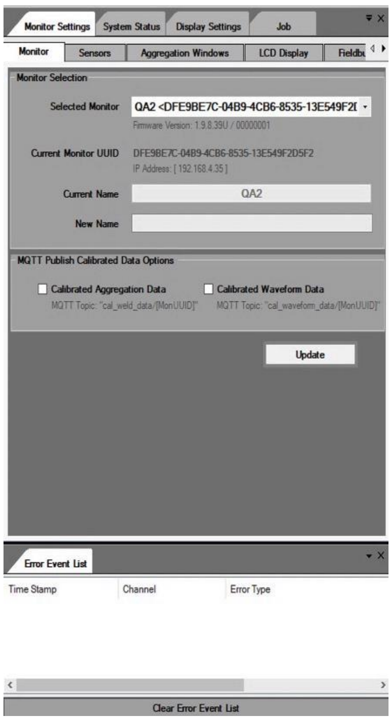
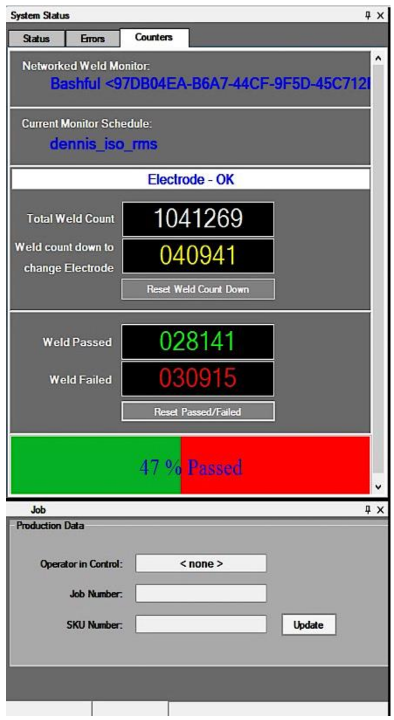
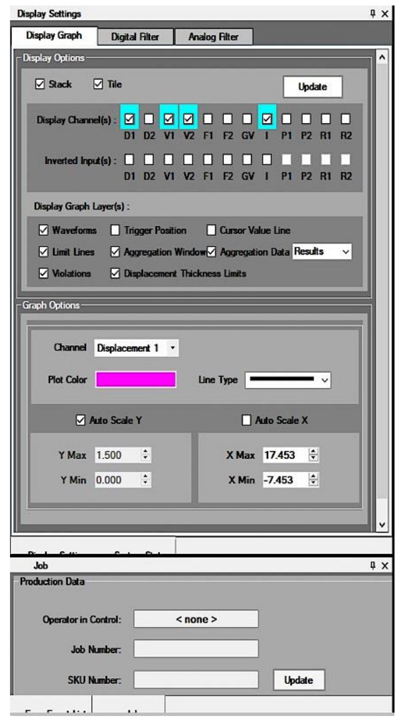
Reset Graph

Use the Reset Graph button after changes to critical schedule settings (e.g., sample rate, aggregation window lengths, limits, etc.) before generating new data.

Monitor / System Status / Display Settings Window

The default configuration for each of the three screen layouts (Developer, Monitor, and Run) includes a left-side column of windows which is optimized differently for each layout. This column serves as a control panel, allowing the user to bring up specific information or tools as needed.

Some windows are common to all three screens. Many are found only on the Developer Screen.

Developer Screen	Run Screen	Monitor Screen
		

These windows are described in more detail in the descriptions of the three use modes below.

Navigating the Screen Docker

The Screen Docker is divided into windows, some of which include multiple windows that have similar types of data or information and each of which can be moved, resized, hidden or closed.

Within the scope of each user role, a user can customize the arrangement; layout and size of the windows in the Screen Docker; the type of data displayed and the manner in which that data displays. The user can save a customized configuration in Developer, Run or Monitor modes, or revert to a default layout for each mode at any time.

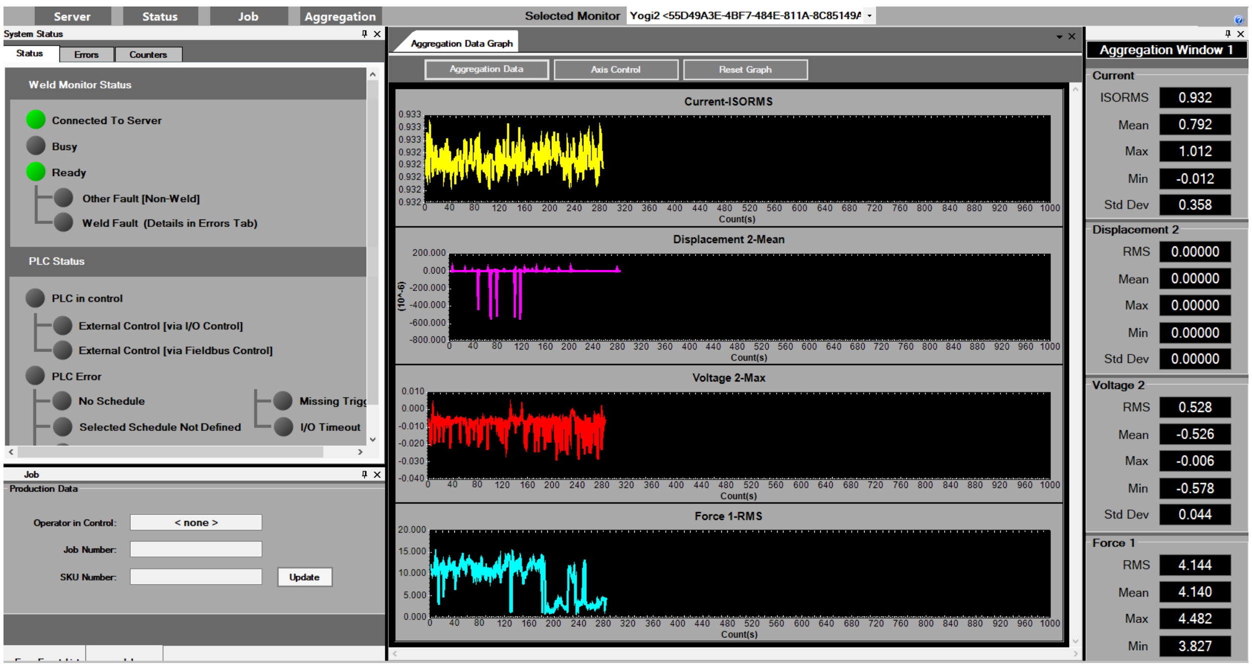


Figure 26: Run Screen Docker

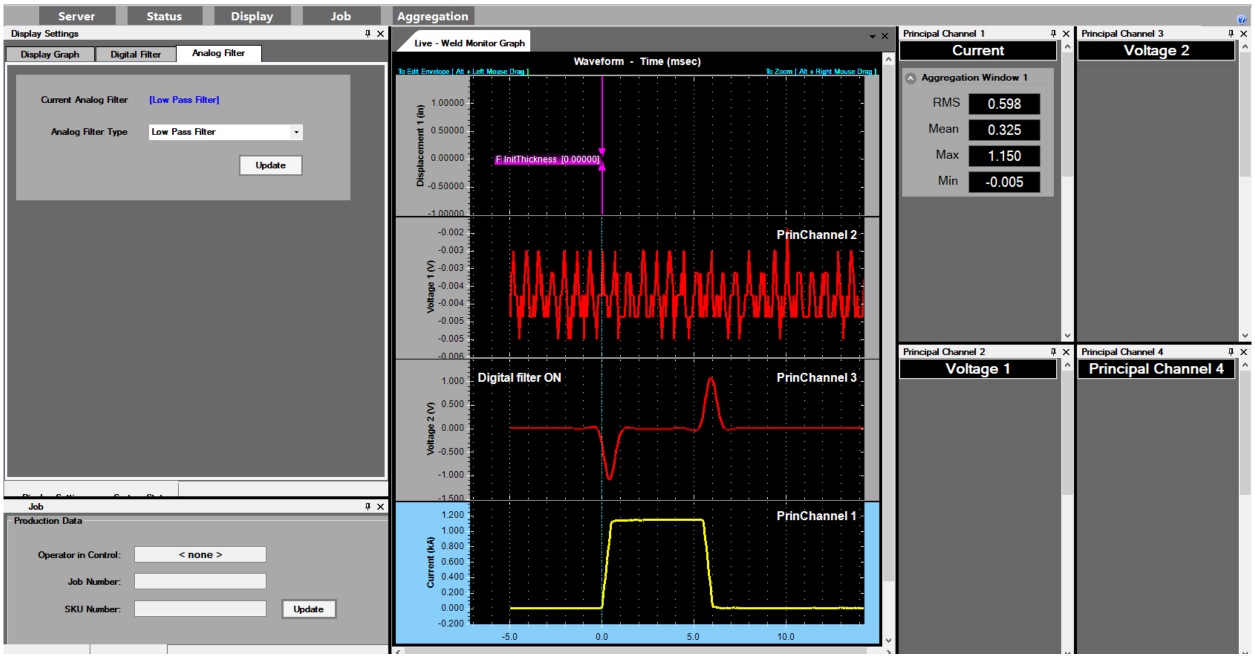


Figure 27: Monitor Screen Docker

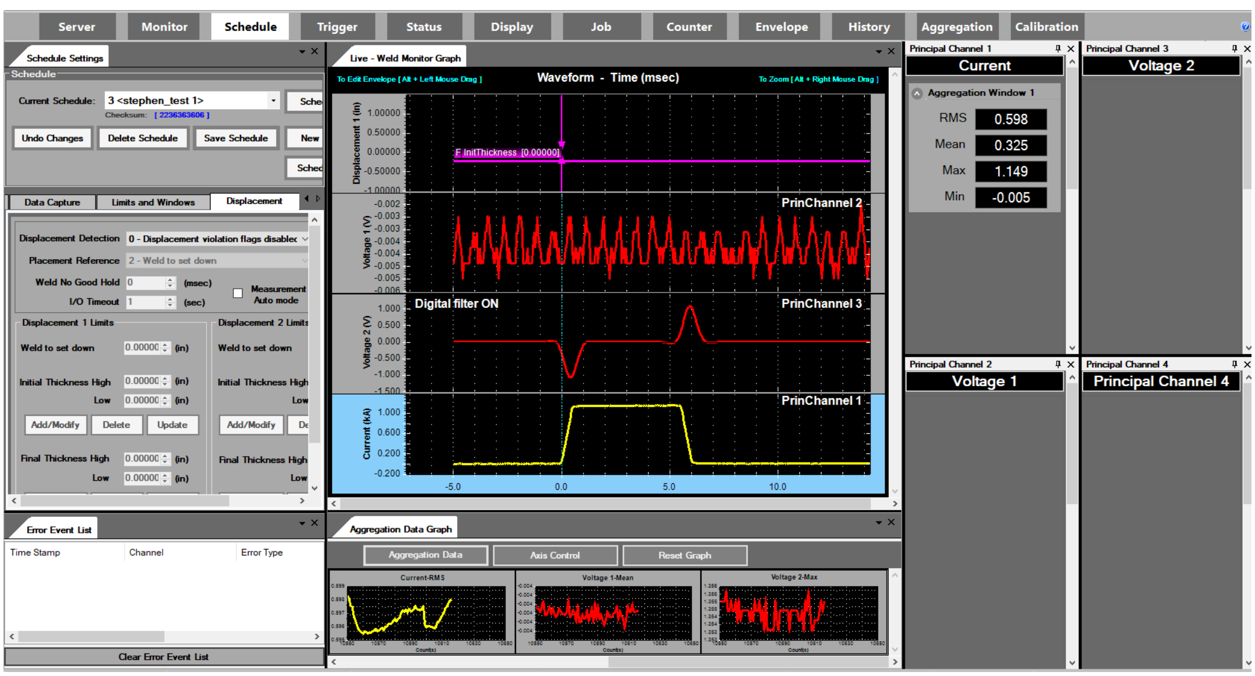


Figure 28: Developer Screen Docker

Window Stack Icons

Icons in the upper right hand corner of each window stack allow the user to rearrange the windows in the stack, change the active window, or close a window. These icons are dynamic and change according to the number and type of windows accessible to each user.

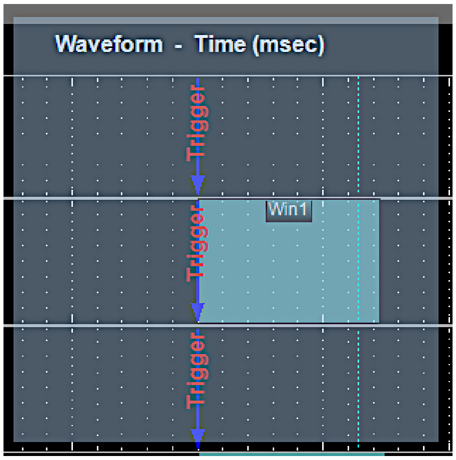
There are four icons – a downward arrow, a pair of leftward/rightward arrows, an **X**, and a pin.

- Click and hold the downward arrow to see a list of the available windows within the window.
- Click the pair of arrows to scroll across the windows in a group.
- Click the **X** to close a window. The other windows in the Screen Docker will resize automatically to fill the space.
- The pin icon allows the user to pin a window in the Screen Docker or move it to one side. If the pin lies sideways, it means that the window is open only temporarily and will close when the cursor moves to another window. Click the pin to keep it open; the pin will become vertical.

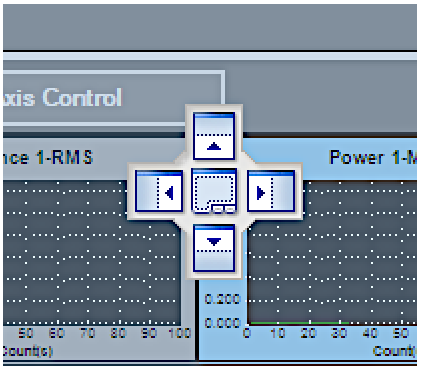
Relocating and Resizing Windows

Any window can be dragged into a different window stack.

- Left-click and hold the top bar of the window to be moved. A transparent gray field will appear.



- Continue to hold and drag the field over another window. A set of placement buttons will appear. Use these to choose where to place the window (top, bottom, left, right, center), and release.



Once the target window is covered by a transparent gray field, release the mouse button and the window will snap into place. The windows in that group will be identified by tabs across the top of the window.

The windows in the Screen Docker are divided by black lines. Click, hold and a drag a black line to resize a window. Windows that are less than full size have scroll bars on the side or the bottom of the window, allowing the user to scroll through the complete window.

Working with WM-Inspect: Operators

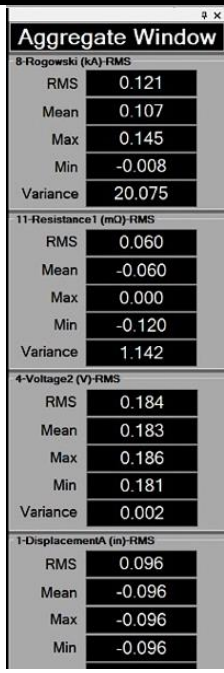
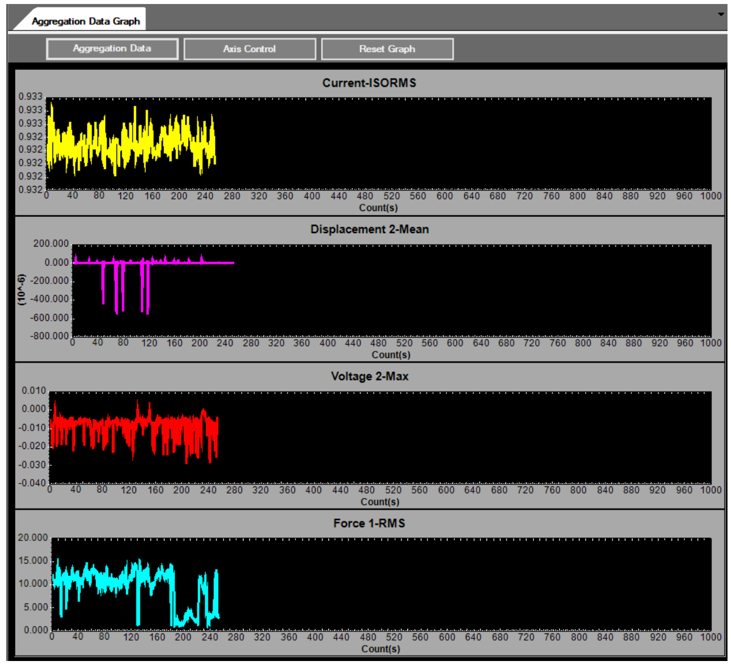
Run Screen versus Monitor Screen

Operators use either the Run screen or the Monitor screen. Both screens provide continuously updated information for the active weld schedule. The two types of screens differ largely in the data they each highlight. (Select Screen Layout on the Menu Bar to choose either screen**.)**

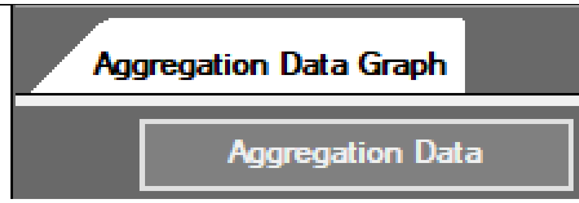
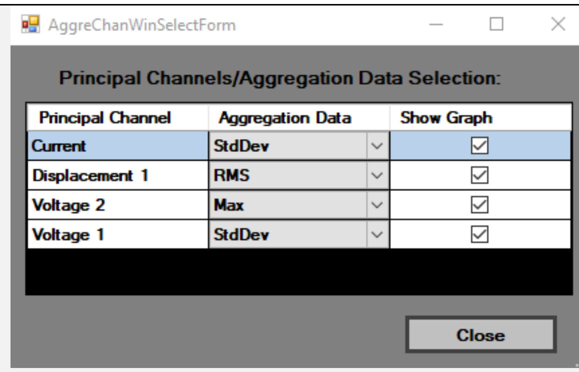
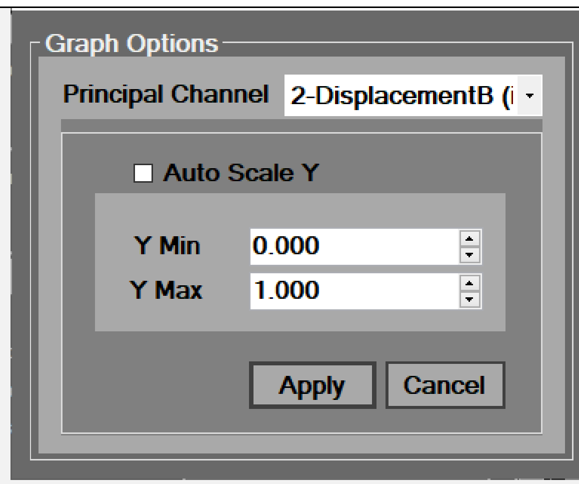
The Run Screen highlights Aggregation Data – displaying selected types of data for a specific point during each weld. This data is continuously updated in the Aggregation Data Window and graphed over time in the Aggregation Data Graph.

Operators can make changes to how aggregation data is configured.

Click here for a detailed description of the Aggregation Data Window.

<table>
<tr><th>Aggregation Data Window</th><th>Aggregation Data Graph</th></tr>
<tr><td>
</td><td>
</td></tr>
</table>

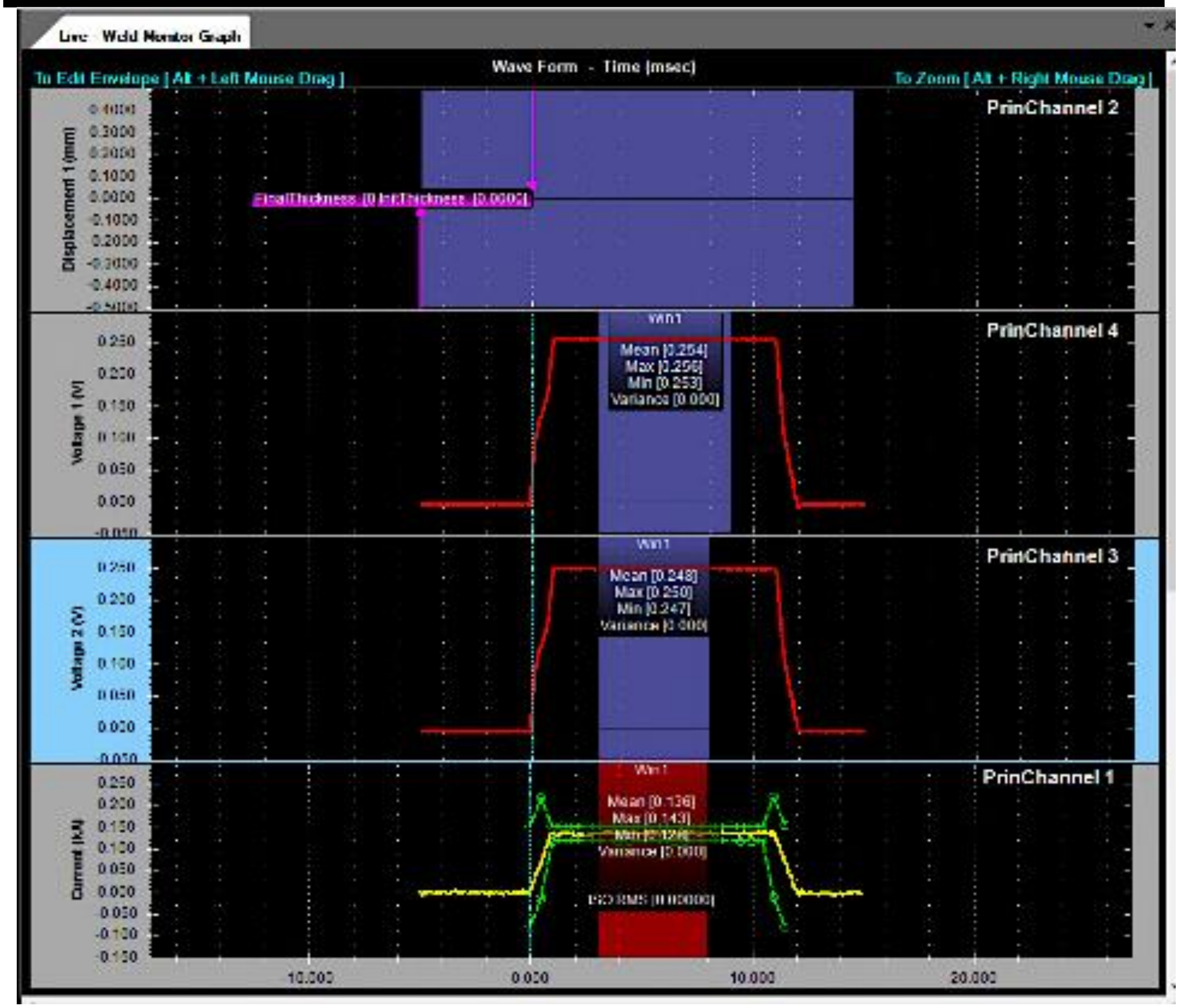
Configure Aggregation Data (Run Screen)

<table>
<tr><td>9. On the Run Screen, Click the Aggregation Data button at the top of the Aggregation Data Graph</td><td>
</td></tr>
<tr><td>10. Select Principal Channel(s) and Aggregation Data to be graphed.
11. Check to have the data graphed
12. Click Close.</td><td>
</td></tr>
<tr><td>13. Select Axis Control</td><td>
</td></tr>
<tr><td>14. Select Principal Channel
15. Set Y scale minimum and maximum values.
16. Click Apply. Click Close.</td><td>
</td></tr>
</table>

The Monitor Screen highlights the Live-Weld Data Graph – a continuously updated graphic representation of selected data (e.g., Voltage, Displacement, Force, Current, Power) for each weld event.

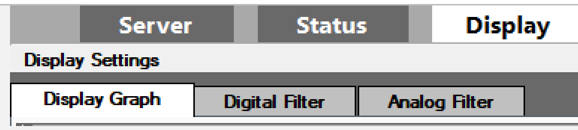
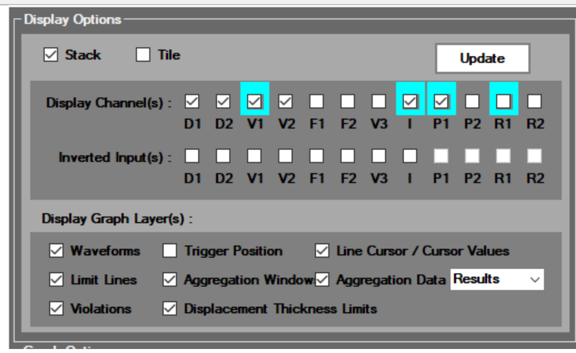
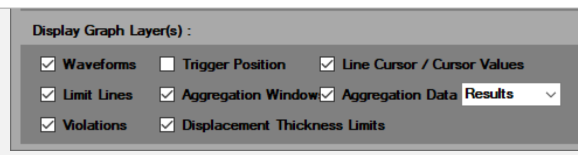
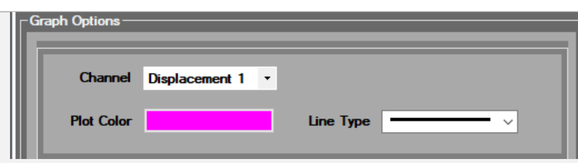
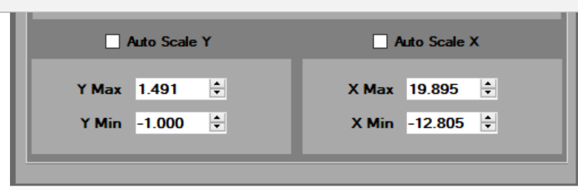
[Click here for a detailed description of the Live – Weld Graph](#).

Live – Weld Monitor Graph



Configure Live-Weld Display Settings (Monitor Screen)

Click here for more information on display settings.

8. On the Monitor Screen, Click **Display** in the Tool Bar to launch the Display Settings window	
9. Select the **Display Graph** Tab	
10. Select **Channels** to be displayed (Principal Channels are highlighted in blue)	
11. Select **Graph Layers**	
12. Indicate any inverted inputs	
13. Select a channel from the dropdown menu and select a color and line type	
14. Choose Auto Scale for the X and Y Axes or set the minimum and maximum vales for each axis.	

Monitor Mode

Monitor Mode allows a user to monitor a weld monitor schedule in real time and is accessible to all types of users. Select Monitor Screen from the Screen Layout Menu.

Monitor Screen Docker

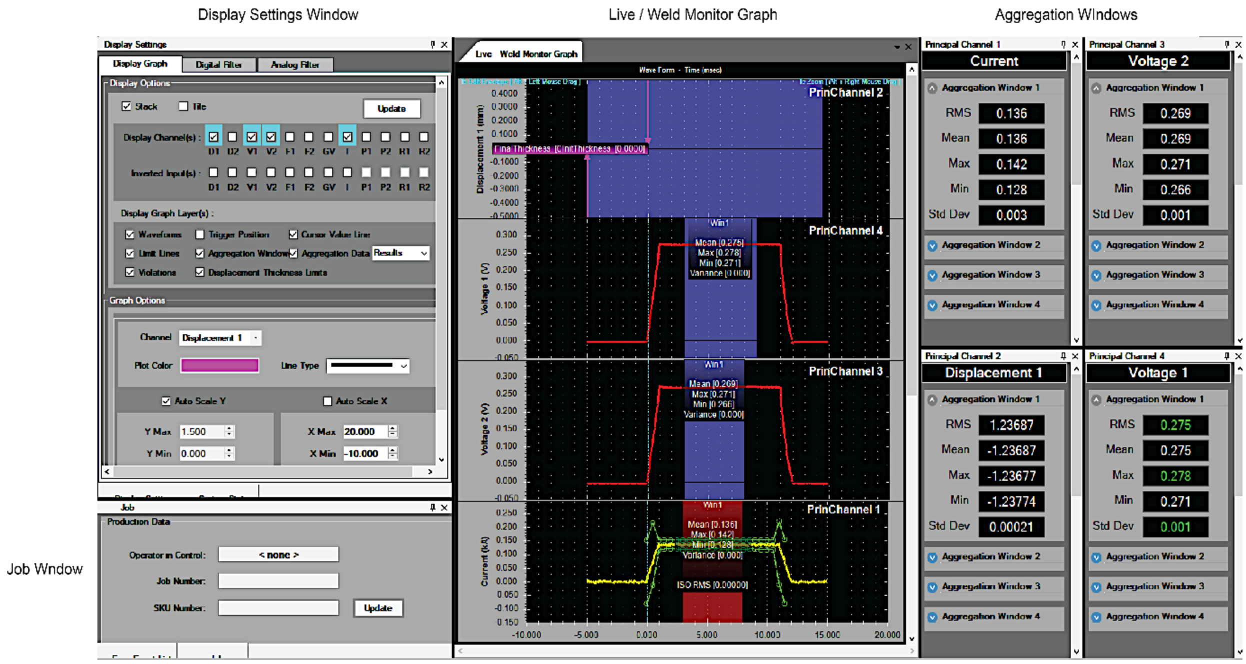


Figure 29: Monitor Screen Docker

Operating in Monitor Mode

The default Monitor Screen provides a continuous update of essential data on a weld schedule, including:

- The Live - Weld Monitor Graph window.
- Aggregation Data Windows for designated channels.
- The Display Settings Window, described below.
- The Error Event List, listing recent weld errors.

As describe above, the Monitor Screen displays with five links in the Tool Bar – Server, Status, Display, Job, and Aggregation. The Aggregation button opens the Aggregation Data Window if it is not currently visible. The other links are described below.

Display Settings

The default Monitor Screen launches with the Display Settings window open. If the Display Settings window is not visible, click on the Display link in the Tool Bar to open it.

The channels shown in the Live – Weld Monitor Graph and the scope and appearance of the data being displayed for each channel are set in the Display Graph tab of the Display Settings window.

Display settings determine the number of display channels, the type of data shown in each channel and the proportion and appearance of the display channels. Details regarding the channels to be monitored and the parameters for those channels are established by an engineer. After these details are established in the development process, the user can change them in the Display Settings window.

If the Display Settings window is not visible, click the Display link in the Tool Bar.

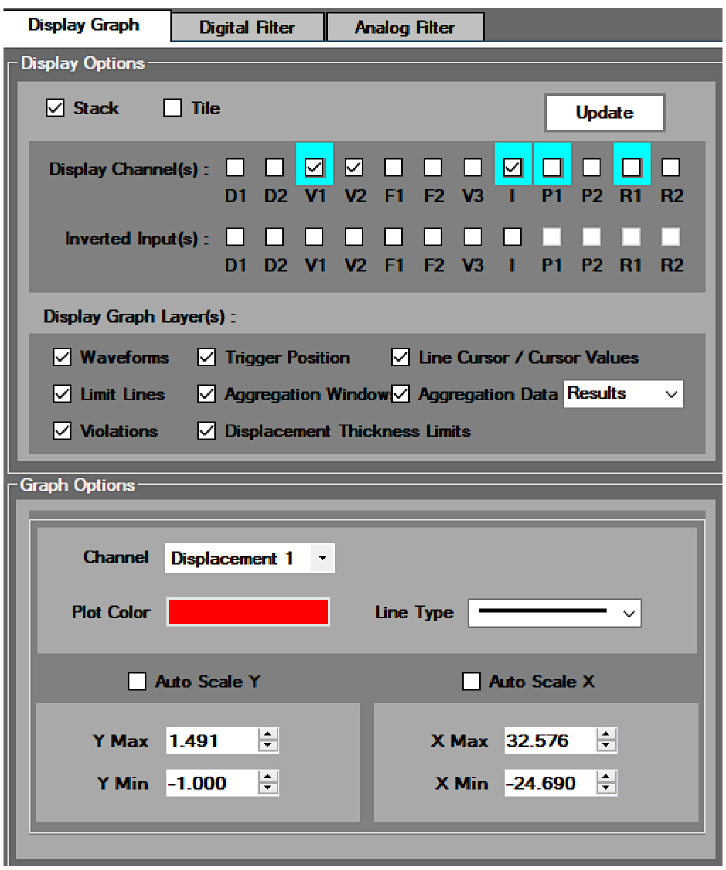


Figure 30: Display Settings window

The Display Settings window has three tabs - Display Graph, Digital Filter and Analog Filter. The Display Graph Tab is divided into two sections, Display Options and Graph Options.

Display Graph: Display Options

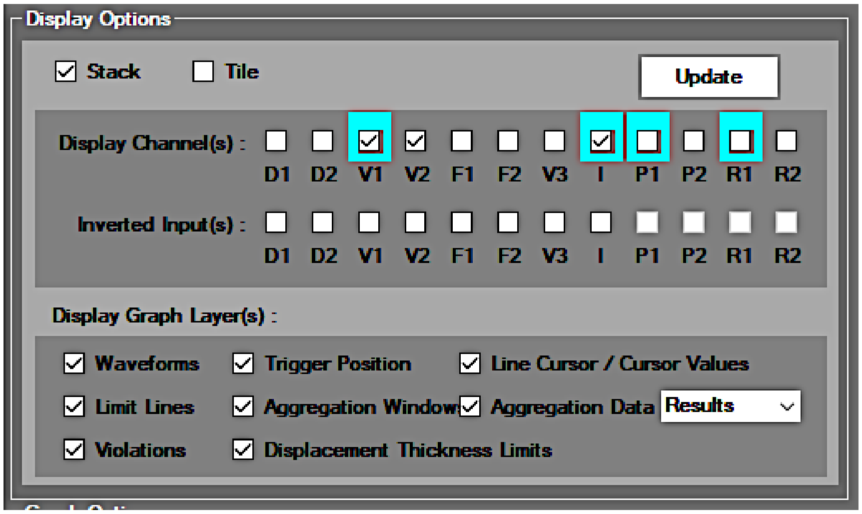
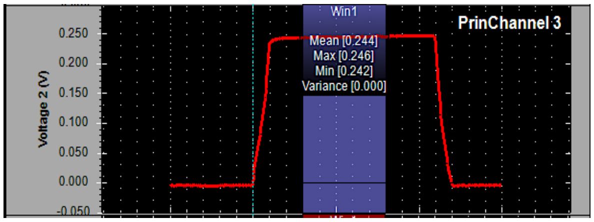


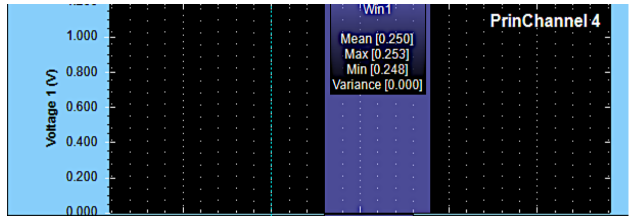
Figure 31: Display Options Window

Use the Display Options section to select the display channels to be monitored and the type of data to be displayed.

- Check the box for each channel to be displayed. Principal channels (as designated by the Engineer who developed the schedule) are highlighted in blue.
  - Channels are identified by the type of input being monitored (D = Displacement, V = Voltage, F = Force, V3 = Voltage 3, I = Current, P = Power, R = Resistance).
  - You can select one to twelve channels.
- Check the boxes for those channels for which the inputs are inverted. (Does not apply to Resistance or Power channels.)
- Check the boxes under **Display Graph Layer(s)** to determine the type of data to be graphed. Not all types of data apply to all channels. Data types include:
  - **Waveforms:** A graphical representation of a value changing over time, (e.g., Resistance).

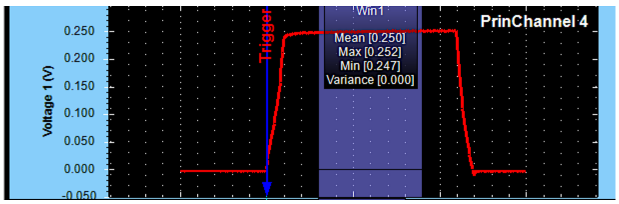


Waveform Shown

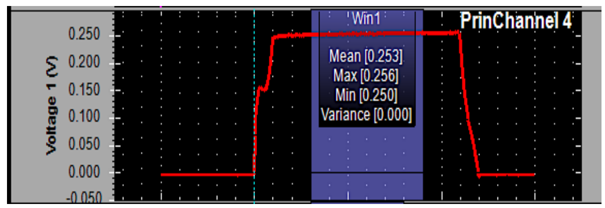


Waveform Not Shown

- **Trigger Position:** The point at which a weld is triggered. Represented in the Live - Weld Graph by a blue downward arrow and/or the word “Trigger” in red.

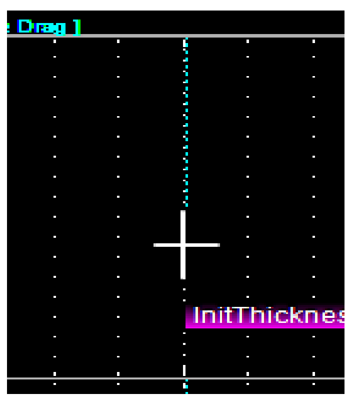


Trigger Position Shown

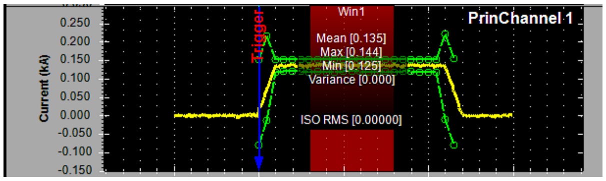


Trigger Position Not Shown

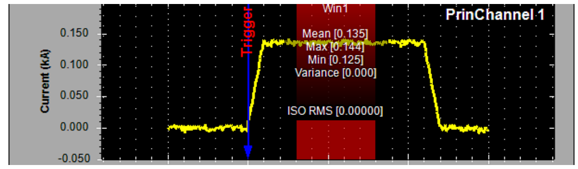
- **Line Cursor / Cursor Values:** Displays a vertical blue line on the x axis, indicating the current value for the cursor in the Live – Weld Monitor Graph.



- **Limit Lines:** The upper and lower limits for a value of the input being monitored (e.g., resistance). These will only appear in the graph if an engineer has set them beforehand.

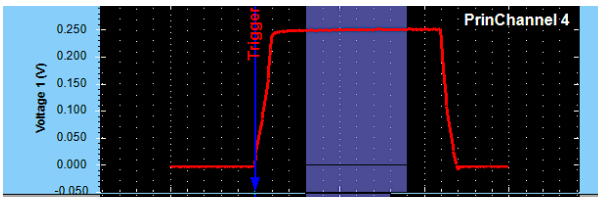


Limit Lines Shown

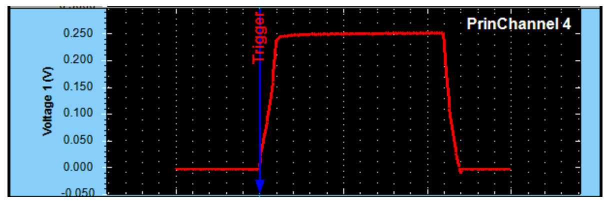


Limit Lines Not Shown

- **Aggregation Window:** Highlights the window of time referenced by the data in the aggregate windows.

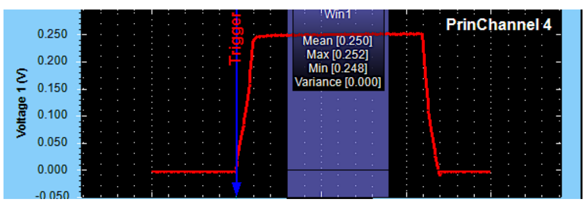


Aggregation Window Highlighted

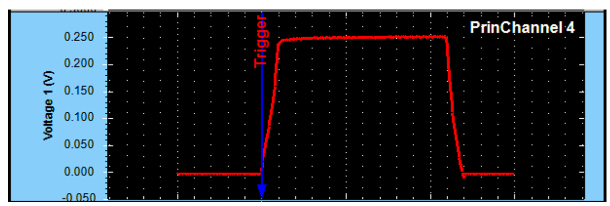


Aggregation Window Not Highlighted

- **Aggregation Data:** Allows the user to select the aggregation data to be displayed in text in the Live – Weld Monitor Graph window.



Aggregation Data Shown



Aggregation Data Not Shown

- Select the aggregation data to be displayed by checking the appropriate boxes on the Results drop down list.

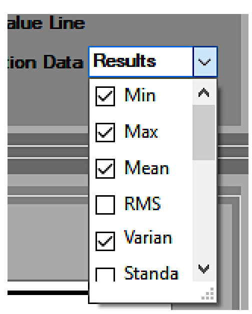


Figure 32: Results List

    - **Violations:** Highlights points where limit value lines have been crossed.
    - **Displacement Thickness Limits:** Shows the upper and lower displacement limits (if these have been configured during the development process).
- Click Update to save the new settings.

Display Graph: Graph Options

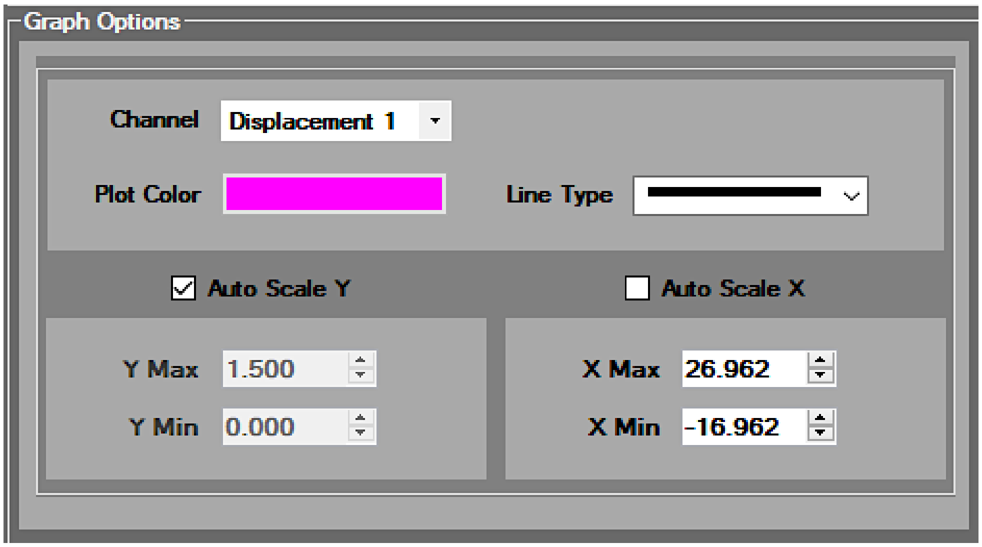


Figure 33: Graph Options window

Use the Graph Options section to determine how the graph for each channel will appear (i.e., scale, proportion, color and line weight).

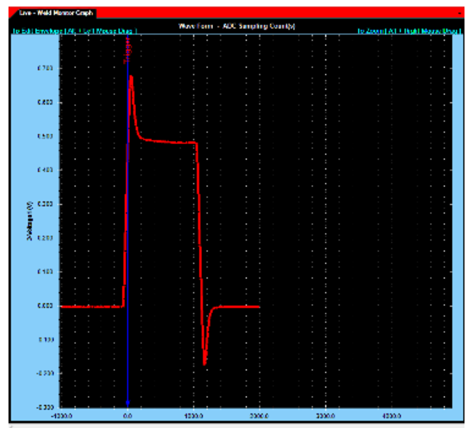
- Select a Channel from the drop down list.
    - Note: All twelve channels are listed, but you will only see data for active channels.
- Select a plot color for that channel. For clarity, choose a different color for each channel.
- Choose a line type for that channel.
- Check the box to determine whether the X and Y axes should scale automatically.
    - Note: If Auto Scale is selected for either axis, the option of setting the minimum and maximum range for that axis is disabled.
    - If you do not check Auto Scale for either axis, set the minimum and maximum values.
- Click Update to save your changes.

Managing the Graphic Display

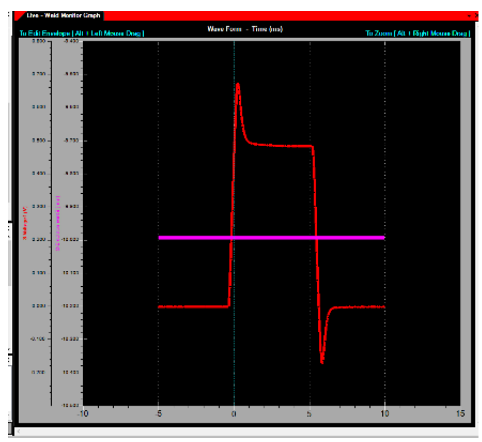
The top of the Display Options section of the Graph Settings window provides the option of stacking and/or tiling the channel graphs.

The value of these options becomes clear once you see the results of having set the other values in the Graph Settings window. We suggest experimenting with different combinations of graph options to find the ideal configuration for monitoring a given situation. See the examples below.

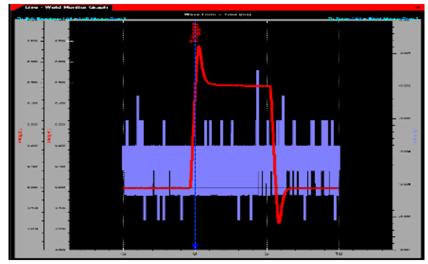
If you choose to graph just one channel, that graph will fill the Live – Weld Monitor Graph.



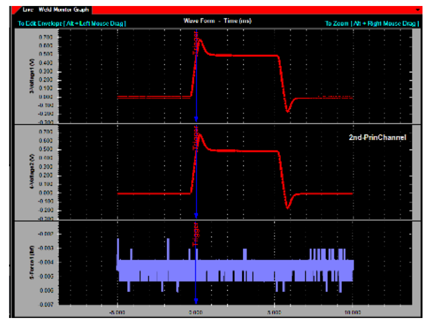
If you choose to graph two channels without stacking or tiling them, both will appear in the same graph, allowing you to compare them across time.



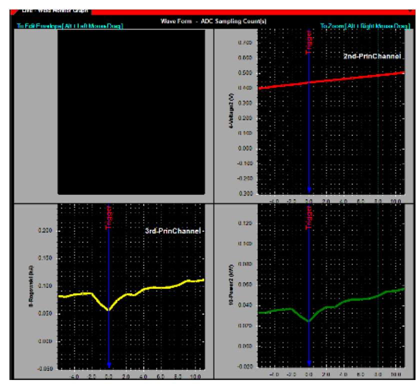
However, if you choose to graph more than two channels, the graphs may obscure each other, as in this example where three separate values are being monitored and one graph exactly matches another.



For more than two channels. You might prefer to stack the channels,

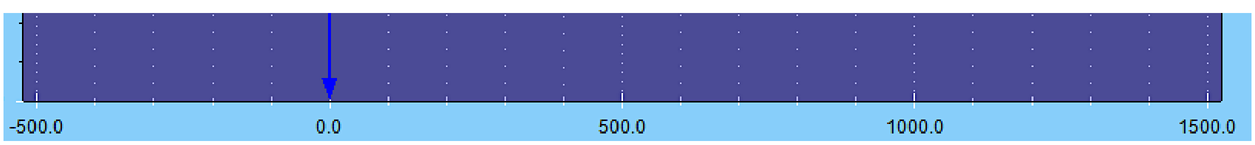


Or stack and tile them.



Time Scale in the Live – Weld Monitor Graph

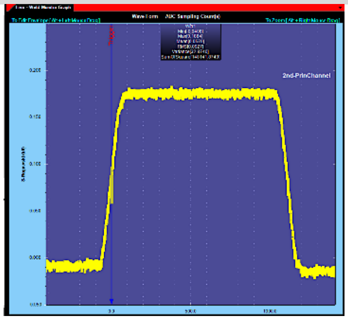
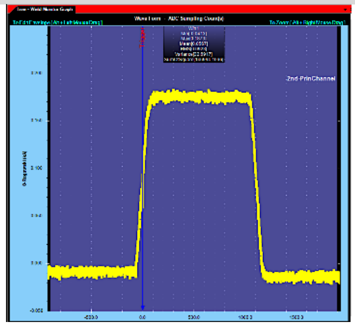
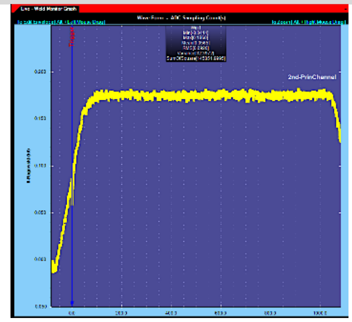
The vertical dotted lines in the Live – Weld Monitor Graph represent a time scale along the X axis. The values represented by the denser lines are shown at the bottom of the window. The lighter lines subdivide the time between the denser lines into five equal parts.



In the example shown above, the time scale runs from 500 milliseconds before the trigger point (the blue arrow at 0.0) to 1500 milliseconds after the trigger point.

To change the time scale, place the cursor over the graph and scroll the mouse button forward to zoom in or backward to zoom out in time.

The three graphs below show the same graph in three different time scales. The trigger point appears in red on all three graphs.

-400 ms to +1400 ms	-900 ms to +1900 ms	-75 ms to +1200 ms
		

Live – Weld Monitor Graph Menu

The Live – Weld Monitor Graph window includes a sub-menu that allows the user to save, print or modify the graph window image.

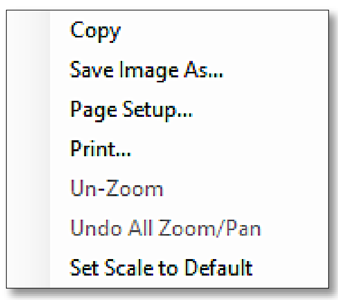


Figure 34: Live Weld Monitor Graph Sub-menu

Right-click on the Live – Weld Graph window to open this menu. Options include:

- **Copy** – Click to save a snapshot image of the window to the clipboard.
- **Save Image As** – Opens a file browser window that allows the user to save a snapshot image of the window to file in several different image file formats.
- **Page Setup** – Allows the user to set the paper size, orientation, and margins to be used when printing the graph window image to paper or to file.
- **Print** – Click to print a snapshot image of the graph window on a connected printer.

- **Un-Zoom/Undo All Zoom Pan** – Becomes active after you have zoomed the graph window. Undoes the last zoom. Repeat or select Undo All Zoom/Pan to undo multiple zooms.
- **Set Scale to Default –** Select to return the graph window to its default layout.

Digital Filter

The Digital Filter tab allows the user to assign a Butterworth filter to a selected channel.

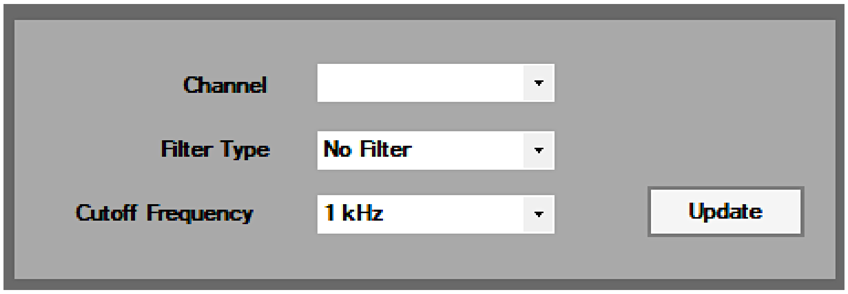


Figure 35: Digital Filter window

1. Select a channel from the dropdown menu.
2. Select a filter type.
3. Select a cutoff frequency.
4. Click Update.

Analog Filter

The Analog Filter tab allows the user to set the type of analog filter, low pass or low frequency.

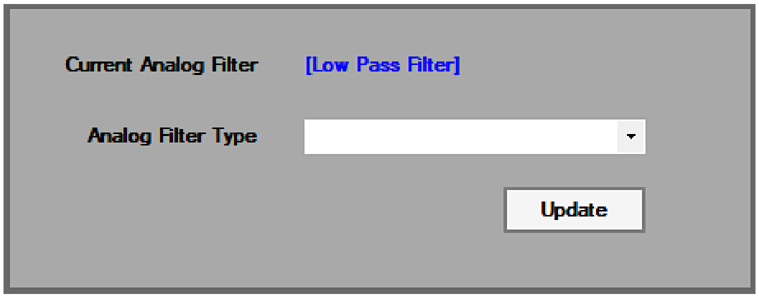


Figure 36: Analog Filter tab

1. Select a filter type from the dropdown menu.
2. Click Update.

Job Window

The left-side column of the default Monitor screen also includes the Job Window, showing production data including operator, job number and SKU number. If it is not visible, click on the Job link in the Tool Bar to surface this window.

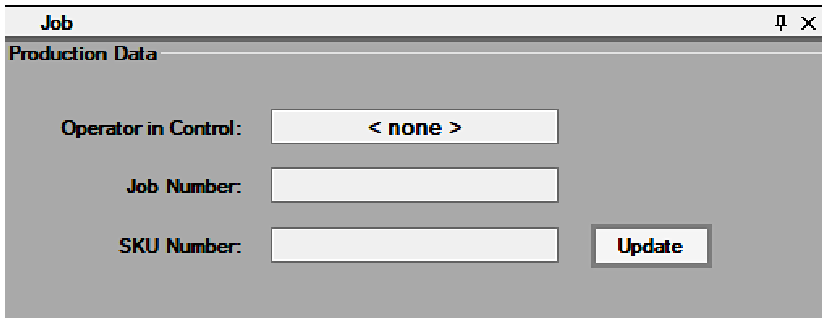


Figure 37: Job Window

Operator in Control: If a user has taken control of the monitor, their name displays here, otherwise the field displays <none>. That user can enter and update the Job and SKU numbers.

System Status

Click the Status link in the Tool Bar to see a snapshot of the status of the device being monitored. In default Monitor Mode, this opens the System Status and Error Event list.

The System Status Window has three tabs, Status, Errors, and Counters.

Status Tab

The **Status tab** provides a quick view of the status of the weld monitor and the PLC; green is good, red indicates a fault.

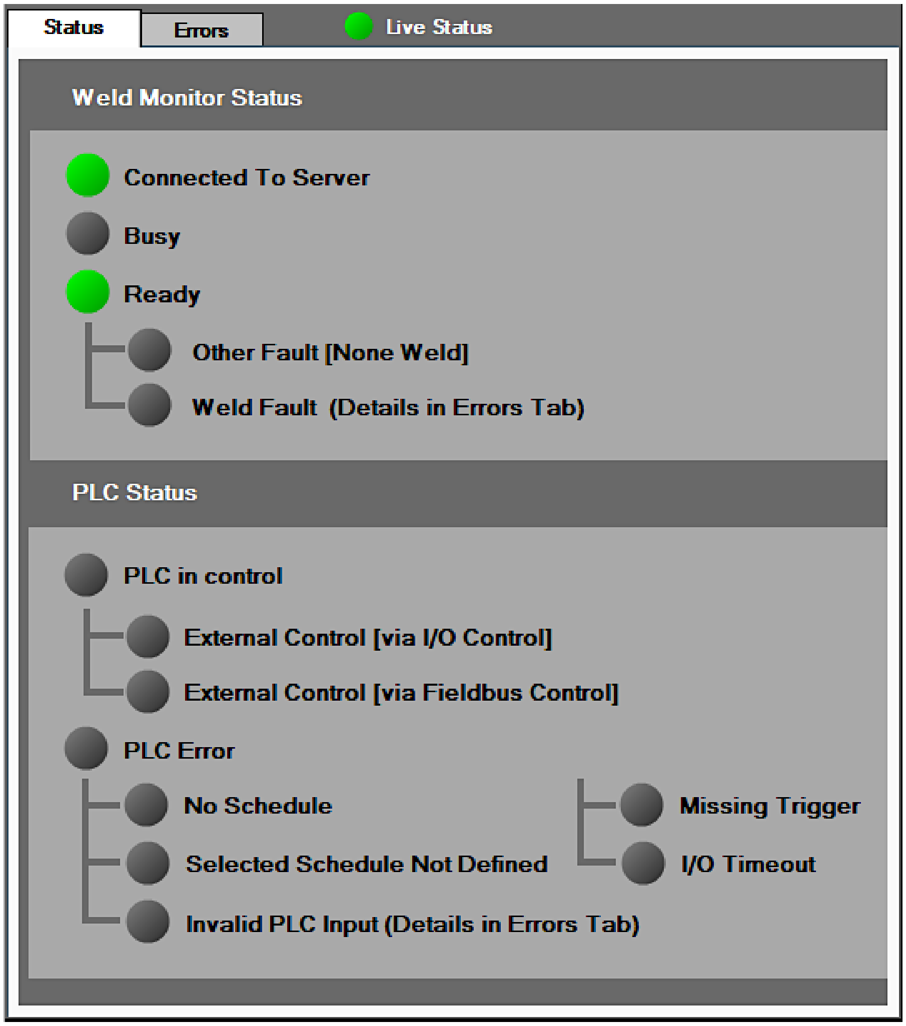


Figure 38: Status Tab

Error Tab

The Error Tab indicates the type of error most recently detected. Red indicates an error.

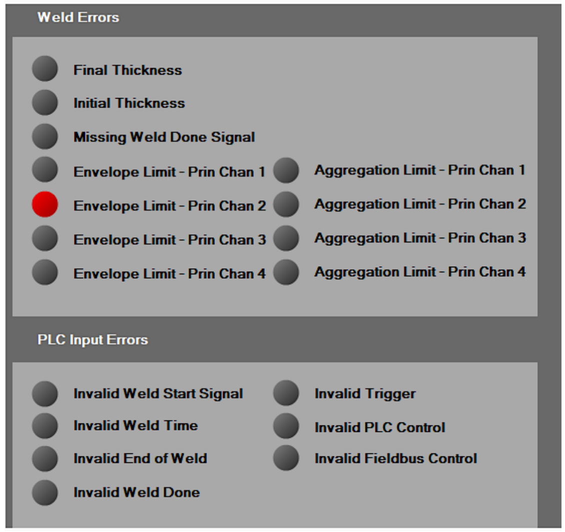


Figure 39: Error Tab

Counters Tab

The Counter Tab identifies the Networked Weld Monitor and the Current Monitor Schedule. It includes the Weld Counter window and the Error Event list.

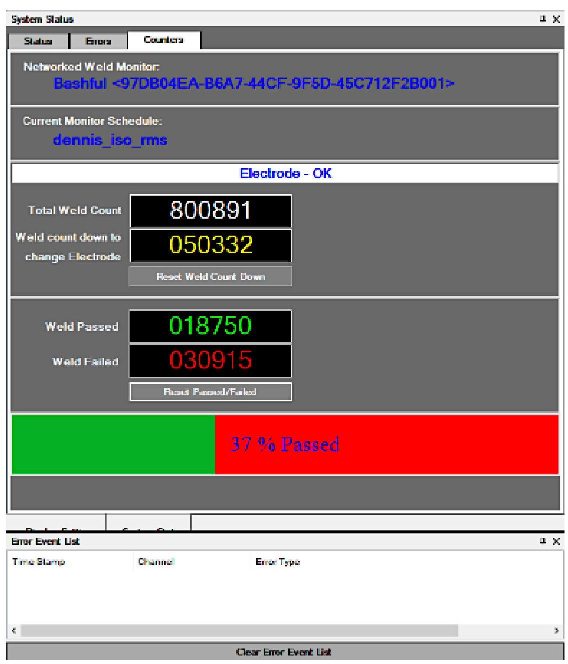


Figure 40: Counters Tab

Weld Counter

The Weld Counter window identifies the monitor and monitor schedule. It shows the total weld count, the number of welds left before the electrode should be changed, and the number and percentage of passed and failed welds.

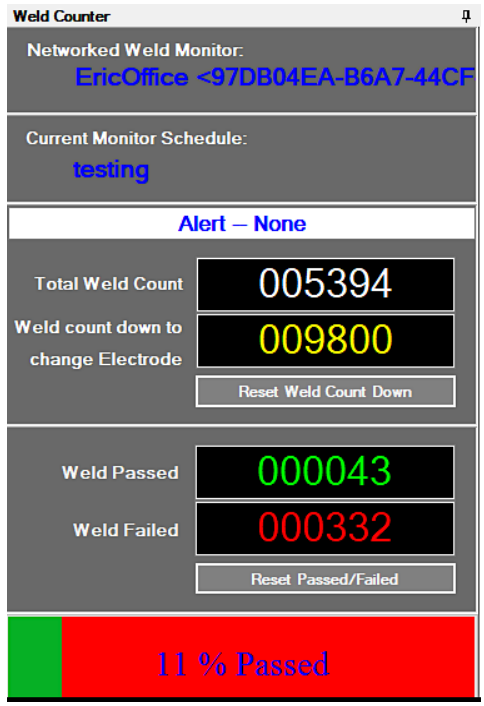


Figure 41: Weld Counter Window

Error Event List

The Error Event List provides a continuously updated list of failed welds and identifies the type of error by channel.

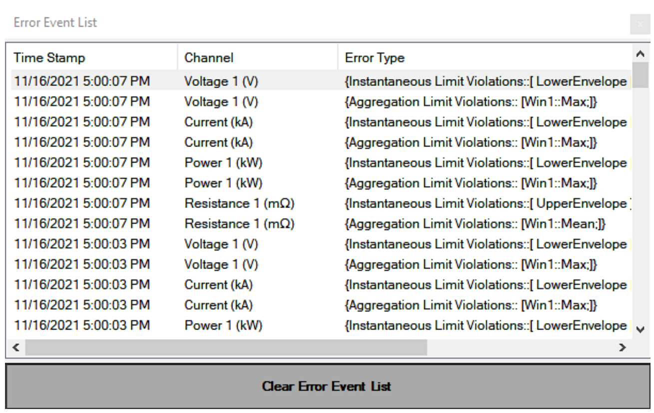


Figure 42: Error Event List

Run Mode

Run Mode provides an operator with continuously updated aggregation data in both the Aggregation Data Graph and Aggregation Data Window. It also includes System Status Window and Job Window, as found in Monitor Mode. It is accessible to all types of users. Select Run Screen from the Screen Layout Menu to work in Run Mode.

The Aggregate Data Window in Run Mode is a simplified version of the one found in Monitor or Developer modes and only includes Window 1 for each channel. Also, the Aggregation Data Graph in Run Mode is larger than the default graphs in the Monitor or Developer screens but is otherwise the same.

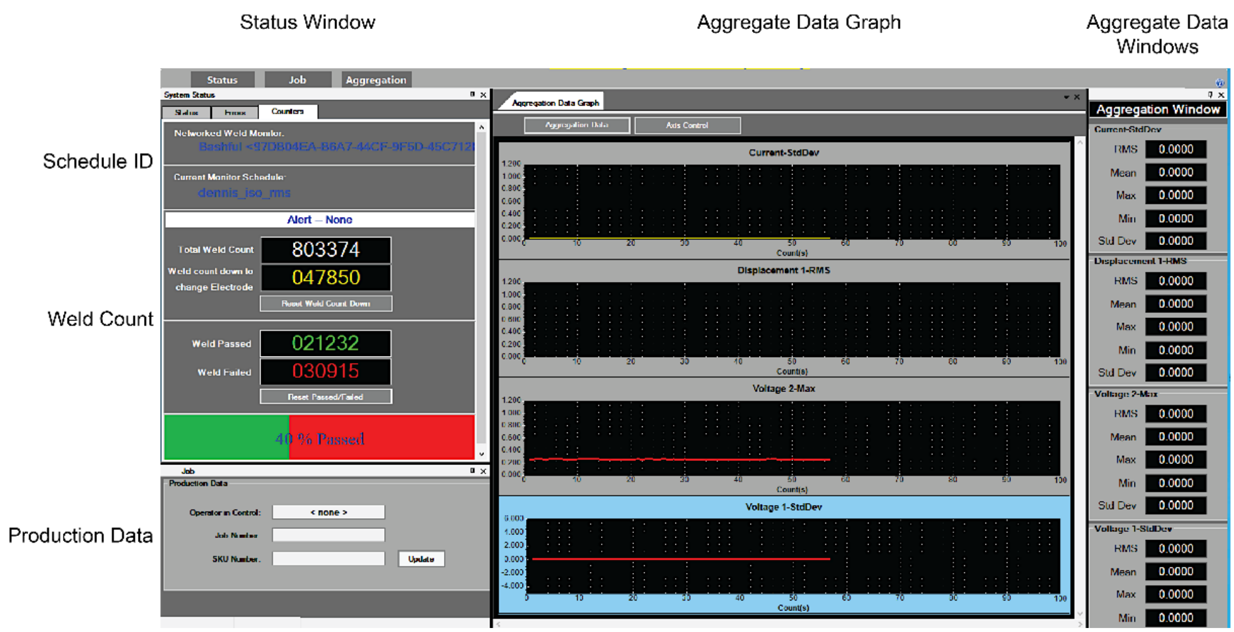


Figure 43: Run Mode Screen Docker

Working with WM-Inspect: Engineers

Developer Screen

The Developer Screen provides engineers with a wide array of tools to develop and refine weld monitor schedules. Open Screen Layout in the Menu Bar to choose the Developer Screen.

It launches with the following windows.

- The Live - Weld Monitor Graph window, reflecting the most recent weld.
- The Aggregation Data Window for designated channels.
- The Aggregation Data Graph for designated channels.
- The System Status Window, described below.
- The Error Event List, a continuously updated error list.
-

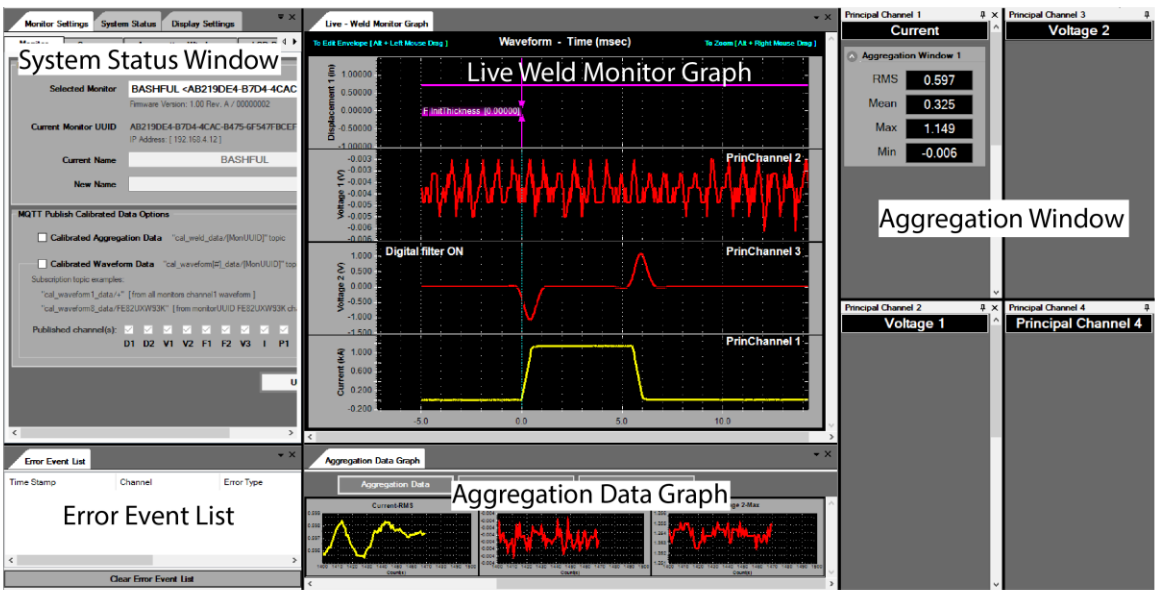


Figure 44: Default Developer Screen Docker

Create a Weld Monitor Schedule

(**Note:** The following assumes that the Central Server and Network Monitor have already been selected, as described above. If you need to change these connections, select Server from the Tool Bar and change the server and/or monitor and click OK.)

There are two ways of creating a new weld monitor schedule. The **Schedule Wizard** automates the process by presenting the user with a series of questions. The **New/Save As** function allows the user to add a new schedule to the Schedule Table or create a new schedule by modifying an existing schedule. Either process begins by selecting the Schedule tool in the Tool Bar to launch the Schedule Settings window.

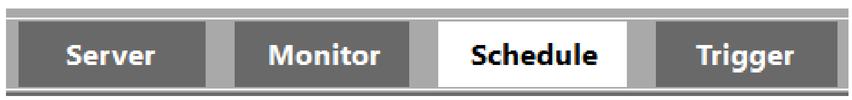


Figure 45: Schedule Settings Tool

Schedule Settings Header

The Schedule Settings header (labeled “Schedule”) allows the user to initiate the process of creating, modifying or deleting a schedule.

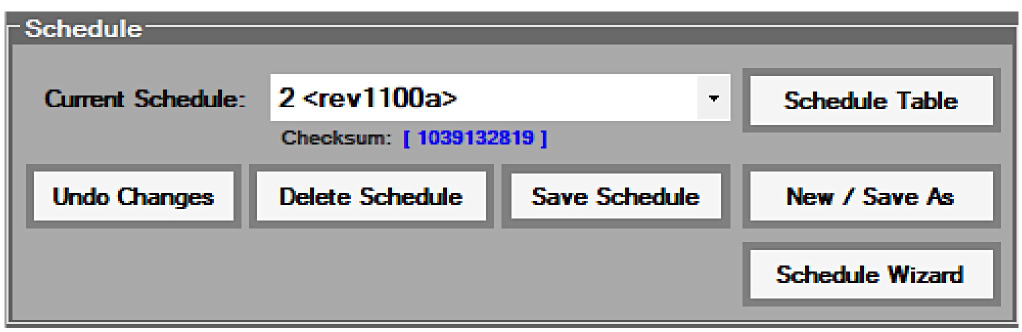


Figure 46: Schedule Settings Header

IMPORTANT: Changes made in the Schedule Settings Window will not be saved until the Save Schedule button in this header is selected.

> **Note:** The Checksum appears below the name of the current schedule, as shown above. For more information about the purpose of the Checksum, see Status Bar.

Schedule Wizard

The Schedule Wizard allows the user to quickly set up a new schedule. Click the Schedule Wizard button in the Schedule header to begin. You will be presented with a series of questions which will allow you to quickly define the initial parameters of a new weld schedule. Answer them and fill in information as required.

Note: The final question asks whether you wish to proceed to the Envelope Limit Wizard screen. Selecting ‘Yes’ launches the Envelope Limit Wizard where you can quickly set the limit lines. The Envelope button in the Tool Bar also launches this tool. See Envelope Tool, below, for more information.

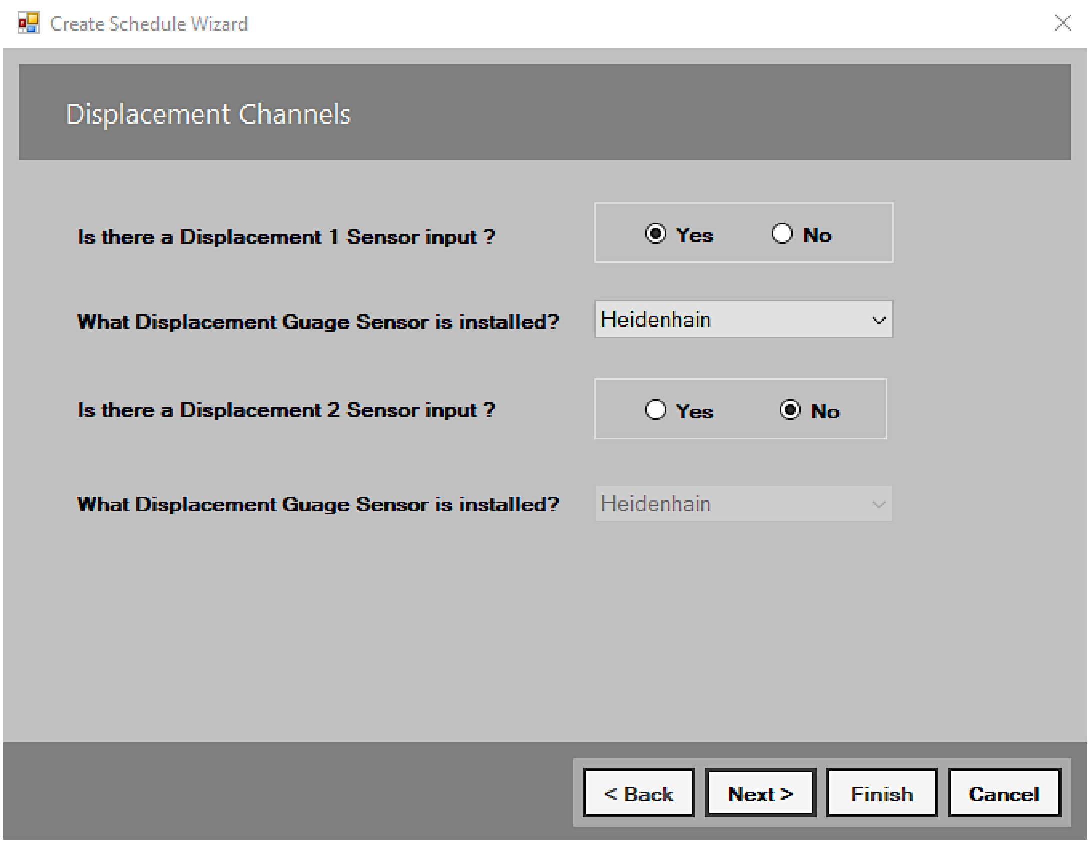


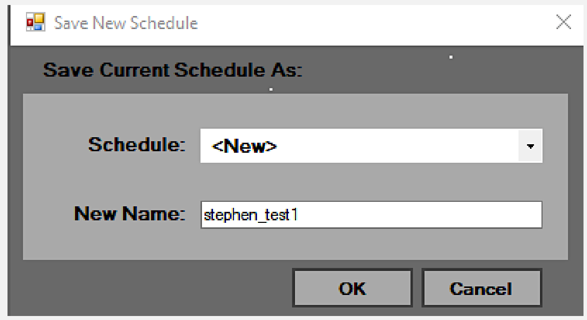
Figure 47: Schedule Wizard

New/Save As

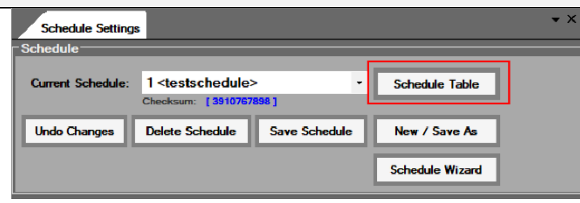
This function allows you to create and name a new weld monitor schedule or create a new schedule based on an existing schedule.

Create a New Schedule

1. Click New / Save As in the Schedule Settings tab. The Save New Schedule window launches.
2. Leave the Schedule field as <New>.
3. Type in the new schedule name in the New Name field.
4. Click OK. A message will display indicating that the new schedule name was saved.

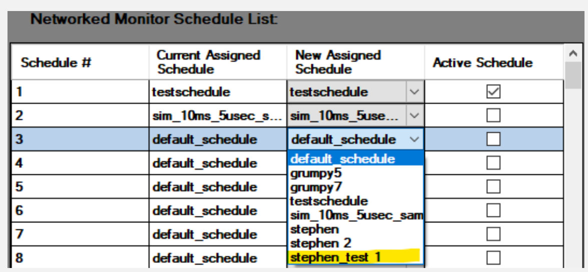


5. Click on the Schedule Table button to open the Schedule Table.

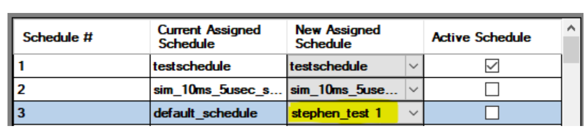


6. Click on the downward arrow next to an unassigned default schedule in the New Assigned Schedule column.
7. The new schedule will appear at the bottom of the list of available schedules in the dropdown list.
8. Select it.

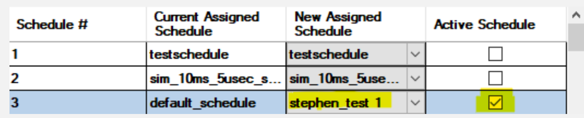
Note: The user can also replace the existing schedule with the new schedule.



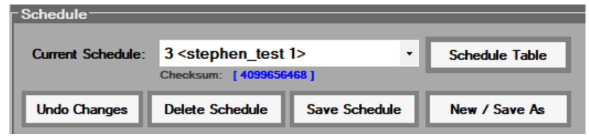
9. Click Update and the new schedule will be added to the Current Assigned Schedule column for that schedule number.



10. Check the Active Schedule check box to make the new schedule the active schedule.

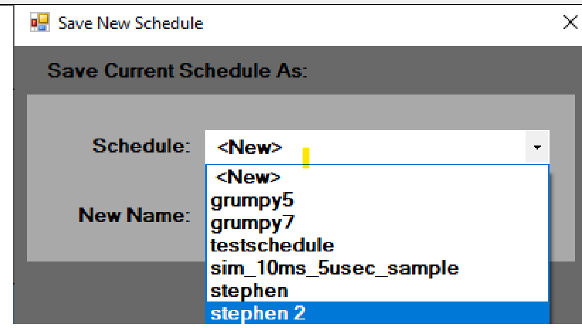


11. Click Update and Close. The new schedule now displays in the Current Schedule window on the Schedule Settings Tab.
12. Click Save Schedule to save.



Create a New Schedule Based on an Existing Schedule

13. At step 1 above, select an existing schedule from the dropdown list.
14. Enter a new name for the new schedule.
15. Proceed as above.



You can now define the parameters for the new weld monitoring schedule.

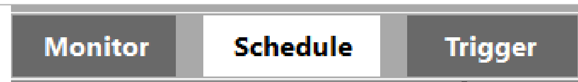
Developing a Weld Monitor Schedule

The WM-200A Monitor can send up to twelve types of data for each weld event to the WM-Inspect software on the user's PC; eight channels for each of the data source inputs on the Monitor and four channels of data derived from that input data.

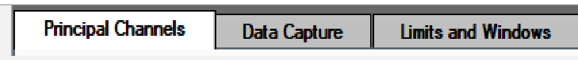
The user can designate up to four channels as principal channels. The system will gather and display additional data, known as Aggregation Data, for these sources.

Designate Principal Channels

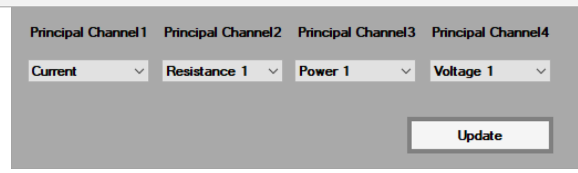
5. Click Schedule button in Tool Bar.

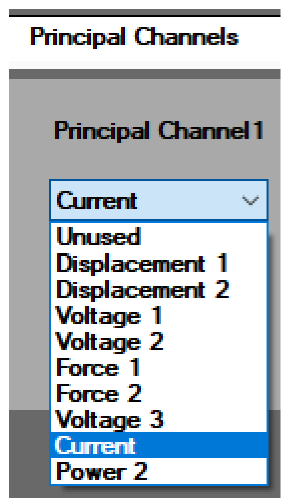


6. Select the Principal Channels Tab



7. Use the dropdown menus for each channel to assign sources to channels. (It is not necessary to assign all four channels.)
8. Click Update.
    a. Note: When you change the data source for a principal channel, the Aggregation Window for that channel will not update until you click Update.





Principal Channel Assignment Constraints

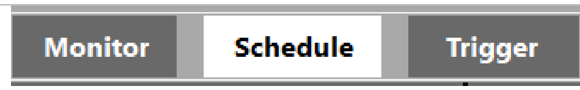
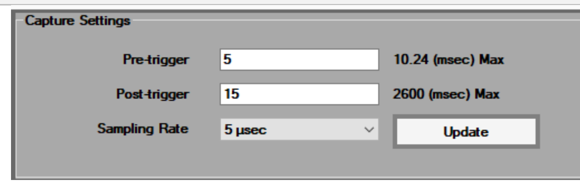
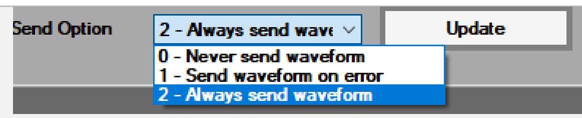
There are constraints regarding which data source can be assigned to Principal Channel 1 and which can be assigned to the other three channels, depending on whether the System is in RMS or ISO_RMS mode. (The system is always in either RMS or ISO_RMS mode.)

The following matrix shows the channel/data source combinations available in RMS and ISO_RMS modes, respectively. (For more about RMS and ISO_RMS modes, see ISO RMS/Cool Time below.)

Possible Channel Combination in RMS and ISO_RMS Modes				
	PC1	**PC2**	**PC3**	**PC4**
ISO_RMS mode	Current	All channels ***except*** • Current • Power • Power 2 • Resistance 2	All channels ***except*** • Current • Power 2 • Resistance 1 • Resistance 2	All channels ***except*** • Current • Power 1 • Power 2 • Resistance 1
RMS mode	All channels ***except*** • Power 1 • Resistance 1 • Resistance 2	All channels ***except*** • Power 1 • Power 2 • Resistance 2	All channels ***except*** • Power 2 • Resistance 1 • Resistance 2	All channels ***except*** • Power 1 • Power 2 • Resistance 1

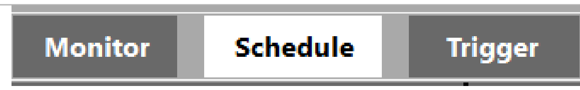
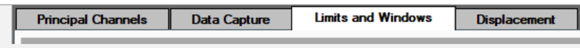
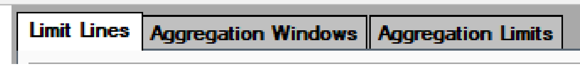
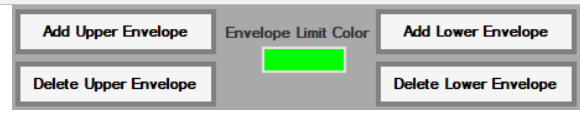
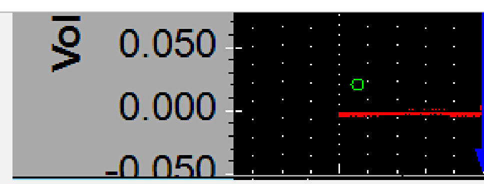
Define Capture Settings

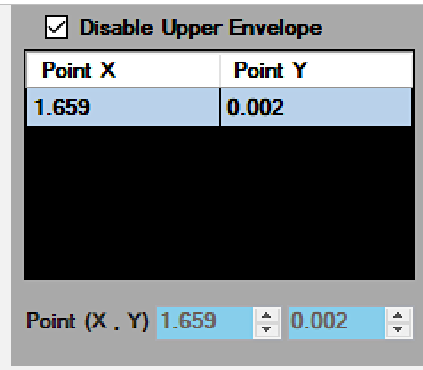
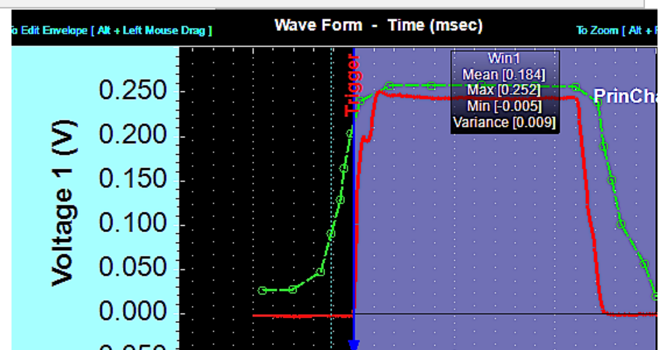
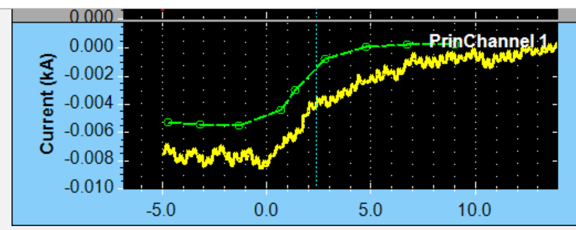
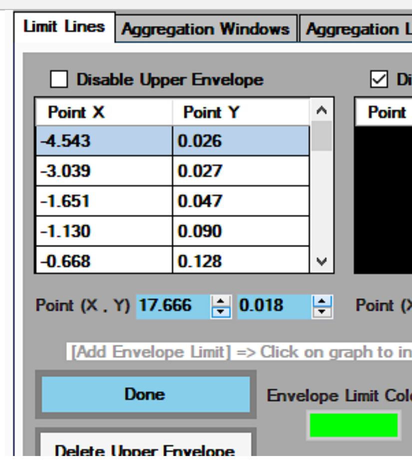
Define the capture interval by setting pre- and post-trigger intervals in milliseconds.

h) Select Schedule from the Tool Bar	
i) Select Capture Settings Tab	
j) Enter values in the Pre- and Post-Trigger time fields (≤ the Max limit shown) k) Use the dropdown menu to select the data capture sampling rate. l) Click Update.	
m) Select a waveform send option n) Click Update.	

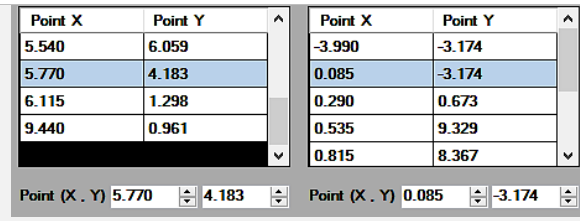
Set Limit Lines for channels

An engineer can set limits for each channel which will cause an alert to be displayed each time a value for a weld falls outside those limits.

8. Select Schedule from the Tool Bar	
9. Select the Limits and Windows tab	
10. Select the Limit Lines tab	
11. Deselect Disable Upper (or Lower) Envelope. (These are selected by default and must be deselected.)	
12. Click Add (Upper or Lower) Envelope (change the Envelope Limit Color, if required, by clicking on the color and selecting a new color from the pop-up menu.) An alert displays at the top of the WM-Inspect window to indicate that the graph display update is stopped pending changes. This allows the user to focus on one instance of a weld rather than trying to map limits over changing welds.	
13. Click on a point on the Live – Weld Monitor Graph after the start of the weld to establish the first point in the limit line. (The point will display in the selected Envelope Limit Color (in this case, green)). 14. The coordinates for that point will automatically populate the first position in the XY Coordinates Table.	

	
15. Continue to define the limit line by clicking points further along the X axis and higher or lower on the Y axis.	
16. Click on additional points on the graph for the selected channel. A limit line connecting the selected points will appear on the graph while the points selected will appear on a table on the Limit Lines tab.	
17. The XY coordinates table will continue to populate with each selected point. When the limit line is complete, click Done. An alert will display at the top of the window indicating that schedule changes have not been saved permanently. 18. Click Done when you are done adding points.	

19. Click Save schedule in the Schedule Settings header to save your changes.
20. A message will display when your schedule has been saved successfully, and the alert about the graphic display will disappear.



21. To modify any point in the limit line, hold down the Alt key and select, hold, and drag one of the points along the limit line in the Live – Weld Monitor Graph. Click Save Schedule to save your changes.
22. Alternatively, the user can change the limit line by scrolling or entering new coordinates in the Point (X, Y) fields. After entering new coordinates, click Add Upper/Lower Envelope and click Done to save changes.

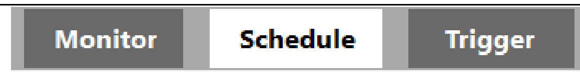
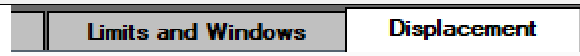
Note: Limit Line Precision

Y Axis: There is a limit to the precision of the limit line values for the Y axis for both Resistance and Power channels; values for Y for these channels may change slightly after update.

X Axis: Using the up/down arrows to adjust the value for X (time), entered value may differ from actual time by 0.01 milliseconds.

Set Displacement Limits

The Displacement tab allows the user to cause the system to flag violations when the displacement is outside the ranges of the initial and final thickness value.

13. Select Schedule Button	
14. Select a Schedule (Defaults to Current Schedule)	
15. Select Displacement Tab.	

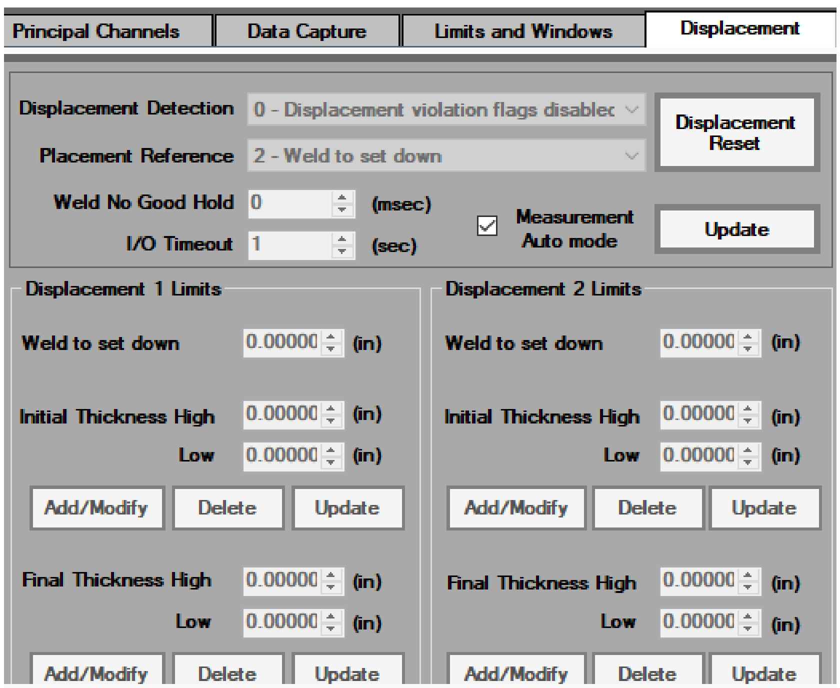
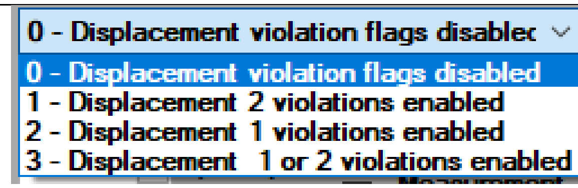
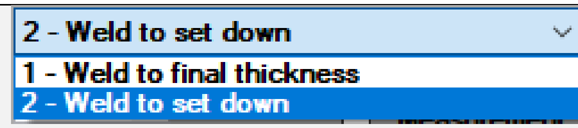
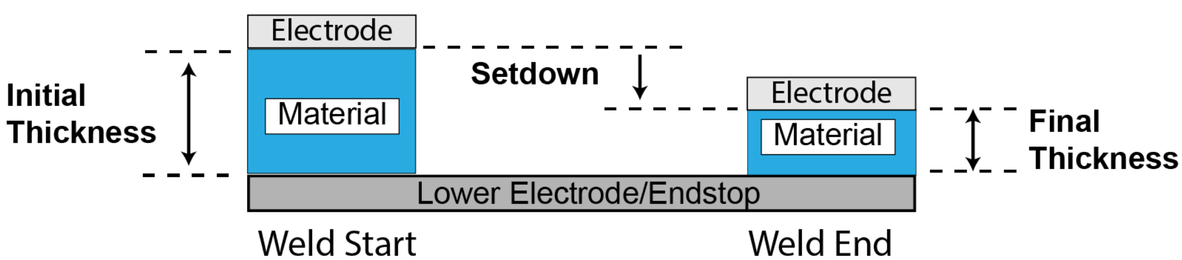
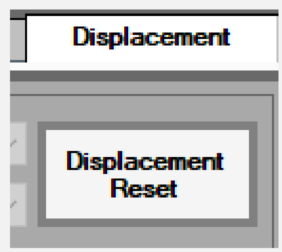
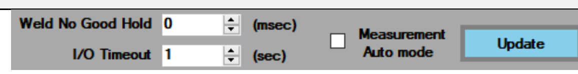


Figure 48: Displacements Window

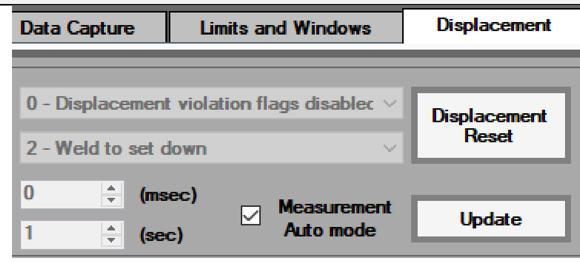
The upper section of the Displacement Tab sets the general parameters for displacement detection, including whether the settings apply to one or both displacement sensors, the placement reference to be used and other parameters.

<table>
<tr><td>1. Determine whether to enable displacement violations on one or both displacement channels.</td><td>
</td></tr>
<tr><td>2. Set Placement Reference – either Weld to final thickness or Weld to set down.
Note: Weld to Set Down value sets the threshold at which the WCO output goes active.</td><td>
</td></tr>
<tr><td colspan="2">Placement Reference

</td></tr>
<tr><td>3. Select Displacement Reset (if Required)
4. Select Displacement 1 or 2 in the dropdown list. Click Update to save.

Resets the displacement position to zero. Typically reset when the weld head is in the down position with no weld material present.</td><td>
</td></tr>
<tr><td>5. Set Weld No Good hold time and I/O Timeout.</td><td>
</td></tr>
<tr><td colspan="2">Weld No Good Hold
Amount of time Weld No Good (Pin 23) output will be active.
I/O Timeout: Allows the user to set the End of Weld timeout in seconds.</td></tr>
</table>

<table>
<tr><td colspan="2">

- Note: A machine error will occur If I/O timeout expires before the End of Weld signal is asserted. Therefore, set the I/O timeout to allow enough time for the End of Weld signal to be asserted within the timeout period.

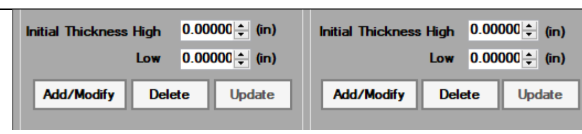
</td></tr>
<tr><td>6. Check Measurement Auto Mode to include the Cool Time measurement (See <u>ISO RMS/Cool Time,</u> above) if required.</td><td>
</td></tr>
<tr><td colspan="2">

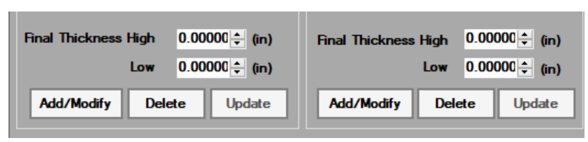
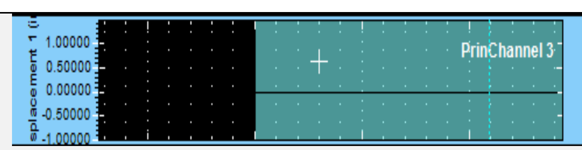
Measurement Auto Mode

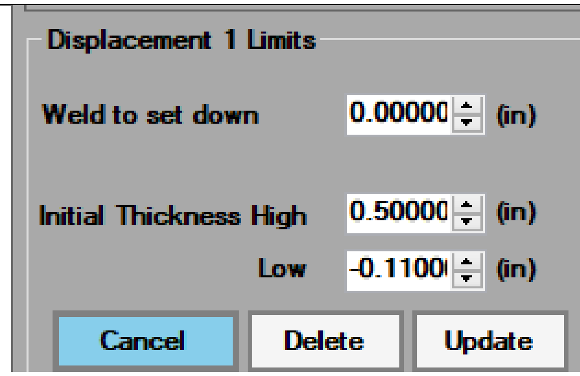
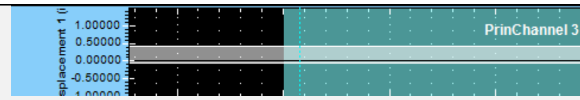
In this mode, initial thickness is measured automatically at the trigger point while final thickness is automatically measured at the end of Cool Time. Initial and final thickness arrows display in the Live – Weld Monitor Graph.

</td></tr>
</table>

The lower section of the Displacement Tab allows the user to set the specific parameters for each displacement sensor. These fields only become active when displacement violation flags are enabled.

<table>
<tr><td>7. Click Add/Modify button for either Initial Thickness or Final Thickness</td><td>


</td></tr>
<tr><td>8. Move cursor to the selected displacement channel. The cursor changes to a cross.</td><td>
</td></tr>
</table>

9. Click on the displacement graph at two points to select high and low displacement limits for the selected thickness value. 10. The selected values appear in the displacement window.	
11. Click Update. The selected range values display on the displacement graph in the Live – Weld Graph. 12. Click Update.	

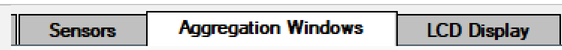
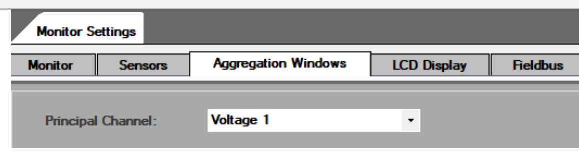
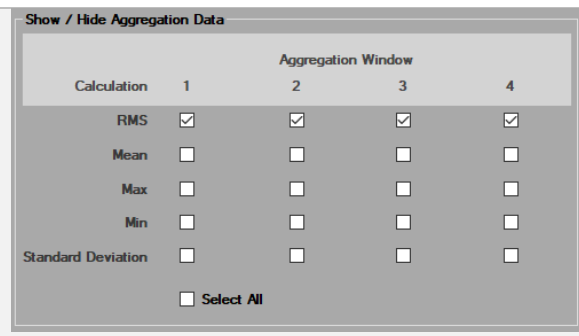
Set Aggregation Data

The NRWM system calculates five aggregation data values for specified windows of time for each principal channel for each weld (RMS, Mean, Minimum, Maximum, and Standard Deviation); an engineer can specify up to four such windows of time for each principal channel.

This procedure encompasses:

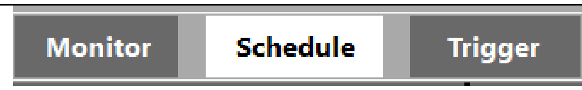
- Designating the aggregation data to be displayed
- Defining the time period for which aggregation data is gathered
- Setting limits on the aggregation data which, if exceeded, will prompt an alert.

Designate Aggregation Data

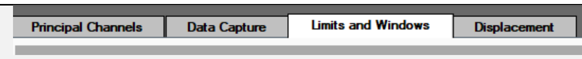
<table>
<tr><td>7. Click the Monitor button in the Tool Bar</td><td>
</td></tr>
<tr><td>8. Select the Aggregation Windows Tab</td><td>
</td></tr>
<tr><td>9. Select a Principal channel from the dropdown menu.</td><td>
</td></tr>
<tr><td>10. Check the type(s) of data to be aggregated and displayed in the Aggregation Window and Aggregation Data Graph.
11. Set data types for up to four windows of time for one or more of the selected principal channels.
a. Not all data types are available for all data sources. (E.g., RMS and Standard Deviation are disabled for Resistance.)
b. The Select All option selects all data types for all windows for a given source.</td><td>
</td></tr>
<tr><td>12. Click Update.</td><td></td></tr>
</table>

Define Start and End Times for Aggregation Data Windows

10. Click the Schedule button on the Tool Bar.

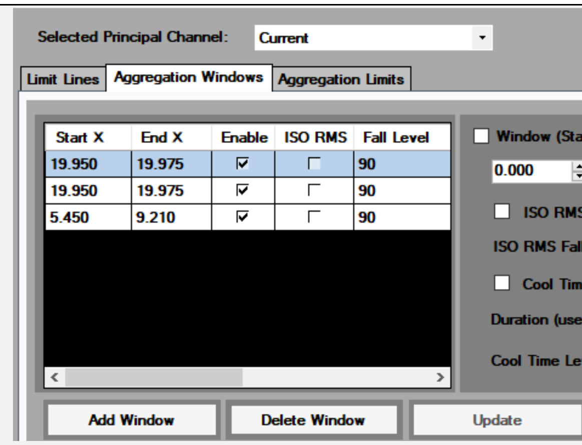


11. Select Limits and Windows tab.

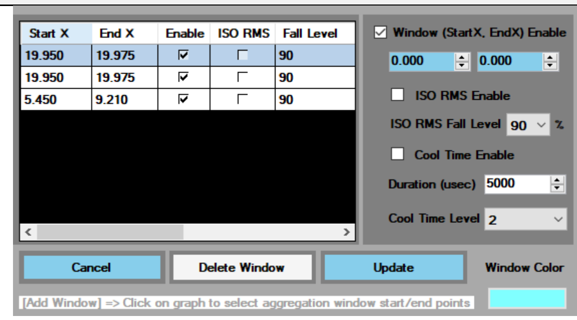


12. Select Aggregation Windows tab.

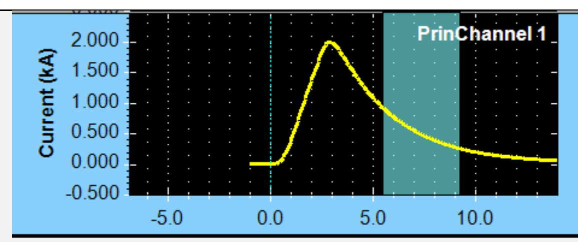
13. Select a principal channel from the drop down menu.
14. Click Add Window.

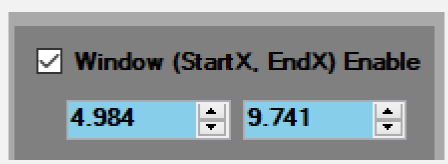


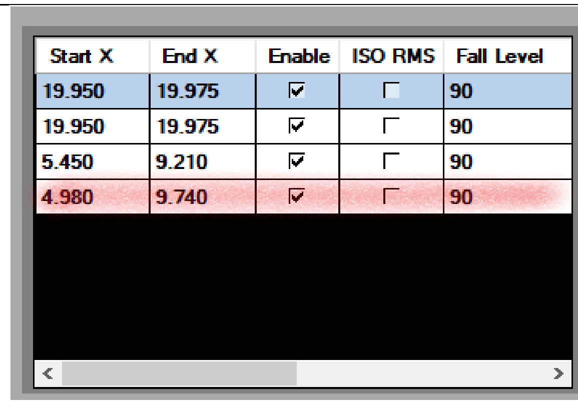
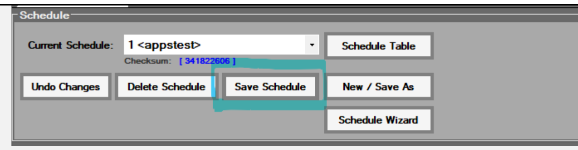
15. The Add Window button changes to Cancel, The Update button and the Window (StartX, EndX) Enable highlighted in the chosen Window Color (blue in this example).



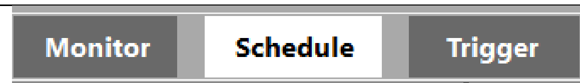
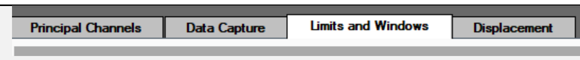
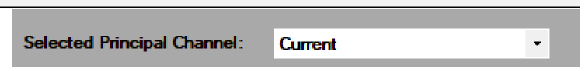
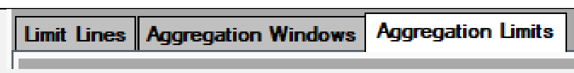
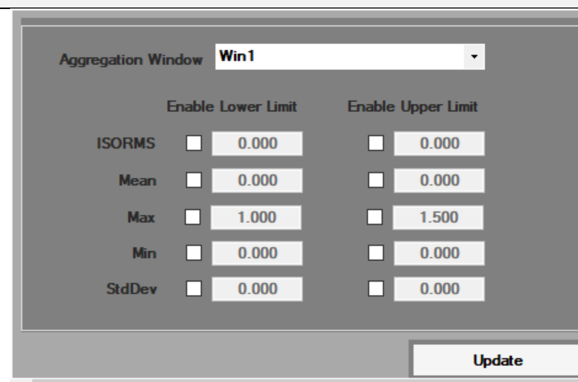
16. Click on two points along the X axis on the Live - Weld graph for the selected channel
a. The selected area is highlighted and the selected points appear in the Window (StartX, EndX) Enable fields.

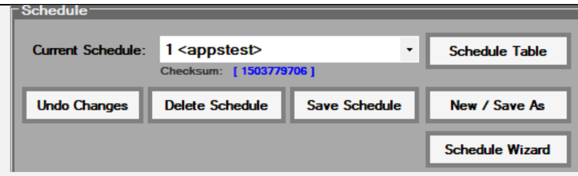
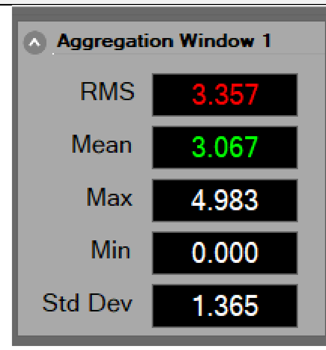
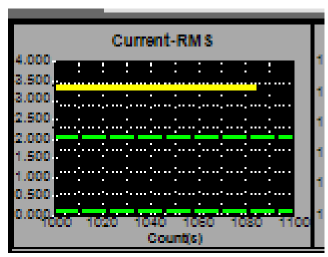




<table>
<tr><td>17. Click Update. The selected points are added to the list of aggregation windows.</td><td>
</td></tr>
<tr><td>18. Click Save Schedule in the top (Schedule) portion of the Schedule Settings window.</td><td>
</td></tr>
</table>

Define Limits of Aggregation Values

<table>
<tr><td>10. Click the Schedule button on the Tool Bar.</td><td>
</td></tr>
<tr><td>11. Select Limits and Windows tab.</td><td>
</td></tr>
<tr><td>12. Select a principal channel from the dropdown menu.</td><td>
</td></tr>
<tr><td>13. Select the Aggregation Limits tab.</td><td>
</td></tr>
<tr><td>14. Select an Aggregation Window from the dropdown list.
15. Click the box next to the Enable Lower Limit or Enable Upper Limit for the aggregation value(s) for which you wish to set limits.
16. Enter limits for each value.
17. Click Update.</td><td>
</td></tr>
</table>

18. Click Save Schedule to Save	
19. If limits are exceeded, they will display in red in the aggregation window. Values within the limits display in green. If no limits are set, the values will display in white. 20. Limit lines will display in the Aggregation Data graph (here in green).	 

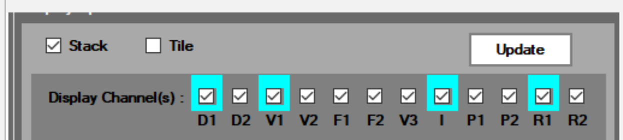
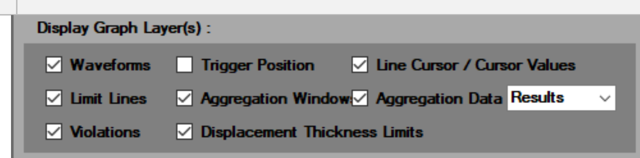
Data Display

The system allows the user to determine what data should be displayed for each channel in the Live – Weld Monitor Graph, the Aggregation Window and the Aggregation Data Graph.

Select Data to Be Displayed For Each Channel

The Live – Weld Monitor Graph presents a graphical representation of the source data for each channel. Select the channels to be graphed and additional data to be displayed.

Click here for more information about display graph options.

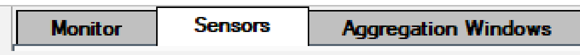
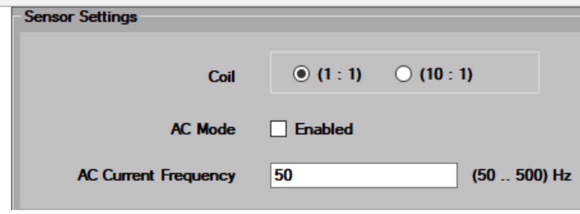
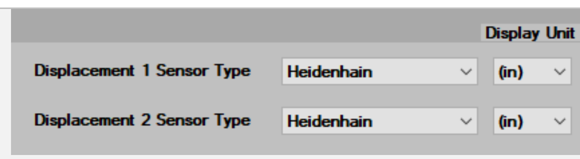
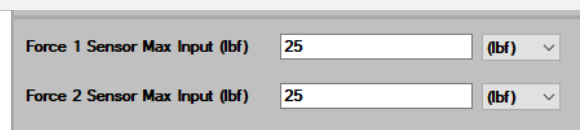
5. Click the Display button in the Tool Bar.	
6. Click on the channels to be displayed in the Live – Weld Monitor Graph. • Principal channels are highlighted in blue. • D = Displacement • V = Voltage • F = Force • I = Current • P = Power • R = Resistance	
7. Use the Display Graph Layer(s) field to select the data to be displayed on Live – Weld Monitor Graph for the selected channels. (Data is channel-specific (e.g., Displacement Thickness Limits are shown in the Displacement channels, etc.)) 8. Click Update.	

Define Input Sources and Filters

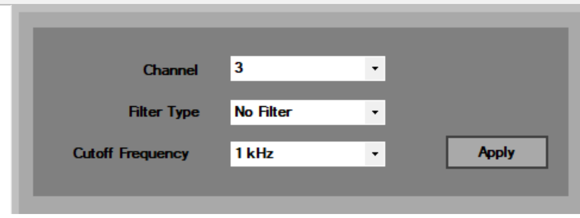
In the process of developing a weld monitoring schedule, it may be necessary to change the input settings to match the equipment being used or to refine the data being captured in relation to the trigger.

Set Sensors

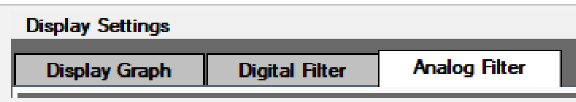
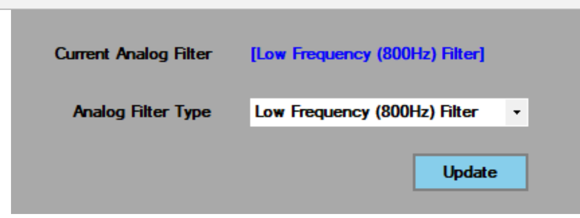
Set sensors to define the type of Rogowski coil being used, the type of displacement sensors being used, and the maximum input for the force sensors.

11) Select Monitor from the Tool Bar	
12) Select the Sensors tab	
13) Select the ratio of the Rogowski coil being used. 14) Indicate whether AC Mode in enabled. 15) If AC Mode is enabled, set the AC Current frequency (within the range of 50 to 500Hz).	
16) Set the sensor type for each displacement sensor (Heidenhain or Ono-Sokki) 17) Set the units (inches or millimeters)	
18) Set the maximum input for each of the two force sensors. 19) Set the display unit (lbf, N, or kgf) 20) Click Update.	

Set Digital Filter

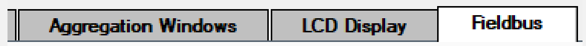
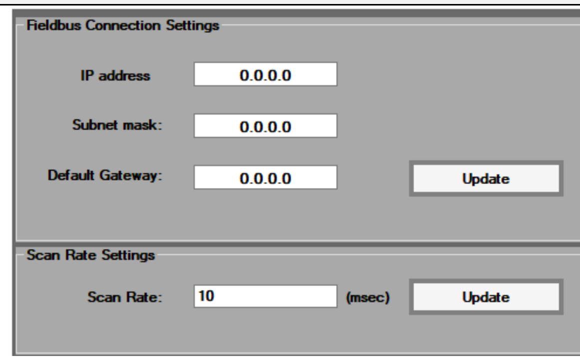
5. Click Display button in Tool Bar	
6. Select Digital Filter Tab	
7. Set Channel, Filter Type and Cutoff Frequency 8. Click Apply	

Set Analog Filter

5. Click Display button in Tool Bar	
6. Select Analog Filter Tab	
7. Set Analog Filter Type 8. Click Update	

Set Fieldbus Connections

Use the Fieldbus tab to define the fieldbus connections settings.

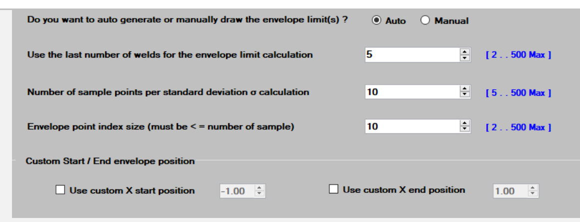
6) Select Monitor in Tool Bar	
2) Select the Fieldbus tab	
7) Set the IP address, subnet mask and default gateway for the fieldbus. 8) Click Update 9) Set the scan rate in milliseconds 10) Click Update.	

Set Envelope Limits

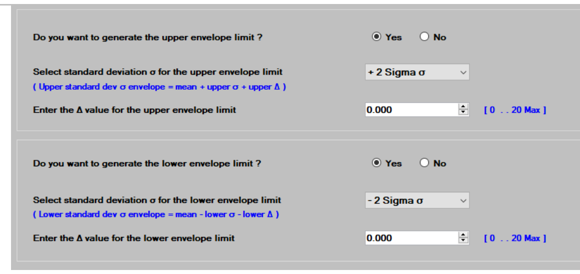
Envelope Limit is a method of quality control which employs statistical methods to monitor and control a process. The system graphs a selected number of the most recent welds, creating an envelope which sets upper and lower limits within the standard deviation established through the Envelope Limit Wizard. This makes it possible for the user to monitor the efficiency of the weld schedule beyond the scope of the individual welds reflected in the Live – Weld Graph, helping to ensure that the process operates efficiently, producing more specification-conforming products with less waste.

- The Envelope Limit Wizard only works with Principal Channels.
- The Envelope Limit Wizard allows the user to choose to create the envelope manually or to define key parameters for the system to automatically generate an SPC envelope.
- We do not recommend using the Envelope Limit Wizard for resistance channels, given the variability of resistance.

To create an envelope, begin by clicking the Envelope Link in the Tool Bar or by answering Yes to the final question in the Schedule Wizard.

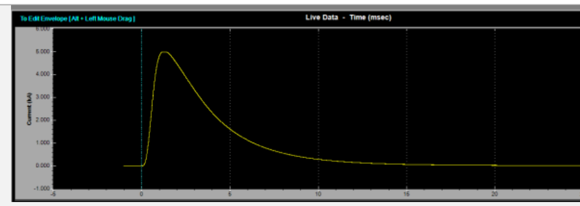
<table>
<tr>
<td>18. Select Envelope on the Tool Bar to launch the Envelope Wizard.</td>
<td>
</td>
</tr>
<tr>
<td>19. Indicate whether you intend to have the envelope limits generated automatically or to draw the limits manually.
20. If you select Manual, all choices other than Envelope point index size on this window are disabled.
21. If you select Auto, set the number of welds, sample points, and point index size. You can also choose to set custom start and end positions for the x axis.</td>
<td>
</td>
</tr>
</table>

22. If Auto is selected, indicate whether to generate upper and/or lower envelope limits.
23. Click Next.

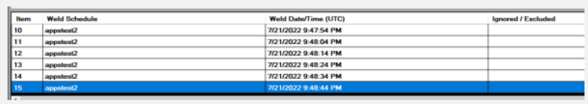


If Auto is selected:

24. The Envelope Limit View will display the envelope automatically generated each time the selected number of welds occur
25. The Weld Data list will display the date and time of each weld
26. The Auto Generated Envelope options displays, allowing the user to change the options selected on the first page of the Envelope Wizard.
27. If options are changed, click Generate Envelope to display the new envelope, click Update Schedule to save the new envelope configuration.
28. Click Finish when done.



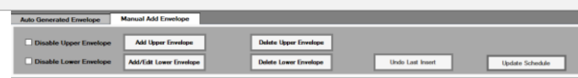
Envelope Limit View



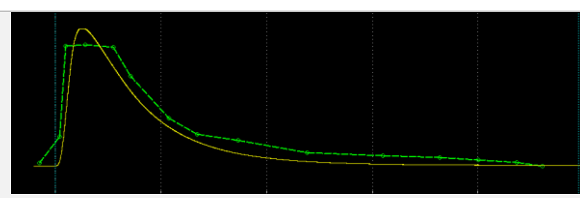
Weld Data List

Auto Generate Envelope Options

29. If Manual is selected, the Manual Add Envelope options display.



30. Select Add/Edit Upper Envelope or Add/Edit Lower Envelope.
31. Click along points in the Live Data graph window to manually build the envelope.
32. Click Update Schedule.
33. Click Finish when done.



Aggregation Windows Tab

(Disambiguation: This is different than the Aggregation Windows tab found in the Monitor Settings window. This tab is used to define a schedule which may be applied to one or more monitors whereas the Monitor Settings window applies to a specific monitor.)

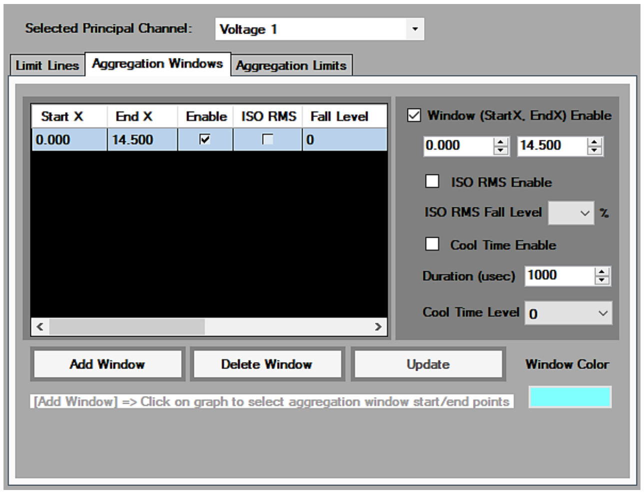


Figure 49: Aggregate Windows interface

Use the Aggregation Windows panel to create and configure up to four aggregate windows for a given channel. In DC mode, each window is defined by a start and end time (StartX, EndX). In AC mode, windows are defined by start and end cycle, as shown below.

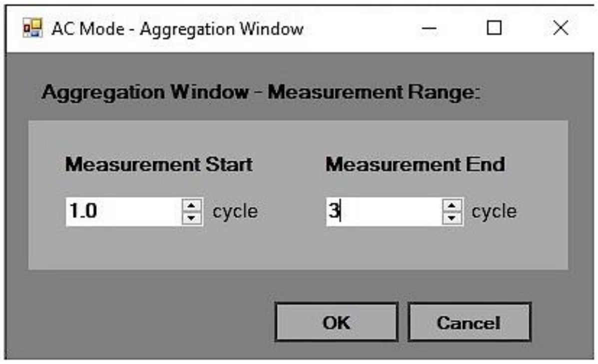


Figure 50: AC Mode Aggregation Window

> **Note:** In AC mode the start and end cycle times may not always fall exactly on the zero crossing of the AC signal. If precision is required, the user has the option of manually adjusting the start and end values (in milliseconds) after the start and end cycle are entered.

The first line in this table defines Aggregate Window I for the selected channel in Aggregate Data Window, the second line defines Aggregate Window 2, etc., for up to four windows.

- Select a principal channel from the dropdown menu.
- In the fields on the right side of the window, enter a value or scroll the up/down arrows to set positive or negative values (in relation to the trigger point) for the time coordinates for the first window for the selected channel (StartX and EndX). (These values will display in the table after you click Update.)
- Click Window Color to select the color for the aggregate window for the selected channel.
- Check Window Enable (if not checked already) to enable the window.
- Click Update to save the window. The pair of coordinates appear on the table on the left side of window.

  Repeat this process to create up to four aggregation windows for the selected principal channel.
- **Important**: The new aggregation window will not populate the Aggregation Data Window until aggregation data has been assigned to it in the Aggregation Windows tab of the Monitor Settings window. Select data elements for the new window in the Aggregation Windows and click Update. The new window will appear in the selected channel's Aggregation Data window.
- To disable an aggregation window without deleting it, un-check the Window (StartX, EndX) Enable box. To delete an aggregation window, click on a line in the Aggregation Windows table to select it and click the Delete Window button. Click Update to save.

Setting Aggregation Window in AC Mode

In AC mode, clicking on Add Window in the Aggregation Windows tab opens the AC Mode – Aggregation window. (AC Mode is set in the Sensors tab.)

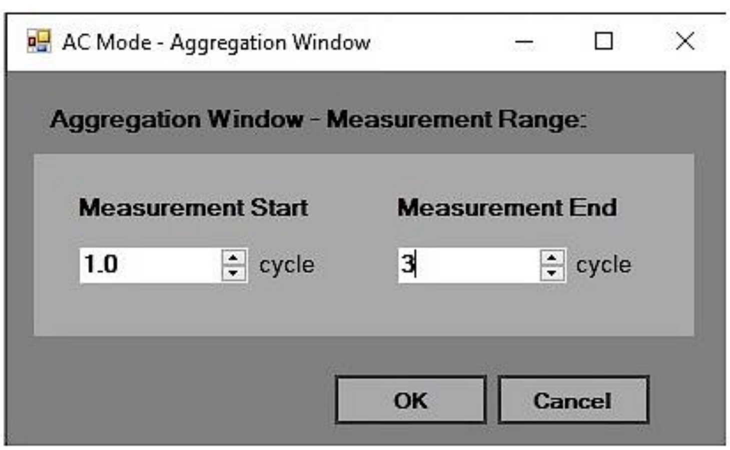
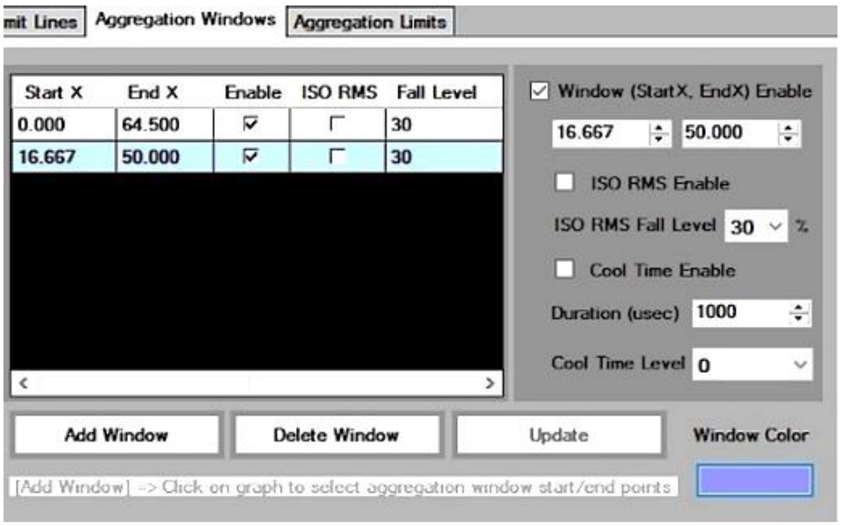


Figure 51: AC Mode Aggregation Window

Use this window to set the coarse times (cycle) for Start and End points. Click OK to return to the Aggregation Windows tab. Click Update.

Use the up and down arrows in the Window (StartX, EndX) fields to fine tune these values. The aggregation window in the Live – Weld Monitor Graph with change in real time. Click Update to save your changes.



ISO RMS/Cool Time

The user also has the option of setting the values for ISO RMS and Cool Time for a Current, provided it is the first principal channel.

Notes

- The ISO RMS and Cool Time features can *only* be applied to the first principal channel.
- ISO_RMS applies only to AC or DC waveforms, not to seam mode. For DC waveforms, ISO_RMS only applies to a single DC pulse.

ISO RMS

The ISO RMS value is calculated for the period from a beginning point (typically the trigger point) to the point where the RMS falls to a fixed percentage of its peak value.

In the example below, the measurement begins at the trigger point (0.000), peaks at 0.5211, and ends when it reaches 0.469 (90% of 0.5211).

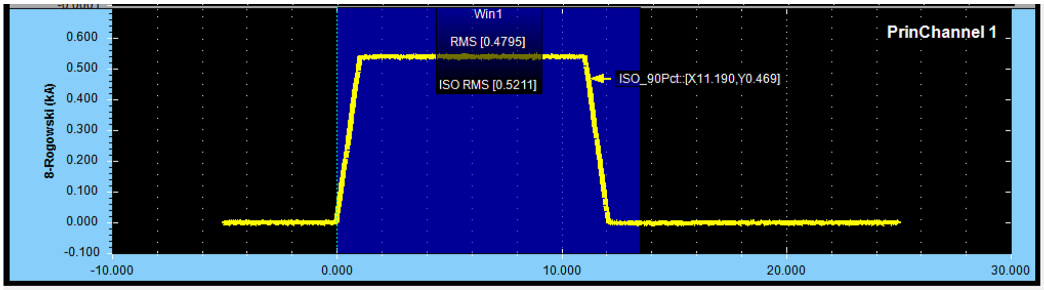


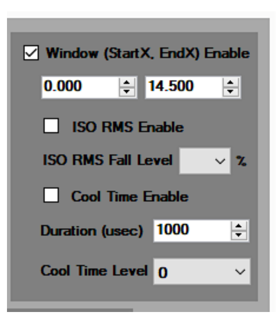
Figure 52: Aggregate window with ISO RMS

In this example, the trigger source was set to ensure that the ISO RMS, the trigger point, and the window start point (StartX) all aligned. It is not necessary for the window to start at the trigger. In some cases, a user may choose to start the window at a later point, in which case the ISO RMS calculation would start when the window starts.

To set ISO RMS, check the Enable ISO RMS box and select a percentage value from the dropdown menu for the ISO RMS fall value.

ISO RMS and Cool Time in AC Mode

When AC mode is used with ISO_RMS, the fall time must be set to 10% for the ISO_RMS reading to be correct in AC mode. Also, the cool time duration should be set longer than the length of a single AC cycle. (E.g., If an AC weld is 60Hz, then the single AC cycle is 16.67ms, and the cool time would have to be set to a value that is greater than 16.67mS (e.g., 17ms).) The aggregation window would need to extend past the last cycle by more than 17ms for cool time to work properly.



Weld Time and Current Finish Time

For single-phase alternating current, the weld time is defined in terms of the number of cycles or, if expressed in milliseconds, the duration of a single cycle multiplied by the number of cycles.

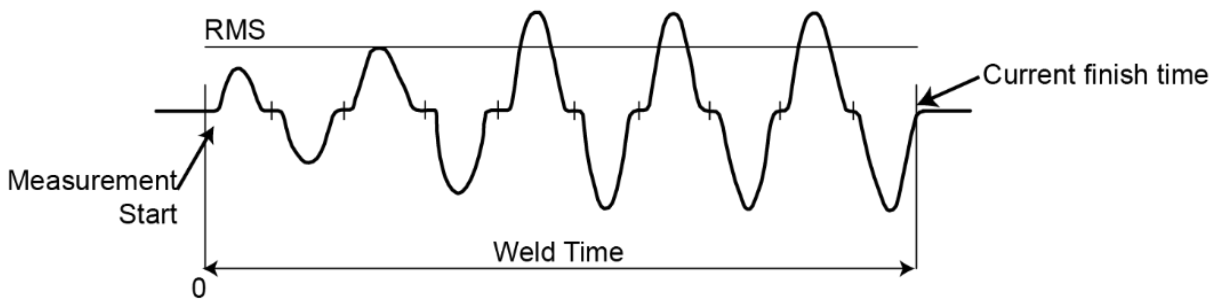


Figure 53: Single phase alternating current

For direct current, the weld time is from the current start time to the point where the RMS falls to a fixed percentage (in this example, 90%) of its peak value. Current flow time is from current start time to the point where the RMS falls to 10% of its peak value.

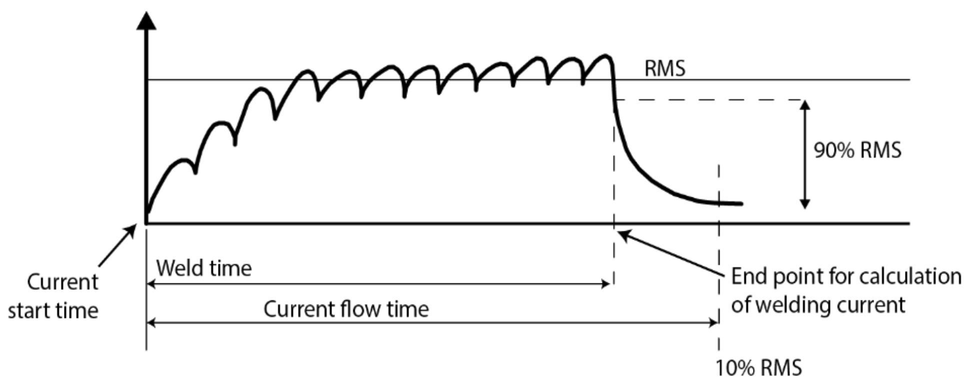


Figure 54: Direct Current Weld Time

Cool Time

Cool Time is the amount of time needed for a welded piece to cool down before it can be reliably measured. Although this value is set in the Aggregate Window Tab, it does not display there. This system uses this value to measure weld displacement when the Measurement Auto Mode box has been checked in the Displacement tab.

When Cool Time is enabled, it is indicated on the Current channel's graph in the Live - Weld Graph by a light blue field that trails the weld in the graph. In the example below, Cool Time is indicated in light blue at the point where the Current graph has returned to 10% of the Current maximum.

> **Note:** Cool Time may also display in white if it exceeds the width of the window or if the end of the aggregate window is set to end at a time before the current returns to 10%. (Either result indicates that Cool Time has not been set up properly.)
>
> **Note:** If the Cool Time appears somewhere in the graph other than at the end of the weld, it indicates interference from signal noise. If this occurs, increase the Cool Time level to raise it above the noise floor to the point where the Cool Time area trails the weld pulse.

The pink arrow in the upper (Displacement A) graph indicates the point at the end of Cool Time where the displacement measurement is made in Auto Mode. Cool Time must be set, and Auto Mode must be selected for this measurement to be made.

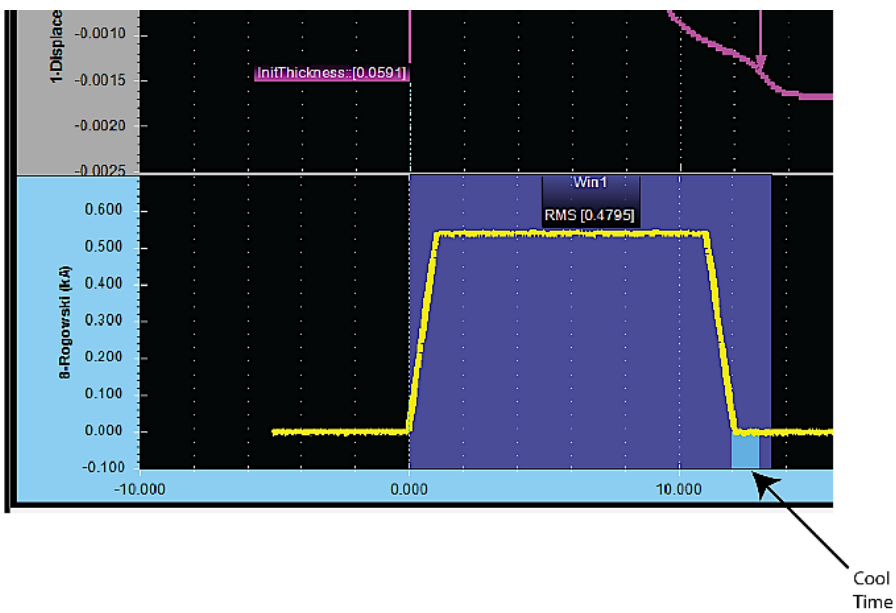
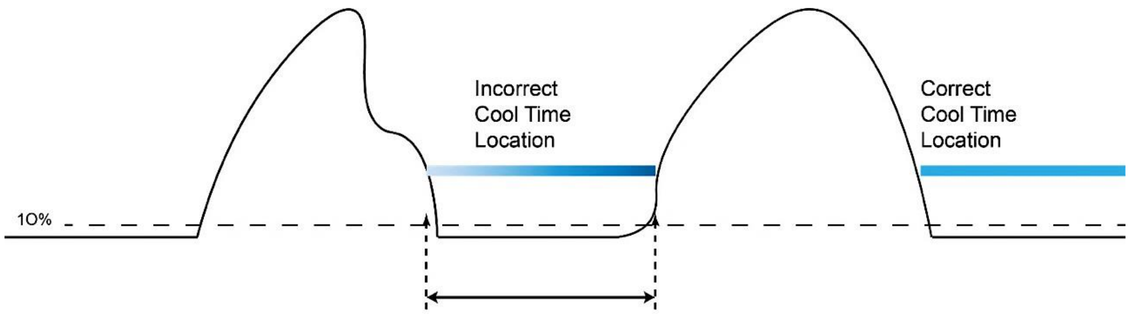


Figure 55: Cool Time and Auto Mode

To set Cool Time, check the Cool Time Enable box, set the duration in microseconds, and set the Cool Time level from the drop-down menu.

Cool Time in Multi-pulse Welds

Cool Time must be longer than the period between the set Cool Time points (e.g., 10%) for pulses in a multi-pulse weld scenario to prevent the cool time from occurring at the wrong point.



Aggregation Limits Tab

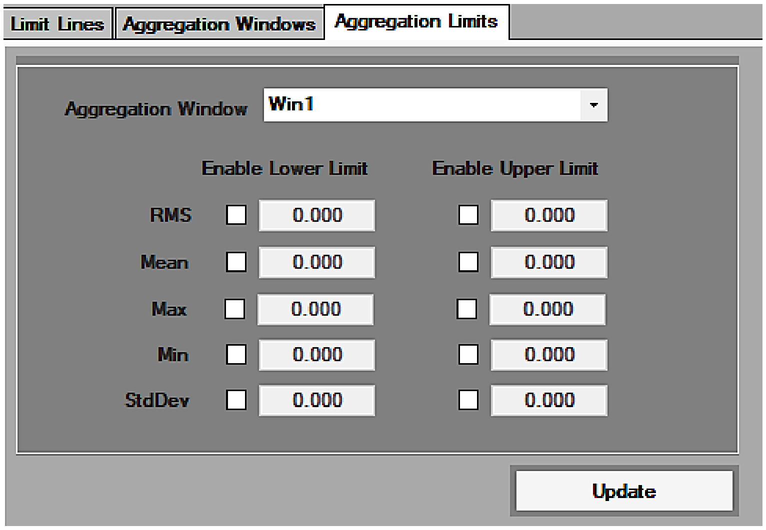


Figure 56: Aggregate Limits Tab

Use the Aggregation Limits Tab to set lower and upper limits for the aggregation values for the windows of the selected channel in the Aggregation Data Window. Check to enable the lower and/or upper limit for RMS, Mean, Max, Min or Standard Deviation (StdDev) values for the selected window.

To set these limits, the Windows must first be defined in the Aggregation Windows tab. Defined windows are listed in the dropdown menu on this tab.

- Select a window from the Aggregation Window dropdown list.
- Select Enable and set the lower and upper limits for each value.
- Click Update to save your changes.

Note: When the measured aggregate value is equal to the limit set, that value may or may not be reported as a violation.

Set LCD Display

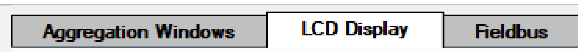
Set the LCD to define the data which appears on the data screen on the front of the WM-200A monitor.

[Click here to learn more about the LCD Display.](#)

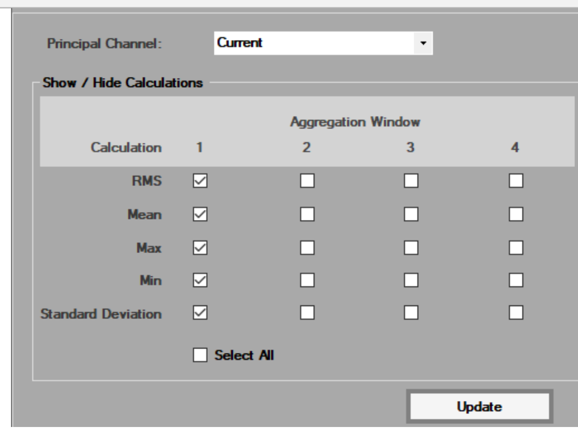
LCD Aggregate Screen

6) Select Monitor in Tool Bar.

7) Select the LCD Display tab.



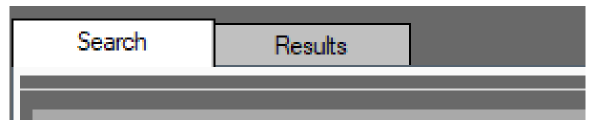
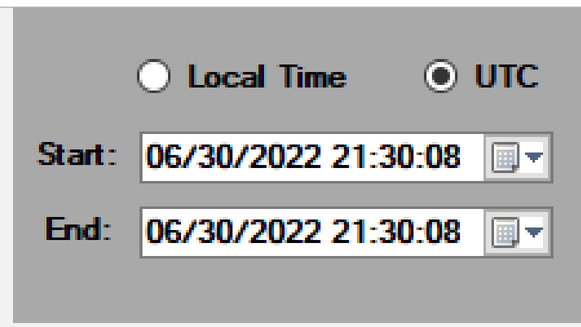
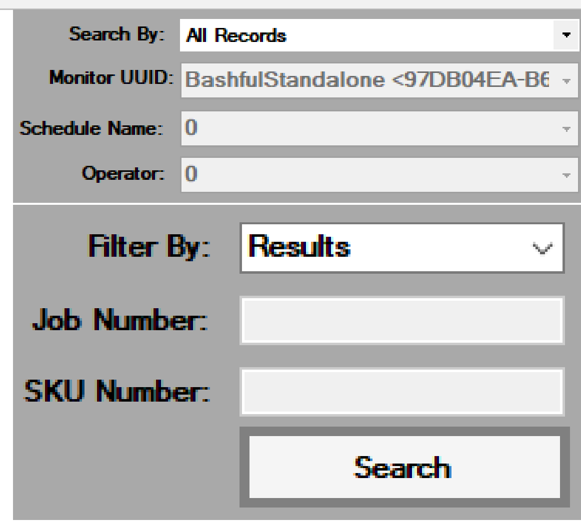
8) Select a Principal Channel.
9) Select which calculations for each aggregation window for that channel.
10) Click Update.



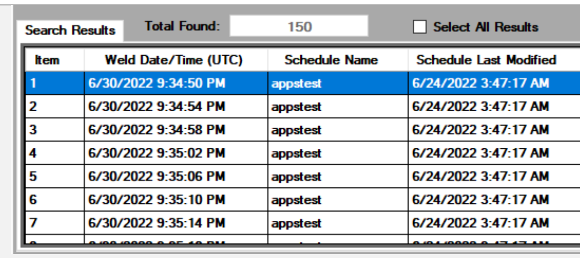
Historical Search

Tools for comparing new weld data to existing data (Historical Data)

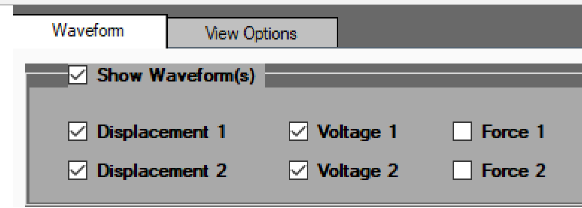
The Historical Data Search tool allows engineers to review data from previously-run welds as a tool for refining new weld monitor schedules.

Search for prior welds that meet user defined parameters.	
13) Click the History button in the Tool Bar	
14) Click Search Tab	
15) Define the time period to be search for previous welds. a. Chose Local Time or Universal Time Code b. Define the start and end times for the search.	
16) Define the search. 17) Click Search.	

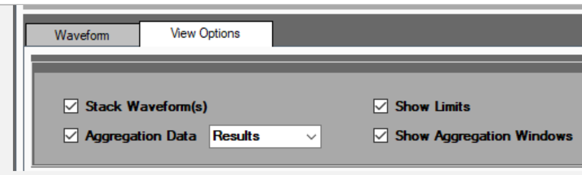
18) If there is data that matches your parameters, it will display in the Search Results table.
19) If there are no matches, widen your search. If there are too many, narrow your search.
20) Click on an item from the list to select it.



21) Select Show Waveform for waveforms in the results graph,
22) Select the channels to be displayed.

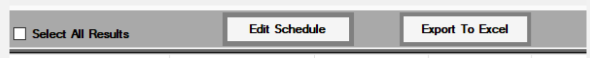


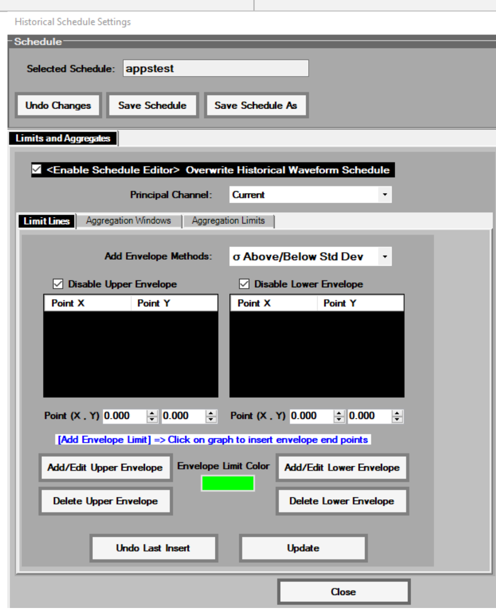
23) Select options on the View Options tab.



Adjust the limit lines and aggregation data for past welds to facilitate comparison to the new weld.

24) Click Edit Schedule on the Search Results window to modify the limit lines and aggregation data for the selected data. The Historical Schedule Settings window displays.

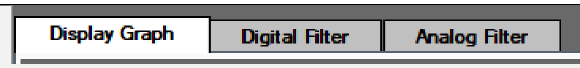
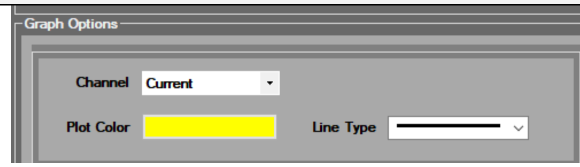




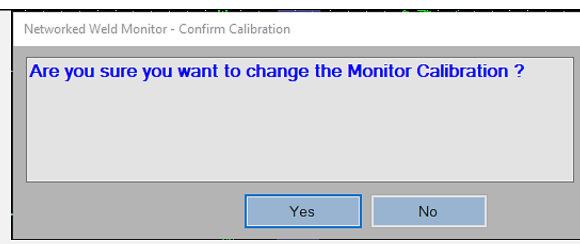
Historical Schedule Settings

Sys Admin

Select Display Graph Options

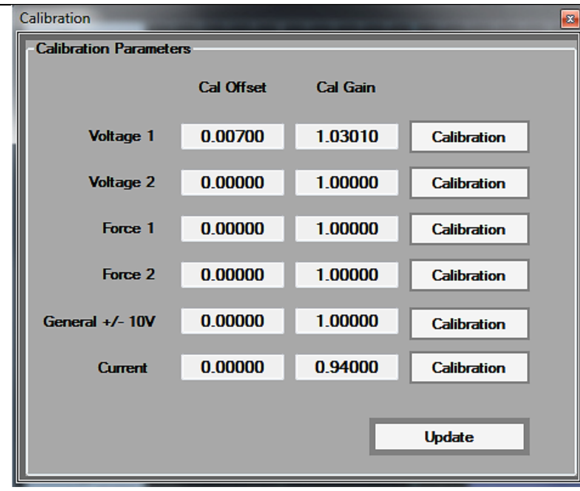
Click Display button in Tool Bar	
Select Display Graph tab	
Select channel, plot color and line type	
Select auto scale for X, Y axes or set minimum and maximum limits for each axis	
Click Update.	

Calibration

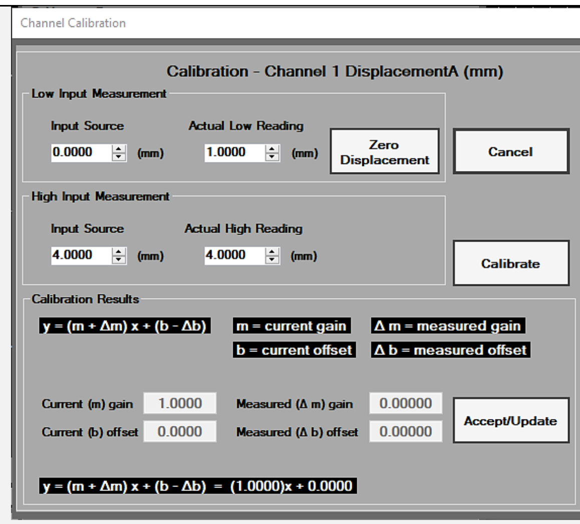
13. Click on Calibration button in the Tool Bar	
14. Click Yes on prompt to continue.	

15. Click the Calibration button for the channel to be calibrated.
16. Click Update.

Note: If the current range in the Trigger Settings window is changed, the calibration offset will also change.

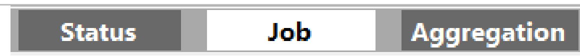
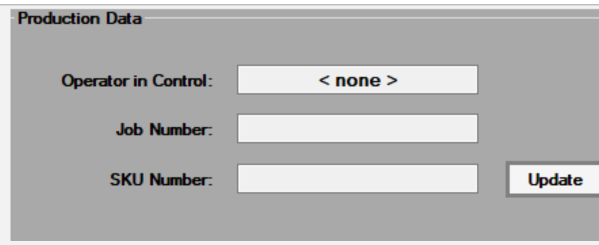


17. Enter the input source and actual reading for the low and high input measurements for the channel to be calibrated.
18. Click Calibrate. The calibration results display, using the formulae shown.
19. Click Accept/Update. Take low and high measurements again, and if the results are satisfactory, the calibration is complete.
20. Otherwise, repeat the calibration again by entering the new measured low and high values, and clicking calibrate and Accept/Update.
21. Repeat as necessary until the low and high measurements are satisfactory.
22. It is helpful to take a screenshot of the calibration values in case they need to be re-entered.
23. Repeat as necessary until the low and high measurements are satisfactory.
24. It is helpful to take a screenshot of the calibration values in case they need to be re-entered.



Job

Change Job or SKU number

4. Click Job button in Tool Bar	
5. Enter Operator name, Job number, SKU number (as required) 6. Click Update	

Additional Development Tools

The Tool Bar for the Developer Screen includes links to engineer-specific windows and tools, described in detail below. These include Monitor, Trigger, Status, Display, Job, Counter, Envelope, History, and Calibration.

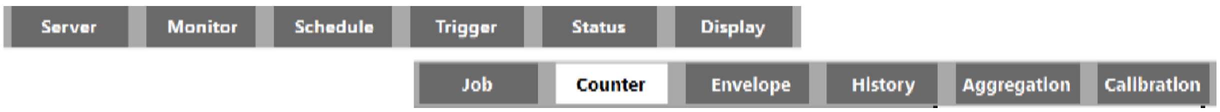
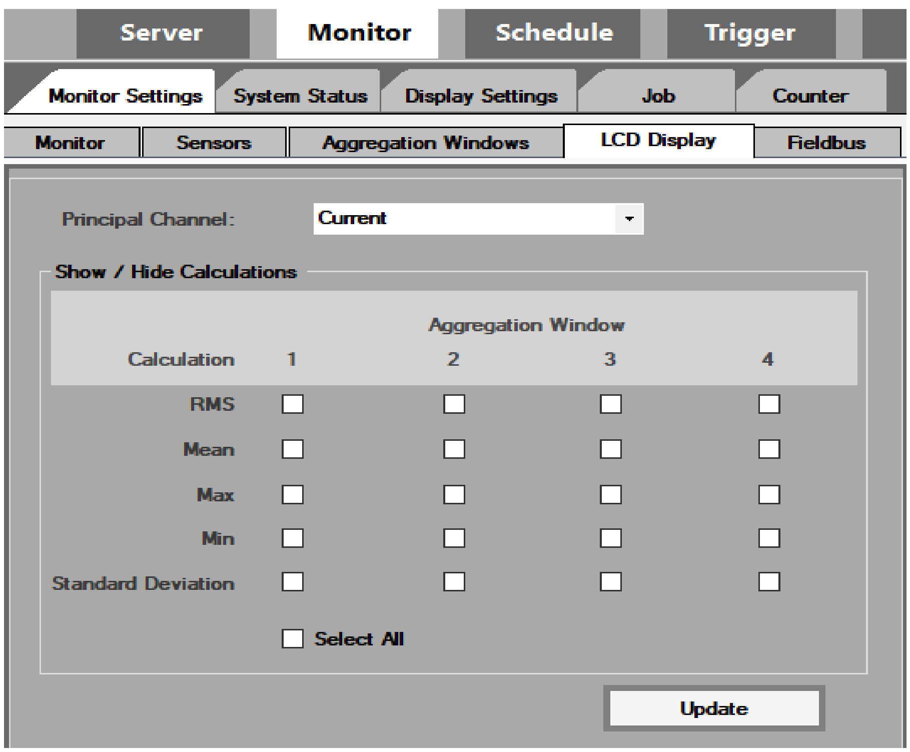


Figure 57: Engineer-Specific Links

Monitor Tool

The Monitor Tool launches a suite of tools which allow engineers to determine what monitoring data is displayed and how that data is displayed.



58: Monitor Tool Window - Developer Screen

Monitor Settings Tab

The default Developer Screen windows launches with the Monitor Settings tab open in the System Status Window. The Monitor Settings Window has five tabs: Monitor, Sensors, Aggregation Windows, LCD Display and Fieldbus. Use the Monitor Settings tab to define how the Monitor connects to the device being monitored and the rest of the system.

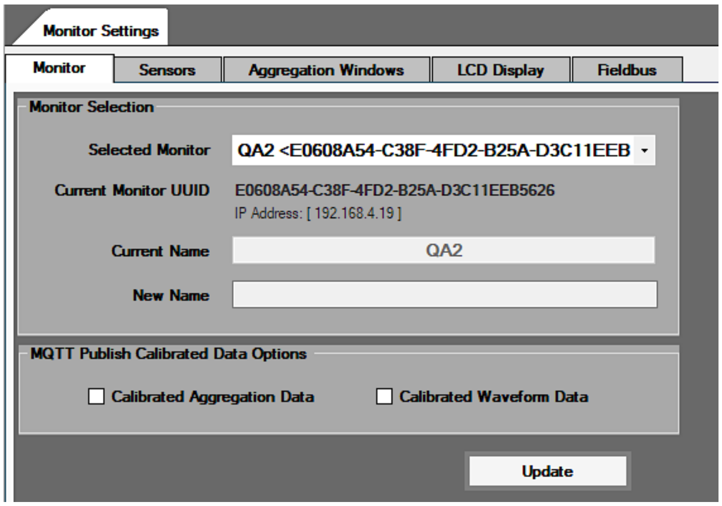
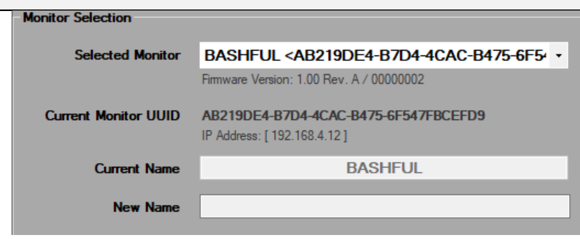


Figure 59: Monitor Settings Tab

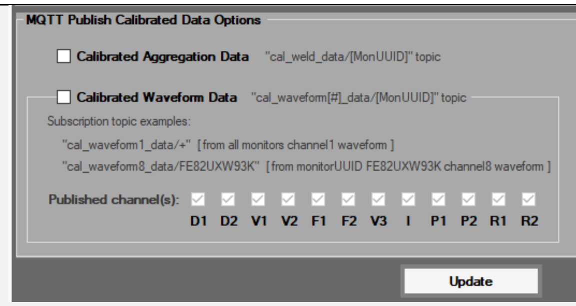
Use the Monitor Tab to select and/or rename the monitor and to choose to publish calibration aggregation data and/or calibrated waveform data via MQTT.

1. Select Monitor from the Tool Bar	
2. Select the Monitor Tab	
3. Select a monitor from the dropdown list. 4. Change the name of the monitor, if required.	

<table>
<tr>
<td>

5. Choose whether to publish Calibrated Aggregation Data and/or Calibrated Waveform Data via MQTT.
    a. Published MQTT data can be read by a third party SPC tool that can receive MQTT messages. The third party SPC tool would be configured to point to the MQTT server (i.e., setting IP of MQTT server in the SPC tool's configuration).
    b. If the user checks the MQTT published data options, the currently connected monitor's data will be published. If MQTT data from another monitor is required, select that monitor first in the GUI, then check the MQTT published data options for that monitor.
6. Click Update to save changes.

</td>
<td>



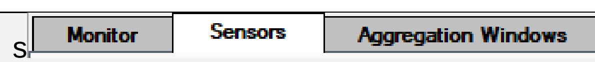
</td>
</tr>
</table>

Sensors Tab

Set sensors to define the type of Rogowski coil being used, the type of displacement sensors being used, and the maximum input for the force sensors.

<table>
<tr>
<td>1) Select Monitor from the Tool Bar</td>
<td>

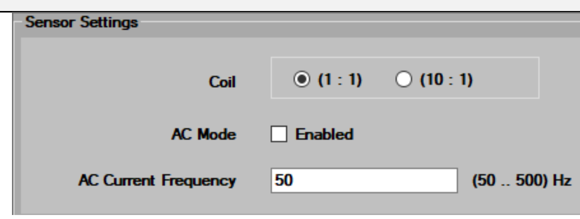
</td>
</tr>
<tr>
<td>2) Select the Sensors tab</td>
<td>



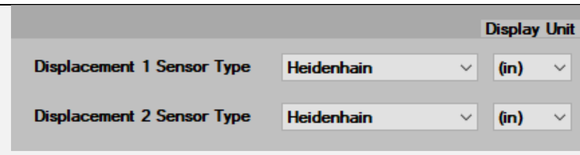
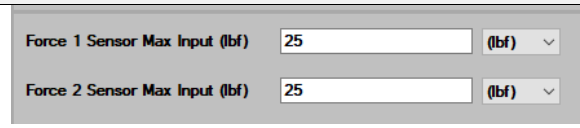
</td>
</tr>
<tr>
<td>

3) Select the ratio of the Rogowski coil being used
4) Indicate whether AC Mode in enabled.
5) If AC Mode is enabled, set the AC Current frequency (within the range of 50 to 500Hz).

</td>
<td>



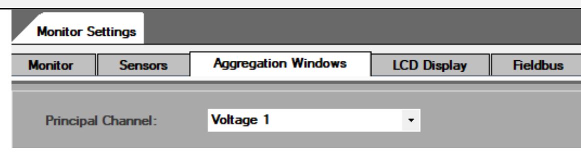
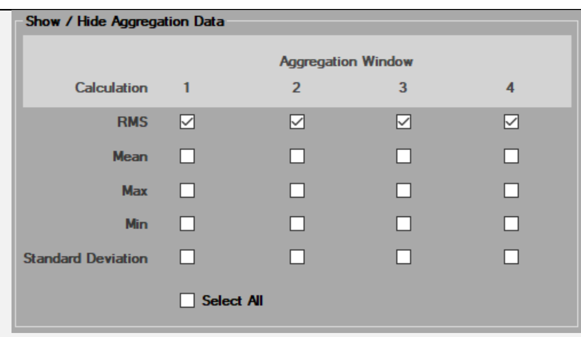
</td>
</tr>
</table>

6) Set the sensor type for each displacement sensor (Heidenhain or Onosokki) 7) Set the units (inches or millimeters)	
8) Set the maximum input for each of the two force sensors. 9) Set the display unit (lbf, N, or kgf) 10) Click Update.	

Aggregation Windows Tab

(Disambiguation: This is different than the Aggregation Windows tab found in the Limits and Windows Tab in the Schedule Window. This tab applies to a specific monitor whereas the Schedule window tab is used to define a schedule which may be applied to one or more monitors.)

Use the Aggregation Windows Tab to select which calculations will display in the Aggregation windows.

1. Click the Monitor button in the Tool Bar	
2. Select the Aggregation Windows Tab	
3. Select a Principal channel from the dropdown menu.	
4. Check the type(s) of data to be aggregated and displayed in the Aggregation Window and Aggregation Data Graph. 5. Set data types for up to four windows of time for one or more of the selected principal channels. (The Select All option selects all data types for all windows for a given source.)	

- RMS: Root Mean Square – the value of the direct current that would produce the same average power dissipation in a resistive load.
- Mean: The sum of all values in the set divided by the number of values.
- Minimum (Min): The lowest value for that channel in a weld.
- Maximum (Max): The highest value for that channel in a weld.
- StdDev: The difference between the RMS value and the Mean value.

6. Click Update. Only selected data types will display in the Aggregation Window once you click Update.

Note: Not all data types are available for all data sources. (E.g., RMS and Standard Deviation are disabled for Resistance.)

Note: When changing the selected principal channel from Current or Voltage (which support RMS and STD DEV) to a Power or Resistance channel (which do not support RMS or STD DEV), it is important to click Update so that RMS and StdDev are deselected.

LCD Display Tab

Use the LCD Display Tab to select which calculations will display on the Aggregation Window of the Monitor's LCD display.

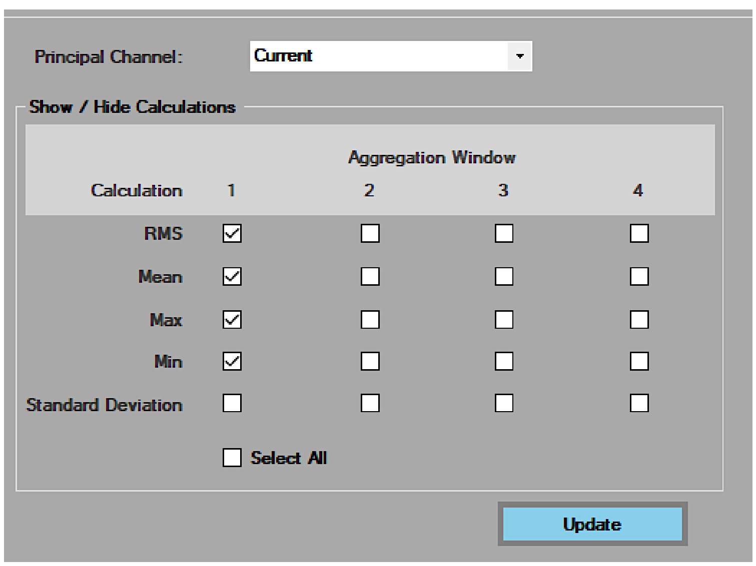
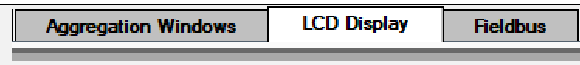
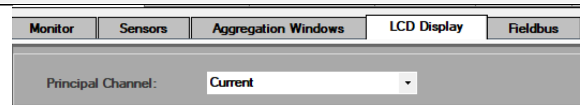
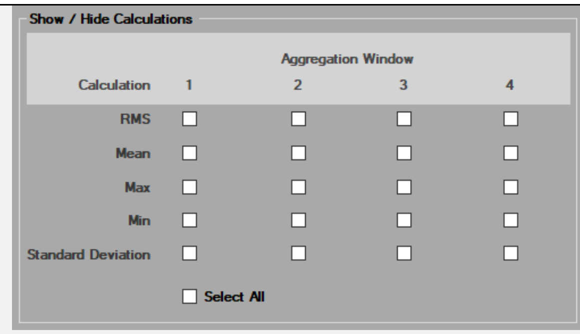


Figure 60: LCD Display Tab

1. Click the Monitor button in the Tool Bar	
2. Select the Aggregation Windows Tab	
3. Select a Principal channel from the dropdown menu.	
4. Click to select which data will appear on the LCD display. 5. Click Update	

Fieldbus Tab

Use the Fieldbus Tab to review or modify the IP address, Subnet mask, Default Gateway, and Scan Rate settings for the fieldbus connection.

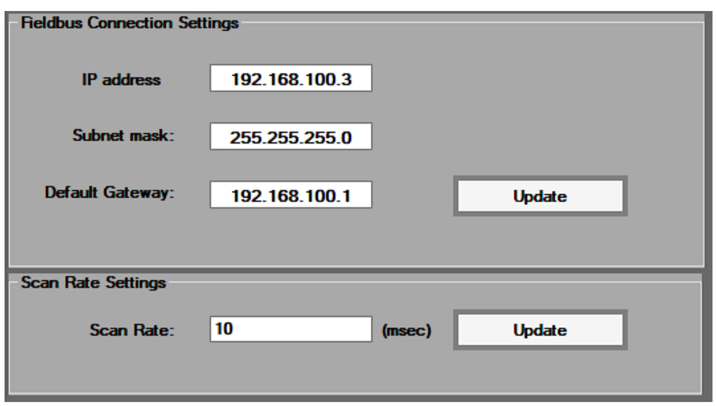
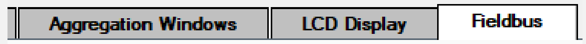
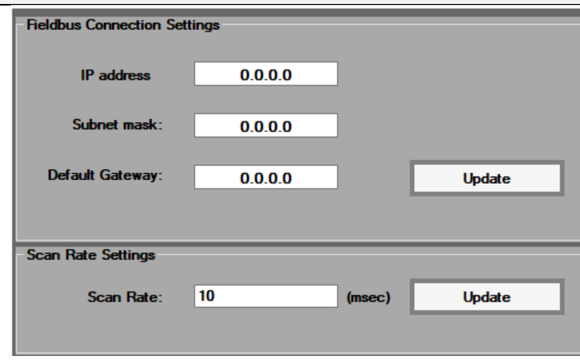
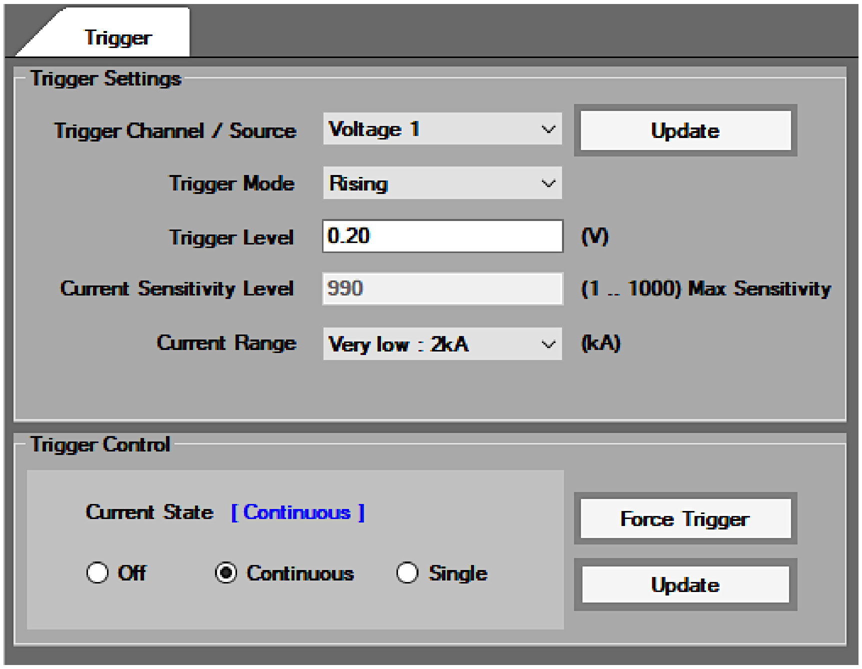


Figure 61: Fieldbus Tab

1) Select Monitor in Tool Bar	
3) Select the Fieldbus tab	
4) Set the IP address, subnet mask and default gateway for the fieldbus. 5) Click Update 6) Set the scan rate in milliseconds 7) Click Update.	

Trigger Tool

Click the Trigger link in the Tool Bar to set the trigger.



Trigger Settings	
1)	Select the Trigger Channel/Source Note: When setting trigger for Current, both Trigger Channel/Source and Trigger Mode must be set to Current
2)	Select the Trigger Mode from the dropdown list.
3)	Set the Trigger Level
4)	If trigger is set for Current, set Current Sensitivity Level from 1 (least sensitive) to 1000 (most sensitive)
5)	Set the Current Range from the dropdown list.

Trigger Control	
1)	Select the Trigger Control (Off, Continuous, or Single)
2)	Click Update.

3)	Click Force Trigger to initiate a trigger event.
4)	Click Update to save changes

Note: A changed trigger level only applies to the selected Channel/Source and is only saved as part of the schedule when the schedule is saved. The changed level is not saved if the trigger source is changed.

Note: The voltage trigger level is more accurate at faster sample rates (e.g., 5uS) with slower rising voltage signals than at slower sample rates (e.g., 100uS) with faster rising voltage signals.

Status Tool

Click the Status link in the Tool Bar to see a snapshot of the status of the device being monitored. In default Monitor Mode, this opens the System Status and Error Event list.

The System Status Window has three tabs, Status, Errors, and Counter.

Status Tab

The **Status tab** provides a quick view of the status of the weld monitor and the PLC; green is good, red indicates a fault.

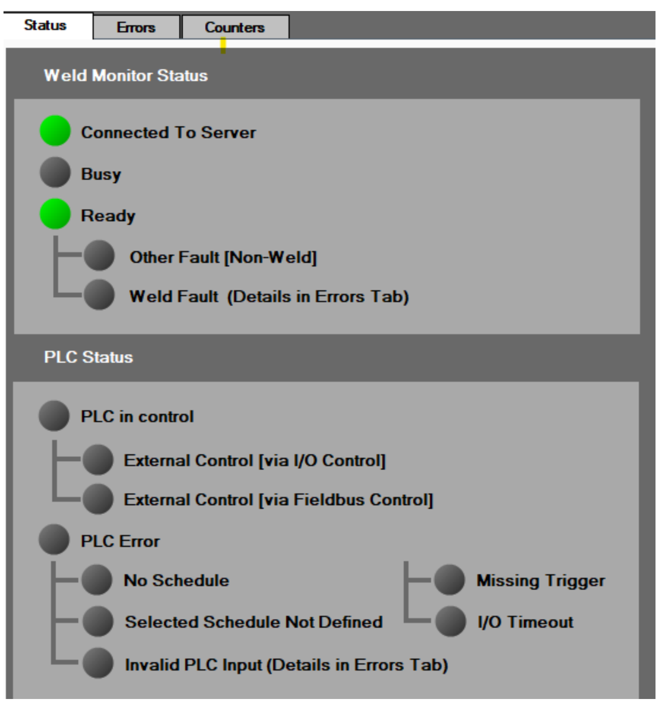


Figure 62: Status Tab

Error Tab

The Error Tab indicates the type of error most recently detected. Red indicates an error.

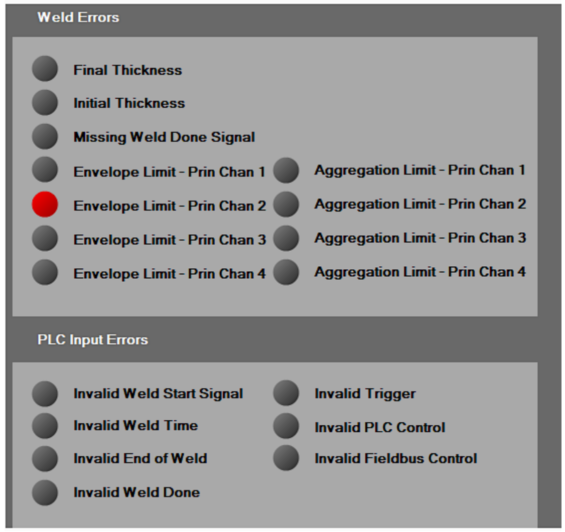


Figure 63: Error Tab

Counter Tab

The Counter Tab identifies the Networked Weld Monitor and the Current Monitor Schedule. It includes the Weld Counter window and the Error Event list.

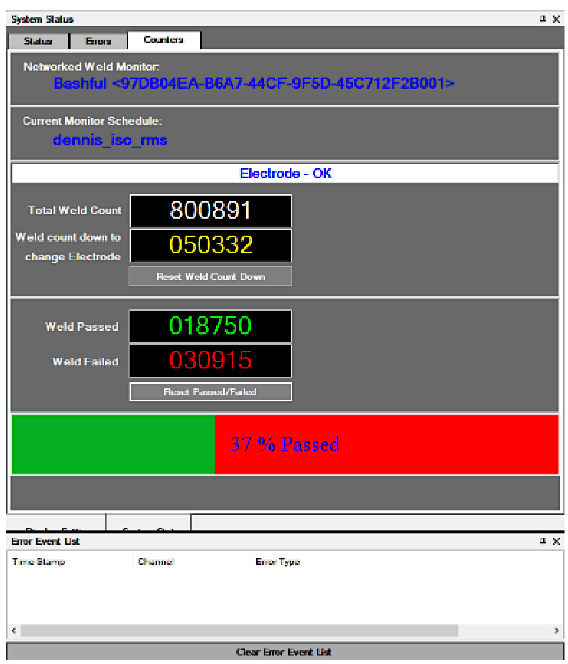


Figure 64: Counters Tab

Weld Counter

The Weld Counter window identifies the monitor and monitor schedule. It shows the total weld count, the number of welds left before the electrode should be changed, and the number and percentage of passed and failed welds.

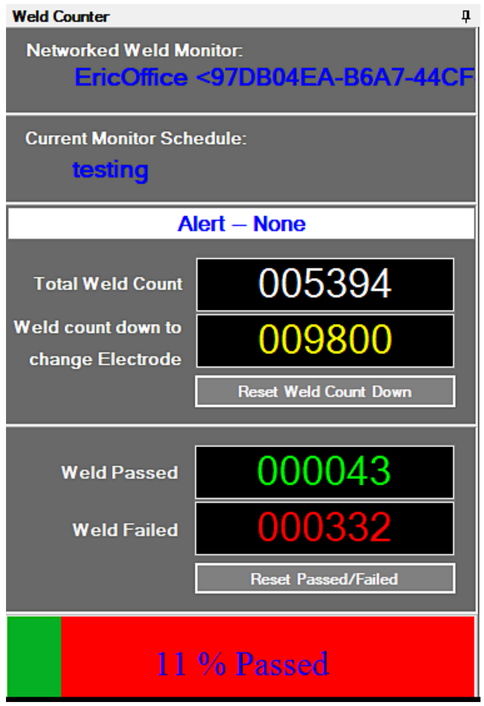
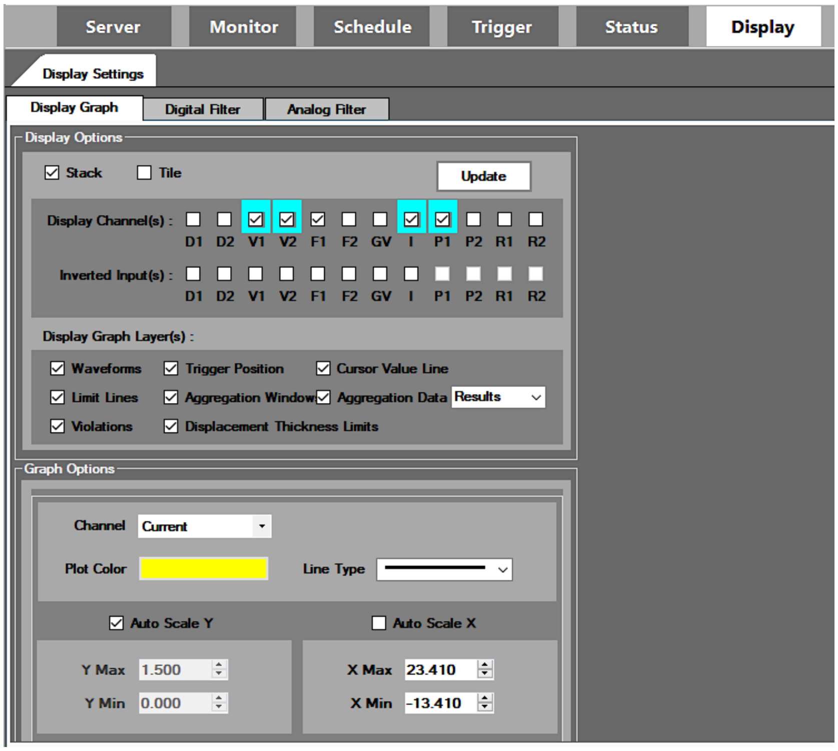


Figure 65: Weld Counter Window

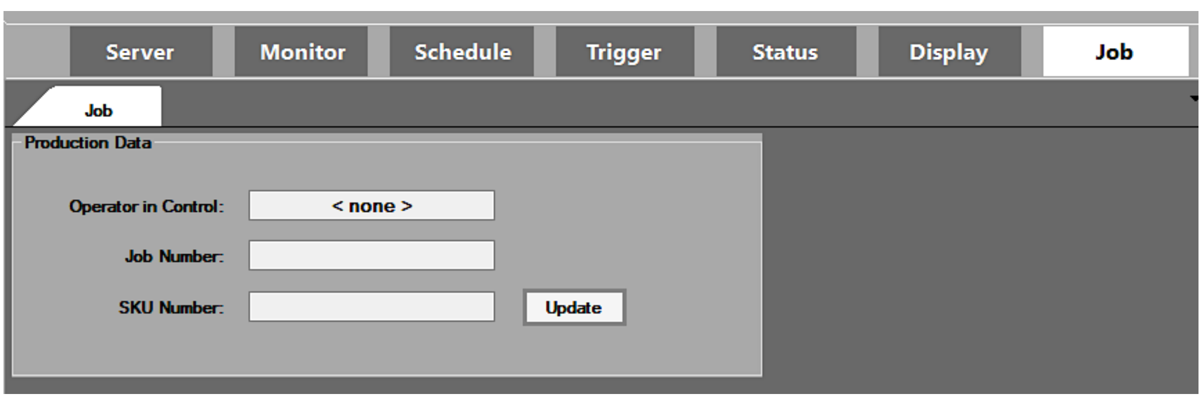
Display Tool

The Display Settings Tab in the Developer Screen functions the same as it does in the Monitor Screen. See Display Settings above for more information.



Job Tool

The Job Window in the Developer Screen functions the same as it does in the Monitor Screen. See Job Window above for more information.



Counter Tool

The Counter Tab displays the Weld Count Reset Window, showing the total weld count. The Electrode Replacement Alert field allows the user to set the number of welds that can be performed before the electrode needs to be replaced. If the Counter Tab is not visible, click the Counter link in the Tool Bar to surface the Counter tab.

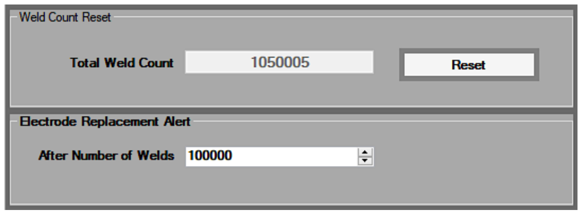


Figure 66: Counter tab

Click Reset to start the total weld count at zero.

Use the arrows or enter a value to change the Electrode Replacement Alert. The highest possible value is 100,000 and the lowest possible value is 100.

Note: The Counter Tab is not the same as the Counters Tab that appears in the System Status window.

Envelope Tool

The Envelope Tool launches the Envelope Limit Wizard.

Envelope Limit Wizard

The Envelope Limit is a method of quality control which employs statistical methods to monitor and control a process. In this case, this system graphs a selected number of the most recent welds, creating an envelope which sets upper and lower limits within the standard deviation established through the Envelope Limit Wizard. This makes it possible for the user to monitor the efficiency of the weld schedule beyond the scope of the individual welds reflected in the Live – Weld Graph, helping to ensure that the process operates efficiently, producing more specification-conforming products with less waste.

- The Envelope Limit Wizard only works with Principal Channels.
- The Envelope Limit Wizard allows the user to choose to create the envelope manually or to define key parameters for the system to automatically generate an SPC envelope.
- We do not recommend using the Envelope Limit Wizard for resistance channels, given the variability of resistance.

To create an envelope, begin by answering Yes to the final question in the Schedule Wizard or by clicking the Envelope Link in the Tool Bar.

- The Envelope Limit Wizard Setup window launches.

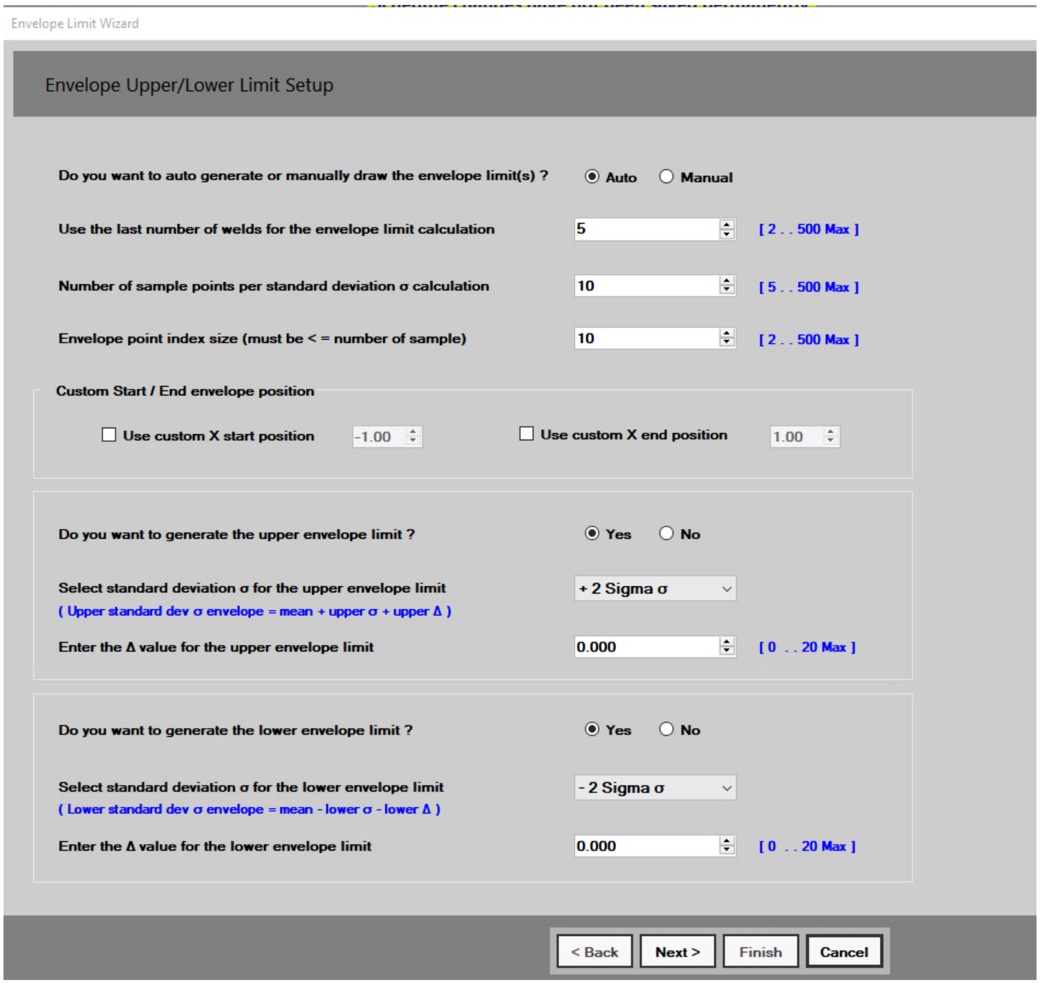


Figure 67: Envelope Limit Wizard

The image below shows a set of envelopes using these settings.

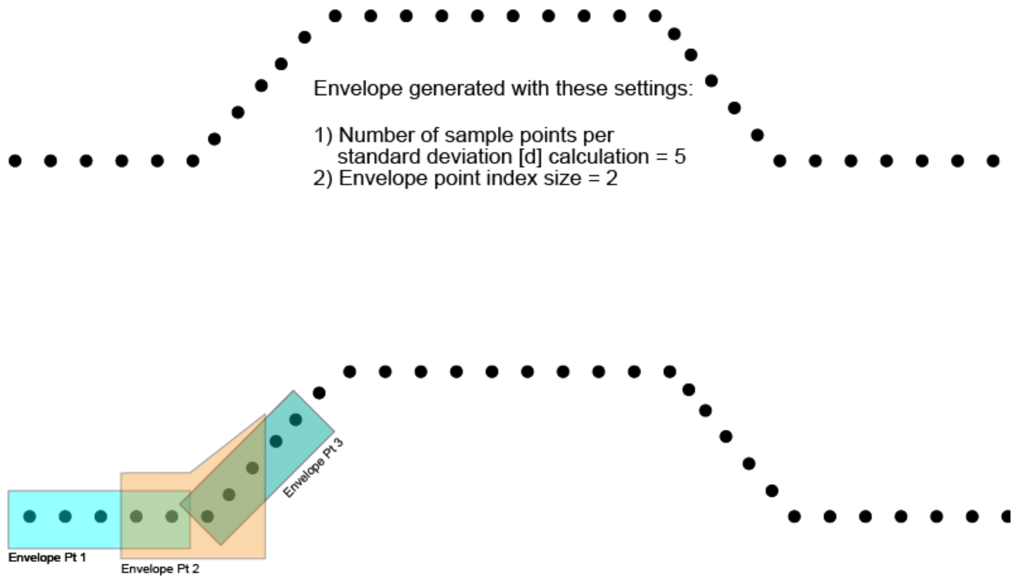


Figure 68: Sample Envelope

- Select whether you want the system to automatically generate the envelope(s) or if you prefer to draw it/them manually.
  - **If you select Auto**, proceed to answer the rest of the questions on the window and select or input the required values.
    - **"Use the last number of welds . . ."**
      - A newly installed version of WM-Inspect will need to establish a number of welds for this field before the Envelope Wizard can automatically generate envelope limits. Therefore, a user would need to set up initial envelope limits using the Envelope Limit Wizard and perform a number of welds to establish a "last number of welds." Those initial welds will remain in the list of welds as long as WM-Inspect remains open. They can be cleared at any time by clicking the Clear Weld Data List button (see below).
    - Set the values for the remaining fields.
    - Click Next.
  - **If you select Manual**, all of the other questions and fields on this window are grayed out except for envelope point index size. Set the index size and click Next.

- The Envelope Limit View Window Displays

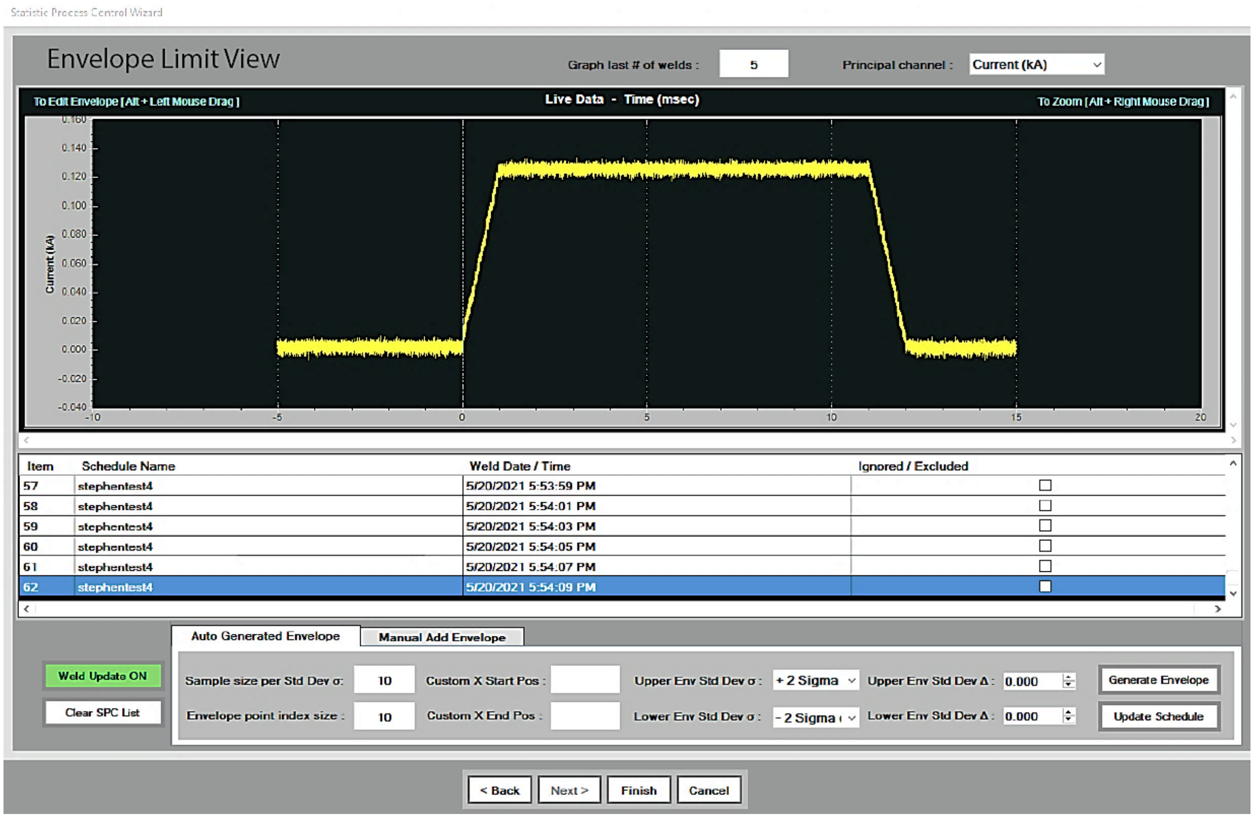


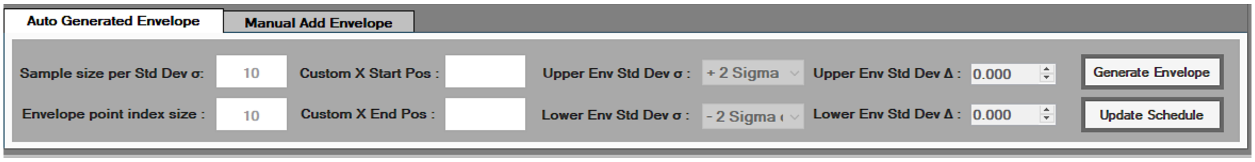
Figure 69: Envelope Limit View Window

The Envelope Limit View window includes:

- A field displaying the number of welds used to generate the envelope
- Principal Channel drop down menu**:** Allows the user to select the Principal Channel to which the Envelope Limits apply.
  - Note: The Envelope Wizard only works with channels which have been defined as principal channels.
- A graph of the last pre-set number of welds (as set by the user in the Envelope Limit Wizard).
- A list of the welds used to generate the statistical data.
- A summary of the values set in the Envelope Limit Wizard. These are displayed on one tab if the envelope if generated automatically or manually.

Auto Generated Envelope Tab

Selecting the Auto Generated Envelope tab means that the envelope limit will be generated automatically.

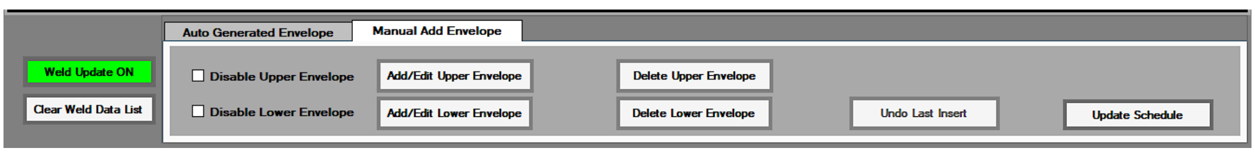


Displays:

- Sample Size per Standard Deviation (**σ**)
- Envelope point index size
- Custom X (time) Start and End positions
- Fields which allow the user to change Upper and Lower Standard Deviation **σ** (sigma) and **Δ** (delta) and generate a new envelope reflecting the new values.
-

Manual Add Envelope Tab

Allows the user to disable, add or delete upper or lower envelopes.



Envelope Wizard Buttons

- **Weld Update On**: Allows data from current welds to be updated to the list.
- **Clear Weld Data List**: Clears all welds from the list
- **Generate Envelope:** (On Auto Generated Envelope tab) Generates an envelope based on the settings established in the Envelope Wizard
- **Update Schedule:** Updates the main schedule with the envelope created in the Envelope Wizard.

History Tool

The History Tool launches the Historical Data Search tool. This tool helps engineers to refine new weld monitor schedules by allowing them to review data from previously run weld operations. Engineers can search for prior welds that meet user-defined parameters, review waveforms from those welds, and adjust the limit lines and aggregation data for those welds to facilitate comparison with the weld monitor schedule being developed.

Search Parameters

To use the History tool, begin by clicking the History Link. The Historical Data Search launches.

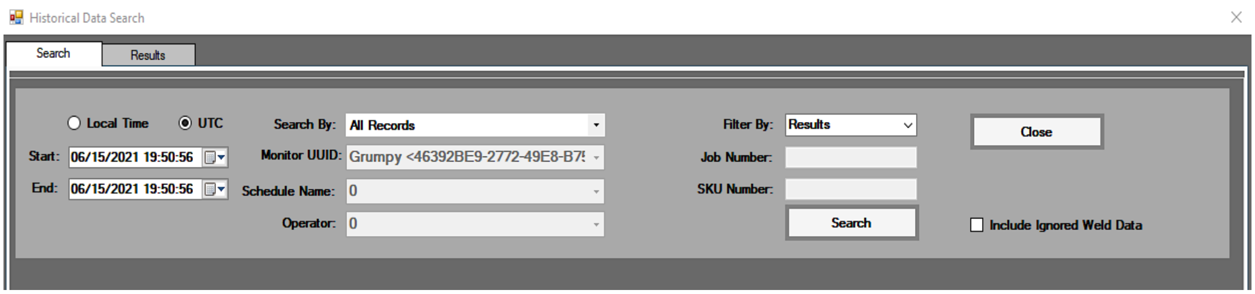
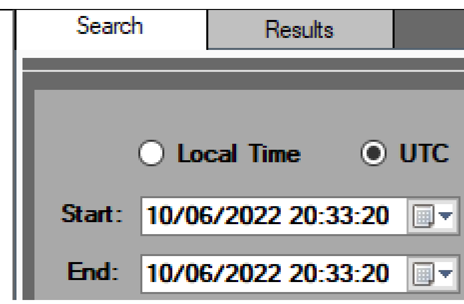
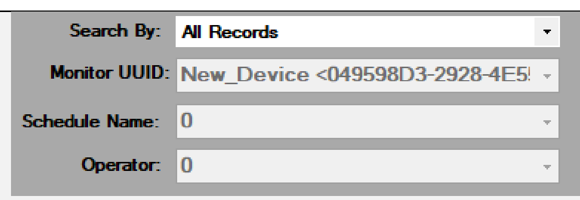


Figure 70: Historical Data Search tool

Set Search Parameters

1) Use the calendar functions to set the start and end times for the period to be searched. 2) Determine whether the time expressed in the start and end times is in local time or UTC based on a 24 hour clock.	
1) Define the scope of the search by selecting an option in the Search By field. a) You can choose to search All Records, in which case other search parameters will be grayed out, or you can search by Monitor UUID,	

Schedule Name, Operator, or some combination of these parameters. b) If you choose to search by one or more parameters, the search fields for those parameters will become active and will provide a dropdown list of available monitors, schedules and/or operators.	
1) Further define the scope of the results to be displayed by applying one or more filters. The default is to have no filter. You can choose to filter by: a) Limit violations b) Aggregation violations c) PLC IO violations d) Job number (enter Job number) e) SKU number (enter SKU number) **f)** Good Weld (No Violation)	

Click **Search**. The Results Tab displays, allowing you to select one or more sets of results to display. (The Historical Data Search Graph at the top of the Results Tab will not populate until results have been selected from the Search Results table.)

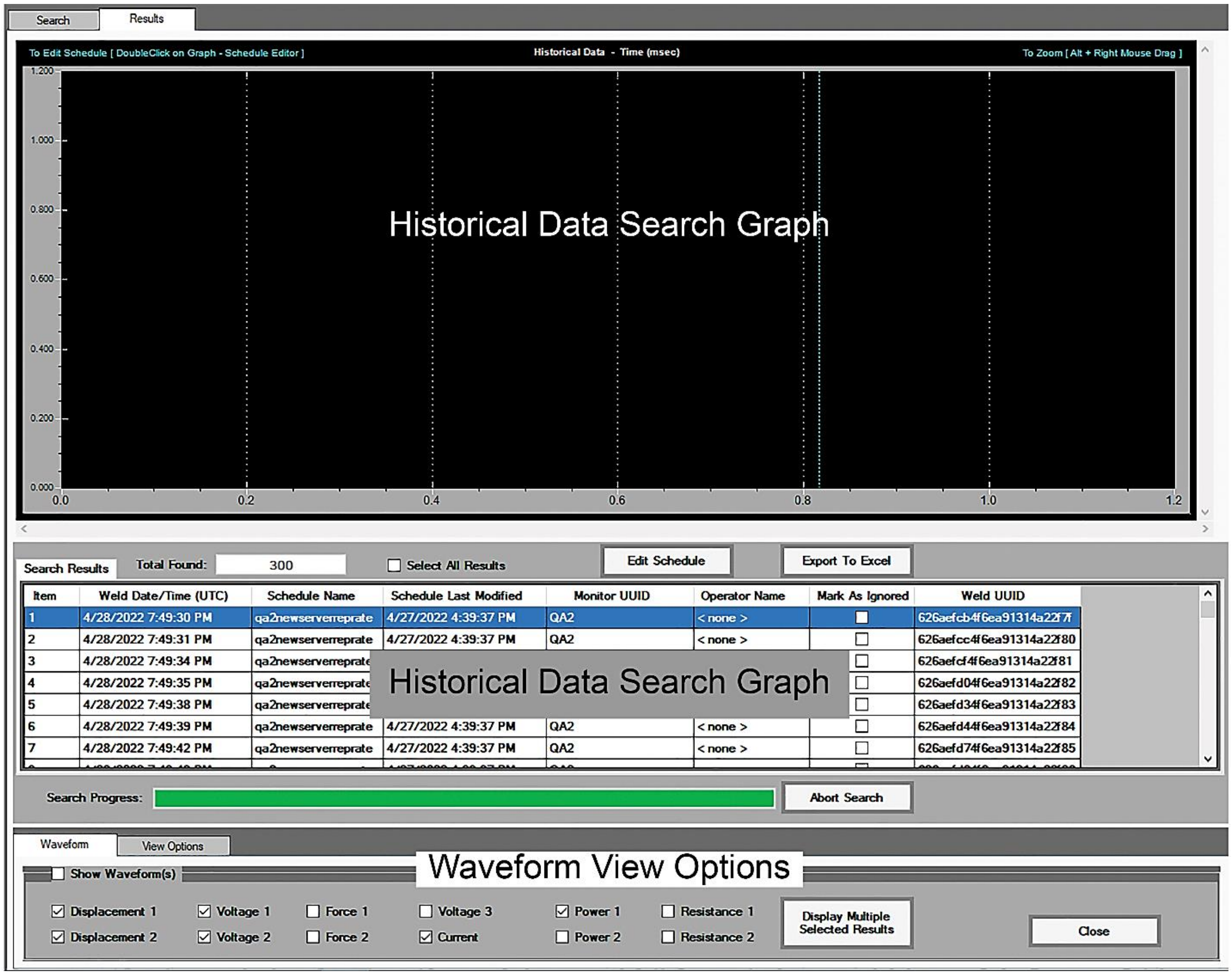


Figure 71: Historical Search Results Tab

Search Results

The Search Results table displays a numbered list of the previous welds that match the search parameters. Different column names will be displayed or hidden, depending on how the user has chosen to filter search results. For each weld, the table may list:

- **Weld Date/Time:** Listed in UTC (regardless of whether the search parameters used Local Time or UTC).
- **Schedule Name**
- **Schedule Last Modified**: Date and Time.
- **Monitor UUID**
- **Operator Name**

  - **Note:** This option will only function if only appear if an operator took control when generating weld data.
- **Mark As Ignored:** Check this box to exclude a given result from future searches if, for example, the weld was bad or was created by the engineer in the process of developing a weld schedule.
  - **Note:** To include excluded welds in subsequent searches, check **Include Ignored Weld Data** in setting the search parameters.
- **Weld UUID**

Click on the title of a data column to toggle the list order between ascending and descending values.

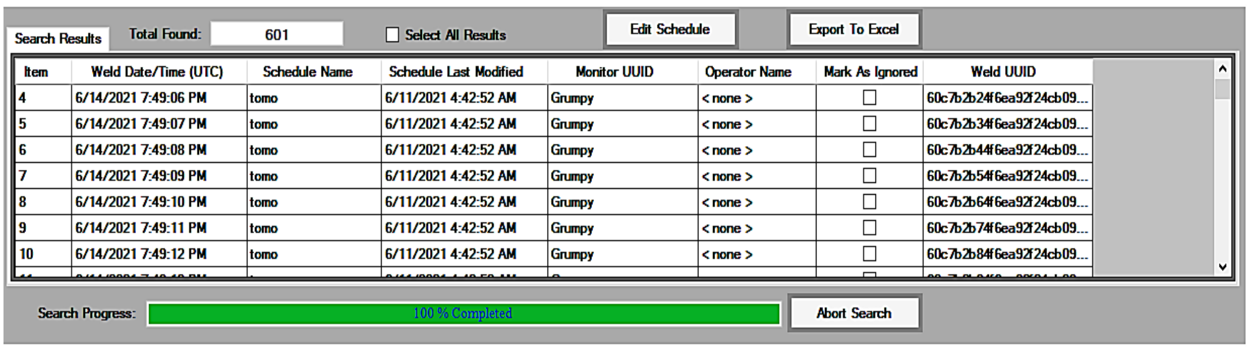


Figure 72: Search Results Window

Total Found

The Total Found field shows how many results match the search parameters. The search can list thousands of results, but the system only allows the user to select up to 300 results for review. If the number of results found is too large, change the period or parameters in the Search window to refine the results. The Search Progress bar shows how close the search is to completion. The user can abort the search at any time if, for example, the results seem too broad.

Waveform Tab

The lower section of the Results tab includes two tabs, Waveform and View Options. These allow the user to select the waveforms to be displayed and determine how they are displayed.

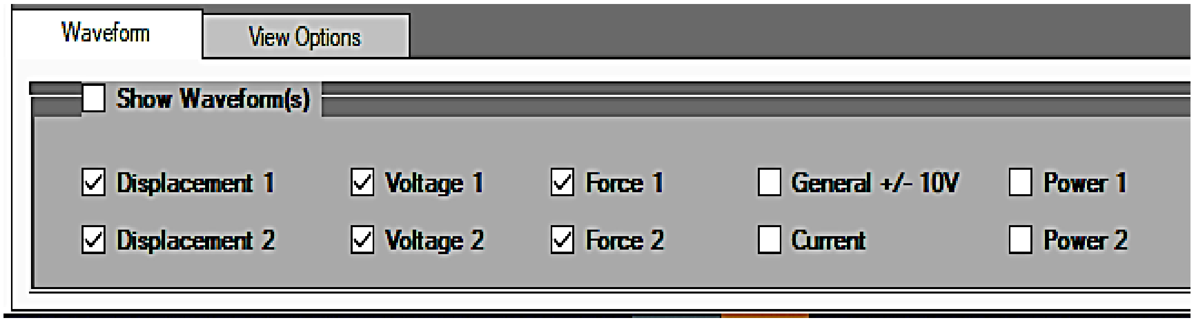
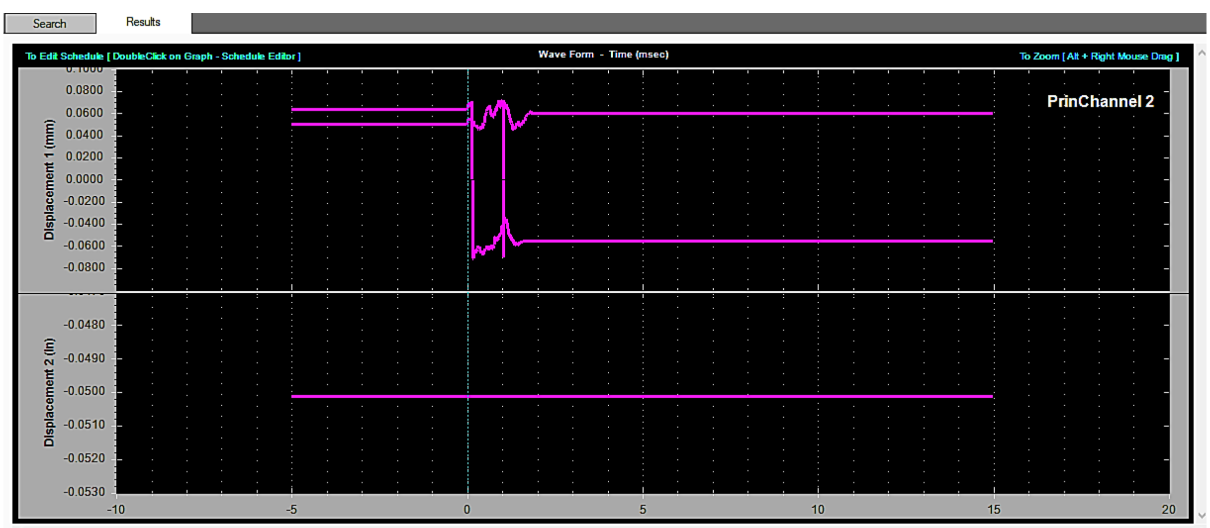


Figure 73: Historical Search Results - Waveform Tab

Check **Show Waveform(s)** and check on the types of waveforms to be displayed. (Waveforms will *not* display if Show Waveform(s) is not checked.)

Choose **Display Multiple Selected Results** when selecting multiple items from the search results list. The waveforms for the selected results will display.

Note: As the pair of graphs below shows, if the waveforms for two or more results differ, those waveforms will display as overlapping waveforms (Displacement 1 (upper)). If two or more waveforms are identical, they will display as a single waveform (Displacement 2 (lower)).



View Options Tab

The View Options tab allows the user to determine how the waveforms will display. These options are similar to those used in the Live – Weld Monitor Graph.

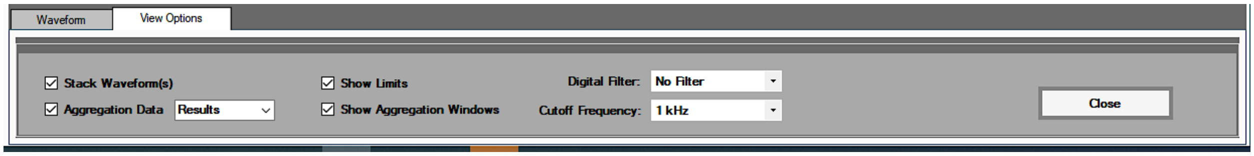
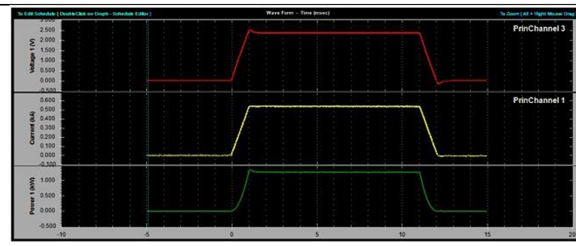
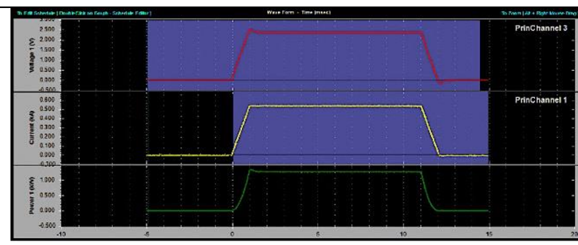
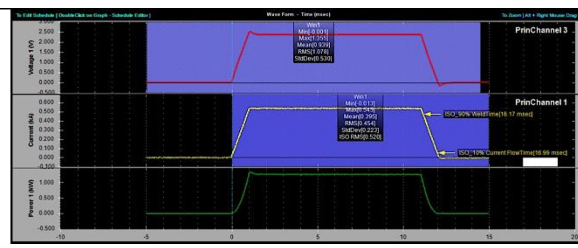
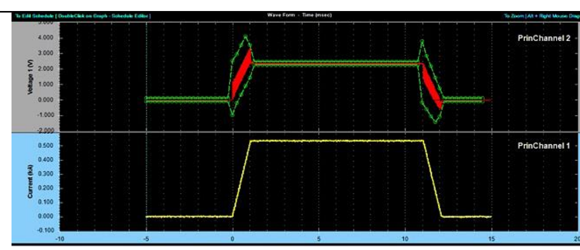


Figure 74: Historical View Options

Stack Waveforms Stacks the waveforms selected in the Waveform tab.	
Show Aggregation Windows Shows the Aggregation Windows for those waveforms which include them (highlighted in blue).	
Aggregation Data Shows the aggregation data associated with the waveform, as selected from the dropdown list on the View Options tab.	
Show Limits Shows the limits associate with a waveform, if established.	
Digital Filter **Cutoff Frequency**	Establishes whether a Butterworth filter is applied and the cutoff frequency for that filter.

Once Show Waveform has been checked and at least one waveform has been selected, the Historical Graph Window will populate, updating as waveforms and view options are selected.

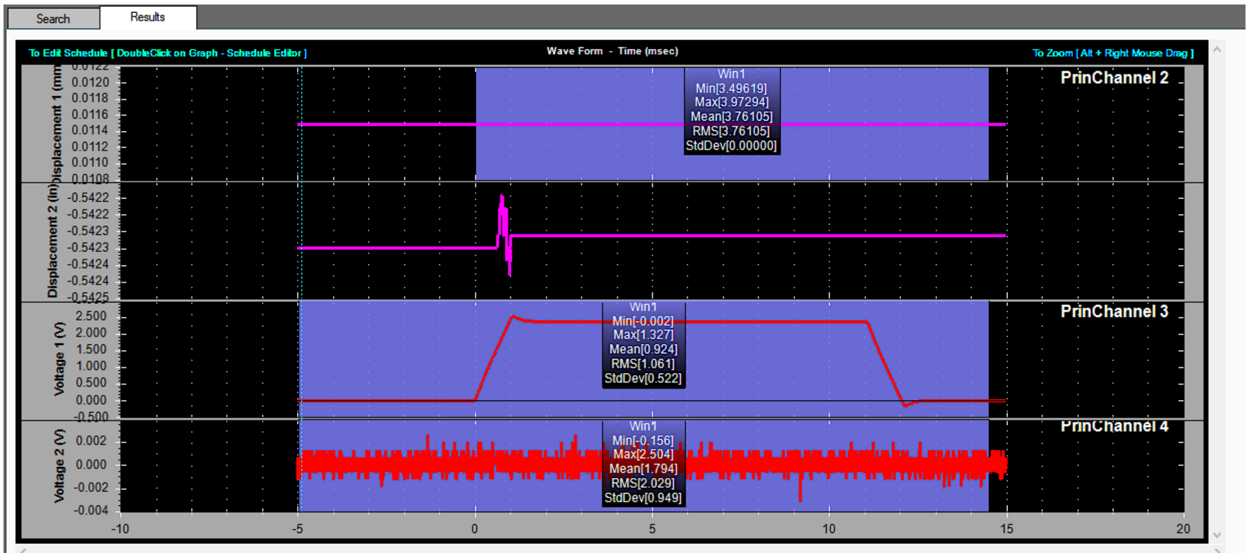
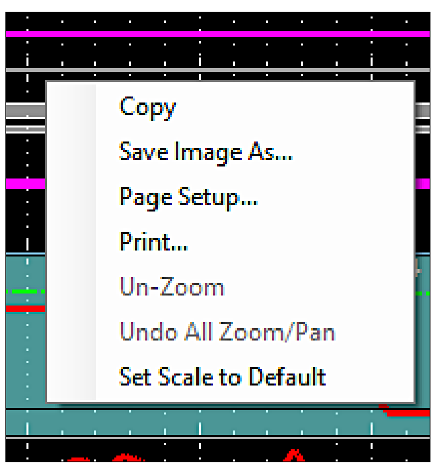


Figure 75: Historical Graph

Similar to the Live – Weld Graph, The Historical Graph displays the waveforms for the selected channels for the selected time period, indicating which channels are principal channels, showing the aggregate data values and the time period sampled for that aggregate data (highlighted in blue).

Hold down the Alt Key and right mouse key and drag to zoom the graph.

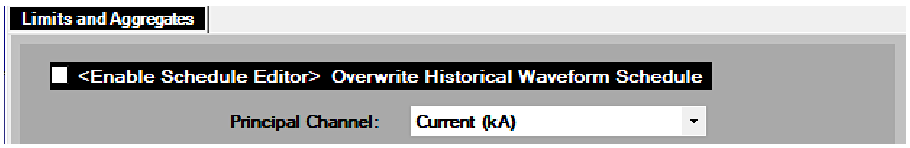
Right clicking on the graph window opens a drop down menu, similar to that found on the Live – Weld Monitor Graph window. Users can copy, save, print the Historical Data Graph window or revert to the default scale.



Edit Schedule

The Edit Schedule button launches the Historical Schedule Settings window. This tool allows the user to view and overwrite the settings for the Limit Lines, Aggregation Windows and Aggregation Limits for the historical weld being reviewed as the current schedule. This tool can also be launched by double-clicking on a principal channel in the Historical Data Search Graph.

The Historical Schedule Settings window is a modified version of Limits and Windows Tab described above, the principal difference being the inclusion of an option to enable the schedule editor.

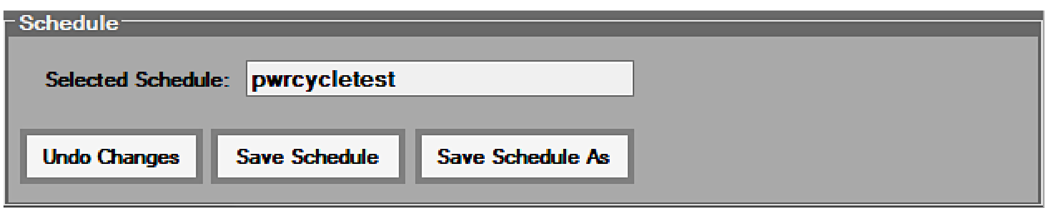


The user must check the Enable Schedule Editor before any changes can be made. Once it is checked, the various options on the Historical Schedule window become active. Click Update after making changes.

Principal Channel Field

The Historical Schedule Settings window launches with all principal channels listed in the dropdown menu. Select the principal channel for which the schedule is to be modified.

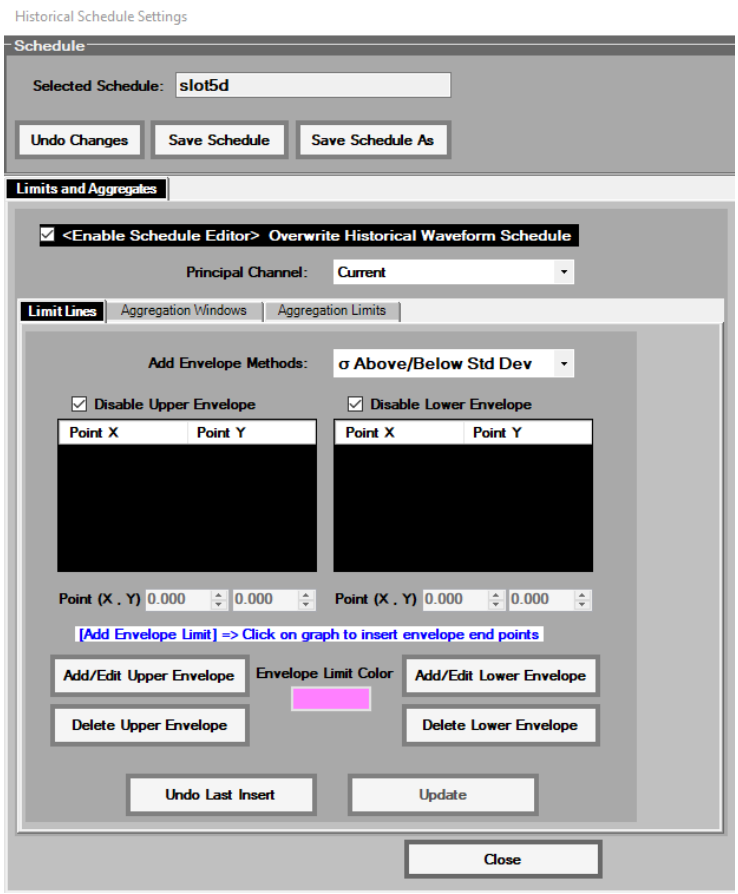
Selected Schedule Field



The Selected Schedule field at the top of the Historical Schedule Settings window is a modified version of the Schedule Settings window described above; it automatically populates with the name of the selected schedule. The user has the option of saving a modified version of the schedule with the same name or with a new name. The user can also undo changes made to a modified schedule.

Edit Schedule - Limit Lines Tab

The Limit Lines Tab allows the user to create or modify the limit lines for a principal channel. There are two ways to generate limit lines – either by using the **σ** (sigma) above and below standard deviation or by manually drawing limit lines.



To create new limit lines:

1. Check Enable Schedule Editor box.
2. Select the Add Envelope Method to be used.
3. Select a principal channel from the dropdown list or click on a channel in the Historical Data Search graph.
4. Un-check the Disable Upper or Lower Envelope box(es). (These are checked by default.)
5. Select Add/Edit Upper Envelope or Add/Edit Lower Envelope.
6. If the Add Envelope Method chosen is Manual Draw, click on the graph to insert end points.

7. The Generate Envelope Limit window displays.

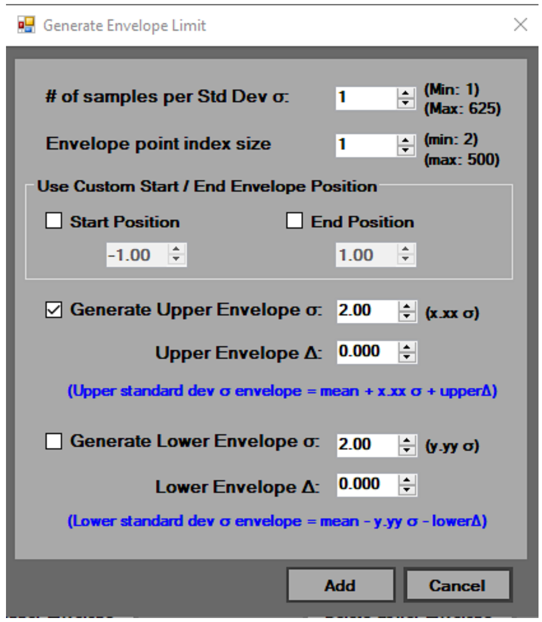
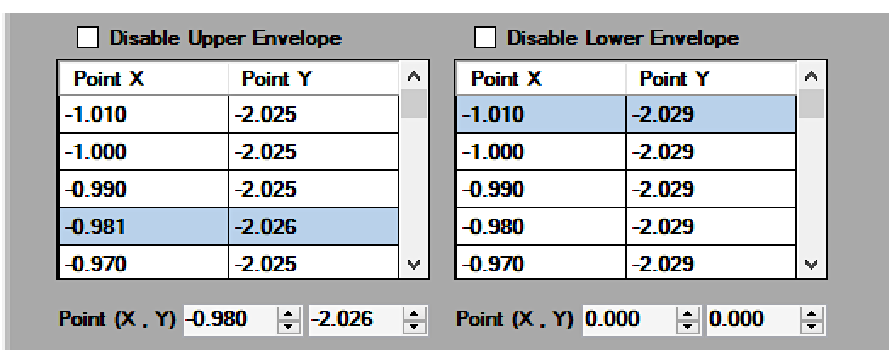


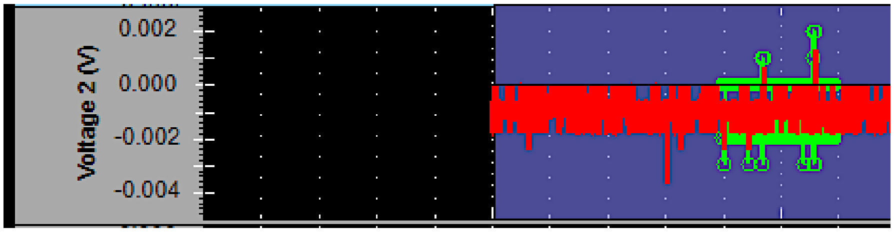
Figure 76: Generate Envelope Limit

a. Set the number of samples per Standard Deviation **Δ** (delta) and envelope point size.
b. To use custom Start and End Envelope Positions, check the appropriate boxes and enter or scroll to the preferred values.
c. To generate the Upper or Lower Envelope standard deviations, **σ** (sigma), check the respective boxes and enter or scroll to the preferred values for **σ** and **Δ** (delta). Click Add.

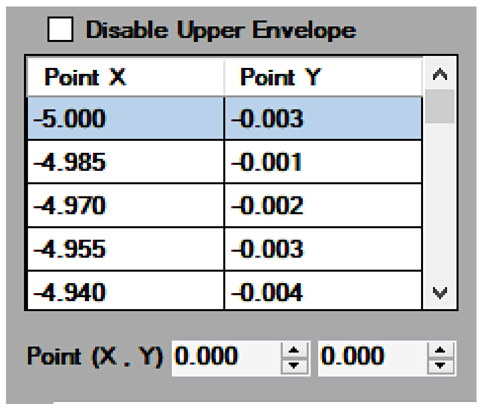
d. The generated values will populate the tables for the upper and lower envelopes in the Limit Lines Tab.



e. The limit lines will also display in the Historical Graph Window.



f. Any pair of points in these tables can be changed by selecting a pair of points (highlighted in blue) and changing the values in the field below the table.



8. Click Update to save changes.

Limit Line Precision

- **Y Axis:** There is a limit to the precision of the limit lines values for the Y axis for Resistance and Power channels. For this reason, these values for Y may change slightly after Update.
- **X Axis:** When using the up/down arrows to adjust the value for X (time), the time entered and the actual time can be off by 0.01 millisecond.

Edit Schedule - Aggregation Windows

The Aggregation Windows tab in the Historical Schedule Settings allows users to add or delete a channel's aggregation window or change the Start and End times, ISO RMS, and Cool Time settings of an existing window.

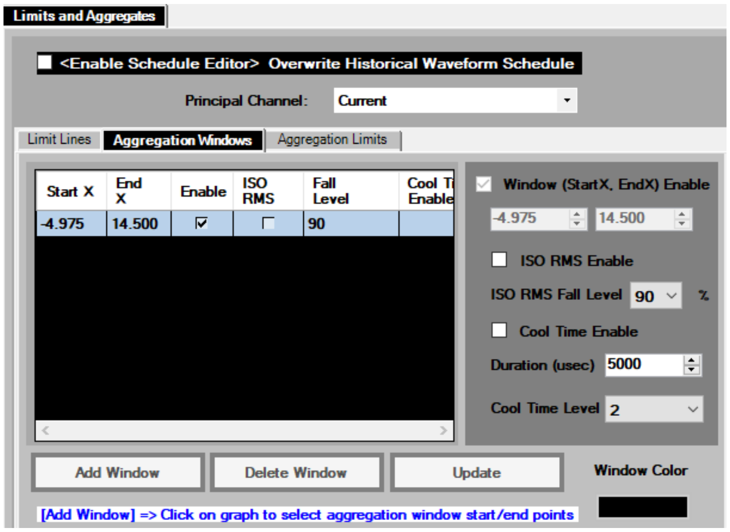
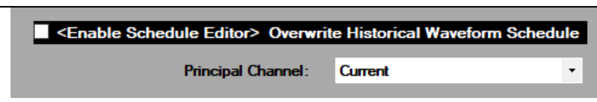
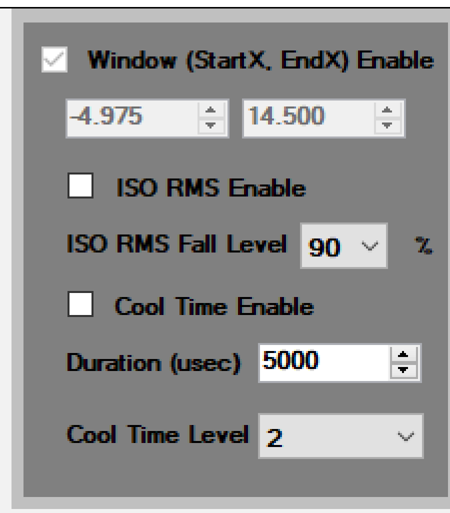


Figure 77: Edit Schedule - Aggregation Windows

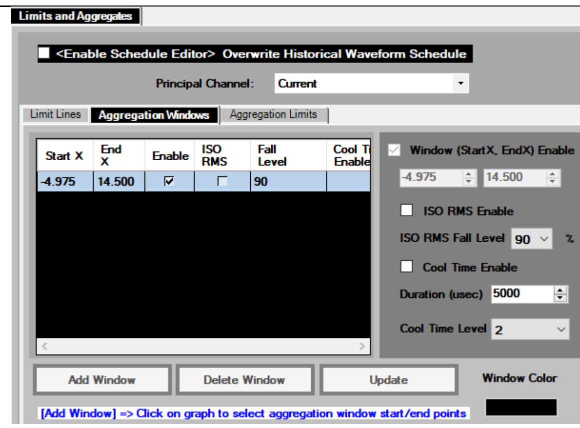
To Edit an Aggregation Window

1. Check Enable Schedule Editor box. 2. Select a principal channel from the dropdown list or click on a channel in the Historical Data Search graph	
1. Check or Uncheck the Window (StartX, EndX) Enable, ISO RMS Enable, and/or Cool Time Enable boxes in the gray box on the right side of the window. Depending on which boxes have been checked: Enter or scroll to new values for StartX and EndX time. 2. Select an ISO RMS Fall Level from the drop down menu. Note: ISO RMS only applies to the Current principal channel, provided it is the first principal channel. ISO RMS can only be applied to one channel.	

<table>
<tr>
<td>
3. Enter or scroll to a new Duration setting.
4. Select a Cool Time level from the drop down menu.
a. Note: This can only be applied to the current principal channel if it is the first principal channel.
5. Click Update. The waveform in the Historical Data Search will update to reflect changes.
</td>
<td></td>
</tr>
</table>

To Add an Aggregation Window

<table>
<tr>
<td>1. Check Enable Schedule Editor box.</td>
<td>

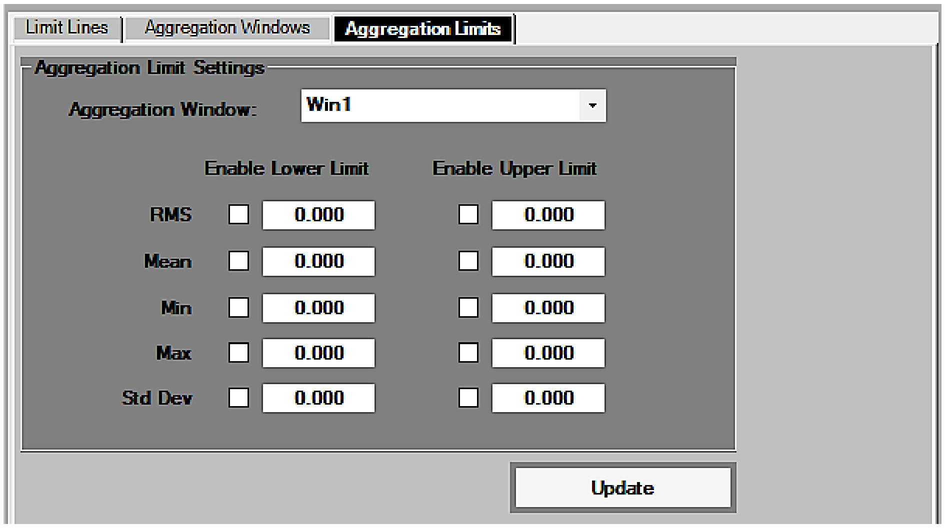


</td>
</tr>
<tr>
<td>2. Select a principal channel from the dropdown list or by clicking on a channel in the Historical Data Search graph.</td>
<td></td>
</tr>
<tr>
<td>3. Click Add Window. The Window (StartX, EndX) Enable box is checked and the StartX and EndX times are set to 0.000. Enter or scroll to new values for start and end times.</td>
<td></td>
</tr>
<tr>
<td>4. Click Update. The list of aggregation windows and the graph each update</td>
<td></td>
</tr>
</table>

to reflect the added window. (This may launch a dialog window confirming update. Click Yes or No.) 5. Click Close.	

Edit Schedule – Aggregation Limits

The Aggregation Windows tab in the Historical Schedule Settings allows users to change the upper and lower limits for each of the values displayed in the aggregation windows.



To Change Aggregation Limits

1. Check Enable Schedule Editor box.
2. Select a principal channel from the dropdown list or by clicking on a channel in the Historical Data Search graph.
3. Select an aggregation window from the drop down list.
   a. Note: This list reflects the number of aggregation windows in the Aggregation Windows tab. Windows added there will appear in the list after the Historical Schedule Settings window has been closed and reopened.
4. Check each item limit to be set and enter a value.
5. Click Update and Close.

Export to Excel

Click Export to Excel to export the data for the selected weld schedule to an Excel spreadsheet. Begin by selecting the search results to be exported. Click Export to Excel. The Export Data window displays, allowing the user to choose the types of data to be included in the Excel spreadsheet. Check the box for each type of data required.

Sampling Rate

The Sampling Rate box on the Export Data window allows the user to choose to include data from all search results or just a sampling of the data by displaying every 2nd, 5th, 10th, 50th or 100th item in the spreadsheet. This is useful when reviewing a large number of welds.

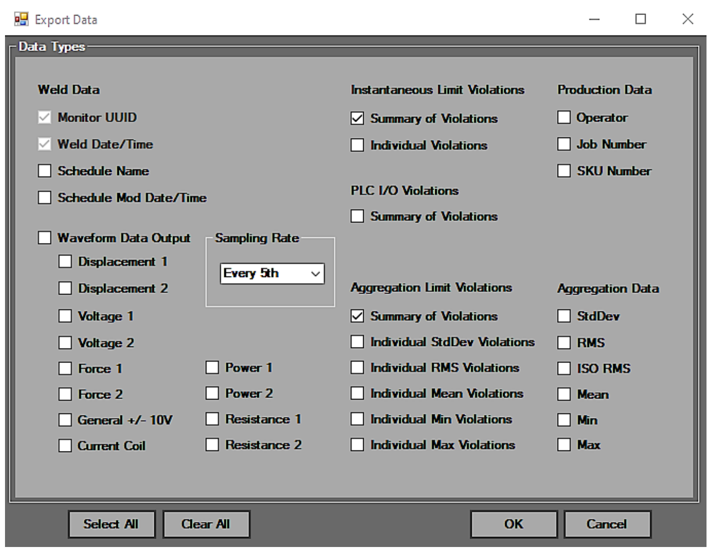


Figure 78: Export Data Window

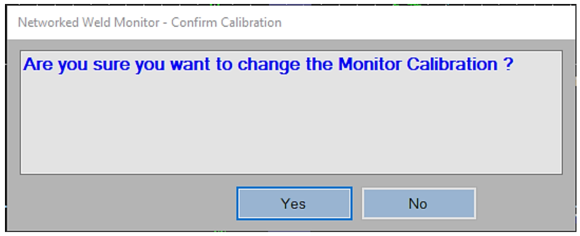
Once the data types have been selected, click OK to generate the Excel spreadsheet. A dialog box will display, naming the file as *Export" current date and time."* Click Save or change the name of the file to save.

Aggregation Tool

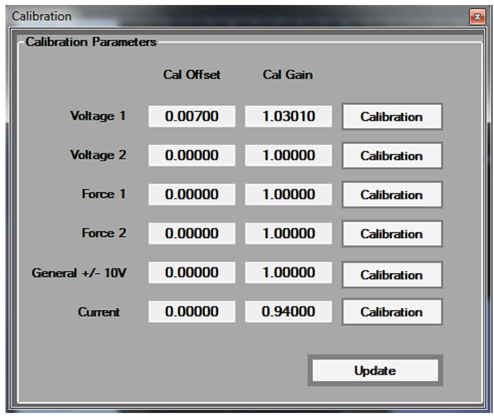
The Aggregation tool launches the Aggregation Window and Aggregation Data Graph windows if they are currently closed.

Calibration Tool

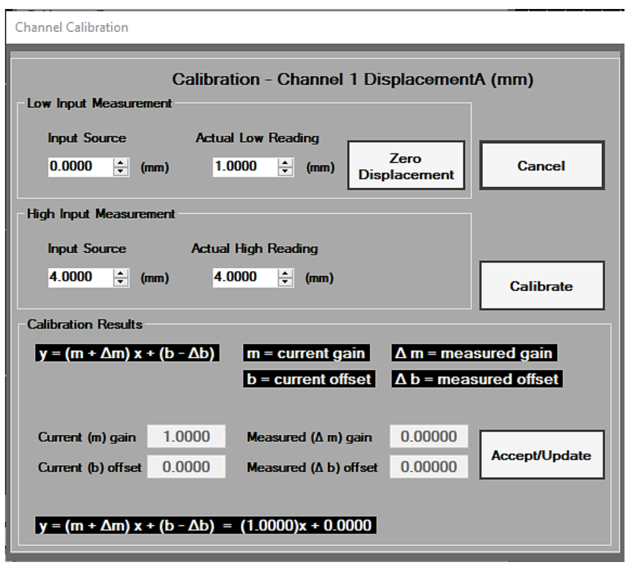
The WM-200A is calibrated at the factory before it is delivered. If you need to calibrate the device, click Calibration in the Tool Bar. An alert displays.



Click Yes to proceed. A calibration parameters list displays.



Click the Calibration button for a selected channel. A calibration window displays.



1. Enter the input source and actual reading for the low and high input measurements for the channel to be calibrated.
2. Click Calibrate. The calibration results display, using the formulae shown.
3. Click Accept/Update. Take low and high measurements again; if the results are satisfactory, the calibration is complete. Otherwise, repeat the calibration again by

entering the new measured low and high values, and clicking calibrate and Accept/Update.

4. Repeat as necessary until the low and high measurements are satisfactory.
5. It is helpful to take a screenshot of the calibration values in case they need to be re-entered.

Calibration by Source

Current Calibration

For current calibration the high input should be at a level at the top of the range at which the unit is being calibrated. (E.g., If the current range is set at 2KA RMS, then the high input should be 2KA RMS and the low input should be about 5% of that, in this case,100A RMS.)

Calibration can be done in AC RMS or DC RMS.

- For DC RMS, the aggregate window should be setup such that only the max peak flat portion of the weld is covered by the aggregate window.
- For AC RMS, set the AC welder to output at least 10 cycles, and set the aggregate window to cover only the cycles in which the peak values of the AC weld have stabilized.
- The aggregate RMS reading should be entered for the actual reading for both DC and AC current.

When calibrating current, the current source must be the specific welder to be used in the system. Place a precision shunt in line with the current flow, and use an oscilloscope to monitor the voltage across the shunt, measuring the peak flat portion of the weld. Use Ohms law (V/R = I) to calculate the current.

> **Note:** Ensure that the wattage rating of the shunt can handle the current you are passing through it. The unit can be calibrated at lower currents such as 4KA or less, even if the unit is to be used to measure higher current ranges up to an including the maximum (200KA). The system is very linear and allows for the use of lower wattage shunts for calibration; it will still operate within specification if precisely calibrated at 4KA.

Voltage Calibration

For voltage calibration on Voltage1 and Voltage 2 channels, use 20V for the high input and 0.1V for the low input. For Voltage Channel 3, use 10V for the high input, and 0.1V for the low input.

For voltage channel calibration, use a DC voltage source with specifications equal to or better than a BK Precision model 9172B power supply. Set up aggregate windows for voltage channels and use the aggregate RMS reading for the actual readings.

Force Calibration

For Force 1 and Force 2 channels, use 10V for the high input, and 0.1V for the low input. Calibrate the force channels according to the desired Lbs. per volt. For example, if a 50Lb. load cell is being used then 10V would yield 5 Lbs. per volt.

For force channel calibration, use a DC voltage source with specifications equal to or better than a BK Precision model 9172B power supply. Set up aggregate windows for force channels and use the aggregate RMS reading for the actual readings.

Administrative Functions

An Administrator can perform all functions in Monitor, Run and Developer modes.

In addition, an Administrator can assign engineer or operator roles to other users and determine the devices to which engineers or operators have access. These functions are accessed under the User Controls in the Menu Bar.

Add/Remove a User

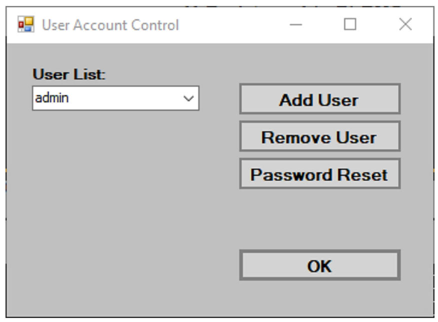


Figure 79: User Account Controls window

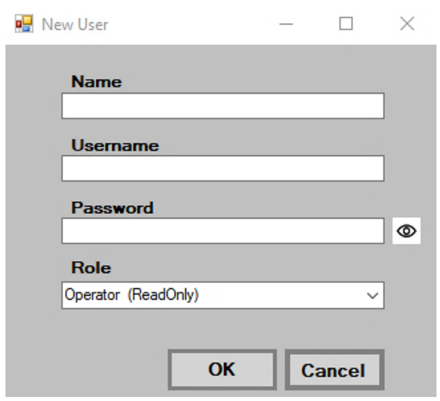


Figure 80: Add User Window

Add a User

- Click Add User on the User Controls menu to add a user. The New User Window displays.
    - Enter the user's name and a Username.
    - Add a password, if required.

    - **Note:** Adding a password is optional. If a password is established for a user, they will need to use it when logging on. If no password has been established, they will be able to log on with just their Username.
  - Assign a role to the user from the dropdown list (Operator, Developer or Administrator).
  - Click OK.

Remove a User

On the User Account Control window.

- Select the user's name from the dropdown list.
- Click Remove User.
- An alert displays asking to confirm that the user is to be removed. Click OK.
- Click OK to close the User Controls Window.

Password Reset

- Click Password Reset to remove the password of the selected user
- After the password has been removed, the user can log on while leaving Password blank. They would then be able to enter a new password in the Password Reset window.

Chapter 4 MAINTENANCE

Section I: Overview

Hardware

The WM-200A requires no user maintenance beyond ensuring that it is kept clean and is used in an appropriate environment, as described in the Hardware Installation section above.

Software

As with any software product, WM-Inspect may need to be updated from time to time. You will be notified by AMADA WELD TECH when and where software updates are available.

Calibration

As with most critical measurement devices, an annual calibration interval is recommended.

Chapter 5 ETHERNET/IP COMMUNICATIONS

Section I: Introduction

This chapter provides instructions on how to setup connectivity to the NRWM Monitor viaEtherNet/IP. Ethernet/IP is an industrial Ethernet network protocol that implements the Common Industrial Protocol (CIP) which provides a comprehensive suite of messages and services for manufacturing automation.

The fieldbus module on the NRWM Monitor uses Ethernet connectors to provide Ethernet/IP connectivity. While these connectors look identical to the standard Ethernet connector used for regular web server functions, do not use either of the fieldbus connectors for regular web server functions.

Figure 81: Fieldbus Connectors

The Ethernet/IP field bus module supports 10/100Mbps speeds. The default address for the fieldbus module is 192.168.100.2. It is a fixed address (no DHCP); it can be changed through the web server function on the monitor by connecting a PC to the standard Ethernet connector (not fieldbus connector).

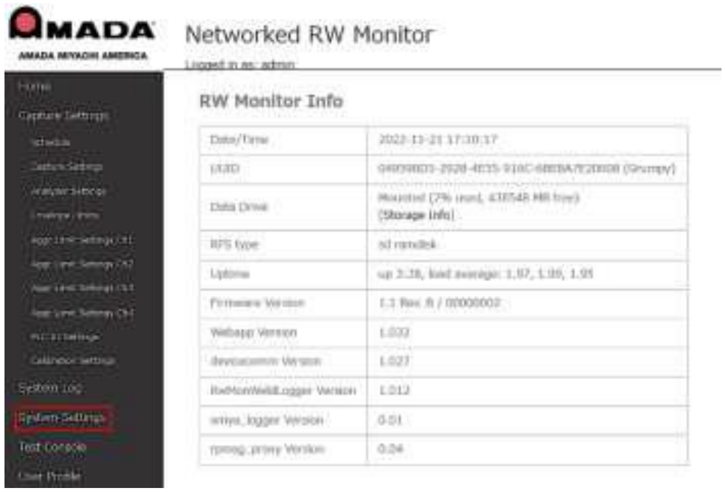
Setting the fieldbus IP address

1. Connect the power plug to the back of the unit.
2. Connect the Ethernet Cable to the standard Ethernet port on the back of the Monitor and attach to your PC.
3. Turn the monitor on and wait for it to load (The device is ready when the LCD screen boots up.)
4. Enter configured IP address in the URL of your web browser.
   a. If reset to default, enter 192.168.4.26.
5. Enter the default user credentials when prompted:

   User: admin

   Password: admin1

6. The IP Settings window displays



80: IP Settings window

7. Select Systems Settings from the menu on the left.

8. The Systems Settings window display.
9. Scroll down to the Send PIC Serial Data field at the bottom of the window.
    a. This field allows you to set or get IP Address (IP), Network Mask (NM), and Gateway Address (GW) settings for the Anybus module.
10. To set Network Settings, type:
    - “IP ddd.ddd.ddd.ddd”
    - “NW 255.255.255.0”
    - “GW ddd.ddd.ddd.ddd”

    (Each ‘ddd’ is a leading-0 filled 3 digit number from 0 to 254.)
11. To get Network Settings, type:

- “IP” to get the IP address
- “NM” to get the Network Mask
- “GW” to get the Gateway address

12. Connect the Ethernet cable to one or two of the fieldbus ports on the back of the monitor and verify connection.

How the Ethernet/IP Data is Scanned

The NRWM provides an I/O interface which allows users to control and monitor the status of the device using an external controller such as a PLC. This requires connecting a custom made interface cable to the external I/O connector and the user’s PLC. Instead of relying on the external I/O interface, the same input and output signals can be accessed as data on the Ethernet/IP interface on the NWRM.

For each PLC scan cycle, new data arrives at the EtherNet/IP interface. Generally, the NWRM will detect one change at a time before acting on it, ignoring the rest of the changes and then waiting for the next scan cycle.

For a typical weld monitor cycle using the END OF WELD input to stop monitoring, the data is checked in the following order.

- If any of the **Schedule** (1 / 2 / 4 / 8 / 16 / 32 / 64 / 128) input bits have changed state, the schedule number will change when **Remote Control – 0 → 1**
- If **Remote Control (in) – 0 → 1**, the NRWM will switch to remote control mode which will start to accept other EtherNet/IP based inputs.
- After switching to remote control mode and loading the selected schedule number, **Ready (out) = 1**.
- If **Start Measure (in) – 0 → 1**, the NWRM will start measuring the weld sensors to monitor weld activities. The Start Measure input can either be left high or can be turned off like a pulse input.
- If **End of Weld (in) – 0 → 1**, after the Start Measure input is turned on, then it will record the weld activity in the time between when the Start Measure input is set high and the End of weld input is set high.

Alternatively, instead of the End of weld input, if Weld Time (in) **– 0 → 1**, after Start measure input is set high then it will record the weld activity until Weld Time (in) **– 1 → 0**.

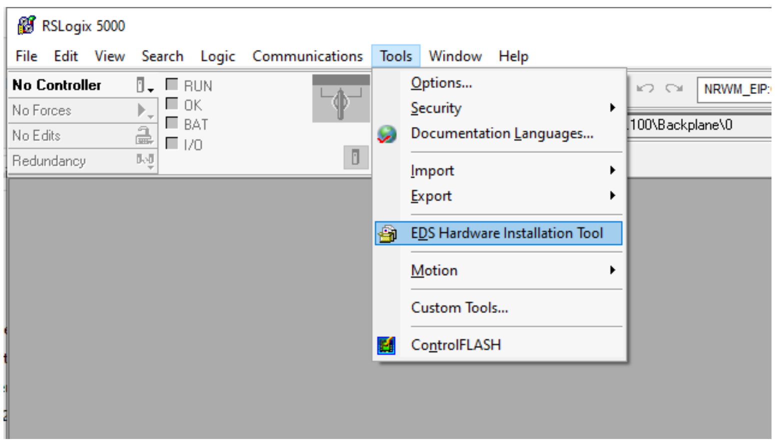
For other control schemes, such as Auto Mode, please refer to I/O modes section in Appendix B.

Section II: EtherNet/IP Configurations

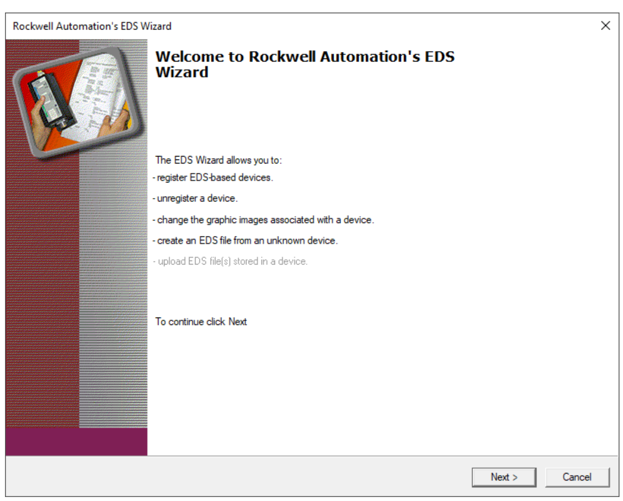
The instructions below describe the required steps to register, setup and configure the NRWM to support the Ethernet/IP fieldbus communications with an ALLEN Bradley Controller PLC. A distribution package which includes an Electronic Data Sheet (EDS) file, controller tag descriptions .csv file for importing, and a sample .acd program are described in the sections below.

The Allen Bradley RS Logix 5000 application, Allen Bradley CompactLogix 1769-L32E controller PLC, sample program and Controller PLC are used to setup and configure the EtherNet/IP™ interface.

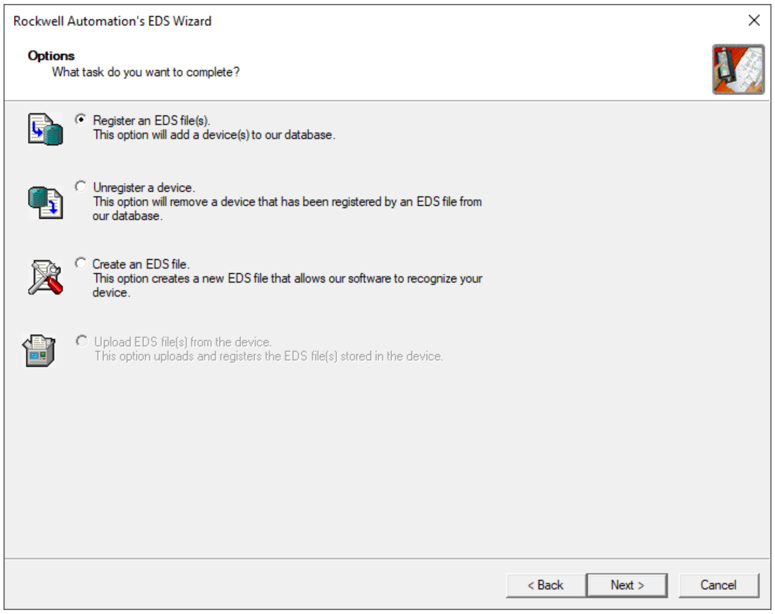
1. To register the NRWM EtherNet/IP™ EDS file via RSLogix 5000 application:
    a) Open the RSLogix5000 application
    b) Select **Tools → EDS Hardware Installation Tool**



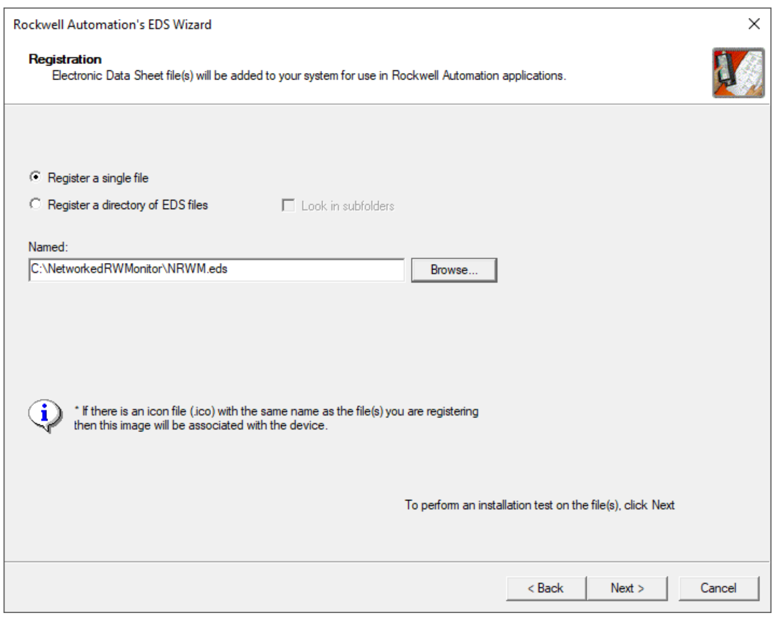
    c) Select **Next** to continue.



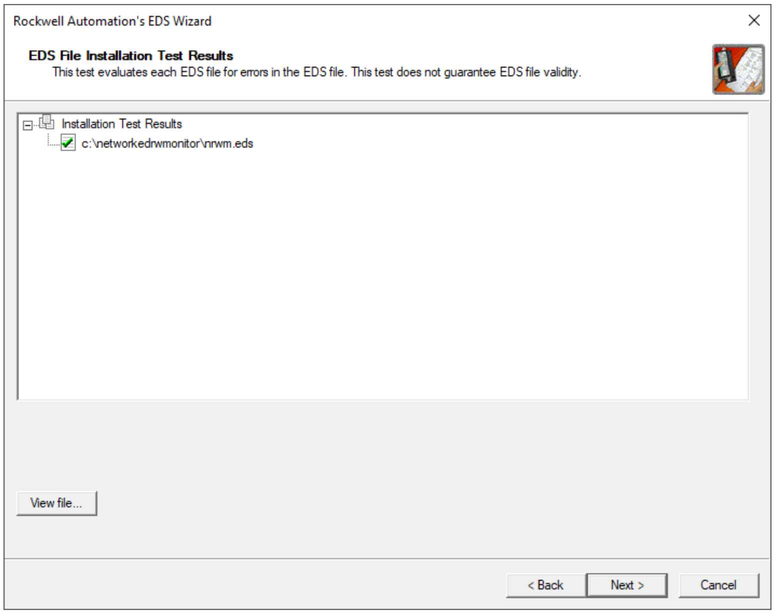
d) Select the *Register an EDS file(s)* option



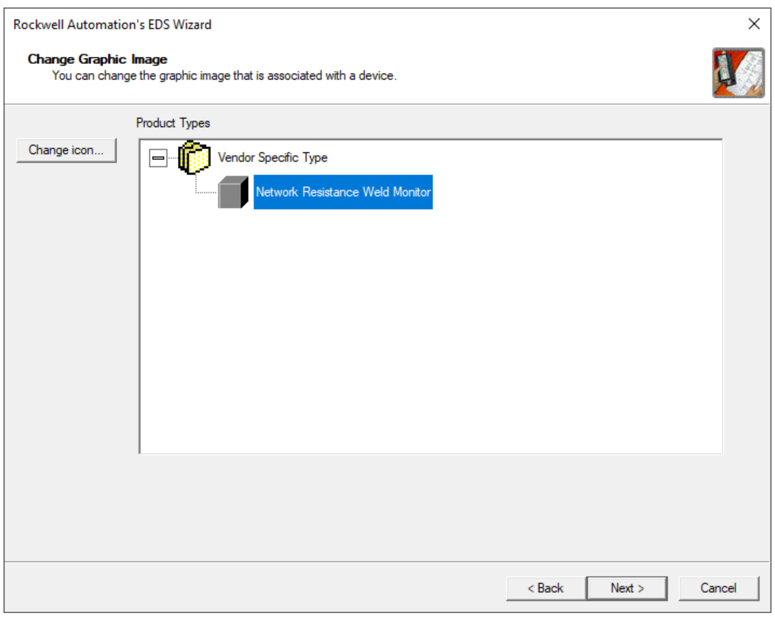
e) Browse to the folder that contains the “NRWM.eds” file. Select the “NRWM.eds” file and click on **Next.**



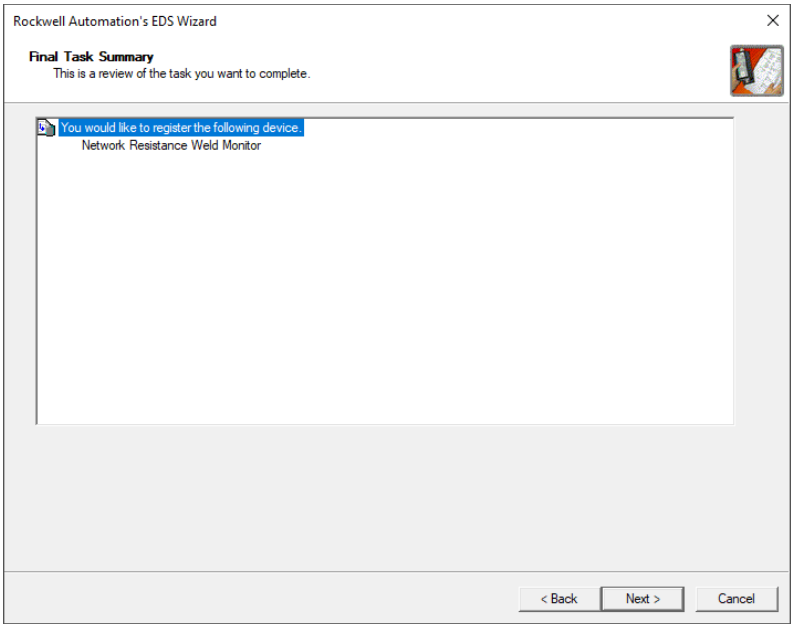
f) Select the “NRWM.eds” file and click on **Next**.



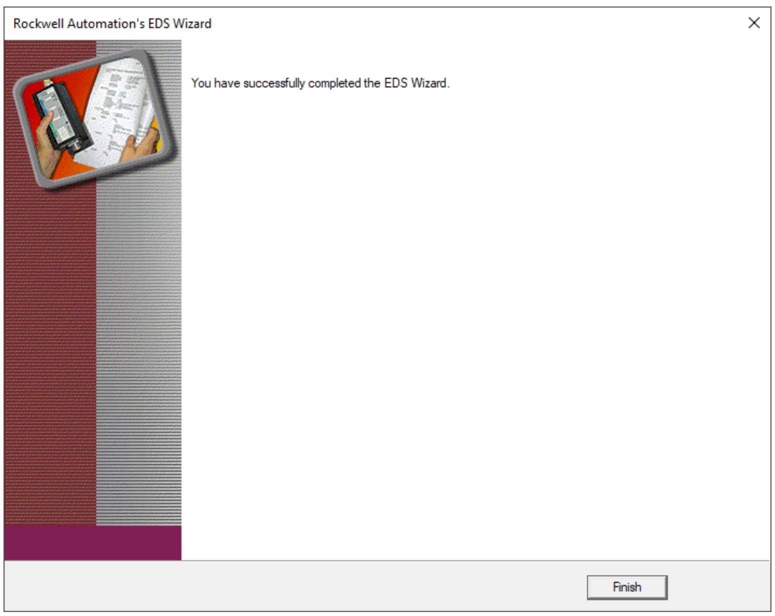
g) Under *Product Types*, select the “NRWM” item/icon under *Vendor Specific Type* and click on **Next**.



h) On the *Final Task Summary*, select “NRWM” and click on **Next.**



i) Click on **Finish** to register the “NRWM.eds” file.



Data Models

Assembly Object (Class Code: 0x04)

PLC Output Status Read [Device to PLC (T>0)]

Class	Instance	Attribute	Name	Size	Description
0x04 (4)	0x64 (100)	0x01 (1)	Weld Good	UINT16	Weld results 0 = Not Within Limits 1= Within Limits
		0x02 (2)	Weld No Good	UINT16	Weld results 0 = Within Limits 1 = Not Within Limits
		0x03 (3)	Machine Error	UINT16	Machine Error Status 0 = No Error 1 = Error
		0x04 (4)	Weld Count Up	UINT16	Weld Counter Max Status 0 = Not active 1 = Active
		0x05 (5)	Displacement Cutoff	UINT16	Displacement Cutoff Status 0 = Not Active 1 = Active
		0x06 (6)	End Thickness Ok	UINT16	Secondary Thickness OK (Not used)
		0x07 (7)	Init Displacement Ok	UINT16	Initial Displacement Status 0 = Not Within Limits 1 = Within Limits
		0x08 (8)	PLC Control Out	UINT16	PLC Control Status 0 = Not Active 1 = Active
		0x09 (9)	Ready Weld	UINT16	Ready for Weld Status 0 = Not Active 1 = Active
		0x0A (10)	Error Primary Channel 1	UINT16	Primary Channel 1 Error Status 0 = No Error 1 = Error
		0x0B (11)	Error Primary Channel 2	UINT16	Primary Channel 2 Error Status 0 = No Error 1 = Error

		0x0C (12)	Error Primary Channel 3	UINT16	Primary Channel 3 Error Status 0 = No Error 1 = Error
		0x0D (13)	Error Primary Channel 4	UINT16	Primary Channel 4 Error Status 0 = No Error 1 = Error
		0x0E (14)	No Weld Detect	UINT16	No Trigger Status 0 = Ok 1 = No Trigger Detect

PLC Input Control [(PLC to Device (0->T)]

Class	Instance	Attribute	Name	Size	Description
0x04 (4)	0x96 (150)	0x01 (1)	Weld Time	UINT16	Weld in progress 0 = Not welding 1 = Turn on while welding
		0x02 (2)	PLC Control	UINT16	Establish PLC control 0 = Local Control 1 = PLC Control
		0x03 (3)	Reset Weld Counter	UINT16	Reset Weld Counter 0 = No Reset 1 = Reset

		0x04 (4)	Schedule 1	UINT16	Schedule # assignment bit 0
					0 = Not set
					1 = Set

		0x05 (5)	Schedule 2	UINT16	Schedule # assignment bit 1
					0 = Not set
					1 = Set

		0x06 (6)	Schedule 4	UINT16	Schedule # assignment bit 2

					0 = Not set 1 = Set

		0x07 (7)	Schedule 8	UINT16	Schedule # assignment bit 3
					0 = Not set
					1 = Set

		0x08 (8)	Schedule 16	UINT16	Schedule # assignment bit 4
					0 = Not set
					1 = Set

		0x09 (9)	Schedule 32	UINT16	Schedule # assignment bit 5
					0 = Not set
					1 = Set

		0x0A (10)	Schedule 64	UINT16	Schedule # assignment bit 6
					0 = Not set
					1 = Set

		0x0B (11)	Schedule 128	UINT16	Schedule # assignment bit 7
					0 = Not set
					1 = Set

		0x0C (12)	Reset Displacement Counter 0	UINT16	Reset Displacement 0 Counter 0 = No reset 1 = Reset
		0x0D (13)	Reset Displacement Counter 1	UINT16	Reset Displacement 1 Counter 0 = No reset 1 = Reset
		0x0E (14)	Trigger In	UINT16	External Trigger 0 = No Trigger 1 = External Trigger

		0x0F (15)	End of Weld	UINT16	End of weld 0 = Not End of Weld 1 = End of Weld
		0x10 (16)	Start Measure	UINT16	Start thickness measurement 0 = Inactive 1 = Start
		0x11 (17)	Reset Error	UINT16	Reset Error 0 = No reset 1 = Reset

Appendix A TECHNICAL SPECIFICATIONS

Physical Dimensions

PARAMETER	SPECIFICATIONS
Dimensions Height: 14 inches (356 mm) Width: 6 inches (152 mm) Depth: 13 inches (330 mm) Weight: 14.0 lb. (6.35 kg)	
Electrical Requirements	Input power requirement: 90 - 264 VAC.
In Line Fuse	10A, 250VAC Time Lag Fuse size 5mm x 20mm (Qty 2)

Technical Parameters

User-selectable ranges and associated resolutions of the hardware are listed below

Channel	Range	Minimum Displayed Resolution (16 bits)	Accuracy	Repeatability
Current	Very Low 2,000A	1A	+/-1% of reading or +/-20A, whichever is greater	+/-1% of full scale
	Low 6,000A	1A	+/-1% of reading or +/-60A, whichever is greater	+/-1% of full scale
	Medium 20,000A	1A	+/-1% of reading or +/200A, whichever is greater	+/-1% of full scale
	High 60,000A	1A	+/-1% of reading or +/600A, whichever is greater	+/-1% of full scale
	Very High 200,000A	3A	+/-1% of reading or +/-2KA, whichever is greater	+/-1% of full scale
Voltage 1&2	+/-10mV to +/-20V	1mV	+/-0.5% of reading or +/5mV	+/-0.5% of reading
Force 1&2	+/-0.0025 lbs. to 2500 lbs.	0.0025 Lbs.	+/-0.5% of reading or +/-0.125 Lbs., whichever is greater	+/-0.5% of reading
Displacement 1&2	Depends on sensor used	Supports Heidenhain sensors supported with 1 micron resolution	+/-0.01mm or +/-0.0005”	+/-1% of reading
Voltage 3	+/-10V	1mV	+/-0.5% of reading or +/-5 mV	+/-0.5% of reading

Channel	Range	Minimum Displayed Resolution (16 bits)	Accuracy	Repeatability
Resistance 1&2 (Derived from aggregate voltage and current values)	Determined by voltage and current inputs 0.001 milliohms to 20 ohms	0.001 milliohms	Dependent on Voltage and Current Accuracy +/-2%	Dependent on Voltage and Current +/-2%
Power 1&2 (Derived from aggregate voltage and current values)	Determined by voltage and current inputs 0.001KW to 4MW	0.001 KW	Dependent on Voltage and Current Accuracy +/-2%	Dependent on Voltage and Current +/-2%

Parameter	Specifications
Current Ranges	2, 6, 20, 60, 200 kA
Weld Time	0.01 milliseconds to 910 seconds
Sampling Rate	200 kHz (5µS) for all channels max. Higher decimation values will yield slower rates.
Measurement Time (Includes 5 second pre-trigger)	915 seconds
Repetition Rate	• 3.6 welds per second for a 100-millisecond measurement period. • Full waveform capture, 16-bit data, on all 8 channels, and 80 aggregated data items at up to 36 welds per 10 seconds.
Database	Microsoft SQL Server Express
Counters	Two resettable counters with user assigned messages
Schedules	128 schedules can be stored on the monitor device. Additional schedules can be stored on the server and imported into the device.

Parameter	Specifications
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 current ranges
Elements Stored in Database	• Time Stamp (Time and date) • Test Record ID • Part serial Part Lot (Lot number) Schedule ID • Schedule name • Weld Time • 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 • Force result 1 & 2 • Initial thickness 1 & 2 • Final thickness 1 & 2 • Alternate Result Weld status • Counter 1 & 2
Waveforms	• Current • Voltage 1 • Voltage 2 • Voltage 3 • Force 1 • Force 2 • Displacement 1 • Displacement 2 • Resistance 1

Parameter	Specifications
	• Resistance 2 • Power 1 • Power 2
Digital Inputs	Refer to Appendix B
Digital Outputs	Refer to Appendix B
Relay Outputs	Refer to Appendix B
Communications	• Fieldbus • Ethernet
Ambient Temperature	10 – 40 °C
Relative humidity	10% to 80% non-condensing

Appendix B ELECTRICAL AND DATA CONNECTIONS

Overview

This appendix describes the electrical and data connectors located on the rear panel of the WM-200A Monitor.

Note: the specifications listed in this appendix may change without prior notice.

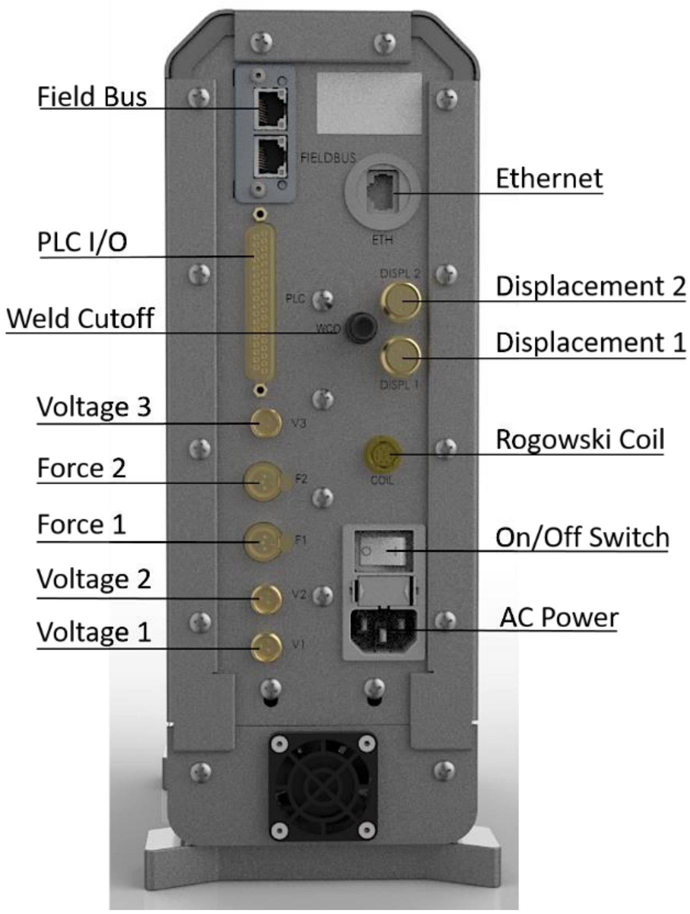


Figure 82: Monitor Rear Panel Connectors

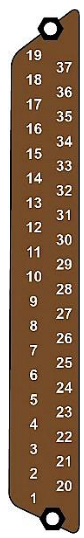
The tables below describe the pins on each connector on the rear panel.

PLC I/O Connector

The PLC Interface consists of the following signals:

- 17 PLC input
- 14 PLC outputs
- 24V PLC Single Output
- Common Out
- Common In
- PLC GND

The interface incorporates all signals required to control and monitor the Weld Monitor. Additional signals will be connected between the PLC and Welder to initiate and terminate welding. Connection to the Weld Monitor is via a 37-pin DSUB connector, described below. The receptacle is a 37 pin female connector.

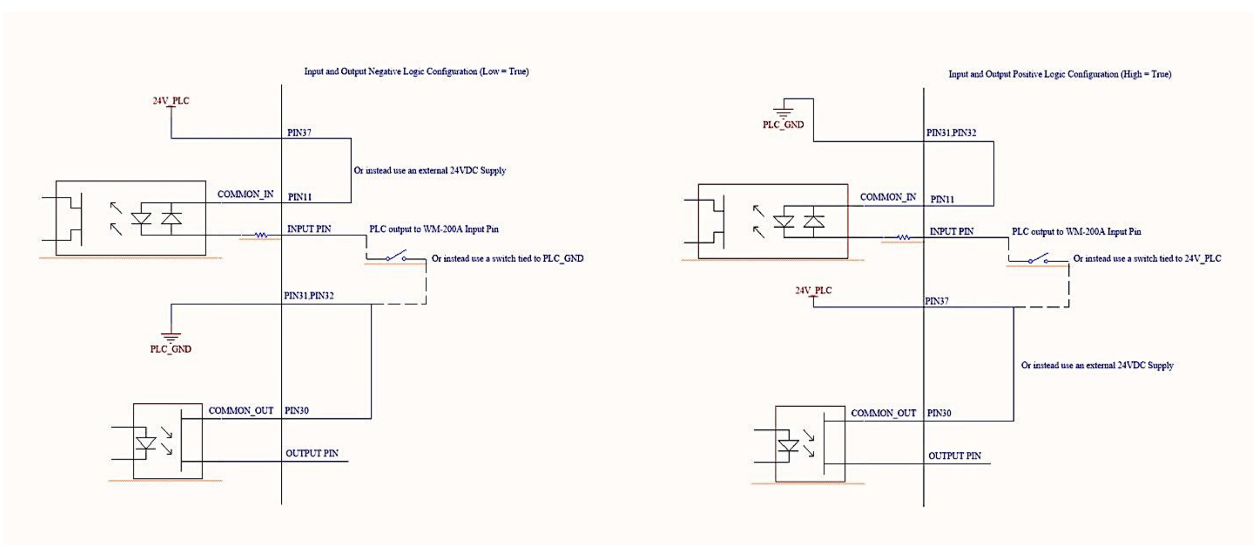


Pin #	Name	IN/OUT	Voltage	Description
1	RST0	I	24 V	Reset Displacement 1 position to zero.
2	RST1	I	24 V	Reset Displacement 2 position to zero.
3	SCH128	I	24 V	Schedule Number assignment by PLC, bit 7 (binary)
4	SCH64	I	24 V	Schedule Number assignment by PLC, bit 6 (binary)
5	SCH32	I	24 V	Schedule Number assignment by PLC, bit 5 (binary)

Pin #	Name	IN/OUT	Voltage	Description
6	SCH16	I	24 V	Schedule Number assignment by PLC, bit 4 (binary)
7	SCH8	I	24 V	Schedule Number assignment by PLC, bit 3 (binary)
8	SCH4	I	24 V	Schedule Number assignment by PLC, bit 2 (binary)
9	SCH2	I	24 V	Schedule Number assignment by PLC, bit 1 (binary)
10	GND			GND
11	COMMON_IN	I		INPUT COMMON
12	TRIG IN	I	24 V	External Trigger In (supported in external automode)
13	PLC CNTL	I	24 V	Activate for PLC to establish control and to activate the schedule assigned by the schedule inputs
14	START MEAS	I	24 V	Initiate initial thickness measurement
15	EOW	I	24 V	End of Weld
16	RST ERR	I	24 V	Reset Errors
17	RST CTR	I	24 V	Reset Weld Counter
18	WELD TIME	I	24 V	Weld in Progress
19	ERR PC1	O	24 V	Primary Channel 1 Error Indicator
20	RDY WELD	O	24 V	Monitor ready for weld to begin
21	WELD GOOD	O	24 V	Weld results were within the defined limits
22	NO WELD DET	O	24 V	No trigger was sensed during a weld
23	WELD NO GOOD	O	24 V	Weld results were not within the defined limits
24	MCH ERR	O	24 V	Machine Error Active when PLC control signals are out of sequence
25	WELD CNT UP	O	24 V	Active when counter reaches its max

Pin #	Name	IN/OUT	Voltage	Description
26	DISP CUTOFF	O	24 V	Active when the displacement reaches the weld cutoff limit
27	END THICKNESS OK	O	24 V	Secondary thickness OK(Unused)
28	I DISP BAD	O	24 V	Activates when the initial thickness is out of limits.
29	SCH1	I	24 V	Schedule Number assignment by PLC, bit 0 (binary)
30	COMMON OUT	I		OUTPUT COMMON
31	GND			PLC_GND
32	GND			PLC_GND
33	PLC CTL OUT	O	24 V	Active when Fieldbus is in control
34	ERR PC4	O	24 V	Primary Channel 4 Error Indicator
35	ERR PC3	O	24 V	Primary Channel 3 Error Indicator
36	ERR PC2	O	24 V	Primary Channel 2 Error Indicator
37	**24 V**	**O**	24 V	91 mA Max. Recommend using external supply for higher current

I/O Logic Configuration



I/O Modes

There may be occasions when a user would need access to the input/output (I/O) signals that pass between the Monitor and a PLC. For example, they may want to check error signals at the interface to turn off a piece of external equipment.

Currently, this can be done through external control using a device such as a PLC, or through local control using WM-INSPECT.

- Note: Local Control means PLC_CNTL (pin 13) input is not active.

In future updates to the system, users will be able to access these signals remotely via remote control, using a fieldbus such as Ethernet/IP.

The table below lists possible I/O modes, including Remote Control.

I/O Mode	Description
External Control **Non-Auto Mode**	A normal case, whereby an external device controls the Monitor through PLC I/O signals. • External device selects the schedule to be run • Initiated by an external device asserting PLC_CTRL (pin 13) • External Control on the Status Bar indicates when this PLC_CTRL is active. • Initial thickness measured at the initiation of the Start Measurement signal (pin 14), activated by the external device • End thickness measured at End of Weld signal (pin 15) or when the “Weld Time” signal is deactivated. • Initial and Final Thickness limit errors reported

External Control
 	
Auto Mode
	In this mode external control is used, but Auto Mode and Cool Time, both set in the WM-Inspect interface, determine when Initial Thickness and Final Thickness are measured.
	• Schedule selected through external device will have Auto Mode enabled
	    o Requires that Auto Mode is enabled in Displacement tab.
	    o Requires that Cool Time is set up in Aggregation Windows Tab.
	• Initiated by an external device asserting the signal “PLC_Control”
	• External device will not assert “Start_Measurement,” “End Of Weld,” or de-assert Weld_Time”

I/O Mode	Description
	• Initial Thickness is measured at the trigger • Final Thickness is measured at the end of Cool Time • PLC (not) in Control indicator on the Status Bar indicates when this mode is active • Initial and Final Thickness limit errors are reported
Local Control **Non- Auto Mode**	Suitable for manual use of WM-200A. May be used to configure and set up the unit. • If External Trigger selected in WM-Inspect, the trigger (trig_in pin 12) is sourced from the 37-pin connector. • External output signals driven to the 37-pin connector • Neither Initial Thickness nor Final Thickness limit errors reported. • Thickness errors will not be reported
Local Control **Auto Mode**	This mode is useful for checking initial and final thicknesses and for adjusting the weld process. • If External Trigger is selected in the schedule, the trigger is sourced from the 37-pin connector • External output signals are driven to the 37-pin connector • Requires that Auto Mode is enabled in Displacement tab • Requires that Cool Time is set up in Aggregation Windows Tab • Initial thickness is measured at the trigger • Final Thickness is measured at the end of Cool Time • Initial and Final Thickness limit errors are reported • Thickness errors are reported
Remote Control **Non- Auto Mode**	As with the first option (External Control – Non Auto Mode), this is a normal case whereby an external device is connected via a Fieldbus to the Monitor. • Remote control of Monitor via the fieldbus (i.e., Ethernet/IP). • If External Trigger is selected in the schedule, the trigger is sourced from the remote Fieldbus end • I/O signals will not be active at the 37-pin connector • External device selects the schedule to be run • Initial thickness measured at the initiation of the Start Measurement signal, activated by the external device • End thickness measured at End of Weld signal or when the "Weld Time" signal is deactivated.

<table>
<tr><th>I/O Mode</th><th>Description</th></tr>
<tr><td></td><td>Initial and Final Thickness limit errors reported</td></tr>
<tr><td>Remote Control

Auto Mode</td><td>As with the External Control – Auto Mode option, this is a normal case whereby an external device is connected via a Fieldbus to the Monitor.

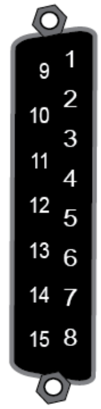
Remote control of Monitor via the fieldbus (i.e., Ethernet/IP).
Schedule selected through external device will have Auto Mode enabled

Requires that Auto Mode is enabled in Displacement tab.
Requires that Cool Time is set up in Aggregation Windows Tab.

Initial thickness is measured at trigger
Final Thickness is measured at end of Cool Time
Initial and Final Thickness limit errors are reported
If External Trigger is selected in WM-Inspect the trigger is sourced from the remote Fieldbus end.
External I/O signals will not be active on the 37-pin connector.
</td></tr>
</table>

Displacement Connectors

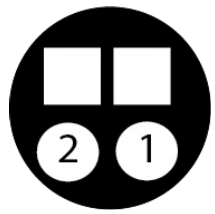
Fifteen pin female connectors.



Pin#	Name	Direction	Voltage
1	SIG1	O	0 to 5 V
2	SIG 2	I	0 to 5 V
3	5 V		
4	GND	I	
5	(Not used)		
6	(Not used)		
7	(Not used)		
8	(Not used)		
9	(Not used)		
10	(Not used)		
11	(Not used)		
12	(Not used)		
13	(Not used)		
14	(Not used)		
15	(Not used)		

WCO- Weld Cutoff

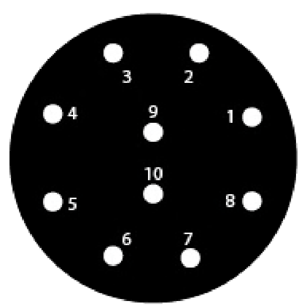
This connector is used to turn off a welder when a configured displacement distance has been reached. Four pin female connector.



Pin#	Name	Direction	
1	COMMON_OUT	I	0 V to 24 V COMMON_OUT voltage is defined by setting this signal high or low on the 37-pin connector.
2	Sig+	I	0 V to 24 V

Rogowski Coil – Current Measurement

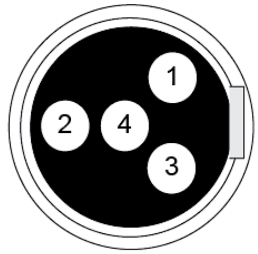
Ten pin female connector.



Pin#	Name	Direction	
1	Sig-	I	plus 10 V to minus 10 V
2	Shield		plus 10 V to minus 10 V
3	Sig+	I	
4-10	Unused		

Force Channels (F1 and F2)

Four pin female connector.



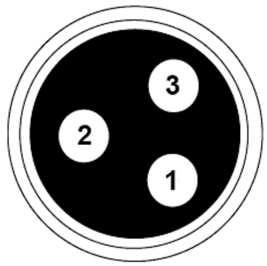
Pin#	Name	Direction	
1	24 V	O	
2	Sig+	I	plus 10 V to minus 10 V
3	GND		
4	Sig-	I	plus 10 V to minus 10 V

Note: Cables to Force Sensor (Load Cell)

- Use a PN 4-41347-01 cable when using a Futek Model IA100 amplifier as an interface between the monitor and the force sensor.
- If using a different interface, use a PN 4-41598-01 cable between the monitor and the force sensor.

Voltage Channels (V1 and V2) and Misc. Voltage Channel (V3)

Three pin male connectors.



Pin#	Name	Direction	
1	SIG-	I	plus 20 V to minus 20 V
2	Earth		
3	Sig+	I	plus 20 V to minus 20 V

Voltage Channel 3 (V3) Recommended Shunt Values

The NRWM system allows the user to measure current using a shunt connected to the V3 input. The table below lists the recommended shunt values for the values listed. 4000 Amps is the highest current value we recommend for this purpose.

Current Min Amps	Current Max Amps	Recommended Shunt Value (Ohms)	Resulting Voltage Min	Resulting Voltage Max
2000	4000	0.0005	1	2
1000	2000	0.001	1	2
500	1000	0.002	1	2
200	500	0.004	0.8	2
80	200	0.01	0.8	2
5	80	0.025	0.125	2

Fieldbus

The fieldbus connect offers two Ethernet connectors to connect the monitor to systems or devices such as a PLC.

Ethernet

An Ethernet is provided for connection to standard web server functions.

AC Power.

Standard Connector.

Weld Monitor PLC Interface

The Weld Monitor can be configured to monitor welds by Weld to setdown or by Weld to final thickness. See Displacement Tab: Placement Reference for more information.

> **Note:** Defining displacement by setdown distance has been referred to as “Absolute Mode” for our MG-3 and MM-400 products and as “Weld to Displacement” for all other Amada Weld Tech products. Defining displacement by final thickness has been referred to as “Reference Mode” for MG-3 and MM-400 products and was not referenced for earlier Amada Weld Tech products.

Timing Diagrams

Debounce periods and delays

- PLC CNTL has a debounce period of 4ms. No other input signal should go active prior to that time except for those schedule signals which must be activated before PLC CNTL.
- PLC STRT MEASURE has a debounce period of 2ms. Any subsequent input signal relevant to the handshaking, such as End of Weld, should wait 2ms before being activated.
- Additional input signals with debounce periods:

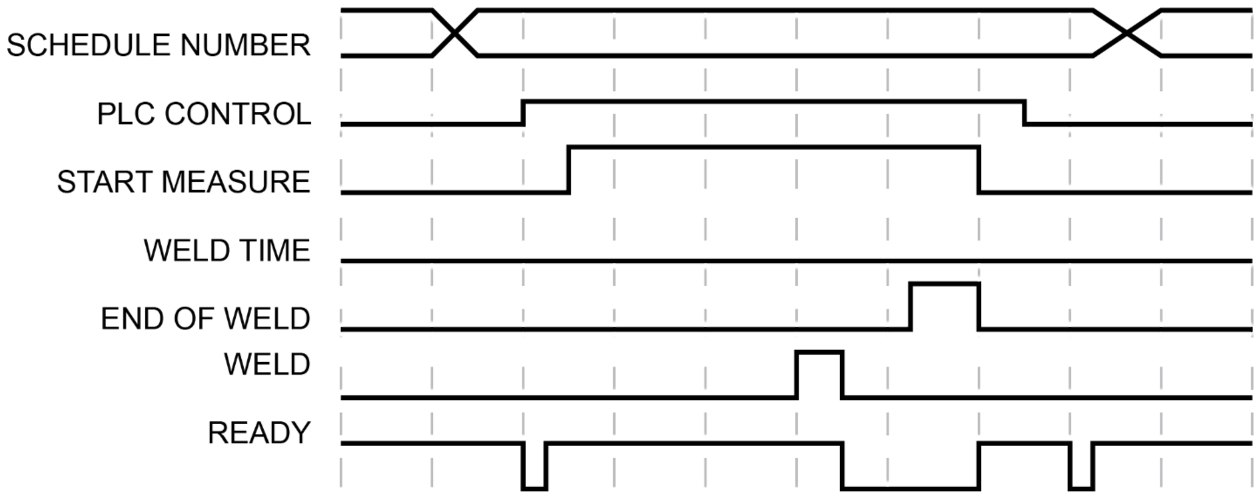
Input Signal	Debounce Period
plc_strt_meas	2ms
plc_rst1	2ms
plc_weld_time	4ms
plc_disp_cutoff	2ms
plc_rst_err	2ms
plc_rst0	2ms
plc_eow	2ms
plc_rst1	2ms

- All active status output signals (WG, NWeld, PCerr, InitDispBad, and EndDispOK, but not WNG) are asserted at the same time.

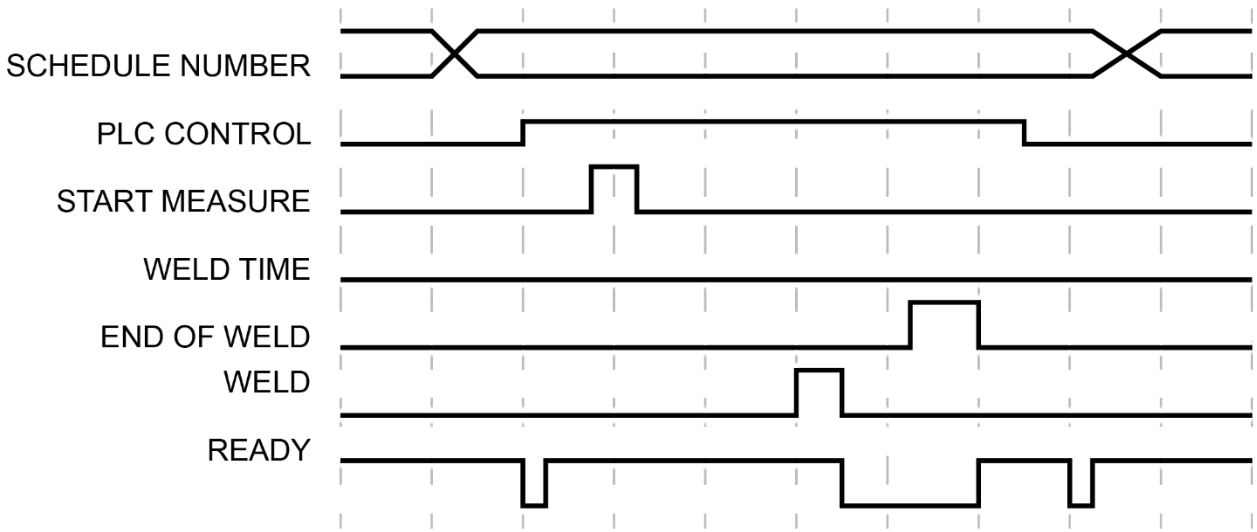
Commonly used acronyms

Acronym	Definition
EOW	End of Weld
EndDispOK	End Displacement OK
InitDispBad	Initial Displacement Bad
NWELD	No Weld
WG	Weld Good
WNG	Weld No Good

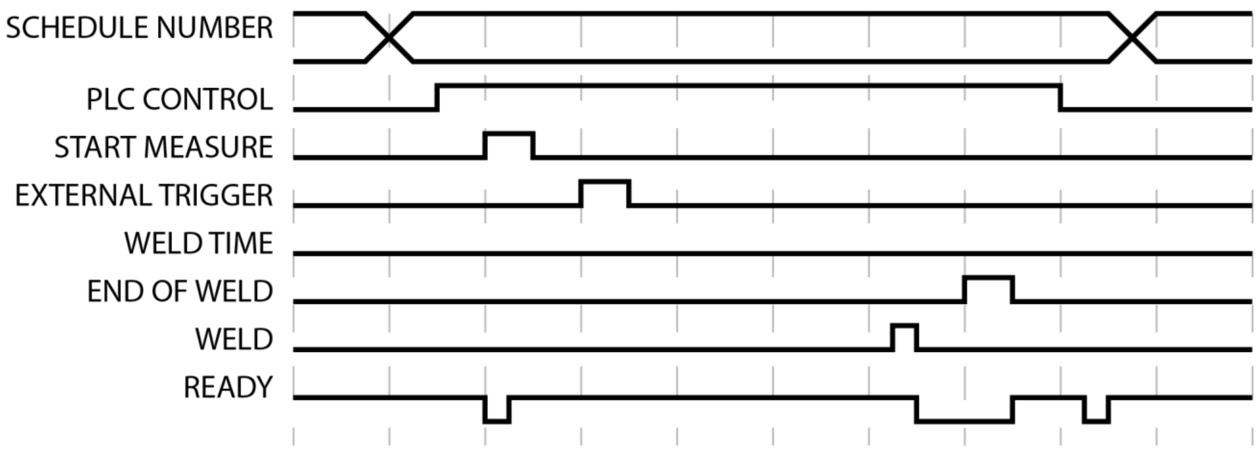
EXTERNAL I/O CONTROL USING END OF WELD



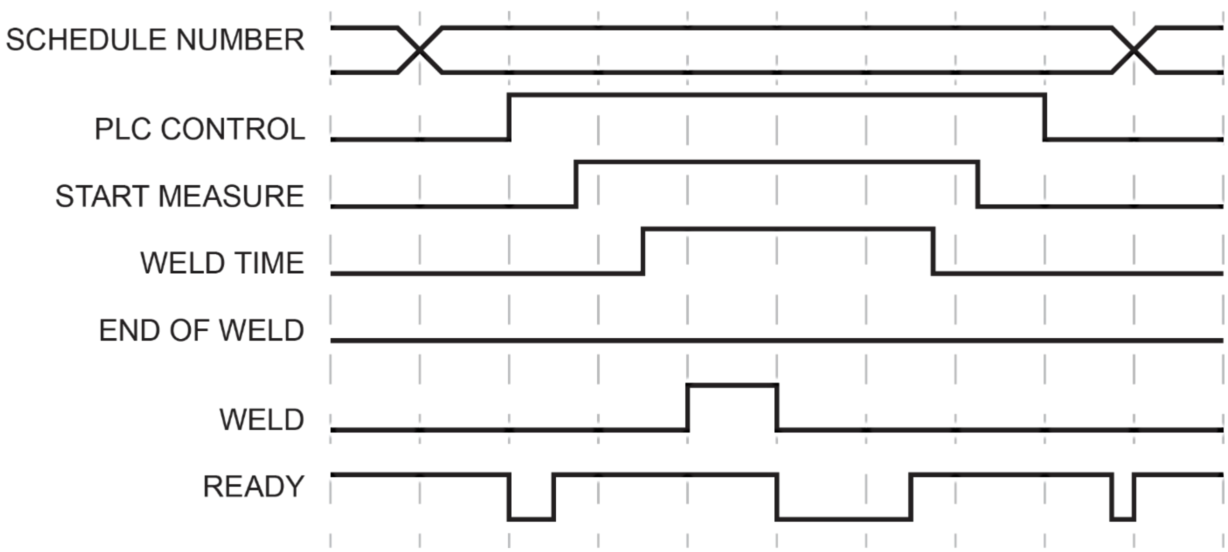
EXTERNAL I/O CONTROL USING END OF WELD (ALTERNATE METHOD)

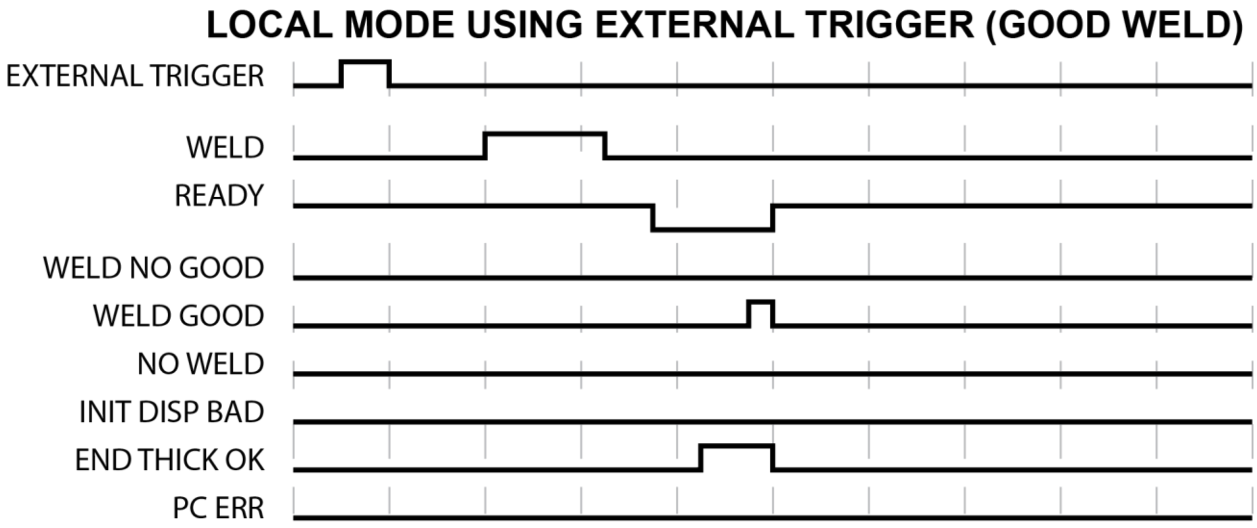


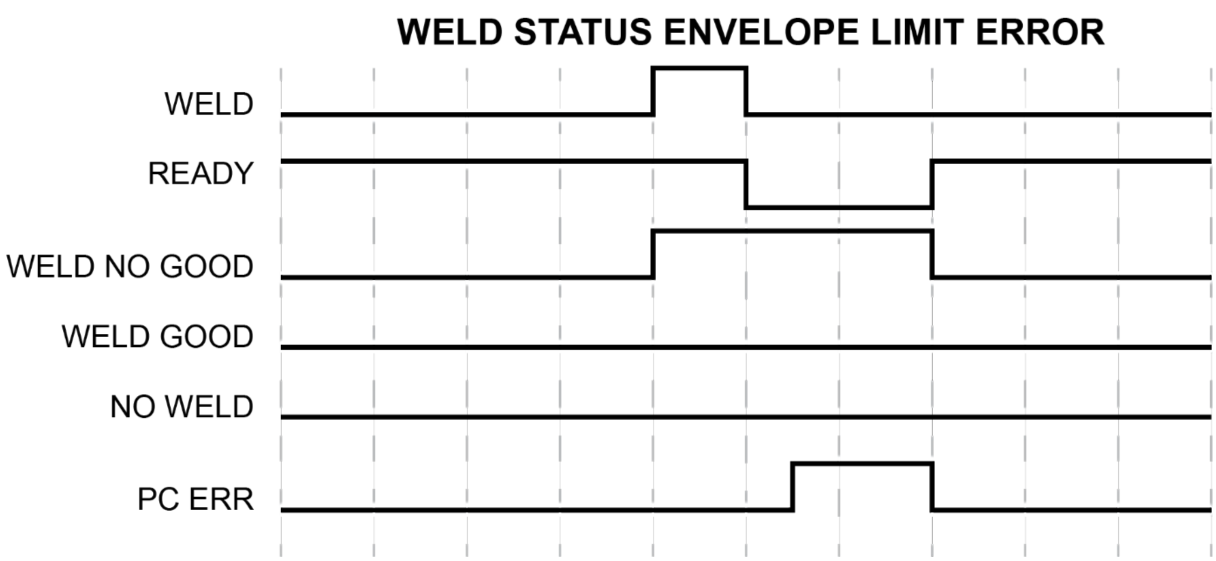
EXTERNAL I/O CONTROL USING END OF WELD AND EXTERNAL TRIGGER



EXT I/O CONTROL USING WELD TIME

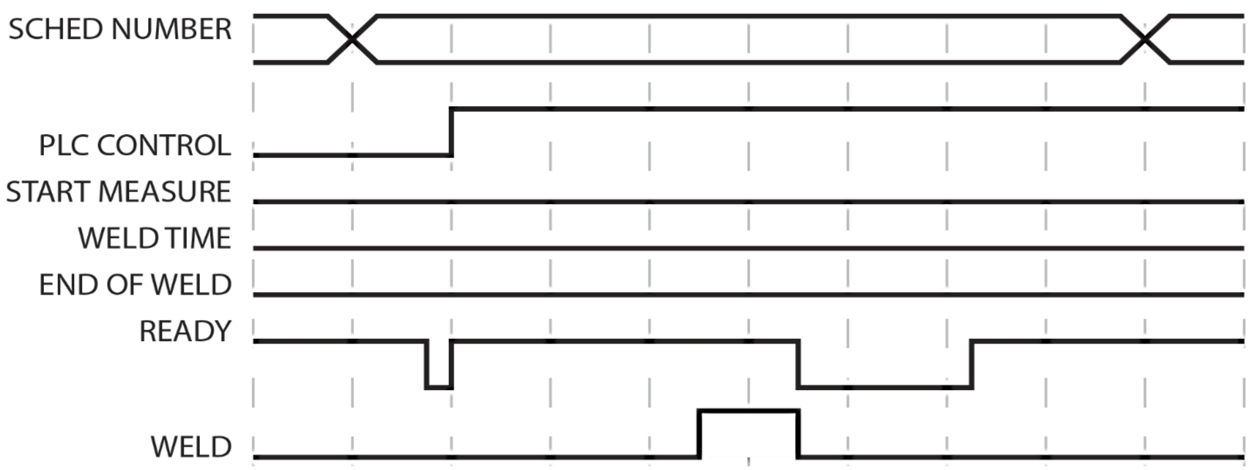



LOCAL MODE USING EXTERNAL TRIGGER (GOOD WELD)
EXTERNAL TRIGGER
WELD
READY
WELD NO GOOD
WELD GOOD
NO WELD
INIT DISP BAD
END THICK OK
PC ERR

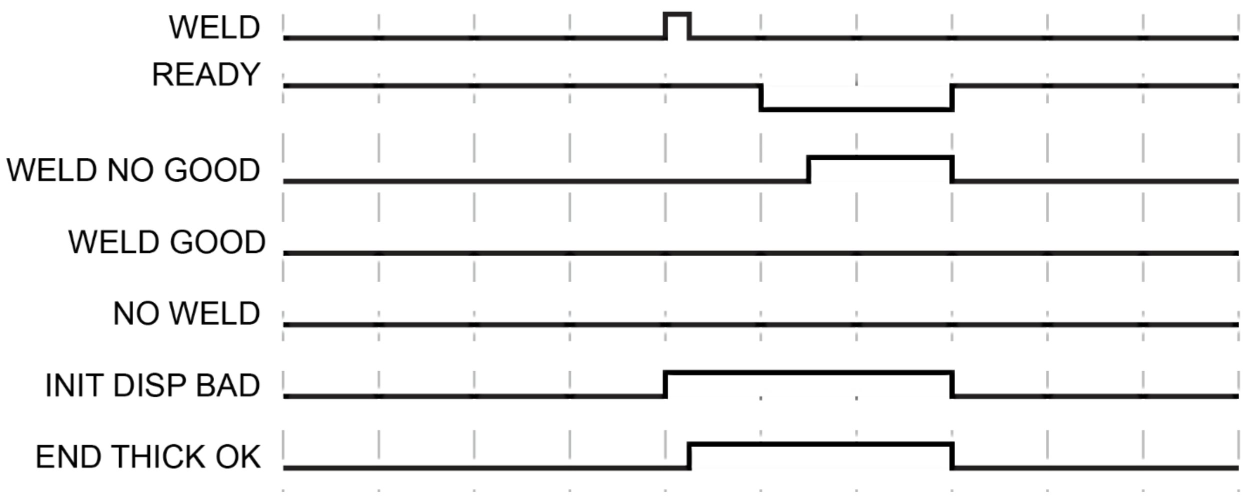

WELD STATUS ENVELOPE LIMIT ERROR
WELD
READY
WELD NO GOOD
WELD GOOD
NO WELD
PC ERR

NO WELD DETECTED IN EXTERNAL MODE (NON-AUTOMODE)

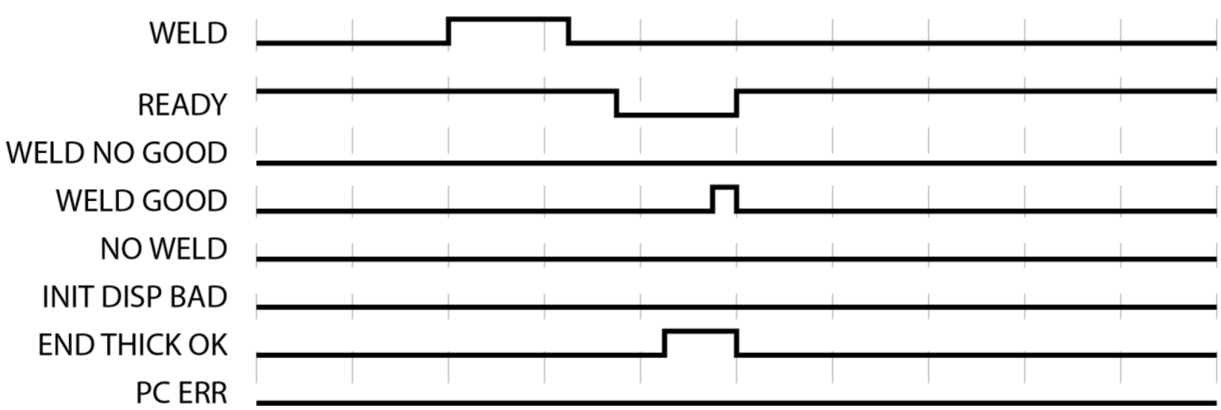
EXT I/O AUTOMODE



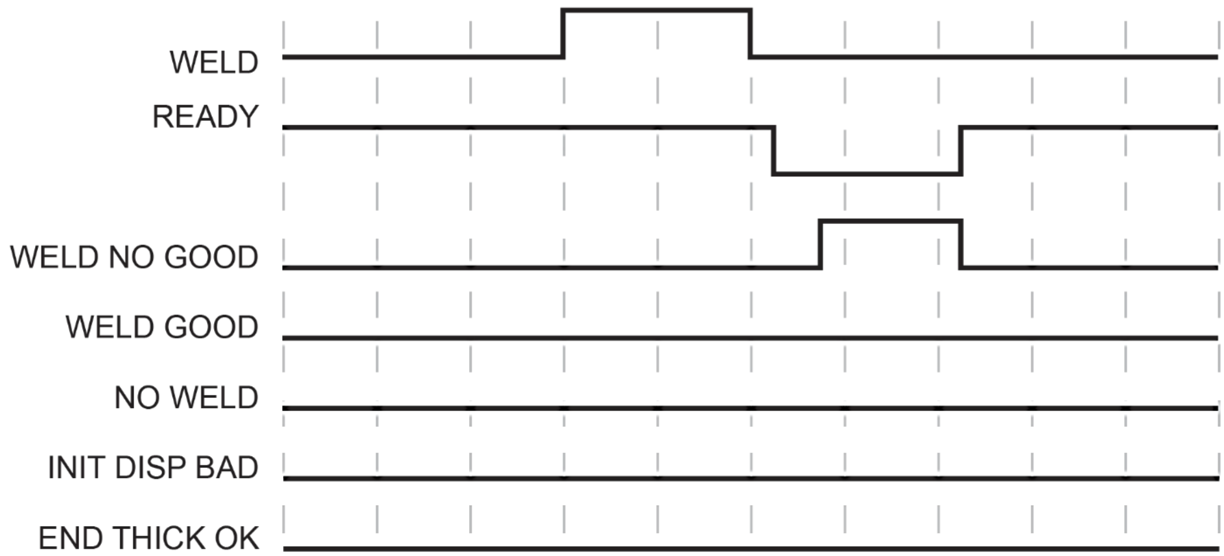
WELD STATUS INITIAL DISPLACEMENT BAD



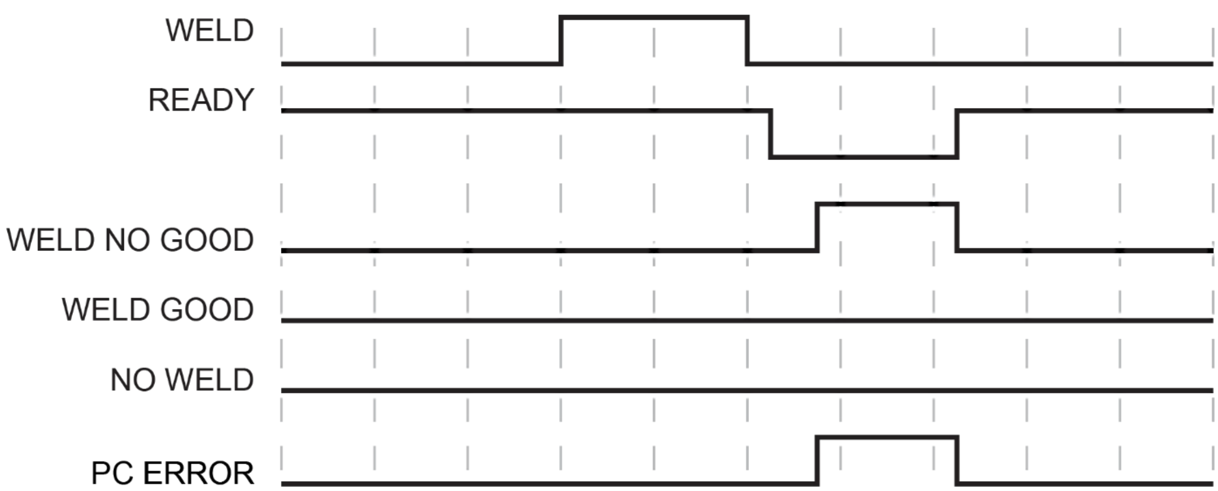
WELD STATUS (GOOD WELD)



WELD STATUS END THICKNESS NOT OK



WELD STATUS AGGREGATE LIMIT ERROR



Appendix C NRWM CENTRAL SERVER RESTAPI

REST API – User Accessible

The RestAPI End Points listed below can be accessed externally by the user via Postman or any third party RestAPI Testing Tool. Refer to the RestAPI End Point Request Tutorials for examples on how to access these end points.

Definitions

1. Get Active Device List

URL: /CDBRestAPI/GetActiveDeviceList/
Method: GET
URL Params: None
Data Params: None

Success response:

{
“device_list” : { List<DeviceInfoCDB> }, // see Data Structure: Device Info
“response” : {
"status": "OK",
“msg": ""
}
}

Error response:

{
“device_list” : null,
“response” : {
"status": "ERR",
“msg": " Error Description "
}
}

2. Update Device Name

URL: /CDBRestAPI/UpdateDeviceName

Method: POST

URL Params: None

Data Params: Device Name Info // see Data Structure: DeviceNameInfo // unique UUID of device to register with

Success response:

{ "status": "OK", msg": ""}

Error response:

{"status": "ERR", "msg": "Error Description"}

3. Get Device Schedule List

URL: /CDBRestAPI/GetDeviceSchedules/<device_uuid>
Method: GET

URL Params: device_uuid = Uuid of registered device

Data Params: None

Success response:

```
{
        “device_schedules” :  {  see Data Structure: Device Schedule Settings },

         “response” : {
                        "status": "OK",
                        “msg": ""
                   }
}
```

Error Response:

```
{
        “device_schedules” :   null,
        “response” :    {
                        "status": "ERR",
                        “msg": " Error Description "
                        }
}
```

4. Get Schedule

URL: /CDBRestAPI/GetSchedule/<schedule name>

Method: GET

URL Params: sch_name = name of schedule, case insensitive, 64 characters max string

Data Params: None

Success response:

```
{
        “settings” :  {  see Data Structure: Schedule Settings },

          “response” : {
                        "status": "OK",
                        “msg": ""
                   }
}
```

Error response:

```
{
        “settings” :  null,
        “response” : {
                        "status": "ERR",
                        “msg": " Error Description "
                   }
}
```

5. Get Device Schedule Info List

URL: /CDBRestAPI/GetDeviceScheduleInfoList/<device_uuid>

To be used by Client GUI during device schedule management.

Method: GET

URL Params: device_uuid = Uuid of registered device

Data Params: None

Success response:

```
{
        "current_schedule" :   1..128   //current active schedule number used by
        device
        "schedule_infoList" :   {  list of schedule info. See Data Structure:
        Schedule Info List},
        "response" :    {
                        "status": "OK",
                         "msg": "
                          }
}
```

Error response:

```
{
        "current_schedule" :   1..128   //current active schedule number used by device
        "schedule_infoList" :   null,
        "response" :    {
                                "status": "ERR",
                                 "msg": " Error Description "
                        }
}
```

6. Get Schedule By Schedule UUID

URL: /CDBRestAPI/GetScheduleByUuid/<schedule uuid>
To get a schedule from schedule UUID.
Method: GET

URL Params: sch_uuid = uuid of schedule, case insensitive, 64 characters max string

Data Params: None

Success response:

```
{
        “settings” :     {  see Data Structure: Schedule Settings },
        “response” :   {
                                "status": "OK",
                                “msg": ""
                       }
}
```

Error response:

```
{
        “settings” :   null,

          “response” : {
                                "status": "ERR",
                                “msg": " Error Description "
                       }
}
```

7. Get List of Available Schedule By Schedule Name

URL: /CDBRestAPI/GetAllScheduleNameList
To get list of available schedule by schedule name.
Method: GET

URL Params: None

Data Params: None

Success response:

```
{
    "allschedule_List" :   {  List of <string>  of schedule name },

        "response" : {
                "status": "OK",
                "msg": ""
            }
}
```

Error response:

```
{
    allschedule_List" :   null,

        "response" : {
                "status": "ERR",
                    "msg": " Error Description "
            }
}
```

8. Get List of All Users

URL: /CDBRestAPI/GetAllUserList
To get list of available users.
Method: GET

URL Params: None

Data Params: None

Success response:


```
{
    "user_list":[{
                "first_name":"String content",
                "last_logontime":"String content",
                "last_name":"String content",
                "user_access":0,
                "user_name":"String content",
                "user_password":"String content",
                "user_role":0
        }]

    “response” : {
                "status": "OK",
                “msg": ""
            }
}
```


Error response:


```
{
    “user_list” :   null,
    “response” : {
            "status": "ERR",
            “msg": " Error Description "
            }
}
```

9. Get User By User Name

URL: /CDBRestAPI/GetUserByUserName/{user_name}
To individual user information by user_name
Method: GET

URL Params: user_name = user name from the user list data structure

Data Params: None

Success response:

```
{
        "settings":    {
                       "first_name":"String content",
                       "last_logontime":"String content",
                       "last_name":"String content",
                       "user_access":0,
                       "user_name":"String content",
                       "user_password":"String content",
                       "user_role":0
                       }
        “response” :   {
                        "status": "OK",
                        “msg": ""
                       }
}
```

Error response:

```
{
        “settings” :  null,
        “response” :   {
                        "status": "ERR",
                        “msg": " Error Description "
                       }
}
```

10. Get Calibrations

URL: /CDBRestAPI/GetCalibrations/<device_uuid>
Method: GET
URL Params: device_uuid = Uuid of registered device
Data Params: None

Success response:

```
{
        “channels_calparams” :  {  see Data Structure: Channel Calibration },

       “response” :   {
                        "status": "OK",
                        “msg": ""
                       }
}
```

Error response:

```
{
        “channels_calparams” :   null,
       “response” :   {
                        "status": "ERR",
                                 “msg": " Error Description "
                       }
}
```

11. Get Production Data

URL: /CDBRestAPI/GetProductionData/<device_uuid>
Method: GET
URL Params: device_uuid = Uuid of registered device
Data Params: None

Success response:

```
{
        “production_data” :  {  see Data Structure: Production Data Settings },
        “response” :   {
                            "status": "OK",
                            “msg": ""
                           }
}
```

Error response:

```
{
        “production_data” :  null,

              “response” : {
                                 "status": "ERR",
                                 “msg": " Error Description "
                            }
}
```

12. Update Production Data

URL: /CDBRestAPI/UpdateProductionData

Method: POST

URL Params: None

Data Params: Production Data Settings // see Data Structure: Production Data Settings

Success response:

{"status": "OK", msg": ""}

Error response:

{"status": "ERR", "msg": "Error Description"}

13. Get Device Display Data Fields

URL: /CDBRestAPI/GetAggregateDisplayData/<device_uuid>

Method: GET

URL Params: device_uuid = Uuid of registered device

Data Params: None

Success response:

```
{
    "aggre_display_fields" : { see Data Structure: Display Aggregate Data Fields },

        "response" : {
                "status": "OK",
                "msg": ""
            }
}
```

Error response:

```
{
    "aggre_display_fields" : null,

        "response" : {
                "status": "ERR",
                "msg": " Error Description "
            }
}
```

14. Get GUI Display Data Fields

URL: /CDBRestAPI/GetGUIAggregateDisplayData/<device_uuid>

Method: GET

URL Params: device_uuid = Uuid of registered device

Data Params: None

Success response:

{
“aggre_display_fields” : { see Data Structure: Display Aggregate Data Fields },

“response” : {
"status": "OK",
“msg": ""
}
}

Error response:

{
“aggre_display_fields” : null,

response” : {
"status": "ERR",
“msg": " Error Description "
}
}

15. Update Device Display Options

URL: /CDBRestAPI/UpdateAggregateDisplayData
Method: POST

URL Params: None

Data Params:

"device_uuid" : UUID of weld monitor device

"aggre_display_fields" : { see Data Structure: Display Aggregate Data Fields },

Success response:

{ "status": "OK", msg": ""}

Error response:

{"status": "ERR", "msg": "Error Description"}

16. Get Central Server DateTime

URL: /CDBRestAPI/GetCDBDateTime
Method: GET
URL Params: None
Data Params: None

Success response:

```
{
        “utctime” :   string format of utc datetime “2020-02-18 16:45:08Z”

        “localtime” :   string format of local datetime “2020-02-18 08:45:08Z”

        “response” : {
                "status": "OK",
                “msg": ""
              }
}
```

Error response:

```
{
        “utctime” :   null
        “localtime” :   null
        “response” : {
                "status": "ERR",
                “msg": " Error Description "
              }

}
```

17. Get Weld Data by Weld ID

URL: /CDBRestAPI/GetRWWeldDataByID/id
Method: GET
URL Params: id – weld data uuid
Data Params: None

Success response:

```
{
    "welddata" : { see Data Structure: Weld Data },

        "response":{
            "status": "OK",
            "msg": ""
        }
}
```

Error response:

```
{
    "welddata" : null,

        "response" : {
            "status": "ERR",
            "msg": " Error Description "
        }

}
```

18. Get Weld Waveform1 by ID

URL: /CDBRestAPI/GetRWWeldWaveform1ByID/id

Method: GET

URL Params: None

Data Params: None

Example: /CDBRestAPI/GetRWWeldWaveform1ByID/id

Note: to get channel 1 waveform data array.

Success response:

```
{
    "weldwaveform1 " :  {  see Data Structure: Weld Waveform1},
    "response" :   {
                        "status": "OK",
                        "msg": ""
                   }
}
```

Error response:

```
{
    "weldwaveform1" :   null,
    "response" :   {
                    "status": "ERR",
                   "msg": " Error Description "
                   }
}
```

19. Get Weld Waveform2 By ID

URL: /CDBRestAPI/GetRWWeldWaveform2ByID/id

Method: GET

URL Params: None

Data Params: None

Success response:

```
{
        "weldwaveform2 " :  {  see Data Structure: Weld Waveform2},
        "response" :    {
                                "status": "OK",
                                 "msg": ""
                        }
}
```

Error response:

```
{
        "weldwaveform2" :   null,
        "response" :    {
                                "status": "ERR",
                                "msg": " Error Description "
                        }
}
```

20. Get Weld Waveform3 By ID

URL: /CDBRestAPI/GetRWWeldWaveform3ByID/id

Method: GET

URL Params: None

Data Params: None

Success response:

```
{
        “weldwaveform3 ” :  {  see Data Structure: Weld Waveform3 },
        “response” :   {
                        "status": "OK",
                        “msg": ""
                }
}
```

Error response:

```
{
        “weldwaveform3” :   null,
        “response” :   {
                        "status": "ERR",
                        “msg": " Error Description "
                }
}
```

21. Get Weld Waveform4 By ID

URL: /CDBRestAPI/GetRWWeldWaveform4ByID/id

Method: GET

URL Params: None

Data Params: None

Success response:

```
{
    "weldwaveform4 " :  {  see Data Structure: Weld Waveform4 },
    "response" :   {
                        "status": "OK",
                        "msg": ""
                   }
}
```

Error response:

```
{
    "weldwaveform4" :  null,
    "response" :   {
                        "status": "ERR",
                        "msg": " Error Description "
                   }
}
```

22. Get Weld Waveform5 By ID

URL: /CDBRestAPI/GetRWWeldWaveform5ByID/id

Method: GET

URL Params: None

Data Params: None

Success response:

```
{
        “weldwaveform5 ” :  {  see Data Structure: Weld Waveform5 },
        “response” :    {
                            "status": "OK",
                            “msg": ""
                        }
}
```

Error response:

```
{
        “weldwaveform5” :   null,
        “response” :    {
                            "status": "ERR",
                            “msg": " Error Description "
                        }
}
```

23. Get Weld Waveform6 By ID

URL: /CDBRestAPI/GetRWWeldWaveform6ByID/id

Method: GET

URL Params: None

Data Params: None

Success response:

```
{
    "weldwaveform6 " :  {  see Data Structure: Weld Waveform6 },
    "response" :   {
                      "status": "OK",
                      "msg": ""
                   }
}
```

Error response:

```
{
    "weldwaveform6" :  null,
    "response" :   {
                   "status": "ERR",
                   "msg": " Error Description "
                   }
}
```

24. Get Weld Waveform7 By ID

URL: /CDBRestAPI/GetRWWeldWaveform7ByID/id

Method: GET

URL Params: None

Data Params: None

Success response:

```
{
        “weldwaveform7 ” :  {  see Data Structure: Weld Waveform7 },
        “response” :    {
                                "status": "OK",
                                “msg": ""
                        }
}
```

Error response:

```
{
        “weldwaveform7” :   null,
        “response” :    {
                        "status": "ERR",
                        “msg": " Error Description "
                        }
}
```

25. Get Weld Waveform8 By ID

URL: /CDBRestAPI/GetRWWeldWaveform8ByID/id

Method: GET

URL Params: None

Data Params: None

Success response:

```
{
    "weldwaveform8 " :  {  see Data Structure: Weld Waveform8 },
    "response" :   {
                    "status": "OK",
                    "msg": ""
                    }
}
```

Error response:

```
{
    "weldwaveform8" :  null,
    "response" :   {
                   "status": "ERR",
                   "msg": " Error Description "
                   }
}
```

26. Get Weld Waveform9 By ID

URL: /CDBRestAPI/GetRWWeldWaveform9ByID/id

Method: GET

URL Params: None

Data Params: None

Success response:

```
{
        “weldwaveform9 ” :  {  see Data Structure: Weld Waveform9 },
        “response” :    {
                         "status": "OK",
                         “msg": ""
                         }
}
```

Error response:

```
{
        “weldwaveform9” :   null,
        “response” :    {
                        "status": "ERR",
                        “msg": " Error Description "
                        }
}
```

27. Get Weld Waveform10 By ID

URL: /CDBRestAPI/GetRWWeldWaveform10ByID/id

Method: GET

URL Params: None

Data Params: None

Success response:

```
{
        “weldwaveform10 ” :  {  see Data Structure: Weld Waveform10 },
        “response” :   {
                        "status": "OK",
                        “msg": ""
                  }
}
```

Error response:

```
{
        “weldwaveform10” :   null,
        “response” :   {
                  "status": "ERR",
                  “msg": " Error Description "
                  }
}
```

28. Get Weld Waveform11 By ID

URL: /CDBRestAPI/GetRWWeldWaveform11ByID/id

Method: GET

URL Params: None

Data Params: None

Success response:

```
{
        "weldwaveform11 " :  {  see Data Structure: Weld Waveform11 },
        "response" :   {
                              "status": "OK",
                              "msg": ""
                       }
}
```

Error response:

```
{
        "weldwaveform11" :  null,
        "response" :   {
                              "status": "ERR",
                              "msg": " Error Description "
                       }
}
```

29. Get Weld Waveform12 By ID

URL: /CDBRestAPI/GetRWWeldWaveform12ByID/id

Method: GET

URL Params: None

Data Params: None

Success response:

```
{
    "weldwaveform12 " :  {  see Data Structure: Weld Waveform12 },
    "response" :    {
                        "status": "OK",
                        "msg": ""
                    }
}
```

Error response:

```
{
    "weldwaveform12" :   null,
    "response" :    {
                        "status": "ERR",
                        "msg": " Error Description "
                    }
}
```

REST API

Internal Application and Server Access ONLY - DO NOT USE

The RestAPI End Points below are for internal use and are not to be accessed by the user. Accessing these RestAPI End Point can potentially cause the database and NetworkedRWMonitor system to be corrupted and not functional.

Definitions

1. Add Schedule

URL: /CDBRestAPI/AddSchedule

Method: POST

URL Params: None

Data Params: Schedule settings

Content type: application/json; charset=UTF-

Field Name	Description	Values
sch_name	Schedule name (case insensitive, save as all lower case)	64 characters max string
sch_uuid	Schedule UUID	UUID string
temp_schedule	Flag indicating schedule has not been permanently saved and can be edited.	bool
sch_index	Schedule index Index = 1 when schedule first created	Int32
sch_status	Schedule Status (unused)	Int32
sch_chksum	Schedule Checksum	UInt32
created_utctime	Schedule UTC time when first original created. (value will be set by RestAPI Service)	"YYYY-MM-DD HH:MM:SS"
last_modified	Schedule UTC time when last modified and a new schedule index copy get created (value will be set by RestAPI Service)	"YYYY-MM-DD HH:MM:SS"
modified_user	Name of user modified schedule	64 characters max string
capture_settings	See Capture Settings data structure	
analyzer_settings	See Analyzer Settings data structure	
limit_settings	See Limit Settings data structure	
aggregate_limit_settings	See Aggregate Limit Settings data structure	
plc_io_settings	See PLC I/O Settings data structure	

Success response:

{ "status": "OK", msg": ""}

Error response:

{"status": "ERR", "msg": "Error Description"}

2. Update Schedule

URL: /CDBRestAPI/UpdateSchedule

Method: POST

URL Params: None

Data Params: Schedule Settings

Content type: application/json; charset=UTF-8

Field Name	Description	Values
sch_name	Schedule name (case insensitive, save as all lower case)	64 characters max string
sch_uuid	Schedule UUID	UUID string
temp_schedule	Flag indicating schedule has not been permanently saved and can be edited.	bool
sch_index	Schedule index Auto increment index # on each copy of modified schedule	Int32
sch_status	Schedule Status (unused)	Int32
sch_chksum	Schedule Checksum	UInt32
created_utctime	Schedule UTC time when first original created. (value will be set by RestAPI Service)	"YYYY-MM-DD HH:MM:SS"
last_modified	Schedule UTC time when last modified and a new schedule index copy get created (value will be set by RestAPI Service)	"YYYY-MM-DD HH:MM:SS"
modified_user	Name of user modified schedule	64 characters max string
capture_settings	See Capture Settings data structure	
analyzer_settings	See Analyzer Settings data structure	

Field Name	Description	Values
limit_settings	See Limit Settings data structure	
aggregate_limit_settings	See Aggregate Limit Settings data structure	
plc_io_settings	See PLC I/O Settings data structure	

Success response:

{ "status": "OK", msg": ""}

Error response:

{"status": "ERR", "msg": "Error Description"}

3. Save Schedule

URL: /CDBRestAPI/SaveSchedule

To save a schedule permanently, change the 'temp_schedule' flag to 0

Method: POST

URL Params: None

Data Params: Schedule Settings

Content type: application/json; charset=UTF-8

Field Name	Description	Values
sch_name	Schedule name (case insensitive, save as all lower case)	64 characters max string
sch_uuid	Schedule UUID	UUID string
temp_schedule	Flag indicating schedule has not been permanently saved and can be edited.	bool
sch_index	Schedule index Auto increment index # on each copy of modified schedule	Int32
sch_status	Schedule Status (unused)	Int32
sch_chksum	Schedule Checksum	UInt32
created_utctime	Schedule UTC time when first original created. (value will be set by RestAPI Service)	"YYYY-MM-DD HH:MM:SS"
last_modified	Schedule UTC time when last modified and a new schedule index copy get created (value will be set by RestAPI Service)	"YYYY-MM-DD HH:MM:SS"
modified_user	Name of user modified schedule	64 characters max string

Field Name	Description	Values
capture_settings	See Capture Settings data structure	
analyzer_settings	See Analyzer Settings data structure	
limit_settings	See Limit Settings data structure	
aggregate_limit_settings	See Aggregate Limit Settings data structure	
plc_io_settings	See PLC I/O Settings data structure	

Success response:

{ "status": "OK", msg": ""}

Error response:

{"status": "ERR", "msg": "Error Description"}

4. Delete Last Update Schedule (Undo Update)

URL: /CDBRestAPI/DeleteLastScheduleUpdate
Method: POST

URL Params: None

Data Params: sch_name = name of schedule, case insensitive, 64 characters max string

Success response:

```
{
        “sch_name” :  “<name of schedule>”, // deleted schedule name with last
schedule index# >”

        “response” : {
                "status": "OK",
                “msg": ""
        }
}
```

Error response:

```
{
        “sch_name” :  “<name of delete schedule with last schedule index# >”

        “response” : {
                "status": "ERR",
                “msg": " Error Description "
        }
}
```

5. Delete Schedule

URL: /CDBRestAPI/DeleteSchedule

Method: POST

URL Params: None

Data Params: sch_name = name of schedule, case insensitive, 64 characters max string

Success response:

{

“sch_name” : “<name of schedule>”, // all schedule indexes under sch_name will be deleted

“response” : {

"status": "OK",

“msg": ""

}

}

Error response:

{

“sch_name” : “<name of schedule>”, // all schedule indexes under sch_name will be deleted

“response” : {

"status": "ERR",

“msg": " Error Description "

}

}

6. Add User

URL: /CDBRestAPI/AddUser
Method: POST

URL Params: None

Data Params: User settings

Content type: application/json; charset=UTF-8

Field Name	Description	Values
first_name	User first name	64 characters max string
last_logontime	UTC time when user last logon	"YYYY-MM-DD HH:MM:SS"
last_name	User last name	64 characters max string
user_access	User level of access (readonly, readwrite or full access)	Int32
user_name	User name for sign on	64 characters max string
user_password	User password for sign on (encrypted password string)	64 characters max string
user_role	User accessible role (operator, engineer or admin role)	Int32
Success response:	{ "status": "OK", msg": ""}	
Error response:	{"status": "ERR", "msg": "Error Description"}	

7. Update User

URL: /CDBRestAPI/UpdateUser

Method: POST

URL Params: None

Data Params: User Settings

Content type: application/json; charset=UTF-8

Field Name	Description	Values
first_name	User first name	64 characters max string
last_logontime	UTC time when user last logon	"YYYY-MM-DD HH:MM:SS"
last_name	User last name	64 characters max string
user_access	User level of access (readonly, readwrite or full access)	Int32
user_name	User name for sign on	64 characters max string
user_password	User password for sign on (encrypted password string)	64 characters max string
user_role	User accessible role (operator, engineer or admin role)	Int32

Success response:

{ "status": "OK", msg": ""}

Error response:

{"status": "ERR", "msg": "Error Description"}

8. Delete User

URL: /CDBRestAPI/DeleteUser

Method: POST

URL Params: None

Data Params: user_name = name of user to be deleted, case insensitive, 64 characters max string

Success response:

```
{
        “user_name” :  “<name of user>”,

                “response” :    {
                                        "status": "OK",
                                        “msg": ""
                                }
}
```

Error response:

```
{
        “sch_name” :  “<name of schedule>”,  // all schedule indexes under
sch_name will be deleted

                “response” :    {
                                        "status": "ERR",
                                        “msg": " Error Description "
                                }
}
```

9. Register Device

URL: /CDBRestAPI/RegisterDevice

Method: POST

URL Params: None

Data Params: Device UUID // see Data Structure: Device ID // unique UUID of device to register with

Success response: { "status": "OK", msg": ""}

Error response: {"status": "ERR", "msg": "Error Description"}

10. Unregister Device

URL: /CDBRestAPI/UnregisterDevice

Method: POST

URL Params: None

Data Params: info // see Data Structure: Device ID // unique UUID of device to unregister with

Success response:

```
{
        “response” :    {
                              "status": "OK",
                              “msg": ""
                        }
}
```

Error response:

```
{
        “response” :    {
                              "status": "ERR",
                              “msg": " Error Description "
                        }
}
```

11. Update Device Schedule List

URL: /CDBRestAPI/UpdateDeviceSchedules

NOTE: To be used by Client GUI during device schedule management.

Method: POST

URL Params: None

Data Params: Device Schedule Name List Settings // see Data Structure: Device Schedule Name List

Success response: { "status": "OK", msg": ""}

Error response: {"status": "ERR", "msg": "Error Description"}

12. Update Device Current Schedule Number

URL: /CDBRestAPI/UpdateDeviceSchedul eNum

To be used by Client GUI during device active schedule selection.

Method: POST

URL Params: None

Data Params: Device Current Schedule Number data // see Data Structure: Device Current Schedule Number Info

Success response: { "status": "OK", msg": ""}

Error response: {"status": "ERR", "msg": "Error Description"}

13. Update Calibrations

URL: /CDBRestAPI/UpdateCalibrations

Method: POST

URL Params: None

Data Params: Channel Calibration Settings // see Data Structure: Channel Calibration Settings

Success response: { "status": "OK", msg": ""}

Error response: {"status": "ERR", "msg": "Error Description"}

Data Structure

A. Schedule Settings

Field Name	Description	Values
sch_name	Schedule name (case insensitive, save as all lower case)	64 characters max string
sch_uuid	Schedule UUID	UUID string
temp_schedule	Flag indicating schedule has not been permanently saved and can be edited.	bool
sch_index	Schedule index Indexing on each copy of modified schedule	Int32
sch_scratchpad	For Internal use only	Int
sch_status	Schedule Status (unused)	Int32
sch_chksum	Schedule Checksum	UInt32
created_utctime	Schedule UTC time when first original created. (value will be set by RestAPI Service)	"YYYY-MM-DD HH:MM:SS"
last_modified	Schedule UTC time when last modified and a new schedule index copy get created (value will be set by RestAPI Service)	"YYYY-MM-DD HH:MM:SS"
modified_user	Name of user modified schedule	64 characters max string
capture_settings	See Capture Settings under Data Structure	
analyzer_settings	See Analyzer Settings under Data Structure	
limit_settings	See Limit Settings under Data Structure	
aggregate_limit_settings	See Aggregate Limit Settings under Data Structure	
plc_io_settings	See PLC I/O Settings under Data Structure	

B. Capture Settings

Field Name	Description	Values
active_channels	Unused	Unused
decimation		Number, units TBD
post_length	Post trigger length	Number of samples per channel
pre_length	Pre trigger length	Number, units TBD
rogowski_V		Number
rogowski_range		0 – 4
rogowski_acmode		0 = Off 1 = On
tag	If in AC mode, this contains the AC cycle frequency (50hz .. 300hz)	string
Rogowski_coil_filter	Coil type (1:1 or 10:1)	0 = 1 to 1 (1:1) 1 = 10 to 1 (10:1)
measurement_automode	Auto measurement of displacement	0 = manual measurement 1 = auto measurement
trigger_type	Trigger type	0 = Disabled 1 = Falling 2 = Rising 3 = Rising or Falling 4= Rogowski
trigger_channel	Trigger Channel	0 – 7
trigger_pattern	Trigger Level	Int32
ch1params	Channel parameters	See Channel Parameters table
ch2params	Channel parameters	See Channel Parameters table
ch3params	Channel parameters	See Channel Parameters table
ch4params	Channel parameters	See Channel Parameters table
ch5params	Channel parameters	See Channel Parameters table
ch6params	Channel parameters	See Channel Parameters table
ch7params	Channel parameters	See Channel Parameters table
ch8params	Channel parameters	See Channel Parameters table
sch_num	Obsolete - Unused	Int32
use_plc_trigger	Trigger control	0 = Normal trigger 1 = PLC triggered
disp1sensor_type	Displacement 1 sensor type	0 = Heidenhain30mm
disp2sensor_type	Displacement 2 sensor type	1 = Heidenhain30mm

C. Channel Parameters

Field Name	Description	Values
tag	Channel Data Tag to label the data type assignment on each channel	0 - Unused 1 - Displacement1 (mm) 2 - Displacement2 (mm) 3 - Voltage1 4 - Voltage2 5 - Power1 6 - Power2 7 – Force (lbf) 8 - Rogowski Coil 9 – Resistance1 10 – Resistance2 11 - Displacement1 (inch) 12 – Displacement2 (inch) 13 – Force (N) 14 – Force (kgf) 15 – Force2 (lbf) 16 – Force2 (N) 17 – Force2 (kgf) 18 – Misc Voltage

D. Analyzer Settings

Field Name	Description	Values
mux1	Mux settings	See Mux Settings table
mux2	Mux settings	See Mux Settings table
mux3	Mux settings	See Mux Settings table
mux4	Mux settings	See Mux Settings table

F. Mux Settings

Field Name	Description	Values
channel	Physical channel assigned to mux	-1 = Unassigned 0 – 11 = Channels 1-12
lower_bit_shift	Number of bit shift used for lower envelope limit to convert 32 bits word to 16 bits word data between GUI and NRWM interface	short
upper_bit_shift	Number of bit shift used for upper envelope limit to convert 32 bits word to 16 bits word data between GUI and NRWM interface	short
win1	Window settings	See Window Settings table
win2	Window settings	See Window Settings table
win3	Window settings	See Window Settings table
win4	Window settings	See Window Settings table

G. Window Settings

Field Name	Description	Values
enabled	Window enable state	0 = disabled 1 = enabled
start	Window start	Numeric value, units TBD
end	Window end	Numeric value, units TBD
cool_time	Cool time duration (micro second unit)	long (min 1000 usec)
cool_time_enabled	cool time enable state	0 = disabled 1 = enabled
cool_time_level	Cool time level	Level 0.15
hold_time	Hold time	Unused
iso_enabled	Iso enable state	0 = disabled 1 = enabled

iso_sampling_percent	Iso sampling percentage	Short (10,20,30,40,50,60,70,80, 90)

H. Limit Settings

Field Name	Description	Values
mux1	Limit Mux settings	See Limit Mux Settings table
mux2	Limit Mux settings	See Limit Mux Settings table
mux3	Limit Mux settings	See Limit Mux Settings table
mux4	Limit Mux settings	See Limit Mux Settings table

I. Limit Mux Settings

Field Name	Description	Values
lower	Lower envelope limit	See Envelope Limit Settings table
upper	Upper envelope limit	See Envelope Limit Settings table

J. Envelope Limit Settings

Field Name	Description	Values
enabled	Envelope limit enabled/disabled	0 = disabled 1 = enabled
Points	Array of integer [x,y] points, up to 2000	Array of integer [[x0,y0],[x1,y1] .. [xN,yN]]

K. Aggregate Limit Settings

Field Name	Description	Values
mux1	Aggregate Limit Mux settings	See Aggregate Limit Mux Settings table
mux2	Aggregate Limit Mux settings	See Aggregate Limit Mux Settings table
mux3	Aggregate Limit Mux settings	See Aggregate Limit Mux Settings table
mux4	Aggregate Limit Mux settings	See Aggregate Limit Mux Settings table

L. Aggregate Limit Mux Settings

Field Name	Description	Values
win1	Aggregate Window Settings	See Aggregate Window Settings table
win2	Aggregate Window Settings	See Aggregate Window Settings table
win3	Aggregate Window Settings	See Aggregate Window Settings table
win4	Aggregate Window Settings	See Aggregate Window Settings table

M. Aggregate Windows Settings

Field Name	Description	Values
lower	Upper aggregate limit settings	See Aggregate Limit Settings table
upper	Lower aggregate limit settings	See Aggregate Limit Settings table

N. Aggregate Limit Settings

Field Name	Description	Values
rms	RMS limit setting	See RMS Limit Setting table
mean	Mean limit setting	See Mean Limit Setting table
min	Min limit setting	See Min Limit Setting table
max	Max limit setting	See Max Limit Setting table
variance	Variance limit setting	See Variance Limit Setting table

O. RMS Limit Setting (same applies for Mean, Min, Max, Variance)

Field Name	Description	Values
value	Limit value	Numeric value: rms = double mean = int32 min = int16 max = int16 variance = int64
enabled	Enabled setting	0 = disabled 1 = enabled

P. PLC I/O Settings

Field Name	Description	Values
detection_flag	Displacement Detection Flag	0 = No displacement flag detection 1 = Use Displacement B 2 = Use Displacement A 3 = Use Displacement A and B 4 = Use Displacement A or B
wng_hold_time	Weld-No-Good hold time	Milliseconds
type	Displacement type	0 = Not used 1 = Weld to setdown 2 = Weld to final thickness
sch_num	Schedule number (unused)	
plc_control	PLC is in control	1 = PLC in control
disp_a	Displacement A Settings	See Displacement Settings table
disp_b	Displacement B Settings	See Displacement Settings table

Q. Displacement Settings

Field Name	Description	Values
weld_to	Weld to thickness	Number, units TBD
initial_thickness	Initial thickness high/low limits	See High/Low Settings table
final_thickness	Final thickness high/low limits	See High/Low Settings table

R. High/Low Settings

Field Name	Description	Values
high	High limit value	Number, units TBD
low	Low limit value	Number, units TBD

S. Device ID

Field Name	Description	Values
device_uuid	UUID of weld monitor device	UUID string

T. Device Name Info

Field Name	Description	Values
device_name	Custom name of weld monitor device	Name string
device_uuid	UUID of weld monitor device	UUID string

U. Device Info

Field Name	Description	Values
device_name	Custom name of weld monitor device	Name string
device_uuid	UUID of weld monitor device	UUID string
last_heartbeat	UUID of weld monitor device	MongoDB Datetime "\/Date(1574356022758)\/" format

Field Name	Description	Values
`pubCalibrateData`	To enable the publishing of weld and waveform data	See Published Calibration Data

V. Device Current Schedule Number Info

Field Name	Description	Values
device_uuid	UUID of weld monitor device	UUID
current_schedule	Current active schedule number used by device	Integer 1..128

W. Device Schedule Settings

Field Name	Description	Values
schedule_settings[128]]		Array of 128 Schedule Settings. See Schedule Settings

X. Schedule Info List

Field Name	Description	Values
sch_name	Name of schedule	string
sch_index	Schedule index	Integer, index number on each schedule copy
sch_uuid	Schedule unique UUID	string
sch_scratchpad	For internal use only	Int32
sch_chksum	Schedule Checksum	UInt32

Y. Channel Calibration Settings

Field Name	Description	Values
Device_uuid	device uuid	string
ch1calparams	Channel 1 calibration Params	See Calibration Parameters
ch2calparams	Channel 1 calibration Params	See Calibration Parameters
ch3calparams	Channel 1 calibration Params	See Calibration Parameters
ch4calparams	Channel 1 calibration Params	See Calibration Parameters
ch5calparams	Channel 1 calibration Params	See Calibration Parameters

Field Name	Description	Values
ch6calparams	Channel 1 calibration Params	See Calibration Parameters
ch7calparams	Channel 1 calibration Params	See Calibration Parameters
ch8calparams	Channel 1 calibration Params	See Calibration Parameters

Z. Calibration Parameters

Field Name	Description	Values
gain	Channel gain	Floating point value
offset	Channel offset	Floating point value

AA. Published Calibration Data

Field Name	Description	Values
pubCalAggreData	Enabling the publishing of calibrated/calculated aggregation data	boolean
pubCalWaveformData	Enabling the publishing of calibrated/calculated waveform data	boolean

BB. Production Data Settings

Field Name	Description	Values
device_uuid	device uuid	
operator_name	Name of login shift operator	64 characters max string
job_number	Job number	64 characters max string
sku_number	sku number	64 characters max string
inhost_control	device is in host control	uint – 0 not in control 1 – in host control

CC. Device Schedule Name List Settings

Field Name	Description	Values
device_uuid	device uuid	
sch_namelist	String array of 128 schedule name	"sch_namelist" : ["schedule_1”, "schedule_2", "schedule_3", "defaultschedule", "defaultschedule", "defaultschedule", "defaultschedule", "defaultschedule", "defaultschedule", "defaultschedule", "defaultschedule", "defaultschedule"],
sch_uuidlist	String array of 128 schedule uuid	"sch_uuidlist" : ["schedule1_uuidxxxx”, " schedule2_uuidxxxx ", " schedule3_uuidxxxx ", "defaultscheduleuuid", "defaultscheduleuuid", "defaultscheduleuuid", "defaultscheduleuuid", "defaultscheduleuuid", "defaultscheduleuuid", "defaultscheduleuuid", "defaultscheduleuuid", "defaultscheduleuuid"],

DD. Weld Parameters

Field Name	Description	Values
utctimestamp	MongoDB DateTime of weld	UTC DateTime Type
last_modified	MongoDB DateTime of weld schedule last modified	UTC DateTime Type
gain	Array of 12 doubles, calibration gain for each input channel	gain[0] = 1.0 (default) .. gain[11] = 1.0 (default)
offset	Array of 12 doubles, calibration offset for each input channel	offset[0] = 0.0 (default) .. offset[11] = 0.0 (default)
sch_num	Monitor device schedule number used for this weld data	Schedule number 1 .. 128
sch_name	Name of schedule used for this weld	Schedule name string
sch_index	Index # of the schedule used for this weld	Int32 (Index starting from 1)
sch_scratchpad	For Internal use only	Int32
princhannel1	Label name of the assigned channel as principal channel1	string
princhannel2	Label name of the assigned channel as principal channel2	string
princhannel3	Label name of the assigned channel as principal channel3	string
princhannel4	Label name of the assigned channel as principal channel4	string
use_plc_trigger	Trigger control	0 = Normal trigger 1 = PLC triggered

EE. Weld Statistical Results

Field Name	Description	Values
princhannel1	Principal1 Channel Statistic	See Principal Channel Statistics table
princhannel2	Principal 2 Channel Statistic	See Principal Channel Statistics table
princhannel3	Principal 3 Channel Statistic	See Principal Channel Statistics table
princhannel4	Principal 4 Channel Statistic	See Principal Channel Statistics table

FF. Principal Channel Statistics

Field Name	Description	Values
win1	Window settings	See Aggregate Window Statistics table
win2	Window settings	See Aggregate Window Statistics table
win3	Window settings	See Aggregate Window Statistics table
win4	Window settings	See Aggregate Window Statistics table

GG. Aggregate Windows Statistics

Field Name	Description	Values
rms		double
min		double
max		double
mean		double
stddev		double
iso_enabled	Flag to indicate if ISO RMS is enabled on this window	Integer (ISO only valid and applicable on principal channel 1)
iso_rms_valid	Flag to indicate if ISO RMS calculation returned valid data	Integer (ISO only valid and applicable on principal channel 1)
iso_rms		double (ISO only valid and applicable on principal channel 1)
iso_x_10pct	Iso rms x location at 10 percent	double (ISO only valid and applicable on principal channel 1)
iso_y_10pct	Iso rms y location at 10 percent	double (ISO only valid and applicable on principal channel 1)
iso_x_Npct	Iso rms x location at N percent. N percent is the user selected sampling percent	Ddouble (ISO only valid and applicable on principal channel 1)
iso_y_Npct	Iso rms y location at N percent. N percent is the user selected sampling percent	double (ISO only valid and applicable on principal channel 1)
Iso_sampling_percent	User selected sampling percent	double (ISO only valid and applicable on principal channel 1)
cool_time_x_final	Final X location for cool time	double (only valid and applicable on principal channel 1)
cool_time_status		Integer (only valid and applicable on principal channel 1)
cool_time_enabled	Flag to indicate if cool time is enabled	Integer (only valid and applicable on principal channel 1)

HH. Weld Analyzer

Field Name	Description	Values
statistics	Statistical results of the weld data	see Weld Statistic Results

II. Weld Envelope Violations

Field Name	Description	Values
violations	Envelope limit violations	See Envelope Limit Violations

JJ. Envelope Limit Violations

Field Name	Description	Values
error_word		See Instantaneous Limit Error Word
princhannel1	Principal1 Channel Envelope Limit results	See Principal Channel Envelope Limit
princhannel 2	Principal 2 Channel Envelope Limit results	See Principal Channel Envelope Limit
princhannel 3	Principal 3 Channel Envelope Limit results	See Principal Channel Envelope Limit
princhannel 4	Principal 4 Channel Envelope Limit results	See Principal Channel Envelope Limit

KK. Principal Channel Envelope Limit

Field Name	Description	Values
channel	Physical channel number	Channel number (0...11) zero based
lower	Lower envelope results	See Envelope Limit Results table
upper	Upper envelope results	See envelope limit results table

LL. Envelope Limit results

Field Name	Description	Values
violationY	Y location of instantaneous violation	double
X	X location of instantaneous violation	Int32
limitY	Y location of envelope limit where violation triggered	double

MM. Weld Aggregation Limit Violations

Field Name	Description	Values
violations	Aggregation limit violations	See Principal Channel Aggregation Limit Violations

NN. Principal Aggregation Limit Violations

Field Name	Description	Values
error_word		See Aggregation Limit Error Word
princhannel1	Principal1 Channel Aggregation Window Limit Violations	See Aggregation Window Limit Violations
princhannel 2	Principal 2 Channel Aggregation Window Limit Violations	See Aggregation Window Limit Violations
princhannel 3	Principal 3 Channel Aggregation Window Limit Violations	See Aggregation Window Limit Violations
princhannel 4	Principal 4 Channel Aggregation Window Limit Violations	See Aggregation Window Limit Violations

OO. Aggregation Window Limit Violations

Field Name	Description	Values
win1	Window settings	*See* Aggregation Window Upper/Lower Limit Violations
win2	Window settings	*See* Aggregation Window Upper/Lower Limit Violations
win3	Window settings	*See* Aggregation Window Upper/Lower Limit Violations
win4	Window settings	*See* Aggregation Window Upper/Lower Limit Violations

PP. Aggregation Window Upper/Lower Limit Violations

Field Name	Description	Values
lower	Lower envelope results	See Aggregation Window limit results
upper	Upper envelope results	See Aggregation Window limit results

QQ. Aggregate Window Limit Results

Field Name	Description	Values
rms	rms upper/lower limit has violated	double
min	min upper/lower limit has violated	double
max	max upper/lower limit has violated	double
mean	mean upper/lower limit has	double
	violated	
stddev	Standard deviation upper/lower limit has violated	double

RR. Weld Data

Field Name	Description	Values
_id	Weld data database id	Id string
welddata_uuid	Uuid of the weld data	Uuid string
device_uuid	Uuid of the monitor device that published the weld data	Uuid string
weld_count	Weld count number from device monitor uuid	integer
markedignore	Flag to ignore this weld data from historical data search	boolean
param	Weld parameters	see Weld Parameters

Field Name	Description	Values
analyzer	Weld analyzer results	See Weld Analyzer
envelopes	Weld limit settings/results	See Weld Envelope Limit Violations
aggregate_limits	Weld aggregate limit settings/results	See Weld Aggregation Limit Violations
plc_io	Weld PLC I/O results data structure	See weld PLC I/O results
production_data	Production data info	See Production Data table
waveform	Waveform data has been moved. See GetRWWeldWaveformByID endpoint	Null

Sample expanded schema of weld data

_id	ObjectId("62b1e352efe2e71d944af06e")	ObjectId
welddata_uuid	62b1e352efe2e71d944af06e	String
device_uuid	049598D3-2928-4E55-916C-6BEBA7E20608	String
weld_count	462926	Int32
markedignore	false	Boolean
param	{ 12 fields }	Object
last_modified	2022-06-21 15:21:29.000Z	Date
utctimestamp	2022-06-21 15:27:12.829Z	Date
sch_num	5	Int32
sch_name	grumpy5	String
sch_index	4	Int32
sch_scratchpad	0	Int32
princhannel_1	Current	String
princhannel_2	Resistance 1	String
princhannel_3	Power 1	String
princhannel_4	Voltage 1	String
gain	[12 elements]	Array
[0]	1.0	Double
[1]	1.0	Double
[2]	1.0	Double
[3]	1.0	Double
[4]	1.0	Double
[5]	1.0	Double
[6]	1.0	Double
[7]	1.0	Double
[8]	1.0	Double
[9]	1.0	Double
[10]	1.0	Double
[11]	1.0	Double
offset	[12 elements]	Array
[0]	0.0	Double
[1]	0.0	Double
[2]	0.0	Double
[3]	0.0	Double
[4]	0.0	Double
[5]	0.0	Double
[6]	0.0	Double
[7]	0.0	Double
[8]	0.0	Double
[9]	0.0	Double
[10]	0.0	Double
[11]	0.0	Double

analyzer	{ 1 field }	Object
statistics	{ 4 fields }	Object
princhannel_1	{ 4 fields }	Object
win1	{ 16 fields }	Object
rms	0.306957	Double
min	-0.000487369019575989	Double
max	0.430509300625457	Double
mean	0.231926	Double
stddev	0.201079413100894	Double
iso_enabled	0	Int32
iso_rms_valid	0	Int32
iso_rms	0.0	Double
iso_x_10pct	3224.0	Double
iso_y_10pct	0.0446754934611323	Double
iso_x_Npct	0.0	Double
iso_y_Npct	0.0	Double
iso_sampling_percent	0	Int32
cool_time_enabled	1	Int32
cool_time_x_final	3424.0	Double
cool_time_status	1	Int32
win2	{ 16 fields }	Object
rms	0.0	Double
min	0.0	Double
max	0.0	Double
mean	0.0	Double
stddev	0.0	Double
iso_enabled	0	Int32
iso_rms_valid	0	Int32
iso_rms	0.0	Double
iso_x_10pct	0.0	Double
iso_y_10pct	0.0	Double
iso_x_Npct	0.0	Double
iso_y_Npct	0.0	Double
iso_sampling_percent	0	Int32
cool_time_enabled	0	Int32
cool_time_x_final	0.0	Double
cool_time_status	0	Int32

win3	{ 16 fields }	Object
rms	0.0	Double
min	0.0	Double
max	0.0	Double
mean	0.0	Double
stddev	0.0	Double
iso_enabled	0	Int32
iso_rms_valid	0	Int32
iso_rms	0.0	Double
iso_x_10pct	0.0	Double
iso_y_10pct	0.0	Double
iso_x_Npct	0.0	Double
iso_y_Npct	0.0	Double
iso_sampling_percent	0	Int32
cool_time_enabled	0	Int32
cool_time_x_final	0.0	Double
cool_time_status	0	Int32
win4	{ 16 fields }	Object
rms	0.0	Double
min	0.0	Double
max	0.0	Double
mean	0.0	Double
stddev	0.0	Double
iso_enabled	0	Int32
iso_rms_valid	0	Int32
iso_rms	0.0	Double
iso_x_10pct	0.0	Double
iso_y_10pct	0.0	Double
iso_x_Npct	0.0	Double
iso_y_Npct	0.0	Double
iso_sampling_percent	0	Int32
cool_time_enabled	0	Int32
cool_time_x_final	0.0	Double
cool_time_status	0	Int32

	Value	Type
princhannel_2	{ 4 fields }	Object
win1	{ 5 fields }	Object
rms	0.946739	Double
min	0.0	Double
max	53.862269	Double
mean	0.562044	Double
stddev	0.761853841747221	Double
win2	{ 5 fields }	Object
rms	0.0	Double
min	0.0	Double
max	0.0	Double
mean	0.0	Double
stddev	0.0	Double
win3	{ 5 fields }	Object
rms	0.0	Double
min	0.0	Double
max	0.0	Double
mean	0.0	Double
stddev	0.0	Double
win4	{ 5 fields }	Object
rms	0.0	Double
min	0.0	Double
max	0.0	Double
mean	0.0	Double
stddev	0.0	Double
princhannel_3	{ 4 fields }	Object
win1	{ 5 fields }	Object
rms	0.03934	Double
min	0.0	Double
max	0.127114	Double
mean	0.012849	Double
stddev	0.0371825066261004	Double
win2	{ 5 fields }	Object
rms	0.0	Double
min	0.0	Double
max	0.0	Double
mean	0.0	Double
stddev	0.0	Double
win3	{ 5 fields }	Object
rms	0.0	Double
min	0.0	Double
max	0.0	Double
mean	0.0	Double
stddev	0.0	Double

win4	{ 5 fields }	Object
rms	0.0	Double
min	0.0	Double
max	0.0	Double
mean	0.0	Double
stddev	0.0	Double
princhannel_4	{ 4 fields }	Object
win1	{ 5 fields }	Object
rms	0.094635	Double
min	0.0	Double
max	0.299384136478774	Double
mean	0.03409	Double
stddev	0.0882816805741712	Double
win2	{ 5 fields }	Object
rms	0.0	Double
min	0.0	Double
max	0.0	Double
mean	0.0	Double
stddev	0.0	Double
win3	{ 5 fields }	Object
rms	0.0	Double
min	0.0	Double
max	0.0	Double
mean	0.0	Double
stddev	0.0	Double
win4	{ 5 fields }	Object
rms	0.0	Double
min	0.0	Double
max	0.0	Double
mean	0.0	Double
stddev	0.0	Double
envelopes	{ 1 field }	Object
violations	{ 5 fields }	Object
error_word	0	Int32
princhannel_1	{ 3 fields }	Object
channel	7	Int32
lower	{ 3 fields }	Object
violationY	0.0	Double
X	0	Int32
limitY	0.0	Double
upper	{ 3 fields }	Object
violationY	0.0	Double
X	0	Int32
limitY	0.0	Double

princhannel_2	{ 3 fields }	Object
channel	10	Int32
lower	{ 3 fields }	Object
violationY	0.0	Double
X	0	Int32
limitY	0.0	Double
upper	{ 3 fields }	Object
violationY	0.0	Double
X	0	Int32
limitY	0.0	Double
princhannel_3	{ 3 fields }	Object
channel	8	Int32
lower	{ 3 fields }	Object
violationY	0.0	Double
X	0	Int32
limitY	0.0	Double
upper	{ 3 fields }	Object
violationY	0.0	Double
X	0	Int32
limitY	0.0	Double
princhannel_4	{ 3 fields }	Object
channel	2	Int32
lower	{ 3 fields }	Object
violationY	0.0	Double
X	0	Int32
limitY	0.0	Double
upper	{ 3 fields }	Object
violationY	0.0	Double
X	0	Int32
limitY	0.0	Double
aggregate_limits	{ 1 field }	Object
violations	{ 5 fields }	Object
error_word	0	Int64
princhannel_1	{ 4 fields }	Object
win1	{ 2 fields }	Object
lower	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
upper	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double

min	0.0	Double
max	0.0	Double
stddev	0.0	Double
win2	{ 2 fields }	Object
lower	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
upper	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
win3	{ 2 fields }	Object
lower	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
upper	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
win4	{ 2 fields }	Object
lower	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
upper	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double

princhannel_2	{ 4 fields }	Object
win1	{ 2 fields }	Object
lower	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
upper	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
win2	{ 2 fields }	Object
lower	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
upper	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
win3	{ 2 fields }	Object
lower	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
upper	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double

win4	{ 2 fields }	Object
lower	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
upper	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
princhannel_3	{ 4 fields }	Object
win1	{ 2 fields }	Object
lower	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
upper	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
win2	{ 2 fields }	Object
lower	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
upper	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double

win3	{ 2 fields }	Object
lower	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
upper	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
win4	{ 2 fields }	Object
lower	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
upper	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
princhannel_4	{ 4 fields }	Object
win1	{ 2 fields }	Object
lower	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
upper	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double

win2	{ 2 fields }	Object
lower	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
upper	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
win3	{ 2 fields }	Object
lower	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
upper	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
win4	{ 2 fields }	Object
lower	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double
upper	{ 5 fields }	Object
rms	0.0	Double
mean	0.0	Double
min	0.0	Double
max	0.0	Double
stddev	0.0	Double

plc_io	{ 1 field }	Object
results	{ 3 fields }	Object
error_word	0	Int32
disp_a	{ 2 fields }	Object
initial_thickness	{ 2 fields }	Object
value	-0.1012992673	Double
error	0	Int32
final_thickness	{ 2 fields }	Object
value	-0.1012992673	Double
error	0	Int32
disp_b	{ 2 fields }	Object
initial_thickness	{ 2 fields }	Object
value	-0.0005511814	Double
error	0	Int32
final_thickness	{ 2 fields }	Object
value	-0.0005511814	Double
error	0	Int32
production_data	{ 5 fields }	Object
device_uuid	049598D3-2928-4E55-916C-6BEBA7E20608	String
operator_name	< none >	String
job_number		String
sku_number		String
inhost_control	0	Int32

SS. Weld Waveform1 Data

Field Name	Description	Values
_id	Weld data database id	Id string
pid	Unused	
welddata_uuid	Uuid of the weld data	Uuid string
utctimestamp	MongoDB DateTime of weld	*UTC DateTime Type*
waveform	Array of double, weld waveform values	Null

Sample expanded schema of weld waveform1 data

_id	ObjectId("62d9cf8cefe2e71680cded4c")	ObjectId
welddata_uuid	62d9cf8cefe2e71680cded4c	String
utctimestamp	2022-07-21 22:13:32.301Z	Date
ch1_disp1waveform	[2003 elements]	Array
[0]	-904094	Int32
[1]	-904094	Int32
[2]	-904094	Int32
[3]	-904094	Int32
[4]	-904094	Int32
[5]	-904094	Int32
[6]	-904094	Int32
[7]	-904094	Int32
[8]	-904094	Int32
[9]	-904094	Int32
[10]	-904094	Int32
[11]	-904094	Int32
[12]	-904094	Int32
[13]	-904094	Int32
[14]	-904094	Int32
[15]	-904094	Int32
[16]	-904094	Int32
[17]	-904094	Int32
[18]	-904094	Int32
[19]	-904094	Int32
[20]	-904094	Int32
[21]	-904094	Int32
[22]	-904094	Int32
[23]	-904094	Int32
[24]	-904094	Int32
[25]	-904094	Int32
[26]	-904094	Int32
[27]	-904094	Int32
[28]	-904094	Int32
[29]	-904094	Int32
[30]	-904094	Int32
[31]	-904094	Int32
[32]	-904094	Int32
[33]	-904094	Int32
[34]	-904094	Int32
[35]	-904094	Int32
[36]	-904094	Int32
[37]	-904094	Int32
[38]	-904094	Int32

TT. Weld Waveform2 Data

Field Name	Description	Values
_id	Weld data database id	Id string
welddata_uuid	Uuid of the weld data	Uuid string
utctimestamp	MongoDB DateTime of weld	*UTC DateTime Type*
ch2_disp2waveform	Array of double, displacement2 waveform values	Data array of double type points

Sample expanded schema of weld waveform2 data

_id	ObjectId("62d9cf8cefe2e71680cded4c")	ObjectId
welddata_uuid	62d9cf8cefe2e71680cded4c	String
utctimestamp	2022-07-21 22:13:32.301Z	Date
ch2_disp2waveform	[2003 elements]	Array
[0]	-688937	Int32
[1]	-688937	Int32
[2]	-688937	Int32
[3]	-688937	Int32
[4]	-688937	Int32
[5]	-688937	Int32
[6]	-688937	Int32
[7]	-688937	Int32
[8]	-688937	Int32
[9]	-688937	Int32
[10]	-688937	Int32
[11]	-688937	Int32
[12]	-688937	Int32
[13]	-688937	Int32
[14]	-688937	Int32
[15]	-688937	Int32
[16]	-688937	Int32
[17]	-688937	Int32
[18]	-688937	Int32
[19]	-688937	Int32
[20]	-688937	Int32
[21]	-688937	Int32
[22]	-688937	Int32
[23]	-688937	Int32
[24]	-688937	Int32
[25]	-688937	Int32
[26]	-688937	Int32
[27]	-688937	Int32
[28]	-688937	Int32
[29]	-688937	Int32
[30]	-688937	Int32
[31]	-688937	Int32
[32]	-688937	Int32
[33]	-688937	Int32
[34]	-688937	Int32
[35]	-688937	Int32
[36]	-688937	Int32
[37]	-688937	Int32
[38]	-688937	Int32

UU. Weld Waveform3 Data

Field Name	Description	Values
_id	Weld data database id	Id string
welddata_uuid	Uuid of the weld data	Uuid string
utctimestamp	MongoDB DateTime of weld	*UTC DateTime Type*
ch3_voltage1waveform	Array of double, voltage1 waveform values	Data array of double type points

Sample expanded schema of weld waveform3 data

_id	ObjectId("62d9cf8cefe2e71680cded4c")	ObjectId
welddata_uuid	62d9cf8cefe2e71680cded4c	String
utctimestamp	2022-07-21 22:13:32.301Z	Date
ch3_voltage1waveform	[2003 elements]	Array
[0]	-153129	Int32
[1]	-153754	Int32
[2]	-153754	Int32
[3]	-153754	Int32
[4]	-154379	Int32
[5]	-154379	Int32
[6]	-153754	Int32
[7]	-153129	Int32
[8]	-152504	Int32
[9]	-153129	Int32
[10]	-153754	Int32
[11]	-153754	Int32
[12]	-153754	Int32
[13]	-153754	Int32
[14]	-153754	Int32
[15]	-154379	Int32
[16]	-155004	Int32
[17]	-154379	Int32
[18]	-153129	Int32
[19]	-151879	Int32
[20]	-152504	Int32
[21]	-153129	Int32
[22]	-153754	Int32
[23]	-153754	Int32
[24]	-154379	Int32
[25]	-154379	Int32
[26]	-154379	Int32
[27]	-153754	Int32
[28]	-153129	Int32
[29]	-153129	Int32
[30]	-153129	Int32
[31]	-153129	Int32
[32]	-153129	Int32
[33]	-152504	Int32
[34]	-153754	Int32
[35]	-154379	Int32
[36]	-154379	Int32
[37]	-154379	Int32
[38]	-153129	Int32

VV. Weld Waveform4 Data

Field Name	Description	Values
_id	Weld data database id	Id string
welddata_uuid	Uuid of the weld data	Uuid string
utctimestamp	MongoDB DateTime of weld	UTC DateTime Type
ch4_voltage2waveform	Array of double, voltage2 waveform values	Data array of double type points

Sample expanded schema of weld waveform4 data

_id	ObjectId("62d9cf8cefe2e71680cded4c")	ObjectId
welddata_uuid	62d9cf8cefe2e71680cded4c	String
utctimestamp	2022-07-21 22:13:32.301Z	Date
ch4_voltage2waveform	[2003 elements]	Array
[0]	-3125	Int32
[1]	-3750	Int32
[2]	-4375	Int32
[3]	-3750	Int32
[4]	-3750	Int32
[5]	-3125	Int32
[6]	-3125	Int32
[7]	-3750	Int32
[8]	-3125	Int32
[9]	-3125	Int32
[10]	-3125	Int32
[11]	-3750	Int32
[12]	-4375	Int32
[13]	-4375	Int32
[14]	-4375	Int32
[15]	-3750	Int32
[16]	-3750	Int32
[17]	-3750	Int32
[18]	-3750	Int32
[19]	-2500	Int32
[20]	-2500	Int32
[21]	-3125	Int32
[22]	-3750	Int32
[23]	-4375	Int32
[24]	-3750	Int32
[25]	-3750	Int32
[26]	-3125	Int32
[27]	-3125	Int32
[28]	-3125	Int32
[29]	-3125	Int32
[30]	-3125	Int32
[31]	-3125	Int32
[32]	-3750	Int32
[33]	-3125	Int32
[34]	-3750	Int32
[35]	-3750	Int32
[36]	-3750	Int32
[37]	-3750	Int32
[38]	-3750	Int32

WW. Weld Waveform5 Data

Field Name	Description	Values
_id	Weld data database id	Id string
welddata_uuid	Uuid of the weld data	Uuid string
utctimestamp	MongoDB DateTime of weld	*UTC DateTime Type*
ch5_force1waveform	Array of double, force1 waveform values	Data array of double type points

Sample expanded schema of weld waveform5 data

_id	ObjectId("62d9cf8cefe2e71680cded4c")	ObjectId
welddata_uuid	62d9cf8cefe2e71680cded4c	String
utctimestamp	2022-07-21 22:13:32.301Z	Date
ch5_force1waveform	[2003 elements]	Array
[0]	-4577	Int32
[1]	-4577	Int32
[2]	-4577	Int32
[3]	-5340	Int32
[4]	-5340	Int32
[5]	-4577	Int32
[6]	-4577	Int32
[7]	-4577	Int32
[8]	-3814	Int32
[9]	-4577	Int32
[10]	-3814	Int32
[11]	-3814	Int32
[12]	-4577	Int32
[13]	-5340	Int32
[14]	-4577	Int32
[15]	-3814	Int32
[16]	-4577	Int32
[17]	-3814	Int32
[18]	-4577	Int32
[19]	-3051	Int32
[20]	-3814	Int32
[21]	-3814	Int32
[22]	-4577	Int32
[23]	-5340	Int32
[24]	-4577	Int32
[25]	-4577	Int32
[26]	-4577	Int32
[27]	-4577	Int32
[28]	-4577	Int32
[29]	-3814	Int32
[30]	-3814	Int32
[31]	-3814	Int32
[32]	-3051	Int32
[33]	-4577	Int32
[34]	-4577	Int32
[35]	-4577	Int32
[36]	-4577	Int32
[37]	-3814	Int32
[38]	-3814	Int32

XX. Weld Waveform6 Data

Field Name	Description	Values
_id	Weld data database id	Id string
welddata_uuid	Uuid of the weld data	Uuid string
utctimestamp	MongoDB DateTime of weld	*UTC DateTime Type*
ch6_force1waveform	Array of double, force2 waveform values	Data array of double type points

Sample expanded schema of weld waveform6 data

_id	ObjectId("62d9cf8cefe2e71680cded4c")	ObjectId
welddata_uuid	62d9cf8cefe2e71680cded4c	String
utctimestamp	2022-07-21 22:13:32.301Z	Date
ch6_force2waveform	[2003 elements]	Array
[0]	-2288	Int32
[1]	-2288	Int32
[2]	-2288	Int32
[3]	-3051	Int32
[4]	-2288	Int32
[5]	-2288	Int32
[6]	-2288	Int32
[7]	-3051	Int32
[8]	-2288	Int32
[9]	-3814	Int32
[10]	-2288	Int32
[11]	-2288	Int32
[12]	-3051	Int32
[13]	-3051	Int32
[14]	-3051	Int32
[15]	-2288	Int32
[16]	-3051	Int32
[17]	-2288	Int32
[18]	-3051	Int32
[19]	-2288	Int32
[20]	-2288	Int32
[21]	-2288	Int32
[22]	-3051	Int32
[23]	-3051	Int32
[24]	-3051	Int32
[25]	-3051	Int32
[26]	-2288	Int32
[27]	-2288	Int32
[28]	-1525	Int32
[29]	-3051	Int32
[30]	-2288	Int32
[31]	-2288	Int32
[32]	-2288	Int32
[33]	-2288	Int32
[34]	-3051	Int32
[35]	-3051	Int32
[36]	-3051	Int32
[37]	-2288	Int32
[38]	-2288	Int32

YY. Weld Waveform7 Data

Field Name	Description	Values
_id	Weld data database id	Id string
welddata_uuid	Uuid of the weld data	Uuid string
utctimestamp	MongoDB DateTime of weld	*UTC DateTime Type*
ch7_voltage3waveform	Array of double, voltage3 waveform values	Data array of double type points

Sample expanded schema of weld waveform7 data

_id	ObjectId("62d9cf8cefe2e71680cded4c")	ObjectId
welddata_uuid	62d9cf8cefe2e71680cded4c	String
utctimestamp	2022-07-21 22:13:32.301Z	Date
ch7_voltage3waveform	[2003 elements]	Array
[0]	-4000000	Int32
[1]	-4000000	Int32
[2]	-5000000	Int32
[3]	-4000000	Int32
[4]	-4000000	Int32
[5]	-5000000	Int32
[6]	-4000000	Int32
[7]	-4000000	Int32
[8]	-3000000	Int32
[9]	-3000000	Int32
[10]	-3000000	Int32
[11]	-3000000	Int32
[12]	-5000000	Int32
[13]	-4000000	Int32
[14]	-3000000	Int32
[15]	-2000000	Int32
[16]	-3000000	Int32
[17]	-2000000	Int32
[18]	-3000000	Int32
[19]	-4000000	Int32
[20]	-4000000	Int32
[21]	-2000000	Int32
[22]	-3000000	Int32
[23]	-4000000	Int32
[24]	-4000000	Int32
[25]	-4000000	Int32
[26]	-3000000	Int32
[27]	-3000000	Int32
[28]	-3000000	Int32
[29]	-3000000	Int32
[30]	-3000000	Int32
[31]	-4000000	Int32
[32]	-3000000	Int32
[33]	-5000000	Int32
[34]	-4000000	Int32
[35]	-4000000	Int32
[36]	-3000000	Int32
[37]	-3000000	Int32
[38]	-3000000	Int32

ZZ. Weld Waveform8 Data

Field Name	Description	Values
_id	Weld data database id	Id string
welddata_uuid	Uuid of the weld data	Uuid string
utctimestamp	MongoDB DateTime of weld	*UTC DateTime Type*
ch8_currentwaveform	Array of double, current waveform values	Data array of double type points

Sample expanded schema of weld waveform8 data

_id	ObjectId("62d9cf8cefe2e71680cded4c")	ObjectId
welddata_uuid	62d9cf8cefe2e71680cded4c	String
utctimestamp	2022-07-21 22:13:32.301Z	Date
ch8_currentwaveform	[2003 elements]	Array
[0]	-649	Int32
[1]	-2761	Int32
[2]	974	Int32
[3]	4873	Int32
[4]	10884	Int32
[5]	14133	Int32
[6]	13646	Int32
[7]	22906	Int32
[8]	22906	Int32
[9]	23068	Int32
[10]	26642	Int32
[11]	32328	Int32
[12]	40614	Int32
[13]	38827	Int32
[14]	41263	Int32
[15]	51011	Int32
[16]	54097	Int32
[17]	58321	Int32
[18]	64657	Int32
[19]	68231	Int32
[20]	76516	Int32
[21]	78466	Int32
[22]	82690	Int32
[23]	93087	Int32
[24]	100722	Int32
[25]	103322	Int32
[26]	103484	Int32
[27]	112907	Int32
[28]	119730	Int32
[29]	120380	Int32
[30]	125091	Int32
[31]	130614	Int32
[32]	139549	Int32
[33]	143286	Int32
[34]	139549	Int32
[35]	146860	Int32
[36]	153196	Int32
[37]	151246	Int32
[38]	149784	Int32

AAA. Weld Waveform9 Data

Field Name	Description	Values
_id	Weld data database id	Id string
welddata_uuid	Uuid of the weld data	Uuid string
utctimestamp	MongoDB DateTime of weld	*UTC DateTime Type*
ch9_power1waveform	Array of double, power1 waveform values	Data array of double type points

Sample expanded schema of weld waveform9 data

_id	ObjectId("62d9cf8cefe2e71680cded4c")	ObjectId
welddata_uuid	62d9cf8cefe2e71680cded4c	String
utctimestamp	2022-07-21 22:13:32.301Z	Date
ch9_power1waveform	[2003 elements]	Array
[0]	99	Int32
[1]	424	Int32
[2]	-149	Int32
[3]	-749	Int32
[4]	-1680	Int32
[5]	-2181	Int32
[6]	-2098	Int32
[7]	-3507	Int32
[8]	-3493	Int32
[9]	-3532	Int32
[10]	-4096	Int32
[11]	-4970	Int32
[12]	-6244	Int32
[13]	-5969	Int32
[14]	-6344	Int32
[15]	-7875	Int32
[16]	-8385	Int32
[17]	-9003	Int32
[18]	-9900	Int32
[19]	-10362	Int32
[20]	-11668	Int32
[21]	-12015	Int32
[22]	-12713	Int32
[23]	-14312	Int32
[24]	-15549	Int32
[25]	-15950	Int32
[26]	-15975	Int32
[27]	-17359	Int32
[28]	-18334	Int32
[29]	-18433	Int32
[30]	-19155	Int32
[31]	-20000	Int32
[32]	-21368	Int32
[33]	-21851	Int32
[34]	-21456	Int32
[35]	-22672	Int32
[36]	-23650	Int32
[37]	-23349	Int32
[38]	-22936	Int32

BBB. Weld Waveform10 Data

Field Name	Description	Values
_id	Weld data database id	Id string
welddata_uuid	Uuid of the weld data	Uuid string
utctimestamp	MongoDB DateTime of weld	*UTC DateTime Type*
ch10_power2waveform	Array of double, power2waveform values	Data array of double type points

Sample expanded schema of weld waveform10 data

_id	ObjectId("62d9cf8cefe2e71680cded4c")	ObjectId
welddata_uuid	62d9cf8cefe2e71680cded4c	String
utctimestamp	2022-07-21 22:13:32.301Z	Date
ch10_power2waveform	[2003 elements]	Array
[0]	2	Int32
[1]	10	Int32
[2]	-4	Int32
[3]	-18	Int32
[4]	-40	Int32
[5]	-44	Int32
[6]	-42	Int32
[7]	-85	Int32
[8]	-71	Int32
[9]	-72	Int32
[10]	-83	Int32
[11]	-121	Int32
[12]	-177	Int32
[13]	-169	Int32
[14]	-180	Int32
[15]	-191	Int32
[16]	-202	Int32
[17]	-218	Int32
[18]	-242	Int32
[19]	-170	Int32
[20]	-191	Int32
[21]	-245	Int32
[22]	-310	Int32
[23]	-407	Int32
[24]	-377	Int32
[25]	-387	Int32
[26]	-323	Int32
[27]	-352	Int32
[28]	-374	Int32
[29]	-376	Int32
[30]	-390	Int32
[31]	-408	Int32
[32]	-523	Int32
[33]	-447	Int32
[34]	-523	Int32
[35]	-550	Int32
[36]	-574	Int32
[37]	-567	Int32
[38]	-561	Int32

CCC. Weld Waveform11 Data

Field Name	Description	Values
_id	Weld data database id	Id string
welddata_uuid	Uuid of the weld data	Uuid string
utctimestamp	MongoDB DateTime of weld	*UTC DateTime Type*
ch11_resistance1waveform	Array of double, resistance1 waveform values	Data array of double type points

Sample expanded schema of weld waveform11 data

_id	ObjectId("62d9cf8cefe2e71680cded4c")	ObjectId
welddata_uuid	62d9cf8cefe2e71680cded4c	String
utctimestamp	2022-07-21 22:13:32.301Z	Date
ch11_resistance1waveform	[2003 elements]	Array
[0]	235946070	Int32
[1]	55687794	Int32
[2]	-157858316	Int32
[3]	-31552226	Int32
[4]	-14184031	Int32
[5]	-10923300	Int32
[6]	-11267331	Int32
[7]	-6685104	Int32
[8]	-6657818	Int32
[9]	-6638156	Int32
[10]	-5771113	Int32
[11]	-4756062	Int32
[12]	-3785738	Int32
[13]	-3959976	Int32
[14]	-3726195	Int32
[15]	-3026386	Int32
[16]	-2865297	Int32
[17]	-2647056	Int32
[18]	-2368328	Int32
[19]	-2225953	Int32
[20]	-1993099	Int32
[21]	-1951533	Int32
[22]	-1859402	Int32
[23]	-1651723	Int32
[24]	-1532723	Int32
[25]	-1494154	Int32
[26]	-1491815	Int32
[27]	-1361775	Int32
[28]	-1278952	Int32
[29]	-1272046	Int32
[30]	-1224140	Int32
[31]	-1172378	Int32
[32]	-1097313	Int32
[33]	-1064332	Int32
[34]	-1101792	Int32
[35]	-1051198	Int32
[36]	-1007722	Int32
[37]	-1020714	Int32
[38]	-1022332	Int32

DDD. Weld Waveform12 Data

Field Name	Description	Values
_id	Weld data database id	Id string
welddata_uuid	Uuid of the weld data	Uuid string
utctimestamp	MongoDB DateTime of weld	*UTC DateTime Type*
ch12_resistance2waveform	Array of double, resistance2 waveform values	Data array of double type points

Sample expanded schema of weld waveform12 data

_id	ObjectId("62d9cf8cefe2e71680cded4c")	ObjectId
welddata_uuid	62d9cf8cefe2e71680cded4c	String
utctimestamp	2022-07-21 22:13:32.301Z	Date
ch12_resistance2waveform	[2003 elements]	Array
[0]	4815100	Int32
[1]	1358203	Int32
[2]	-4491786	Int32
[3]	-769546	Int32
[4]	-344542	Int32
[5]	-221113	Int32
[6]	-229004	Int32
[7]	-163712	Int32
[8]	-136427	Int32
[9]	-135469	Int32
[10]	-117295	Int32
[11]	-115998	Int32
[12]	-107721	Int32
[13]	-112679	Int32
[14]	-106027	Int32
[15]	-73513	Int32
[16]	-69319	Int32
[17]	-64299	Int32
[18]	-57998	Int32
[19]	-36640	Int32
[20]	-32672	Int32
[21]	-39826	Int32
[22]	-45350	Int32
[23]	-46999	Int32
[24]	-37231	Int32
[25]	-36294	Int32
[26]	-30197	Int32
[27]	-27677	Int32
[28]	-26100	Int32
[29]	-25959	Int32
[30]	-24981	Int32
[31]	-23925	Int32
[32]	-26872	Int32
[33]	-21809	Int32
[34]	-26872	Int32
[35]	-25534	Int32
[36]	-24478	Int32
[37]	-24794	Int32
[38]	-25036	Int32

EEE. Display Aggregate Data Fields

32 binary bits word of the aggregate data fields of the selected principal channel to be displayed on the device LCD display screen or GUI aggregation window

Field Name	Description	Values
mux1_aggregate_fields	32 bits binary word of aggregate fields to be displayed for mux1 or principal channel 1	See 32 binary bit descriptions below
mux2_aggregate_fields	32 bits binary word of aggregate fields to be displayed for mux2 or principal channel 2	See 32 binary bit descriptions below
mux3_aggregate_fields	32 bits binary word of aggregate fields to be displayed for mux3 or principal channel 3	See 32 binary bit descriptions below
mux4_aggregate_fields	32 bits binary word of aggregate fields to be displayed for mux4 or principal channel 4	See 32 binary bit descriptions below

Each mux binary bitmask is defined as:

bit 0 : win1_rms bit 1 : win1_mean bit 2 : win1_min bit 3 : win1_max bit 4 : win1_ standard dev bit 5 : win2_rms bit 6 : win2_mean bit 7 : win2_min bit 8 : win2_max bit 9 : win2_ standard dev	bit 10 : win3_rms bit 11 : win3_mean bit 12 : win3_min bit 13 : win3_max bit 14 : win3_standard dev bit 15 : win4_rms bit 16 : win4_mean bit 17 : win4_min bit 18 : win4_max bit 19 : win4_ standard dev

Error Words

A. Instantaneous Limit Error Word

This 32-bit word is a summary of instantaneous limit violations.

Each bit corresponds to the limit listed below. 0 = no violation, 1 = violation

	Bit	Limit	
(LSB)	0	PrinChannel1	Upper
	1		Lower
	2		NOT USED
	3		
	4		
	5		
	6		
	7		
	8	PrinChannel2	Upper
	9		Lower
	10		NOT USED
	11		
	12		
	13		
	14		
	15		

	Bit	Limit	
		PrinChannel1	Upper
			Lower
			NOT USED
	20		
	21		
	22		
	23		
	24	PrinChannel2	Upper
	25		Lower
	26		NOT USED
	27		
	28		
	29		
	30		
(MSB)	31		

B. Aggregate Limit Error Word

This 64-bit word is a summary of aggregate limit violations. Each bit corresponds to the aggregate limit window listed below. Note that this error word does not indicate violation occurrence to the level of the individual violation, only to the lower/upper window. 0 = no violation, 1 = violation. To find out which individual violation occurred, the aggregate limits violation data needs to be examined.

	Bit	Limit		
(LSB)	0	Mux 1	Win 1	Lower
	1			Upper
	2		Win 2	Lower
	3			Upper
	4		Win 3	Lower
	5			Upper
	6		Win 4	Lower
	7			Upper
	8		Win 5	Lower
	9			Upper
	10		Win 6	Lower
	11			Upper
	12		Win 7	Lower
	13			Upper
	14		Win 8	Lower
	15			Upper
	16	Mux 2	Win 1	Lower
	17			Upper
	18		Win 2	Lower
	19			Upper
	20		Win 3	Lower
	21			Upper
	22		Win 4	Lower
	23			Upper
	24		Win 5	Lower
	25			Upper
	26		Win 6	Lower
	27			Upper
	28		Win 7	Lower
	29			Upper
	30		Win 8	Lower
	31			Upper

	Bit	Limit		
	32	Mux 3	Win 1	Lower
	33			Upper
	34		Win 2	Lower
	35			Upper
	36		Win 3	Lower
	37			Upper
	38		Win 4	Lower
	39			Upper
	40		Win 5	Lower
	41			Upper
	42		Win 6	Lower
	43			Upper
	44		Win 7	Lower
	45			Upper
	46		Win 8	Lower
	47			Upper
	48	Mux 4	Win 1	Lower
	49			Upper
	50		Win 2	Lower
	51			Upper
	52		Win 3	Lower
	53			Upper
	54		Win 4	Lower
	55			Upper
	56		Win 5	Lower
	57			Upper
	58		Win 6	Lower
	59			Upper
	60		Win 7	Lower
	61			Upper
	62		Win 8	Lower
(MSB)	63			Upper

C. PLC I/O Error Word

This 32-bit word is a summary of PLC I/O errors. For each bit defined below, 0 = no error, 1 = error.

	Bit	Error
(LSB)	0	Displacement A Final Thickness
	1	Displacement A Initial Thickness
	2	Displacement B Final Thickness
	3	Displacement B Initial Thickness
	4	
	5	
	6	
	7	
	8	
	9	
	10	
	11	
	12	
	13	
	14	
	15	

	Bit	Error
	16	Final Thickness
	17	Initial Thickness
	18	
	19	
	20	
	21	
	22	
	23	
	24	
	25	
	26	
	27	
	28	
	29	
	30	
(MSB)	31	

The following conditions are required to set the plc error word:

1. Bits 16 or 17 is set to denote an error.
2. Displacement flags have a value of 001 thru 100

The individual displacement error flag words are set as follows:

1. Bits 16 or 17 determines which thickness error word gets set
2. Displacement flags determine whether Displacement A or B get set: 001: Displacement B

   010: Displacement A

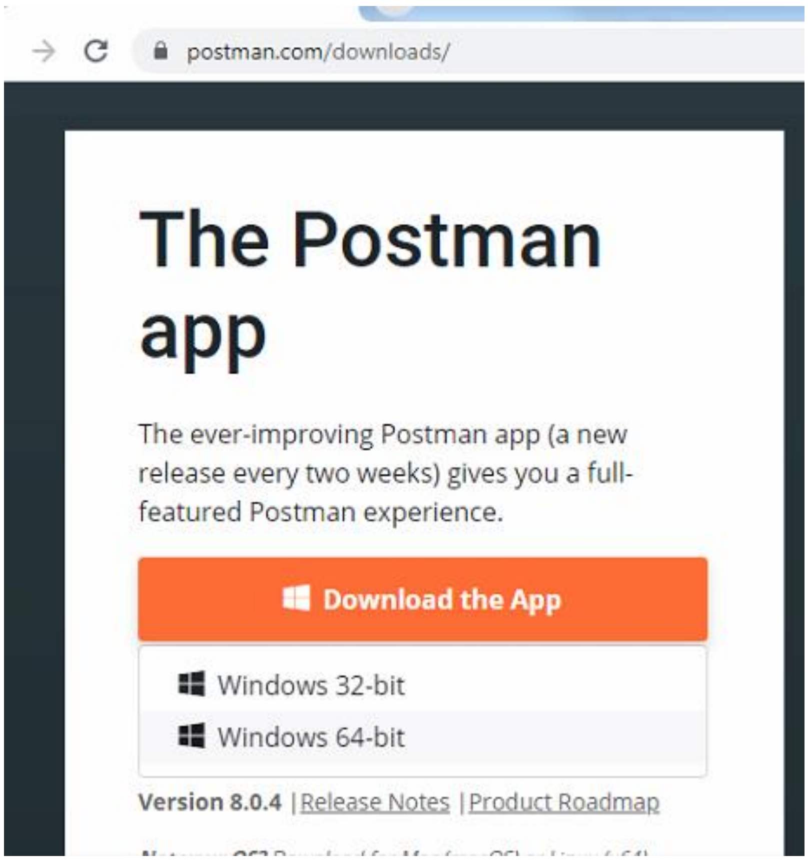
   011: Both Displacement A/B

   100: Based on thickness values vs. limits for both A/B

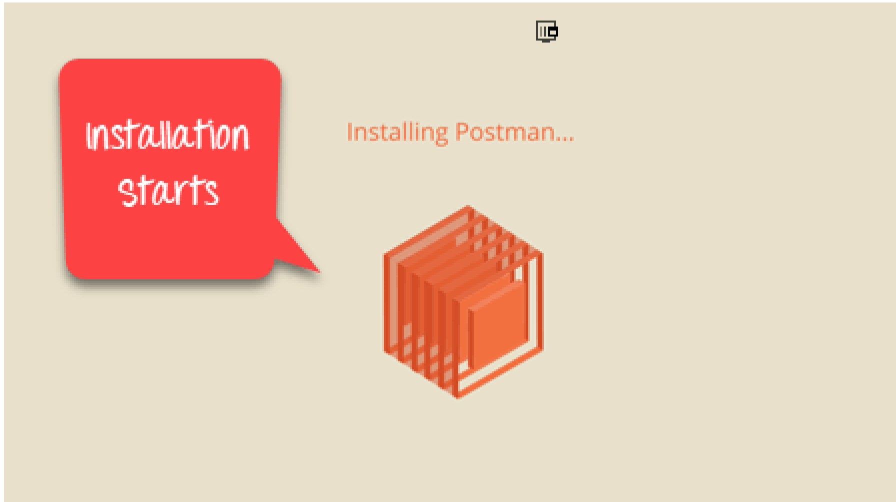
RestAPI End Point Calls – Tutorials

There are many ways the NRWM Central Server RestAPI end points can be invoked whether directly via web browser http:// request or via third party Rest API testing tools. The examples below use the Postman API Tools to demonstrate how the RestAPI end points can be called.

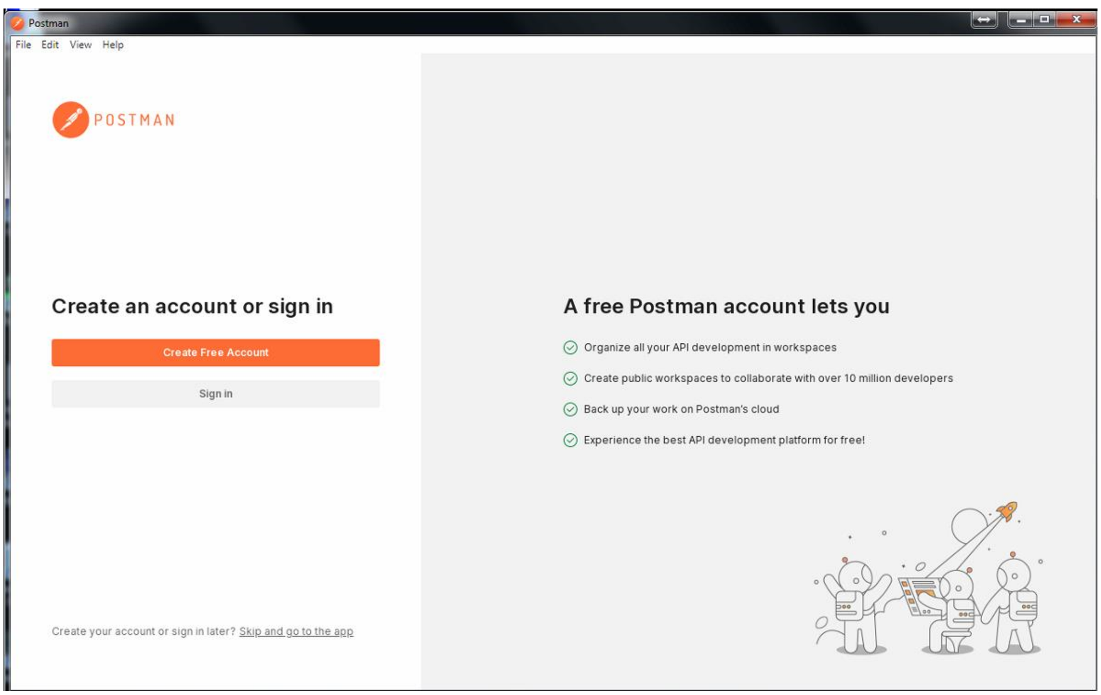
1. Download Postman from the link https://www.postman.com/downloads/ and choose your Windows 32 bits or 64 bits OS platform.



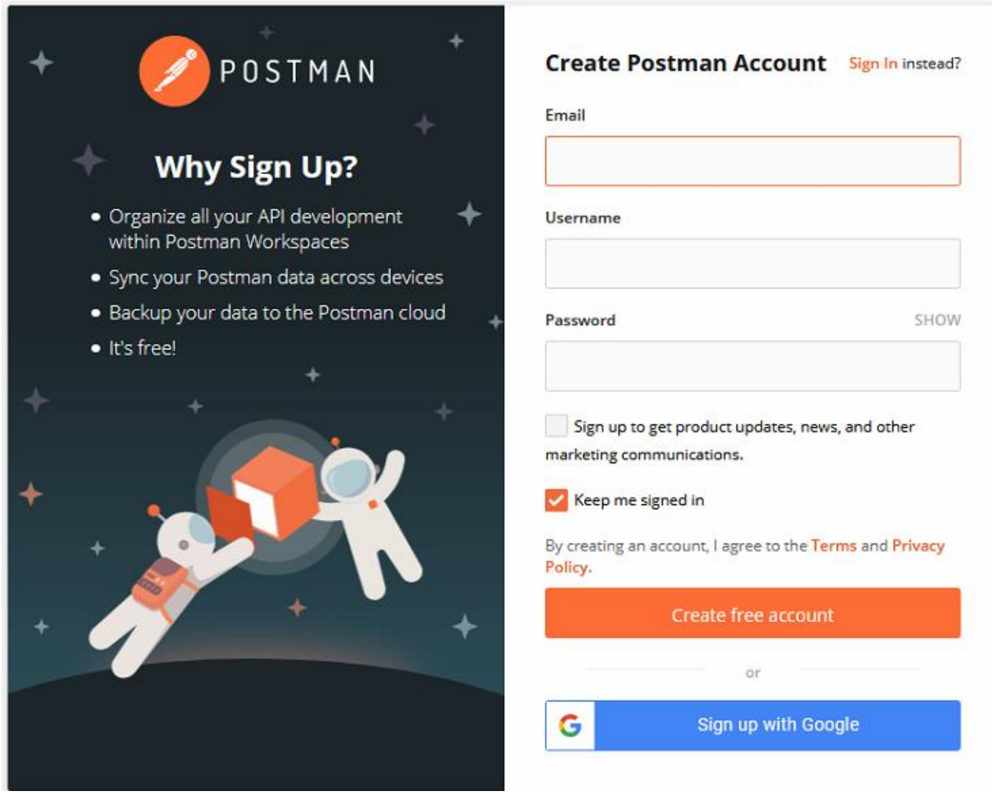
2. Once the download is completed, run and install Postman.



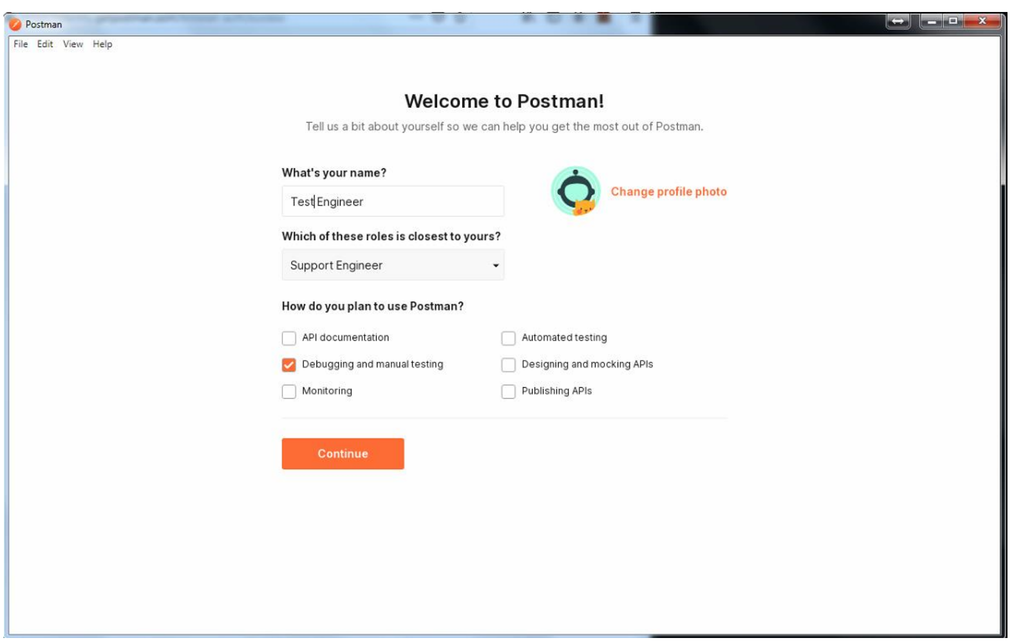
3. Once the installation has started, it will display a window to "Create an account or sign in"



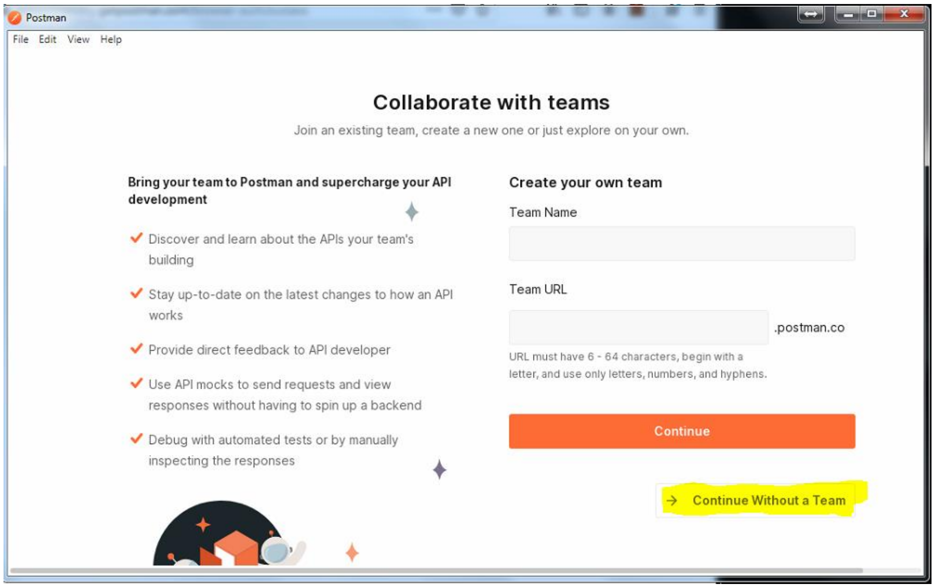
4. Click on the 'Create free Account' and proceed with signing up for the free account



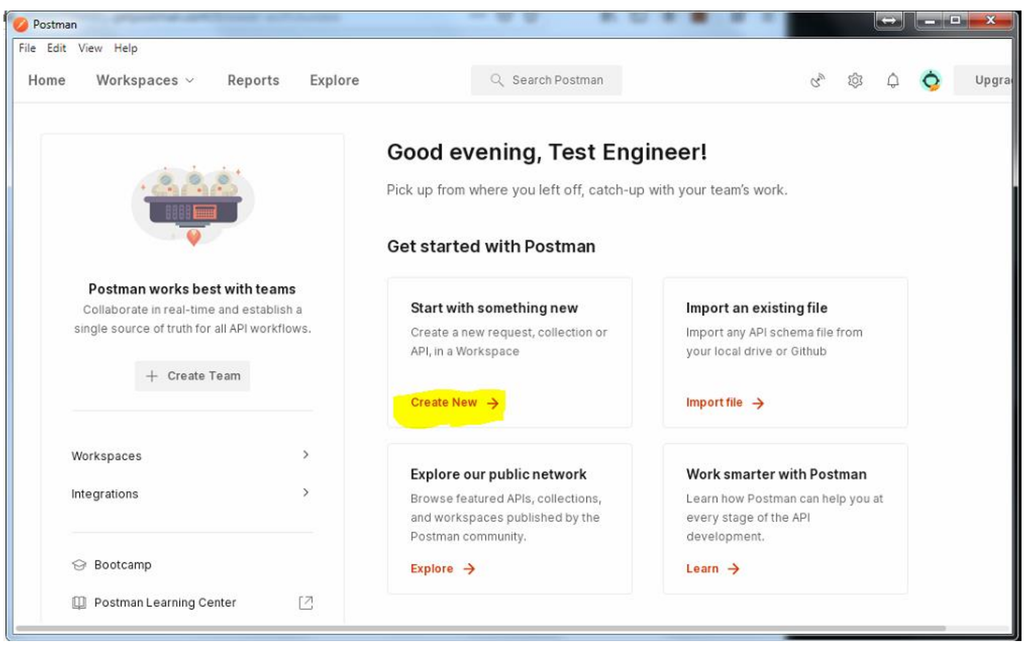
5. Once sign on, select your profile preference and click on the 'Continue'



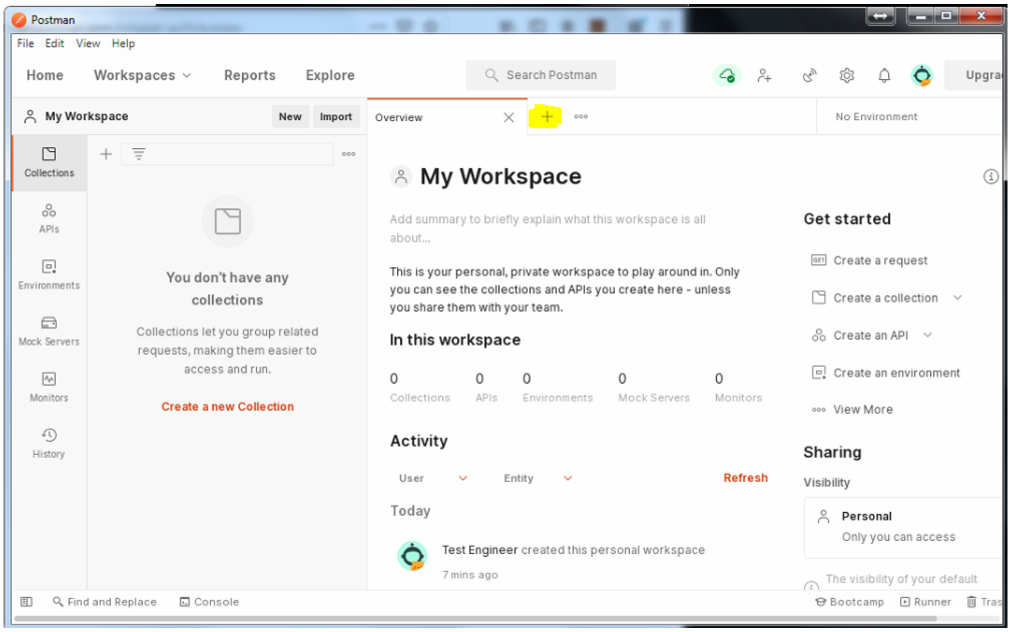
6. Click on the ‘Continue Without a Team’



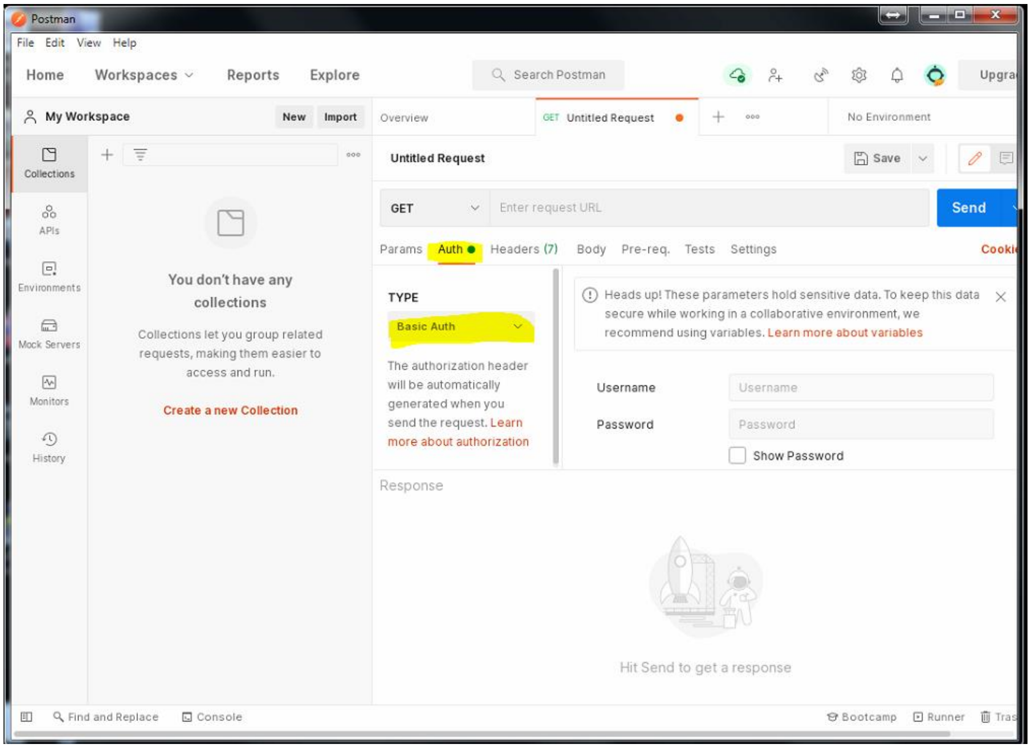
7. You will see the Startup Screen of your workspace.   click on the the ‘Create New -> ‘



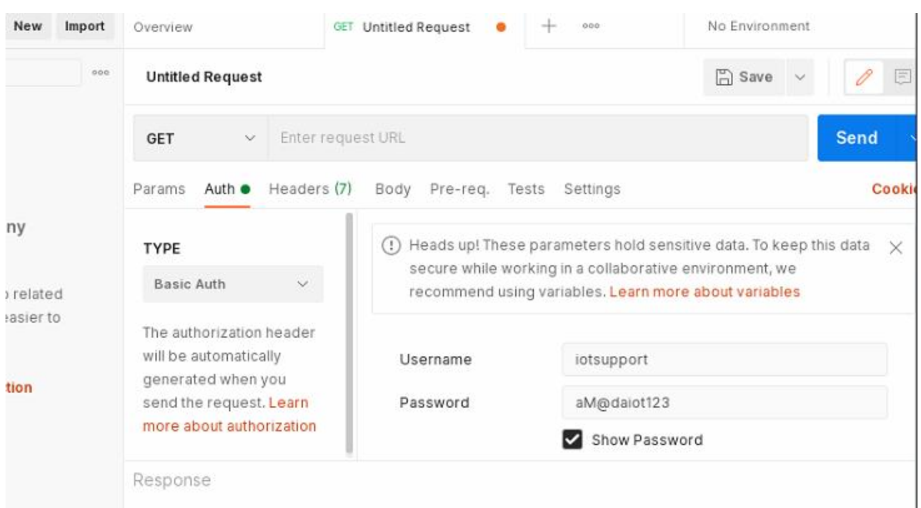
8. A new default Workspace will display. click on the '+' to open a new tab



9. Click on the the 'Auth' menu and select 'Basic Auth' from the TYPE dropdown menu



10. Enter the Host PC NRWM Central Server RestAPI Webserver username/password crendentials. This is the Admin privilege user that was granted read/write access to the NRWM RestAPI webserver during the initial NRWM server installation.



Working with Postman Get Request.

1. Set your HTTP request ‘GET’ type
2. In the request URL field, input link
3. Click Send

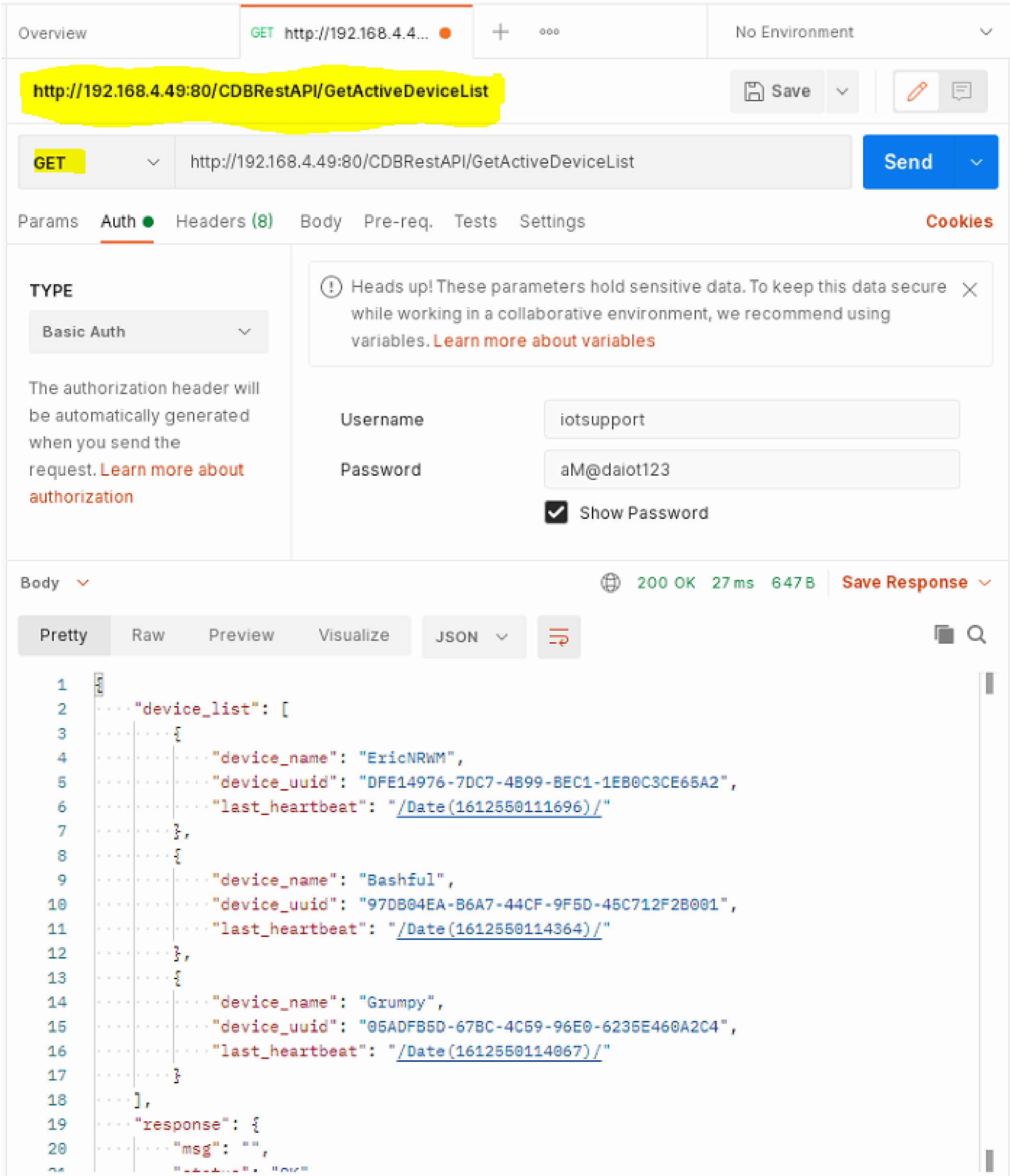
   You will see 20 OK message

   There should be returned results in the body

Example #1: Tto invoke the RestAPI ‘GetActiveDeviceList’ GET end point, enter the HTTP request as shown below.

http://192.168.4.49:80/CDBRestAPI/GetActiveDeviceList

where ‘192.168.4.49’ is the Host Central Server PC IP address and ‘:80’ is the RestAPI port number.



4. Click ‘Send’ to send the Get request. The result will return in Body section.

Working with Postman Post Request

Post requests are different than the get request as there are data needed to be posted and updated via end point.

Example #2: To invoke the POST RestAPI ‘UpdateDeviceName’ end point.

1. Select the device to update based on the ‘device_uuid’ value of the returned results above. From Grumpy device, the device_uuid = “05ADFB5D-67BC-4C59-96E0-6235E460A2C4”. Enter the HTTP POST request as shown below.
2. Set your HTTP request to POST
3. Set the URL field, input link as shown below

http://192.168.4.49:80/CDBRestAPI/UpdateDeviceName

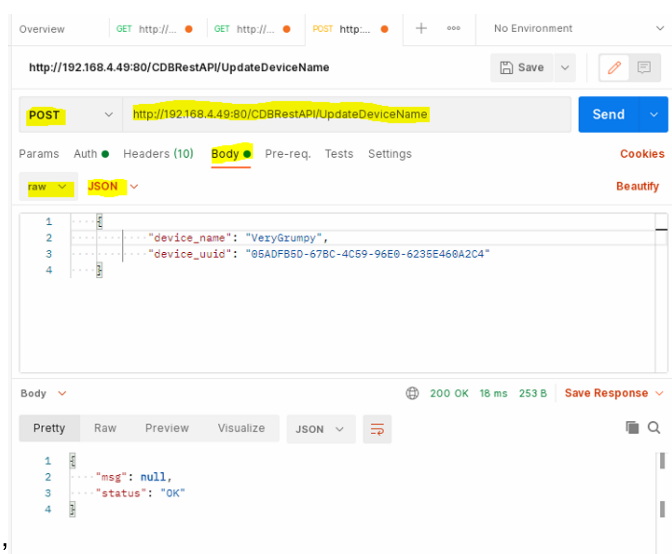
4. Switch to the Body tab
5. In the Body, click ‘raw’ and select ‘JSON’

The data parameters for the ‘UpdateDeviceName’ POST end point are defined in the ‘DeviceNameInfo’ data structure. (Refer to the ‘UpdateDeviceName’ end point definition)

6. Enter the data to update as shown below and click ‘Send’

```
{
        "device_name": "VeryGrumpy",
        "device_uuid": "05ADFB5D-67BC-4C59-96E0-6235E460A2C4"
}
```

7. This POST will update the device_name to ‘VeryGrumpy



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