WM-200A

USER MANUAL



WM-200A Network Resistance Welding Monitor System

990-562

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Revision	Record

Revision	EO	Date	Basis of Revision
A-Draft 2	46049	06/2021	None. Development only, not released.
В	46609	5/2022	Product Release
			Add Quick Start Guide
			 Update Rear Panel connector call-outs
		0 11/2023	Update Displacement Sensor Cable image
			Add how to "Connect Central Server PC Network Port"
С	C 46780		Change Chapter 3 Title
Ũ	107.00		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



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 preapproved 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.

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

11. Installation and Other Services. Seller shall provide installation services ("**Installation Services**") to Buyer if set forth in the Acknowledgment. If Installation Services are provided for in the Acknowledgment, 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 custommade 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 <u>here</u>.

Basic tasks for all users

Launch the Software

- 1. Click the Network RW Monitor Software button to launch the software.
- The Login screen displays.

	× X
Login	Login
User name	User name
Password ©	Password
Login Cancel	Login Cancel
Server Online Connection Settings	Server Offline Connection Settings

- 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 <u>Connect Central Server PC</u> <u>Network Port</u> 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.

Central Server:	MyrtleLabRen	noteServer.:64	52.140.50
	Add Server	Update	Remove
Networked Monito	r(s) Available:		Blink Monit
Networked Monito	E Bashful <97DE	304EA-B6A7-44	4CF-9F5D-4
IP Address: [0.0.0	.0]		worked Monitor

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.

File Screen Layout Display Options User Controls Help		
	Weld monitor switching schedule	
Server Monitor Schedule Ti	igger Status Display Job Counter Envelope History	Aggregation Calibration
Monitor Settings	Live - Weld Monitor Graph	Principal Obarmel 1 U X Principal Obarmel 3 U X Current Principal Obarmel 3 U X
Nonitor Sensors Aggregation Windows LCD D	To Fell Envelope (All + Left Moure Dog) Weveform - Time (msec) To Zoons (All + Right Moure Dog)	
Monter Selection Selected Monter Crumpy <040508D3 2928 4E55 016 Finance Veson: 1.9.6 4107 (2000001	Control Contro Control Control Control Control Control Co	Aggrogation Window 1 Aggrogation Window 1 RMS 0.303 Mean 0.134 Mean 0.226 Max 0.148
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c	Control (1) Contro(1) Control (1) Control (1) Control (1) Control (1)	Mean 0.763 RMS 0.323 Max 0.845 Mean 0.319 Min 0.000 Max 0.350 Min 0.004 Min 0.004
Time Stamp Channel Error Type	Aggregation Data Auto Control Result Graph	
Cer fire Even List	Construction Co	· >
Not Ready 😑 Weld Good 2022 05 31 2	157.13 Logon User Role. admin Admin Current Monitor Schedule. 5 (grumpynew) Checksum. [35345	78112] Local Control 🕘 Central Server 🔵 WeldMonitor

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

Working with WM-Inspect: Operators

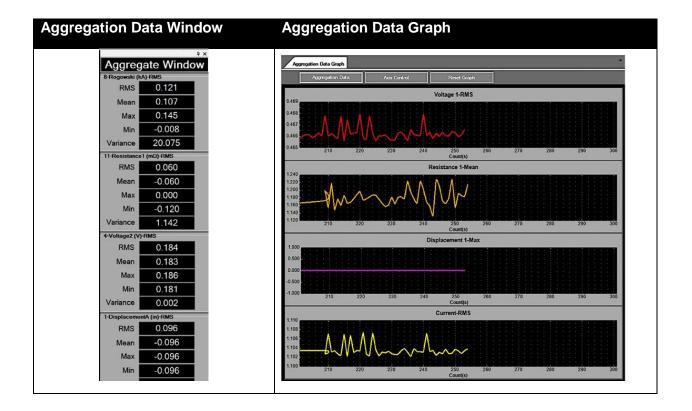
Run Screen versus Monitor Screen

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.



Configure Aggregation Data (Run Screen)

1.	On the Run Screen, Click the Aggregation Data button at the top of the Aggregation	Aggregation Data Graph				
	Data Graph	Aggregation Data				
2.	Select Principal Channel(s) and Aggregation Data to be		×			
	graphed.	Principal Channels/Aggregation Data Selection: Principal Channel Aggregation Data Show Graph				
3.	Check to have the data graphed	Principal Channel Aggregation Data Show Graph Current StdDev V				
	• •	Displacement 1 RMS V	ъ			
4.	Click Close.	Voltage 2 Max v				
		Voltage 1 StdDev V				
		Close	.:			
5.	Select Axis Control	Graph tion Data Axis Control				
6.	Select Principal Channel	_ Graph Options				
7.	Set Y scale minimum and		16			
	maximum values.	Principal Channel 2-DisplacementB (i •				
8.	Click Apply.	□ Auto Scale Y Y Min 0.000 ÷	ľ			
		Y Max 1.000 ≑				
		Apply Cancel				

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.

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<u>Click here for a detailed description of the Live – Weld Graph.</u>

Wold Monitor Cronk

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	Status Display Job
2.	Select the Display Graph Tab	ServerStatusDisplayDisplay SettingsDisplay GraphDigital FilterAnalog Filter
3.	Select Channels to be displayed (Principal Channels are highlighted in blue)	Display Options Image: Stack Tile Update Display Channel(s): Image: Stack Display Channel(s): Image: Stack Display Channel(s): Image: Stack Display Channel(s): Image: Stack Display Graph Layer(s): Image: Stack Image: Stack Trigger Position Image: Stack Image: Stack Image: Stack </td
4.	Select Graph Layers	Display Graph Layer(s) : Waveforms Trigger Position Line Cursor / Cursor Values Limit Lines Aggregation Window Josplacement Thickness Limits
5.	Indicate any inverted inputs	Inverted Input(s): D1 D2 V1 V2 F1 F2 V3 I P1 P2 R1 R2
6.	Select a channel from the dropdown menu and select a color and line type	Graph Options Channel Displacement 1 • Plot Color Line Type •
7.	Choose Auto Scale for the X and Y Axes or set the minimum and maximum vales for each axis.	Auto Scale Y Auto Scale X Y Max 1.491 ÷ X Max 19.895 ÷ Y Min -1.000 ÷ X Min -12.805 ÷

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.

1. Click So	hedule button in Tool Bar.		Monitor	Schedule	Trigger
2. Select t	ne Principal Channels Tab		Principal Channels	Data Capture	Limits and Windows
channel (It is not channel	,	nels.	Principal Channel 1 Principa Current ∨ Resistar	l Channel2 Principal Ch nce 1 V Power 1	annel3 Principal Channel4 Voltage 1 V Update
4. Click Up	odate.			ncipal Channe Principal Chan Current Unused Displacement Displacement Voltage 1 Voltage 2 Force 1 Force 2 Voltage 3 Current Power 2	nel 1

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.

1.	Click the Display button in the Tool Bar	Status Display Job
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 	✓ Stack Tile Update Display Channel(s): ✓
	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.))	Display Graph Layer(s) : ✓ Waveforms Trigger Position ✓ Line Cursor / Cursor Values ✓ Limit Lines ✓ Aggregation Window ✓ Aggregation Data Results ✓ ✓ Violations ✓ Displacement Thickness Limits
4.	Click Update.	

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		Server		Monitor	Sc	hedule
2.	Select the Aggregation Windows Tab		Sensors	A	ggregation Window	is LC	D Display
3.	Select a Principal channel from the		Monitor Settings				
	dropdown menu.	ļ	Monitor Sensors	s	Aggregation Windows	LCD Displa	ay Fieldbus
			Principal Channel:		Voltage 1	٠	
4.	Check the type(s) of data to be		Show / Hide Aggrega	ition [)ata		
	aggregated and displayed in the		Calculation	1	Aggregation 2	Window 3	4
	Aggregation Window and Aggregation		RMS		-		
	Data Graph.		Mean				
5.	Set data types for up to four windows of		Мах				
	time for one or more of the selected		Min				
	principal channels.		Standard Deviation				
a.	Not all data types are available for all data				Select All		
	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				
1.	Click the Schedule Button on the 100 Bar	Monitor Schedule Trigger		
2.	Select Limits and Windows tab	Principal Channels Data Capture Limits and Windows Displacement		
3.	Select Aggregation Windows tab	Limit Lines Aggregation Windows Aggregation Limits		
4.	Select a principal channel from the drop down menu.	Selected Principal Channel: Current • Uimit Lines Aggregation Windows Aggregation Limits		
5.	Click Add Window.	Start X End X Enable ISO RMS Fall Level □ Window (Start 19.950 19.975 IV □ 90 0.000 ÷ 19.950 19.975 IV □ 90 □ ISO RMS 5.450 9.210 IV IV 90 □ ISO RMS ISO RMS ISO RMS Fall □ Cool Time Duration (usec Cool Time Lev ▲ Add Window Delete Window Update		
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).	Start X End X Enable ISO RMS Fall Level 19.950 19.975 I 90 90 19.950 19.975 I 90 90 5.450 9.210 I I 90 ISO RMS Fall Level 90 ISO RMS Fall Level 90 1000 Cool Time Enable ISO RMS Fall Level 90 1000 1000 Cool Time Enable Duration (usec) 5000 1000 1000 Cancel Delete Window Update Window Color [Add Window] -> Click on graph to select aggregation window start/end points 10000 10000		
7. a.	Click on two points along the X axis on the Live - Weld graph. The selected area is highlighted and the selected points appear in the Window (StartX, EndX) Enable fields.	2.000 1.500 1.000 0.000 -5.0 0.0 5.0 10.0 Window (StartX, EndX) Enable 4.984 ♀ 9.741 ♀		

8.	Click Update. The selected points are					
	added to the list of aggregation windows.	Start X	End X	Enable	ISO RMS	Fall Level
		19.950	19.975	v		90
		19.950	19.975	v	Г	90
		5.450	9.210	N	Г	90
		4.980	9.740	V		90
		Schedule				>
9.	Click Save Schedule in the top (Schedule)		appstest>	•	Schedule Table	
	portion of the Schedule Settings window.		ksum: [341822606] ste Schedule Save		New / Save As Schedule Wizard	

Define Limits of Aggregation Values

1.	Click the Schedule button on the Tool Bar	Monitor Schedule Trigger
2.	Select Limits and Windows tab	Principal Channels Data Capture Limits and Windows Displacement
3.	Select a principal channel.	Selected Principal Channel: Current
4.	Select Aggregation Windows tab	Limit Lines Aggregation Windows Aggregation Limits
5.	Select an Aggregation Window from the dropdown list.	Aggregation Window Win1 *
6.	Click Update.	Enable Lower Limit Enable Upper Limit ISORMS 0.000 0.000
		Mean 0.000 0.000 Max 1.000 1.500
		Min 0.000 0.000 StdDev 0.000 0.000
		Update

7. Click Save Schedule to Save	Schedule Current Schedule: 1 <appstest> Checksum: [1503779706] Undo Changes Delete Schedule Save Schedule New / Save As Schedule Schedule</appstest>
 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. Limit lines will display in the Aggregation Data graph. 	Aggregation Window 1 RMS 3.357 Mean 3.067 Max 4.983 Min 0.000 Std Dev 1.365

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	Server Monitor Schedule
2) Select the Sensors tab	S. Monitor Sensors Aggregation Windows
 Select the ratio of the Rogowski coil being used Indicate whether AC Mode in enabled. If AC Mode is enabled, set the AC Current frequency within the range specified. 	Sensor Settings Coil (1 : 1) (10 : 1) AC Mode Enabled AC Current Frequency 50 (50 500) Hz
 6) Set the sensor type for each displacement sensor (Heidenhain or Onosokki) 7) Set the units (inches or millimeters) 	Display Unit Displacement 1 Sensor Type Heidenhain (in) Displacement 2 Sensor Type Heidenhain (in)
 8) Set the maximum input for each of the two force sensors. 9) Set the display unit (lbf, N, or kgf) 10) Click Update. 	Force 1 Sensor Max Input (lbf) 25 (lbf) Force 2 Sensor Max Input (lbf) 25 (lbf)

Set Digital Filter

Click here for more information about the Digital Filter.

1.	Click Display button in Tool Bar	Status Display Job	
2.	Select Digital Filter Tab	Display Settings Display Graph Digital Filter Analog Filter	
	Set Channel, Filter Type and Cutoff Frequency Click Apply	Channel 3 • Filter Type No Filter • Cutoff Frequency 1 kHz • Apply	

Set Analog Filter

Click here for more information about the Analog Filter.

1. Click Display button in Tool Bar	Status Display Job
2. Select Analog Filter Tab	Display Settings Display Graph Digital Filter Analog Filter
 Set Analog Filter Type Click Update 	Current Analog Filter [Low Frequency (800Hz) Filter] Analog Filter Type Low Frequency (800Hz) Filter • Update

Define Capture Settings

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

a) Select Schedule from the Tool Bar	Monitor Schedule Trigger
b) Select Capture Settings Tab	Principal Channels Data Capture Limits and Windows

c)	Enter values in the Pre- and Post-	Capture Settings			
	Trigger time fields (≤ the Max limit	Pre-tri	igger	5	10.24 (msec) Max
	shown)	Post-tri		15	2600 (msec) Max
d)	Use the dropdown menu to select the	Sampling	Rate	5 μsec Υ	Update
	data capture sampling rate.				
e)	Click Update.				
f)	Select a waveform send option	Send Option	2 - Alwa	ays send wave 🗸	Update
g)	Click Update.			er send waveform d waveform on error	
			2 - Alwa	ays send waveform	

Set Fieldbus Connections

Use the Fieldbus tab to define the fieldbus connections settings.

1) Select Monitor in Tool Bar	Server Monitor Schedule
1) Select the Fieldbus tab	Aggregation Windows LCD Display Fieldbus
 Set the IP address, subnet mask and default gateway for the fieldbus. 	- Fieldbus Connection Settings
3) Click Update4) Set the scan rate in milliseconds5) Click Update.	IP address 0.0.0.0 Subnet mask: 0.0.0.0 Default Gateway: 0.0.0.0 Update
	Scan Rate Settings Scan Rate: 10 (msec) 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	Monitor S	chedule Trigger	
2.	Select the Limit Lines tab	Limit Lines Aggregation	on Windows Aggregation Limits	
3.	Deselect Disable Upper (or Lower) Envelope. (These are selected by default and must be deselected.)	Disable Upper Envelope	Disable Lower Envelope	
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.	Add Upper Envelope Env	Add Lower Envelope Delete Lower Envelope	
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.	0.000 0.000 0.002 0.002 0.002 0.004 0.006 0.008 0.000 -5.0 0.0 5.0 10.0		
			Jpper Envelope	
		Point X	Point Y ^	
		-4.720	-0.005	
		-3.184	-0.005	
		-1.329 0.684	-0.006	
		1.373	-0.004	
		Point (X , Y) 9		
	Click Update.			

7. To modify a limit line, select the	6.724	0.000	
coordinates for a given point in the table	9.002	0.000	
and change the point coordinates in the			~
fields below the table.	Point (X . Y)	2.803 ≑ -0.0	001 ≑

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	Monitor Schedule Trigger
2.	Select a Schedule (Defaults to Current Schedule)	Schedule 7 < grumpy2> Schedule Table Checksum: [2864192027]
3.	Select Displacement Tab	Limits and Windows Displacement
4.	Determine whether to enable displacement violations on one or both displacement channels	0 - Displacement violation flags disablec 0 - Displacement violation flags disabled 1 - Displacement 2 violations enabled 2 - Displacement 1 violations enabled 3 - Displacement 1 or 2 violations enabled
5.	Set Placement Reference – either Weld to final thickness or Weld to set down.	2 - Weld to set down ∨ 1 - Weld to final thickness 2 - Weld to set down
6.	Set WNG hold time, Set I/O Timeout time, Select Measurement Auto mode, if required	Weld No Good Hold 0
7.	Click Add/Modify button for either Initial Thickness or Final Thickness	Initial Thickness High 0.00000(÷) (in) Initial Thickness High 0.00000(÷) (in) Low 0.00000(÷) (in) Low 0.00000(÷) (in) Add/Modify Delete Update Add/Modify Delete Update

	Final Thickness High 0.00000 (‡) (in) Final Thickness High 0.00000 (‡) (in) Low 0.00000 (‡) (in) Low 0.00000 (‡) (in) Add/Modify Delete Update Add/Modify Delete Update
 Move cursor to the selected displacement channel. The cursor changes to a cross. 	1.00000 0.000000 0.00000000
 Click on the displacement graph at two points to select high and low 	Displacement 1 Limits
displacement limits for the selected thickness value.	Weld to set down 0.00000 (in)
10. The selected values appear in the displacement window.	Initial Thickness High 0.50000 (in) Low -0.1100 (in) Cancel Delete Update
 11. Click Update. The selected range values display on the displacement graph in the Live – Weld Graph. 12. Click Update 	C 1.00000 E 0.50000 C .50000 C .500000 C .50000 C .

Set Limits Lines

Click here for more information on setting limit lines.

1. Select Schedule Button	Monitor Schedule Trigger
 Select a Schedule (Defaults to Current Schedule) 	Schedule Current Schedule: 7 <grumpy2> * Schedule Table Checksum: [2864192027]</grumpy2>
3. Select Limits and Windows Tab	Principal Channels Data Capture Limits and Windows Displacement
4. Select Principal Channel	Selected Principal Channel: Current
5. Select Limit Lines Tab	Selected Principal Channel: Current

Limit Lines Aggregation Windows Aggregation Limits 6. Uncheck Disable Button ✓ Disable Upper Envelope Disable Lower Envelope Point X Point Y Point X Point Y 7. Click Add Upper/Lower Envelope Add Upper Envelope Envelope Limit Color Add Lower Envelope Delete Upper Envelope Delete Lower Envelope Click limit line points on selected 0.00 0.001 channel on Live-Weld graph 0.00

Set Envelope Limits

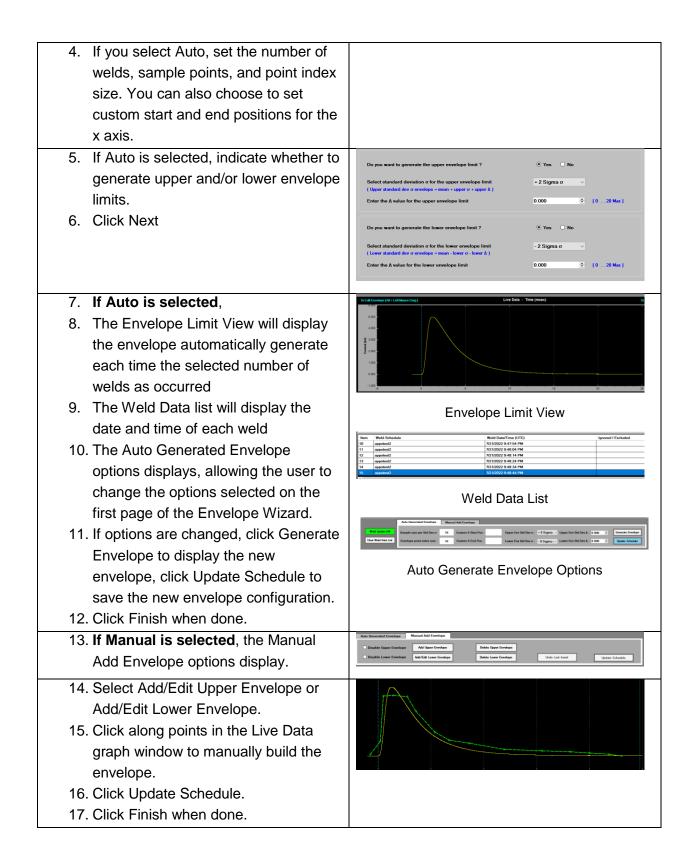
Envelope Limit is a method of quality control which employs statistical methods to monitor and control a process. The system graphs a selected number of the most recent welds, creating an envelope which sets upper and lower limits within the standard deviation established through the Envelope Limit Wizard. 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

 Select Envelope on the Tool Bar to launch the Envelope Wizard 	Counter Envelope History
 Indicate whether you intend to have the envelope limits generated automatically or to draw the limits manually. If you call at Manual all choices other 	Do you want to auto generate or manually draw the envelope limit(a)? • Auto • Manual Use the last number of welds for the envelope limit calculation 5 • • • • [2500 Max] Number of sample points per standard deviation or calculation 10 • • • • • • • • • • • • • • •
 If you select Manual, all choices other than Envelope point index size on this window are disabled. 	



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.

Weld Count	366,797
Current	
W1 RMS	0.000
W1 Mean	0.000
W1 Max	0.000
W1 Min	0.000
W2 Not Enabled	
W3 Not Enabled	
W4 Not Enabled	
Resistance 1	
W1 Mean	0.000
Power 1	
W1 RMS	0.000
W1 Mean	0.000
Voltage 1	
W1 RMS	0.000

LCD Aggregate Screen

1) Select Monitor in Tool Bar	Server	N	Ionitor	S	chedule
2) Select the LCD Display tab	Aggregation W	indows	LCD D	isplay	Fieldbus
3) Select a Principal Channel	Principal Channel:	Current		•	
 Select which calculations for each aggregation window for that 	Show / Hide Calculat		Agaregatio		
channel.	Calculation	1	Aggregatio 2	3	4
5) Click Update.	RMS				
b) blok opulie.	Mean				
	Max				
	Min				
	Standard Deviation				
		Select	All		
					Update

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.

Search for prior welds that meet user defined parameters.		
 Click the History button in the Tool Bar 	Envelope History Aggregation	
2) Click Search Tab	Search Results	
 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. 	Local Time ● UTC Start: 06/30/2022 21:30:08 End: 06/30/2022 21:30:08	
4) Define the search.5) Click Search.	Search By: All Records Monitor UUID: BashfulStandalone <97DB04EA-BE	
 If there is data that matches your parameters, it will display in the 	Search Results Total Found: 150 Select All Results Item Weld Date/Time (UTC) Schedule Name Schedule Last Modified 1 6/30/2022 9:34:50 PM appstest 6/24/2022 3:47:17 AM	
Search Results table. 7) If there are no matches, widen your search. If there are too many, narrow your search.	2 6/30/2022 9:34:54 PM appstest 6/24/2022 3:47:17 AM 3 6/30/2022 9:34:58 PM appstest 6/24/2022 3:47:17 AM 4 6/30/2022 9:35:02 PM appstest 6/24/2022 3:47:17 AM 5 6/30/2022 9:35:06 PM appstest 6/24/2022 3:47:17 AM 6 6/30/2022 9:35:10 PM appstest 6/24/2022 3:47:17 AM	
 Click on an item from the list to select it. 	7 6/30/2022 9:35:14 PM appstest 6/24/2022 3:47:17 AM	

 Select Show Waveform for waveforms in the results graph, 	Waveform View Options
10) Select the channels to be displayed.	Show Waveform(s)
	Displacement 1 Voltage 1 Force 1
	✓ Displacement 2 ✓ Voltage 2 Force 2
14) Coloct options on the View Options	
11) Select options on the View Options tab.	Waveform View Options
	✓ Stack Waveform(s) ✓ Show Limits
	✓ stack waverorm(s) ✓ show timits
Adjust the limit lines and aggregation data f	or past welds to facilitate comparison to
the new weld.	
12) Click Edit Schedule on the Search	Select All Results Edit Schedule Export To Excel
Results window to modify the limit	
lines and aggregation data for the	
selected data. The Historical Schedule Settings window displays.	
Historical Schedule Settings	
Schedule	
Selected Schedule: appstest	
Undo Changes Save Schedule Save Sc Limits and Aggregates	hedule As
✓ <enable editor="" schedule=""> Overwrite His</enable>	torical Waveform Schedule
Principal Channel: Curr	
LimilLines Aggregation Windows Aggregation Lin	nits
	bove/Below Std Dev -
	Disable Lower Envelope nt X Point Y
Point (X , Y) 0.000 ≑ Point	(X,Y) 0.000 💠 0.000 💠
[Add Envelope Limit] => Click on graph to i	nsert envelope end points
Add/Edit Upper Envelope Limit C	olor Add/Edit Lower Envelope
Delete Upper Envelope	Delete Lower Envelope
Undo Last Insert	Update
	Close
Historical Sch	edule Settings

Sys Admin

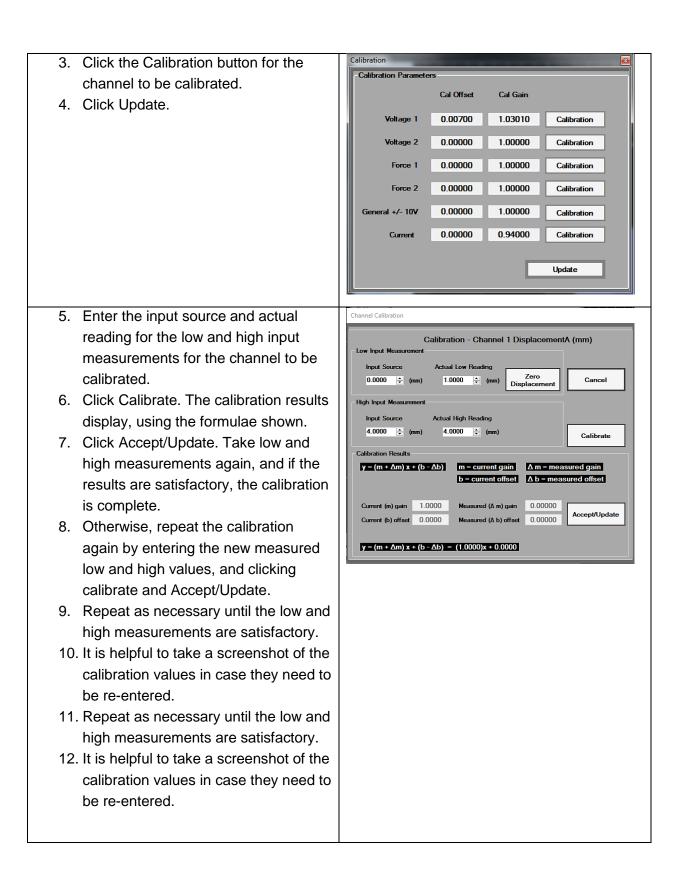
Select Display Graph Options

Click Display button in Tool Bar	Status Display Job
Select Display Graph tab	Display Graph Digital Filter Analog Filter
Select channel, plot color and line type	Graph Options Channel Current Plot Color Line Type
Select auto scale for X, Y axes or set minimum and maximum limits for each axis	✓ Auto Scale Y ▲ Auto Scale X Y Max 1.500 ↓ X Max 14.483 ↓ Y Min 0.000 ↓ X Min -7.393 ↓
Click Update.	- Display Options Stack I Tile Update

Set Calibration

Click here for more information on monitor calibration

 Click on Calibration button in the Tool Bar 	History Aggregation Calibration
2. Click Yes on prompt to continue.	Networked Weld Monitor - Confirm Calibration Are you sure you want to change the Monitor Calibration ? Yes No



Change Job or SKU number

Click here for more information about the Job Window

1. Click Job button in Tool	Bar Status	Job Aggregation
 Enter Operator name, Johnumber, SKU number (as required) 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

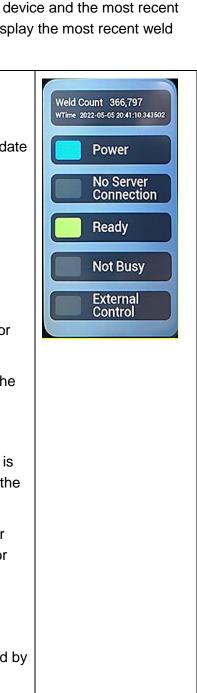
The front panel of the WM-200A includes an LCD screen that displays three selectable screens which show the current state of the device, system data about the device and the most recent aggregate data for selected principal channels. All screens also display the most recent weld count. Touch each screen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

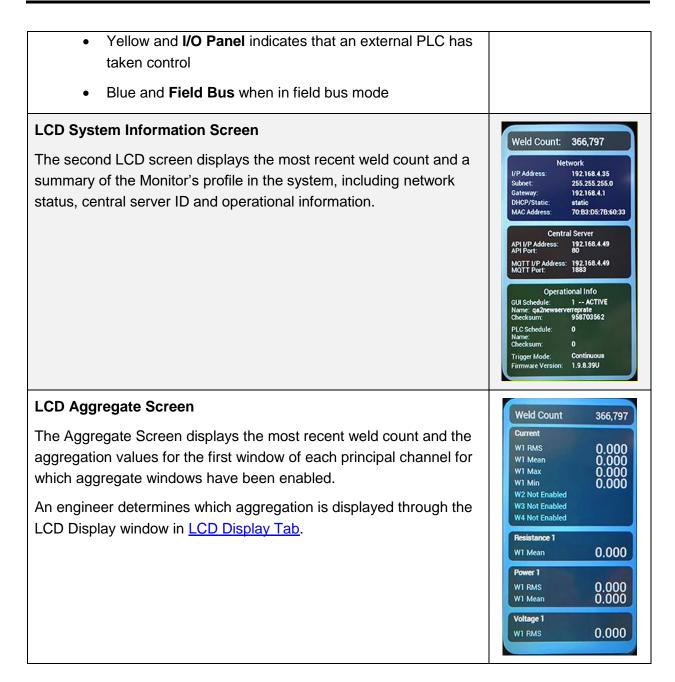
System Status Screen

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







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** <u>below</u> for technical specifications.

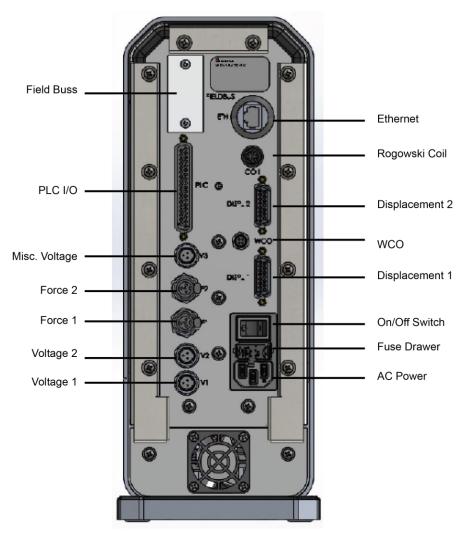


Figure 2: WM-200A Back

Server

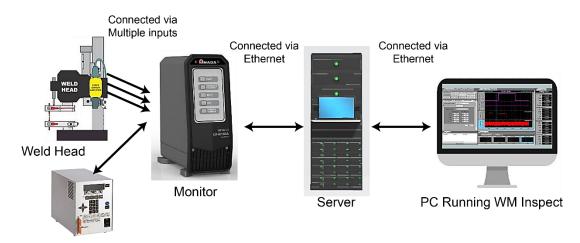
The system required a server PC running Win10 PRO 64 bits with a minimum Ethernet data transfer rate of 10/100 Mbps.

Computer

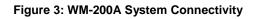
The system requires a laptop or desktop PC connected to the network and running WM-Inspect.

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.



Power Supply



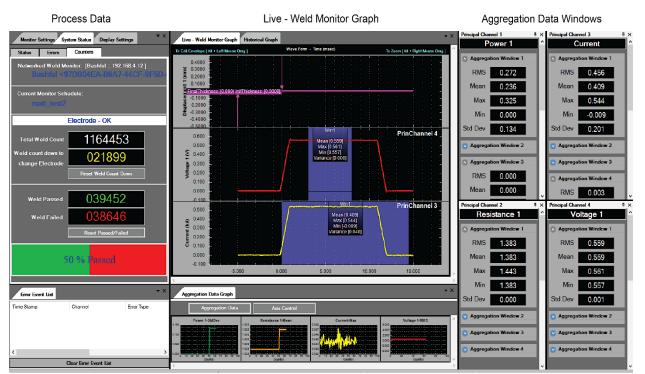
Software

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.



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 <u>Live – Weld Monitor Graph.</u>

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 <u>Aggregation Data Window</u>, and are graphed over time in the <u>Aggregation Data Graph</u>.

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.

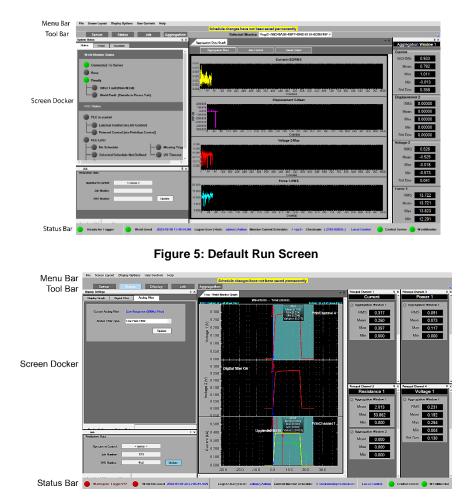


Figure 6: Default Monitor Screen

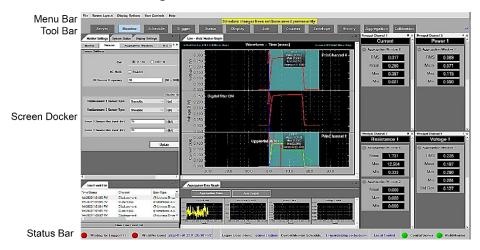


Figure 7: Default Developer Screen

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



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 threeprong 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 <u>Connecting the Monitor to a</u> <u>Welding System</u> 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 <u>Connecting the Monitor to</u> <u>a Welding System</u>, 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.

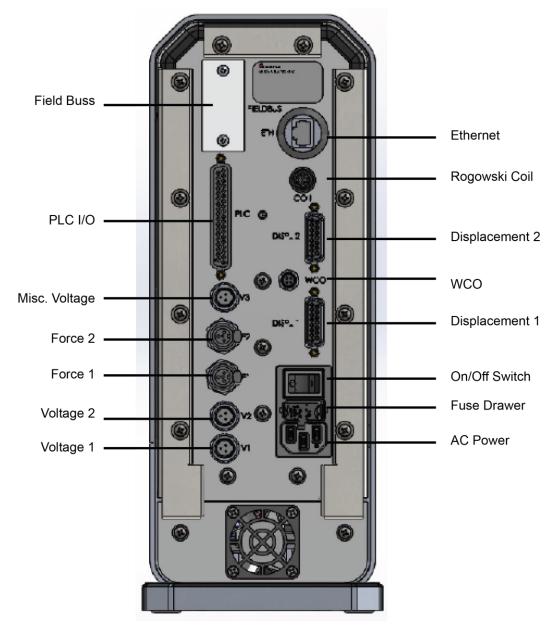


Figure 9: Monitor Connectors

WM-200A Network Resistance Welding Monitor System

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 <u>Set Displacement Limits</u> .)

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 <u>Sensor Cables</u> 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.
- 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.

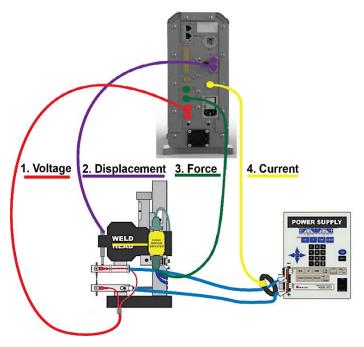


Figure 10: Single Head, Opposed Weld Connectivity

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.

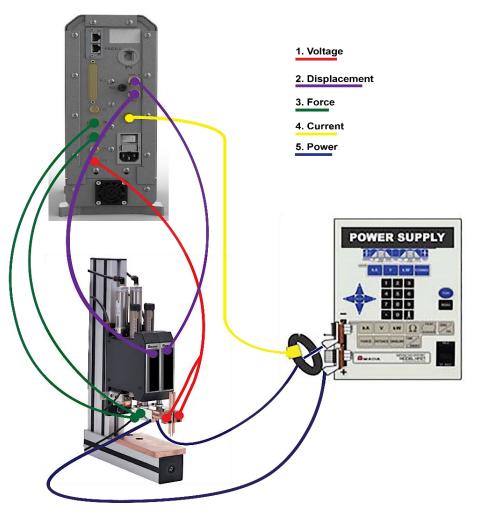


Figure 11: Parallel Weld (Dual Head) Connectivity

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.

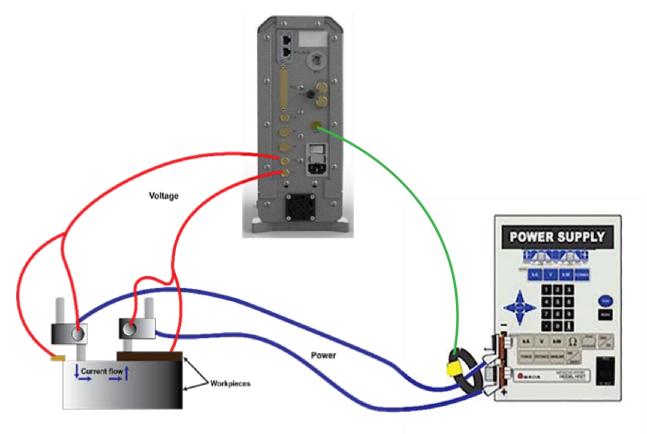


Figure 12: Step (Indirect) Welding Connectivity

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 <u>Displacement Connectors</u> 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.

Current Sensor (Rogowski Coil)





SK-1193305 Adapter cable

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.

Weld Cutoff Cable



[Shown: Part No. 4-41605-01: Weld cutoff cable]

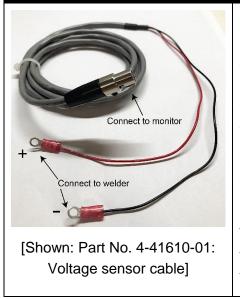
Input (to welder)

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).

Voltage Sensors



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.

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 <u>Basic Functions</u> below, unless you need to install software on another client PC or <u>move a NFWM monitor to another network or server</u>.

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.

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🗲 🔿 👻 🕇 🚺 > This	PC > OS (C:) >	NRWM Instal	lation Files Prer	elease	
✤ Quick access Desktop	Name	^ WMonitor_CD	BServerPC	Date modified 10/1/2020 4:31 PM	Type Appli
 Deartop x Downloads x⁺ Documents x⁺ Pictures x⁺ Music x⁺ NRWM Installation : Wideos 	Retworked	Troubles Pin to St	h Windows Def		Appli
ConeDrive		Restore	previous version	15	

This will launch the Prerequisites Setup Wizard.



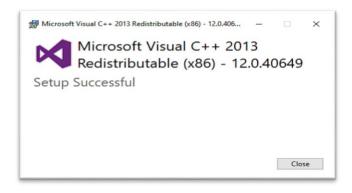
Click Next. Two Visual C++ prerequisite files are listed.

Prerequisites Select which prerequisites will be installed		2
Name Visual C++ Redistributable for Visual Studio 2013 Update 5 x86 Visual C++ Redistributable for Visual Studio 2015-2019 x86	Required 12.0.40649 14.26.2872	Fou
<)

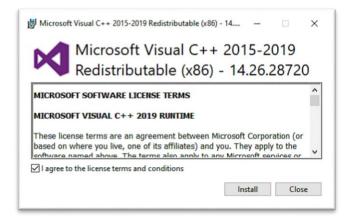
Select both prerequisites and click Next. A license agreement displays.



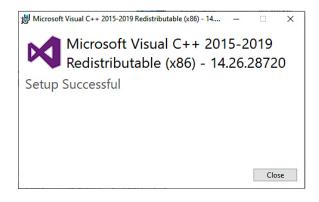
Click to agree to the license terms and click Install. Once the setup is successful, a window displays.



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.

elect Installation Folder		
his is the folder where NetworkedRV	WMonitor will be installed.	
o install in this folder, click "Next". To Browse".	o install to a different folder, en	ter it below or click
older:		
:WetworkedRWMonitor\		Browse
: WetworkedRWMonitor \		Browse
C: WetworkedRWMonitor \		Browse
		Browse
C: WetworkedRWMonitor\ nced Installer		Browse

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

NetworkedRWMonitor Setup	
Ready to Install	
The Setup Wizard is ready to begi	in the NetworkedRWMonitor installation
Click "Install" to begin the installati installation settings, dick "Back".(ion. If you want to review or change any of your Click "Cancel" to exit the wizard.
vanced Installer	< Back Install Cancel

Click Install. The IP Address Settings window displays.

MongoDB Server IP Address :	192.168.4.49 Current IP Address: [192.168.4.126]	MongoDB User Name :	miyachi2
MongoDB Server Port :	27017 Default Port: [27017]	MongoDB Password :	•••••
		Test Connection Status	: Test Success
Mosquitto (MQTT) Broker IP Address :	192.168.4.49 Current IP Address: [192.168.4.126]	(MQTT) Broker User Name :	admin
Mosquitto (MQTT) Broker Port :	1883 Default Port: [1883]	(MQTT) Broker Password :	•••••
		Test Connection Status	: Test Success
Rest WebServer IP Address :	192.168.4.49 Current IP Address: [192.168.4.126]	Rest WebServer User Name (Windows User Credentials)	iotsupport
Rest WebServer Port :	80 Default Port: [80]	Rest WebServer Password :	•••••
		Test Connection Status	: Test Success

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.

Networked Central Server Connection Settings				
MongoDB Server IP Address :	192.168.4.1 Current IP Address: [192.168.4.1]	MongoDB User Name :	miyachi2	
MongoDB Server Port :	27017	MongoDB Password :	•••••	
	Default Port: [27017]	Test Connection Status:		
				×
Mosquitto (MQTT) Broker IP Address :	192.168.4.1 Current IP Address: [192.168.4.1]	(MQTT) Broker User Name :	admin	~
Mosquitto (MQTT) Broker Port :	1883	(MQTT) Broker Password :	•••••	Rest WebServer IP Address 192.168.4.1 is invalid or inaccessible.
	Default Port: [1883]	Test Connection Status:	IP - No response	ОК
Rest WebServer IP Address :	192.168.4.1 Current IP Address: [192.168.4.1]	Rest WebServer User Name (Windows User Credentials)	: iotsupport	
Rest WebServer Port :	80	Rest WebServer Password :	••••••	
	Default Port: [80] Update IIS Config	Test Connection Status:		
Manage Devices			Update Close	

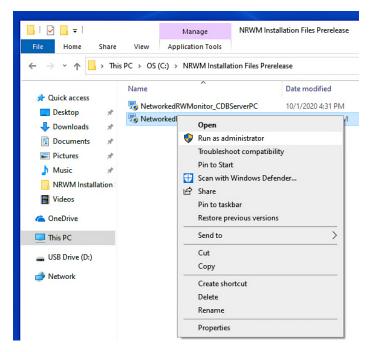
Figure 13 - IP No Response message

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.

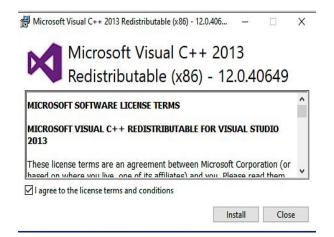


Click Next.

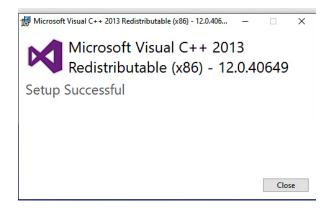
The list of prerequisites displays.

RetworkedRWMonitor Setup		— ———————————————————————————————————
Prerequisites Select which prerequisites will be installed		
Name Visual C++ Redistributable for Visual Studio 2013 Update 5 x86 Visual C++ Redistributable for Visual Studio 2015-2019 x86 Visual C++ Redistributable for Visual Studio 2015-2019 x64 Robo3T Mosquitto MQTT Broker OpenSSL (64-bit)	Required 12.0.40649 14.26.2872 14.26.2872	Foun
Advanced Installer < Back Next >	Can	

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



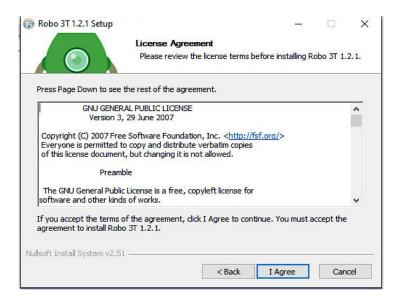
Agree to the terms and click Install. Once the setup is successful, a window displays.



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.

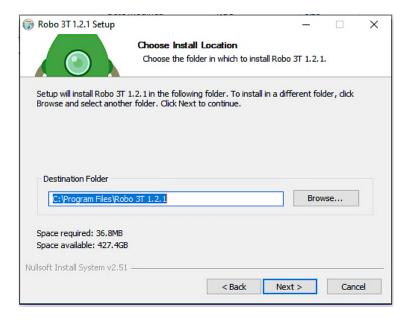


Click Next to start the Robo 3T installation. The license agreement displays.



Click I Agree.

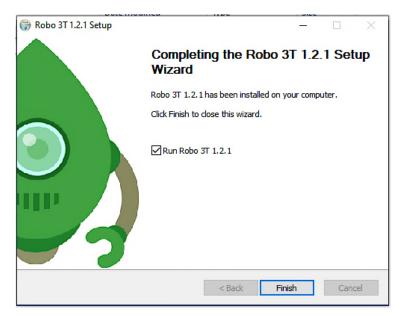
The Installation Location window displays.



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

	Choose Start	Menu Folder			
	Choose a Star	t Menu <mark>folder for t</mark> h	ne Robo 3T 1.2.1	shortcuts	
Select the Start Menu fol can also enter a name to			he program's sho	rtcuts. Yo	u
Robo 3T 1.2.1					
Accessibility					
Administrative Tools					
Dell					
Maintenance					
Microsoft Office Tools					
NetworkedRWMonitor					
StartUp					
System Tools Windows PowerShell					
This off of the offer					
Do not create shortc.	uts				
	1				
lsoft Install System v2.5:					
Isoft Install System v2.5:		-		-	

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.

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Preamble the GNU General Public License i the GNU General Public License i the locenses for most software a ublic License is intended to guas resoftware Foundaton, use there software Foundation, use then use space Ao free software is prices of it in new free prog o protect your rights, we need ou distribute copies of the software to reample, if you distribute co uset make sure that they, too, i berefores that use the GNU GP o copy. distribute and/or modifie	Welcome to Eclipse Mosquitto Setup Setup Mosquito. It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer.	ntrast, the GNU General re for all its users. We, its vay by its authors. You can an change the software or have certain responsibilities if ms that you received. You e giving you legal permission
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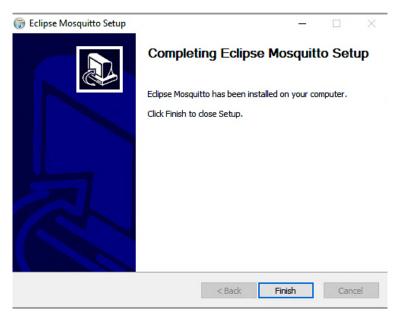
Click Next to start the Eclipse Mosquitto setup.

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		Version 3, 29 June 2007		
Copyright © 2007 Free Software	🎲 Eclipse Mosquitto Setup		- 🗆 🗙	
veryone is permitted to copy a	Choose Components		0	
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o protect your rights, we need ou distribute copies of the soft				have certain responsibilities if
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Make sure the Service component is checked and click Next.

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	Version 3, 29 June 2007		
Copyright © 2007 Free Softwar	🕽 Eclipse Mosquitto Setup - 🗆 🗙	1	
veryone is permitted to copy a	Choose Install Location		
reamble	Choose the folder in which to install Eclipse Mosquitto.		
he GNU General Public License i	* *		
The licenses for most software a Public License is intended to gua free Software Foundation, use t pply it to your programs, too.	Setup will install Edipse Mosquitto in the following folder. To install in a different folder, click Browse and select another folder. Click Install to start the installation.	intrast, the GNU General ire for all its users. We, the vay by its authors. You can	
/hen we speak of free software istribute copies of free softwar se pieces of it in new free prog		u have the freedom to an change the software or	
o protect your rights, we need	Destination Folder	nave certain responsibilities i	
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or example, if you distribute co just make sure that they, too, i		ms that you received. You	
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copy, distribute and/or modify	Space available: 427.4 GB	e giving you legal permission	
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equires that modified versions b	< Back Install Cancel	ersions.	
L			
	○ I agree ● I don't agree		

Keep the default folder path and click Install.



Click Finish to complete the Eclipse Mosquitto Setup.

👸 Setup - OpenSSL 1.1.1a (64-bit) - 🛛	×
License Agreement	
Please read the following important information before continuing.	
Please read the following License Agreement. You must accept the terms of this agreement before continuing with the installation.	
DONATIONS NEEDED! If you are a business you should be contributing regular donations. If you are a generous individual, consider regular donations. Most people simply take and run - leaving me to foot the bill. That's not nice. Some businesses even drop their customers onto me to provide direct support to the customer (ahem, PayPai). That's just evil. Even if you can't afford a small, one time donation of \$10, at least drop a line saying how much you appreciate the effort put into this project (and, optionally, what you use OpenSSL for). Lots of complaints and few compliments is discouraging.	
LEGAL NOTICE: This product indudes software developed by the OpenSSL	¥
I accept the agreement	
O I do not accept the agreement	
Next >	Cancel

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

	GNU GENERAL PUBLIC LICENSE	- 2
	Version 3, 29 June 2007	
Copyright © 2007 Free Software	Setup - OpenSSL 1.1.1a (64-bit) — 🗌	×
Everyone is permitted to copy a		
Preamble	Select Destination Location Where should OpenSSL (64-bit) be installed?	
- Combie		
The GNU General Public License i		
The licenses for most software a	Setup will install OpenSSL (64-bit) into the following folder.	intrast, the GNU General ire for all its users. We, the
Public License is intended to gua Free Software Foundation, use 1		way by its authors. You can
apply it to your programs, too.	To continue, dick Next. If you would like to select a different folder, dick Browse.	
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distribute copies of free softwar use pieces of it in new free prog		an change the software or
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To protect your rights, we need you distribute copies of the soft		have certain responsibilities if
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must make sure that they, too,		ins that you received. Tou
Developers that use the GNU GP		e giving you legal permission
to copy, distribute and/or modif	At least 268.7 MB of free disk space is required.	
For the developers' and authors		d authors' sake, the GPL
requires that modified versions t	<back next=""> C</back>	ancel ersions.
	◯ I agree	

Keep the default location and click Next.

Setup - OpenSSL 1.1.1a (64-bit)				
Select Start Menu Folder				
Where should Setup place the program	's shortcuts?		(
Setup will create the program	s shortcuts in the follow	wing Start Me	en <mark>u</mark> folder.	
To continue, click Next. If you would lik	e to select a different	folder, click E	Browse.	
OpenSSL			Browse	
				3
		Next >		

Keep the default folder name and click Next.

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Copyright © 2007 Free Software	🖇 Setup - OpenSSL 1.1.1a (64-bit) — 🗆	×
Everyone is permitted to copy a	Select Additional Tasks	
Preamble	Which additional tasks should be performed?	
The GNU General Public License i		
The licenses for most software a Public License is intended to gue Free Software Foundation, use apply it to your programs, too. When we speak of free software datribute copies of free software use pieces of it in new free prog To protect your rights, we need you distribute copies of the software For example, if you distribute co must make sure that they, too, i Developers that use the GNU GP to copy, distribute and/or modif	Select the additional tasks you would like Setup to perform while installing OpenSSL (64-bit), then click Next. Copy OpenSSL DLLs to: (a) The Windows system directory (b) The OpenSSL binaries (bin) directory	ntrast, the GNU General re for all its users. We, the way by its authors. You can u have the freedom to an change the software or wave certan responsibilities if ms that you received. You a giving you legal permission
For the developers' and authors requires that modified versions t	<back next=""> C</back>	d authors' sake, the GPL ancel
	○ I agree ● I don't agree	

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

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	Version 3, 29 June 2007			
opyright © 2007 Free Software	🔀 Setup - OpenSSL 1.1.1a (64-bit) —	×	1	
veryone is permitted to copy a	Ready to Install			
reamble	Setup is now ready to begin installing OpenSSL (64-bit) on your computer.			
he GNU General Public License i				
	Click Install to continue with the installation, or click Back if you want to revie	wor		
he licenses for most software a ublic License is intended to qua	change any settings.		intrast, the GNU General ire for all its users. We, the	
ree Software Foundation, use 1	Destination location:		vav by its authors. You can	
pply it to your programs, too.	C:\Program Files\OpenSSL-Win64	<u></u>		
when we speak of free software			u have the freedom to	
istribute copies of free softwar	Start Menu folder: OpenSSL		an change the software or	
se pieces of it in new free prog				
o protect your rights, we need	Additional tasks: Copy OpenSSL DLLs to:		ave certain responsibilities i	if
ou distribute copies of the soft	The Windows system directory			
or example, if you distribute co			ms that you received. You	
iust make sure that they, too, i				
evelopers that use the GNU GP		~	e giving you legal permission	1
o copy, distribute and/or modify	<	>		
or the developers' and authors'			d authors' sake, the GPL	
equires that modified versions b	< Back Install	Cancel	ersions.	
				Î
	○ Lagree ● Ldon't agree			

Click Install.

WM-200A Network Resistance Welding Monitor System



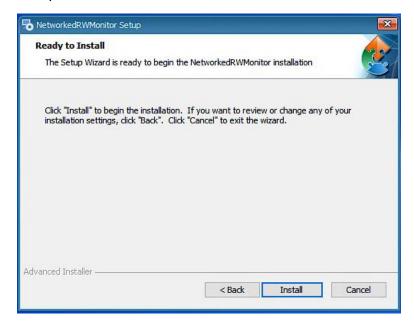
Make sure all boxes are unchecked then click Finish to complete the Open SSL setup.



Click Next to start the NetworkedRWMonitor Setup Wizard.

To NetworkedRWMonitor Setup	-
Select Installation Folder This is the folder where NetworkedRWMonitor will be installed.	
To install in this folder, click "Next". To install to a different folder, enter "Browse". Folder:	r it below or dick
C:\NetworkedRWMonitor\	Browse
Advanced Installer	Cancel

Keep the default folder path then click Next.



Click Install to begin the installation process.

NetworkedRWMonitor Setup	nitor		
Please wait while the Setup V several minutes.	Wizard installs NetworkedR	WMonitor,This may	y take
Status: Configuring Win	dows features.		

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

MongoDB Server IP Address :	64.52.140.50 Current IP Address: [64.52.140.50]	MongoDB User Name :	miyachi2
MongoDB Server Port :	30785 Default Port: [27017]	MongoDB Password :	•••••
		Test Connection Status:	Test Success
Mosquitto (MQTT) Broker IP Address :	64.52.140.50 Current IP Address: [64.52.140.50]	(MQTT) Broker User Name :	admin
Mosquitto (MQTT) Broker Port :	30786	(MQTT) Broker Password :	•••••
		Test Connection Status:	Test Success
Rest WebServer IP Address :	64.52.140.50 Current IP Address: [64.52.140.50]	Rest WebServer User Name (Windows User Credentials)	iotsupport
Rest WebServer Port :	30787 Default Port: [80]	Rest WebServer Password :	•••••
		Test Connection Status:	Test Success

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.



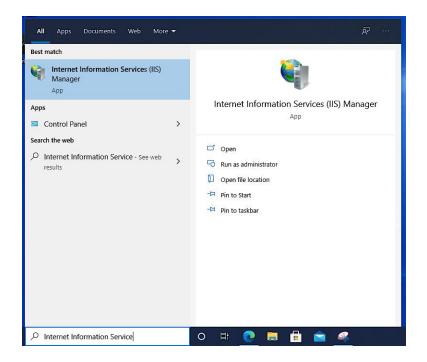
Click Finish to complete the NetworkedRWMonitor Setup.

← → ● DESKTOP-	6P45ADQ >	😡 😣 🟠 I
Connections	PESKTOP-6P45ADQ Home Filter: • @ • @ • @ • @ • @ • @ • @ • @ • @ • @	Actions Manage Server Restant Stop View Application Pools View Stes Get New Web Platform Components Help

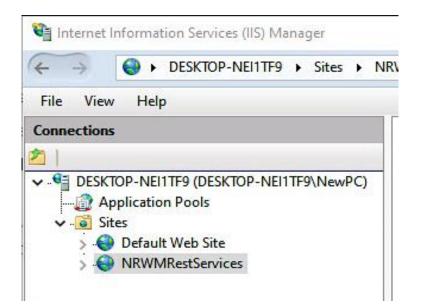
WM-200A Network Resistance Welding Monitor System

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.

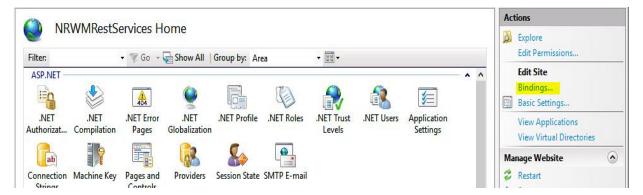
If the IIS window does not launch, go to the Windows search bar and type "Internet Information Service" and press Enter to launch the IIS window.



Expand the tree on the left and click on NRWMRestServices.



Click on Bindings under Edit Site in the Actions window.

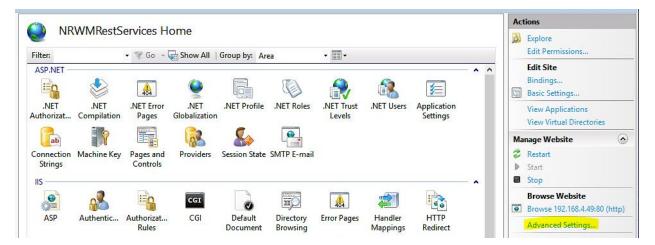


The Edit Site Binding window displays.

lit Site Binding			? >
Гуре:	IP address:	Port:	
http	192.168.4.51	~ 80]
Host name:			
Example: www.	.contoso.com or marketing.conto	so.com	

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.

~	(General)	
	Application Pool	DefaultAppPool
	Bindings	http:192.168.4.49:80:
	ID	2
	Name	NRWMRestServices
	Physical Path	C:\NetworkedRWMonitor\RestWeb
	Physical Path Credentials	
	Physical Path Credentials Logon	ClearText
	Preload Enabled	True
~	Behavior	
	Enabled Protocols	http
>	HSTS	
>	Limits	
Ph	ysical Path Credentials	
[us	sername, password] Credentials fo	or the user identity that should be hysical path for the virtual directory.

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.

(General)	
Application Pool	DefaultAppPool
Bindings	http:192.168.4.49:80:
ID	2
Name	NRWMRestServices
Physical Path	C:\NetworkedRWMonitor\Rest
Physical Path Credentia	als
onnect As	?
Path credentials: Specific user: Application user (pass-	through authentication)
Specific user:	
Specific user: Application user (pass-	through authentication)
Specific user: Application user (pass-	through authentication)
Specific user: Application user (pass- Set Credentials User name: NRWM_CDB2 Password:	through authentication) ? × Fancel
Specific user: Application user (pass- Set Credentials User name: NRW/M_CDB2 Password:	through authentication) ? × ancel
Specific user: Application user (pass- Set Credentials User name: NRWM_CDB2 Password:	through authentication) ? × Fancel
Specific user: Application user (pass- Set Credentials User name: NRW/M_CDB2 Password:	through authentication) ? × ancel

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.

Filter:		• 🐨 Go •	Show All	Group by: Ar	ea	-			
ASP.NET -						_			•
10		404	9	ē			2	1	
.NET Authorizat	.NET Compilation	.NET Error Pages	.NET Globalization	.NET Profile	.NET Roles	.NET Trust Levels	.NET Users	Application Settings	
ab	7	III BI	62	8	•				
Connection Strings	Machine Key	Pages and Controls	Providers	Session State	SMTP E-mail				
IIS									- ^
OF THE	<u>8</u>		CGI	0		404			
ASP	Authentic	Authorizat Rules	CGI	Default Document	Directory Browsing	Error Pages	Handler Mappings	HTTP Redirect	
	15	۷	0	-	4		-	9	
HTTP	IP Address and Doma	ISAPI Filters	Logging	MIME Types	Modules	Output	Request	SSL Settings	
Respon	and Doma					Caching	Filtering		
WebDAV									
Authori									
Manageme	nt								- ^
onfigurat									
Editor									

WM-200A Network Resistance Welding Monitor System

The Authorization Rules window launches.

Mode	Users	Roles	Verbs	Entry Ty	pe
Allow	iotsupport			Local	
	Edit Allow Authoriz	ration Rule		?	×
	 All users All anonymou Specified roles Example: Adr Specified user iotsupport, N 	or user groups: ninistrators s: RWM_CDB2			
	Example: Use	to specific verbs:	OK	Cancel	

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.

	Server/IP 192.168.4.10	0	Port 80	Se
ome	l			
apture Settings				
Schedule	Central API Ser	ver Crede	ntials	
Capture Settings				e.
Analyzer Settings	Login	iotsupport		
Envelope Limits	Change Password			
Aggr Limit Settings Ch1	Confirm Password			Ŷ
Aggr Limit Settings Ch2	Commin Password			
Aggr Limit Settings Ch3		Set		
Aggr Limit Settings Ch4				
PLC IO Settings				
Calibration Settings	Central MQTT E	Broker		
stem Log				

- 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.

ADA MIYACHI AMERICA			
	Server/IP 192.168.4.100	Port 80	Set
me			
oture Settings			
Schedule	Central API Serve	r Credentials	
Capture Settings	Logia Lis	taunnart	
nalyzer Settings	Login	otsupport	
nvelope Limits	Change Password		
ggr Limit Settings Ch1	Confirm Password		
ggr Limit Settings Ch2			
ggr Limit Settings Ch3		Set	
ggr Limit Settings Ch4			
C IO Settings			
libration Settings	Central MQTT Bro	oker	
em Log	Server/IP 192,168,4,100	Port 1883	Set
	192.100.4.100	F UIL 1003	Set
tem Settings			
item Settings er Profile	Waveform Data St	torage	

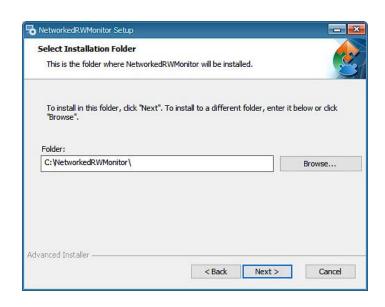
6. Power cycle the Monitor unit to allow the unit to start communications with the designated Central Server.

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.



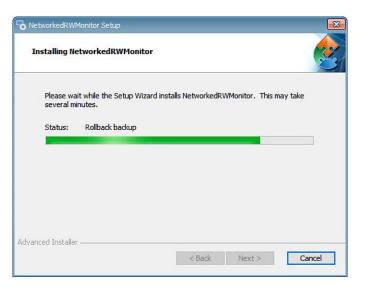
Click Next.



Click YES to overwrite and upgrade the previous installation.

Ready to Install	
The Setup Wizard is ready to be	egin the NetworkedRWMonitor installation
	lation. If you want to review or change any of your . Click "Cancel" to exit the wizard.

Click Install.



WM-200A Network Resistance Welding Monitor System

MongoDB Server IP Address :	192.168.1.78 Current IP Address: [192.168.1.78]	MongoDB User Name :	miyachi2
MongoDB Server Port :	27017 Default Port: [27017]	MongoDB Password :	•••••
		Test Connection Status:	Test Success
Mosquitto (MQTT) Broker IP Address :	192.168.1.78 Current IP Address; [192.168.1.78]	(MQTT) Broker User Name :	admin
Mosquitto (MQTT) Broker Port :	1883 Default Port: [1883]	(MQTT) Broker Password :	•••••
		Test Connection Status:	Test Success
Rest WebServer IP Address :	192.168.1.78 Current IP Address: [192.168.1.78]	Rest WebServer User Name (Windows User Credentials)	iotsupport
Rest WebServer Port :	80 Default Port: [80]	Rest WebServer Password :	•••••
		Test Connection Status:	Test Success

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

 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.

③ 192.168.4.14			C
	Authorizatio	access this site on required by http://192.168.4.14 tion to this set is not secure stamm Sign in Cancel	

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

🗋 Amada Mijachi America Networ 🗙	+				×
← → O © Not secu	re 192.168.4.14/syssettings		☆	\$ Ð	
	Networked R\ Logged in as: admin	W Monitor			Î
Home					
Capture Settings	Device UUID				- 1
Schedule Capture Settings	8E3A0ACA-3030-47D4-1	AFD-E268FA1DBC11			1
Analyzer Settings Envelope Limits	Set RTC Time				
Aggr Limit Settings Ch1 Aggr Limit Settings Ch2	2021-09-15 16.50	Set			
Aggr Limit Sattings Ch3 Aggr Limit Sattings Ch4 PLC ID Sattings	Central API Ser	ver			
Calibration Settings	Servet/IP 192 168 4 49	Port 80	Set		
System Log System Sottings Test Console	Central API Ser	ver Credentials			
User Profile	Login	iotsupport			
	Change Password				
	Confirm Password				
		Set			10

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.

Amada Miyachi Amarica Networ 🗙	+						-		×
← → O ▲ Not secu	ire 192.168.4.14/syssettings				$\overline{\mathcal{D}_1}$	☆	Ē	8	
		N Monitor	0						
Home									
Capture Settings	Device UUID								
Schedule	8E3A0ACA 3030 47D4 8	SAFD E268FA1DB	211						
Capture Settings									
Analyzer Settings	Set RTC Time								
Envelope Limits									
Aggr Limit Settings Ch1 Aggr Limit Settings Ch2	2021-09-15 16:54	Set							
Aggr Limit Settings Ch3									
Aggr Limit Settings Ch4	Central API Ser	ver							
PLC IO Settings	oonaarra roon	voi							
Calibration Settings	Server/IP 192.168.6[49	Po Po	rt 80 S	iot					
System Log									
System Settings	Central API Ser	war Cradant	iala						
Test Console	Central AFI Ser	ver credent	1415						
User Profile	Login	iotsupport							
	Change Password	1							
	Confirm Password								
	Comitin Password								
		Set							

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

Amada Miyachi America Networ	+					-		×
← → O ▲ Not secu	re 192.168.4.14/syssettings			54	5 =	È	۲	
	Central API Ser	ver Credentiale						
AMADA MIYACHI AMERICA								
	Login	iotsupport						
Capture Settings	Change Password							
Schedule								
Capture Settings	Confirm Password							
Analyzer Settings Envelope Limits		Set						
Aggi Linit Settings Ch1								
Aggr Limit Settings Ch2								
Aggr Limit Settings Ch2	Central MQTT E	Broker						
Aggr Limit Settings Ch4								
PLC IO Settings	Server/IP 192.168.6 49	Port 1883	Set					
Calibration Settings								
System Log	Waveform Data	Storogo						
System Settings	waveloini Data	Storage						
	Aiways store 👻 S	et						
Test Console								
User Profile								
	Ethernet Setting	gs						
	IP sotting sta	DC .						

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.

- → O ▲ Not secur	re 192.168.4.14/syssettings	s 1000		☆	炸	Ē		
MADA	IP address 1	92.168.4.14						
MADA MIYACHI AMERICA	Network mask 2	55.255.255.0						
lome	Gateway IP 1	92.168.4.1						
apture Settings	MAC address 7	0:B3:D5:7B:60:1E						
Schedule								
Capture Settings								
Analyzer Settings	Change Etherr	net Settings						
Envelope Limits								
Aggr Limit Settings Ch1		Static IP V						
Aggr Limit Settings Ch2	IP Address	192.168.6.14						
Aggr Limit Settings Ch3	Network Mask	255,255,255.0						
Aggr Limit Settings Ch4	Network Widsk	233.233.233.0						
PLC IO Settings	Gateway	192.168.6.1						
Calibration Settings		Set						
/stem Log								
ystem Settings								
est Console								
	The functions below an	e intended for developm	ent use and should be us	sed with extr	eme ca	aution i	n	

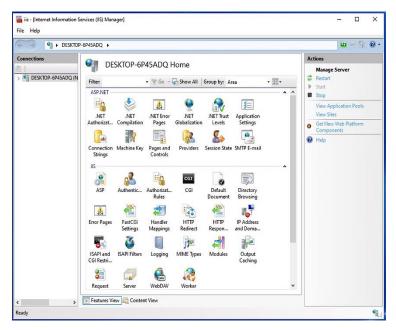
 Navigate to the TCP-IP settings for the server PC and set the IP address in the same range as the new network. (In this example, the IP address would be changed from 192.168.4.49 to 192.168.6.49, and the Default gateway would be changed from 192.168.4.1 to 192.168.6.1.)

ternet Protocol Version 4 (TCP/IPv4) Properties	X Internet Protocol Version 4 (TCP/IPv4) Properties
General	General
You can get IP settings assigned automatically if your network sup this capability. Otherwise, you need to ask your network administ for the appropriate IP settings.	
○ Obtain an IP address automatically	Obtain an IP address automatically
● Use the following IP address:	Use the following IP address:
IP address: 192 . 168 . 4 . 49	IP address: 192 . 168 . 6 . 49
Subnet mask: 255 . 255 . 255 . 0	Subnet mask: 255 . 255 . 255 . 0
Default gateway: 192 . 168 . 4 . 1	Default gateway: 192 . 168 . 6 . 1
Obtain DNS server address automatically	Obtain DNS server address automatically
Ouse the following DNS server addresses:	Use the following DNS server addresses:
Preferred DNS server:	Preferred DNS server:
Alternate DNS server:	Alternate DNS server:
Validate settings upon exit	Validate settings upon exit Advance

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

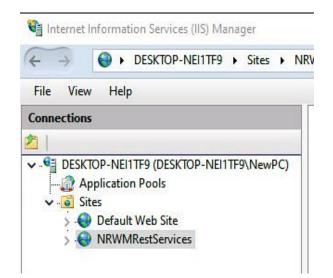
MongoDB Server IP Address :	192.168.4.49 Current IP Address: [192.168.4.49]	MongoDB User Name :	miyachi2
MongoDB Server Port :	27017 Default Port: [27017]	MongoDB Password :	•••••
	belautroit.[2/07/]	Test Connection Status	Not Tested
Mosquitto (MQTT) Broker IP Address :	192.168.4.49 Current IP Address: [192.168.4.49]	(MQTT) Broker User Name	admin
Mosquitto (MQTT) Broker Port :	1883 Default Port: [1883]	(MQTT) Broker Password :	•••••
	Detault Foit. [1003]	Test Connection Status:	Not Tested
Rest WebServer IP Address :	192.168.4.49 Current IP Address: [192.168.4.49]	Rest WebServer User Name (Windows User Credentials)	iotsupport
Rest WebServer Port :	80 Default Port: [80]	Rest WebServer Password :	•••••
		Test Connection Status:	Not Tested

- 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.

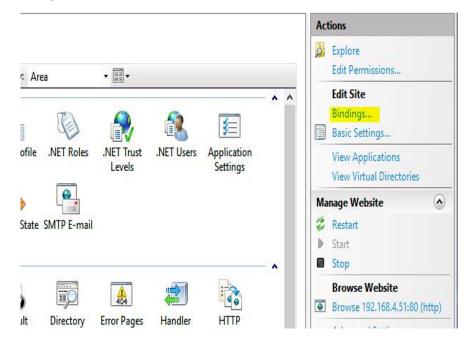


WM-200A Network Resistance Welding Monitor System

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.

dit Site Binding			?	×
Type: http Host name:	IP address:	Port: ✓ 80		
Example: www.cor	toso.com or marketing.contos	o.com		

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

	WMRestS	onvicos H	omo							Act	tions
Filter: ASP.NET				Group by: Ar	Ea	• [25] •		2	- ^ ^	à	Explore Edit Permissions Edit Site Bindings
.NET Authorizat	.NET Compilation	.NET Error Pages	.NET Globalization	.NET Profile	.NET Roles	.NET Trust Levels	.NET Users	Application Settings			Basic Settings View Applications View Virtual Directories
Connection Strings	Machine Key	Pages and Controls	Providers	Session State	SMTP E-mail				- •	2 4	nage Website @ Restart Start Stop
ASP	Authentic	Authorizat Rules	CGI CGI	Default Document	Directory Browsing	404 Error Pages	andler Mappings	HTTP Redirect		۲	Browse Website Browse 192.168.4.49:80 (http Advanced Settings

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

~	(General)		
	Application Pool	DefaultAppPool	
	Bindings	http:192.168.4.49:80:	
	ID	2	
	Name	NRWMRestServices	
	Physical Path	C:\NetworkedRWMonitor\RestWe	bS
	Physical Path Credentials		
	Physical Path Credentials Logon	ClearText	-
	Preload Enabled	True	
~	Behavior		
	Enabled Protocols	http	
>	HSTS		
	1000 000		
>	Limits		
Ph	Limits ysical Path Credentials sename, password] Credentials fc		

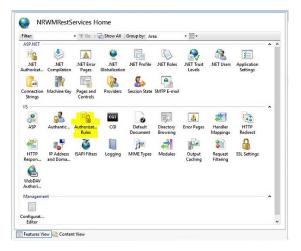
15. Click on the ellipsis to the right of Physical Path Credentials to set the name and password for a specific user. The Connect As window launches.

~	(General)			
	Application Pool	DefaultAppPool		
	Bindings	http:192.168.4.49:80:		
	ID	2		
3	Name	NRWMRestServices		
- á	Physical Path	C:\NetworkedRWMonit	or\RestV	leb
	Physical Path Credentials	5		
onr	nect As		?	>
Pat	Specific user:			
•	Specific user:	rough authentication)	Set	
0		nrough authentication)	_	
0	Application user (pass-th		_	
0	Application user (pass-th		_	
0	Application user (pass-th Set Credentials User name: NRWM_CDB2		_	
Pi	Application user (pass-th Set Credentials User name: NRWM_CDB2 Password:		_	
•	Application user (pass-th Set Credentials User name: NRWM_CDB2		Cancel	
Pi	Application user (pass-th Set Credentials User name: NRWM_CDB2 Password:		Cancel	
Pi	Application user (pass-th Set Credentials User name: NRWM_CDB2 Password: ••••••		Cancel	~

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.

Mode	Users	Roles	Verbs	Entry Type	
Allow	iotsupport			Local	
	Edit Allow Authoriz	zation Rule		?	×
	Allow access to t	his Web content to:			
	O All users				
	O All anonymou				
	O Specified role	s or user groups:			
	Example: Adr				
	Specified user	s:			
	iotsupport, N	IRWM_CDB2			
	Example: Use	er1, User2			
	Apply this rule	e to specific verbs:			
	Example: GET	r, post			

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.

MongoDB Server IP Address :	192.168.6.49 Current IP Address: [192.168.4.49]	MongoDB User Name :	miyachi2
MongoDB Server Port :	27017 Default Port: [27017]	MongoDB Password :	•••••
Mosquitto (MQTT) Broker IP Address :	192 168 6 49	(MQTT) Broker User Name :	Test Success
Mosquitto (MQTT) Broker Port :	Current IP Address: [192.168.4.49]	(MQTT) Broker Password :	admin
	Default Port: [1883]		Test Success
Rest WebServer IP Address :	192.168.6.49 Current IP Address: [192.168.4.49]	Rest WebServer User Name (Windows User Credentials)	iotsupport
Rest WebServer Port :	80 Default Port: [80]	Rest WebServer Password :	aM@daiot123
		Test Connection Status:	Test Success

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 <u>Connect Central</u> <u>Server PC Network Port</u> 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 <u>above</u>. 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 <u>above</u>.

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.

MongoDB Server IP Address :	192.168.4.49 Current IP Address: [192.168.4.49]	MongoDB User Name :	miyachi2
MongoDB Server Port :	27017 Default Port: [27017]	MongoDB Password :	•••••
		Test Connection Status	: Not Tested
Mosquitto (MQTT) Broker IP Address :	192.168.4.49 Current IP Address: [192.168.4.49]	(MQTT) Broker User Name :	admin
Mosquitto (MQTT) Broker Port :	1883 Default Port: [1883]	(MQTT) Broker Password :	••••••
		Test Connection Status	: Not Tested
Rest WebServer IP Address :	192.168.4.49 Current IP Address: [192.168.4.49]	Rest WebServer User Name (Windows User Credentials)	: iotsupport
Rest WebServer Port :	80 Default Port: [80]	Rest WebServer Password :	•••••••
		Test Connection Status	: Not Tested

 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.

MongoDB Server IP Address :	192.168.4.49 Current IP Address: [192.168.4.491	MongoDB User Name : miyachi2
MongoDB Server Port :	27017 Default Port: [27017]	MongoDB Password :
		Test Connection Status: Not Tested
Mosquitto (MQTT) Broker IP Address :	192.168.4.49 Current IP Address: [192.168.4.49]	(MQTT) Broker User Name : admin
Mosquitto (MQTT) Broker Port :	1883 Default Port: [1883]	(MQTT) Broker Password :
		Test Connection Status: Not Tested
Rest WebServer IP Address :	192.168.4.49 Current IP Address: [192.168.4.49]	Rest WebServer User Name : iotsupport
Rest WebServer Port :	80 Default Port: [80]	Rest WebServer Password :
		Test Connection Status: Not Tested

 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	System Display, sound, notifications, power
3. Select Power & Sleep option from the left side column	() Power & sleep
 Make changes to the sleep option- Select Never 	Sleep When plugged in, PC goes to sleep after Never ✓

1.	Launch the Control Panel App (you may need to search for it).	Control Panel
2.	Click on Hardware and Sound	Hardware and Sound View devices and printers Add a device
3.	Under Power Options, choose Change when the computer sleeps	Power Options Change power-saving settings Change what the power buttons do Change when the computer sleeps Choose a power plan Edit power plan
4.	Choose a Balance or Power Saver plan	Choose or customize a power plan A power plan is a collection of hardware and system settings (like display brightness, sleep, etc.) that manages how your computer uses power. <u>Tell me more about power plans</u> Preferred plans
	(Either will work)	O Balanced (recommended) Change plan settings Automatically balances performance with energy consumption on capable hardware.
5.	Click on Change plan settings	Power saver Change plan settings Saves energy by reducing your computer's performance where possible. Show additional plans
6.	Select Never from the dropdown list for the option "Put the computer to sleep."	Change settings for the plan: Balanced Choose the sleep and display settings that you want your computer to use.
7.	Click Save Changes.	Change advanced power settings Restore default settings for this plan Save changes Cancel

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 <u>Starting a Session</u>.

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 (<u>https:/www.imprivata.com</u>) 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.

-des	×
Login	Connection Settings
	User name
	Password
	Login Cancel

 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.

Central Server:	MyrtleLabRen	noteServer::64	52.140.50
	Add Server	Update	Remove
Networked Monito Networked Monito		804FA-B6A7-44	Blink Monit
Information IP Address: [0.0.0			
User in Control:		ake Control - Net	nadrad Manitar

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 <u>History.</u>
 - 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.

WM-200A Network Resistance Welding Monitor System

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.

MongoDB Server IP Address :	64.52.140.50 Current IP Address: [64.52.140.50]	MongoDB User Name :	miyachi2
MongoDB Server Port :	30785 Default Port: [27017]	MongoDB Password :	•••••
		Test Connection Status	: Test Success
Mosquitto (MQTT) Broker IP Address :	64.52.140.50 Current IP Address: [64.52.140.50]	(MQTT) Broker User Name	admin
Mosquitto (MQTT) Broker Port :	30786 Default Port: [1883]	(MQTT) Broker Password :	•••••
		Test Connection Status	:: Not Tested
Rest WebServer IP Address :	64.52.140.50 Current IP Address: [64.52.140.50]	Rest WebServer User Name (Windows User Credentials)	: iotsupport
Rest WebServer Port :	30787 Default Port: [80]	Rest WebServer Password :	
		Test Connection Status	: Not 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

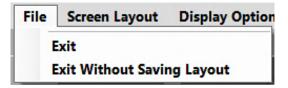
File Screen Layout Display Options User Controls Help

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.

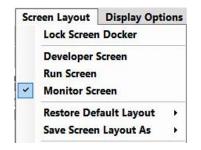
File Menu



- 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).

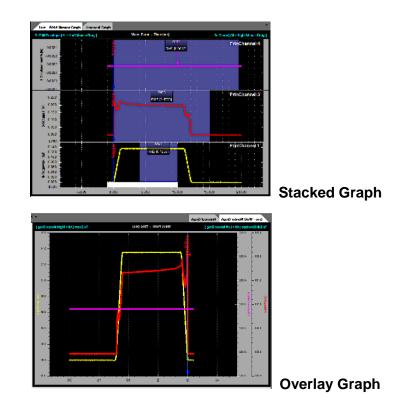
Display Options Menu

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.

Dis	splay Options User C	ontrols Help
~	Stack Graph	
	Overlay Graph	
	Display Tile Graph	
~	Display Row Graph	
	Data Logging Level	٠
~	Tool Bar	
4	Status Bar	

Stack Graph/Overlay Graph

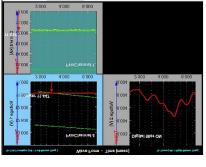
This pair of options applies to the Live – Weld Monitor Graph. They allow the user to choose between displaying the graphs from all channels as a column of different graphs stacked together and displaying them all on one graph. These options are only available in the Developer and Monitor screens.



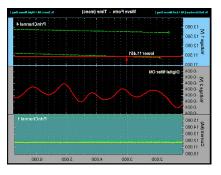
WM-200A Network Resistance Welding Monitor System

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 <u>Add/Remove a User</u> below for more information.)

Password Control

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

🖳 Password Update	-		×
Old Password			
New Password		•	٩
Confirm Password		•	٩
Update	Cancel		

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.

Help	
U	ser Manual
Sj	stem Information

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.

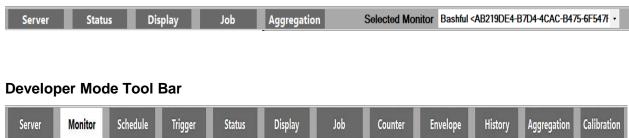
Run Mode Tool Bar



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CHAPTER 3: OPERATIONS

Monitor 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.

System Status		д
Status Errors	Counters	
Networked Weld M Bashful <9		A7-44CF-9F5D-45C712F2B0
Current Monitor Sch dennis_isc		
	Alert -	- None
Total Weld Count	1263	510
Weld count down to change Electrode	-0009	919
	Reset Weld Co	unt Down
Weld Passed	0465	79
Weld Failed	0543	37
	Reset Passed	I/Failed
mor Event List		4
Time Stamp	Channel	Error Type
r		
-	Clear Erro	Event List

WM-200A Network Resistance Welding Monitor System

Job Tool

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

Job		д 2	×
Production Data			
Operator in Control:	< none >]	
Job Number:			
SKU Number:		Update	

Aggregation Tool

The Aggregation tool surfaces the <u>Aggregation Data Graph</u> and <u>Aggregation Data Window</u> 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 <u>Developer Screen</u>, below for more information.

Status Bar

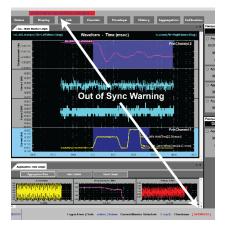
The Status Bar provides real time updates on the most recent weld and basic information about the user's role and the active layout. The Status Bar appears in all user modes.

Ready for Trigger	Weld Good	2022-04-05 14:09:07.290538	Logon User Role:	admin Admin	
		Current Monitor Schedule: 2 <rev1100a></rev1100a>	Checksum: [1039132819]	Local Control	Central Server 🔵 WeldMonitor

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 <u>LCD Information</u> <u>Screen</u>.
 - 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.

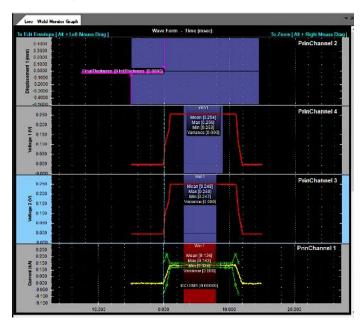


Figure 19: Live - Weld Monitor Graph (showing input from four principal channels)

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 <u>Developer Screen</u> and <u>Monitor Screen</u> 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.

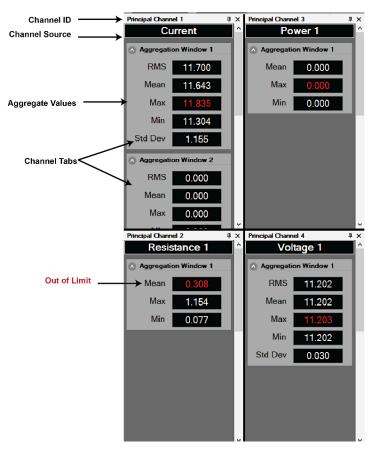


Figure 20: Aggregation Data Status Window

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 <u>Run Mode</u>, 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.)

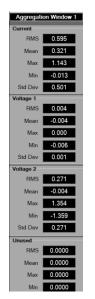


Figure 21: Aggregation Data Window, Run Mode

In <u>Monitor</u> and <u>Developer</u> 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.).

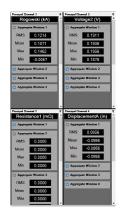


Figure 22: Aggregation Data Window in Developer or Monitor Mode

Aggregation Data Graph

The Aggregation Data Graph window, found in <u>Developer</u> and <u>Run</u> 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 <u>Limits and Windows</u> 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.

Aggregatio	n Data G	Graph																				•
/	ggregatio	on Da	ta		A	xis Con	trol			Reset	Graph											
								(Curre	ent-ISO	RMS											
0.933	· · · · · · · · · · · · · · · · · · ·	• • • •	1.		,																	
0.933 0.932 0.932	ي الله	NI,	l,	44	1																	
0.932		17	li b	Ш,	74																	
0.932	80	120	160	200	240 2	80 32	0 360	400	440			60 600	640	680	720	760	800	840	880	920	960	1000
										Count												_
200.000								Dis	spiac	ement	2-Me	an				_						
0.000	- ' I I		T ^{head}	4.4	·																	
(9, -200.000 •€ -400.000																						
-600.000																						
-800.000	40	80 ·	120	160 20	00 241	0 280	320 3	360 4	00 44	40 480 Col	520 int(s)	560 6	00 64	0 68	0 720	760	800	840	880	920	960	1000
									Volt	age 2-l												
0.010								••••														
-0.010	TNÀ		17	nan apa	î.																	
-0.020	W.M	Y.		L L	ų.																	
-0.030												60 600										
0.040 0 4	0 80	120	160	200	240 2	180 32	0 360	400	440	480 5 Count		60 600	640	680	720	760	800	840	880	920	960	1000
20.000									For	ce 1-R	MS											
15.000																						
10.000	Ard.	44			1																	
5.000			ľ																			
0.000	0 80	120	160	200	240	290 2	20 360	400	440	480	20 5	60 600	640	690	720	760	200	940	000	920	080	1000
	00	120	100	200	240 1	200 3.	20 300	400	440	Count		00 000	040	080	720	100	000	040	000	020	000	1000

Figure 23: Aggregation Data Graph Window in Run Mode

Aggregation Data Graph			* X
Aggregation Data	Axis Control	Reset Graph	
Voltage 1-RMS	Resistance 1-Mean	Displacement 1-Max	Current-RMS

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 Graph			• ×
Aggregation Data	Axis Control	Reset Graph	

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.

💀 AggreChanWinSelectForm — 🗆 🖂											
Principal Chan	nels/Aggregation	Dat	ta Selection:								
Principal Channel	Aggregation Data		Show Graph								
Current	StdDev	\sim									
Displacement 1	RMS	~	\square								
Voltage 2	Max	~									
Voltage 1	StdDev	<									
			Close								

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.

Graph Options Principal Channel 2-DisplacementB (i •
Auto Scale Y
Y Min 0.000 + Y Max 1.000 +
Apply Cancel

- 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.



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.

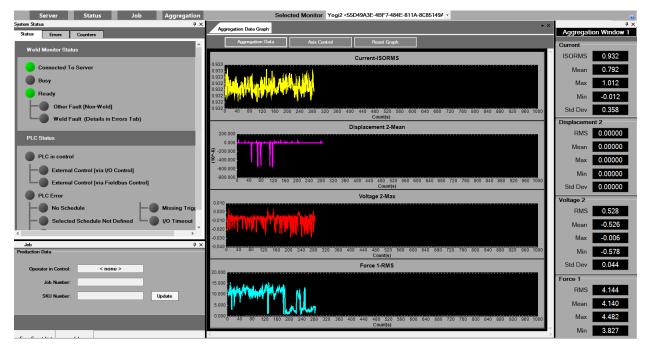


Figure 26: Run Screen Docker

CHAPTER 3: OPERATIONS

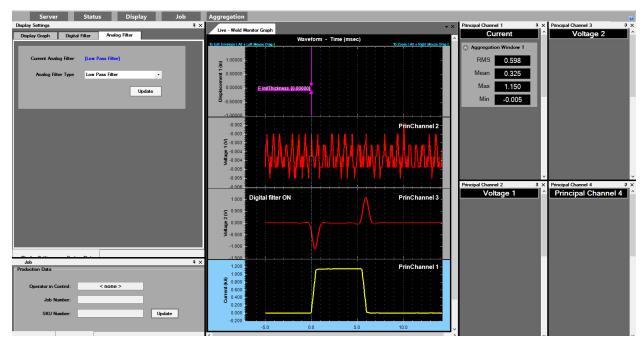


Figure 27: Monitor Screen Docker

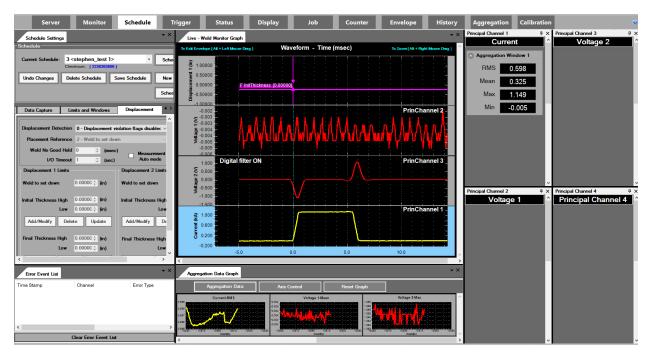


Figure 28: Developer Screen Docker

WM-200A Network Resistance Welding Monitor System

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.

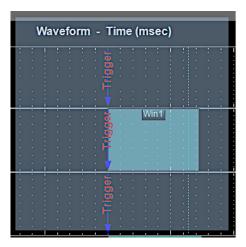
There are four icons – a downward arrow, a pair of leftward/rightward arrows, an **X**, and a pin.

- 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.

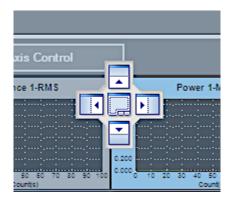
Relocating and Resizing Windows

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

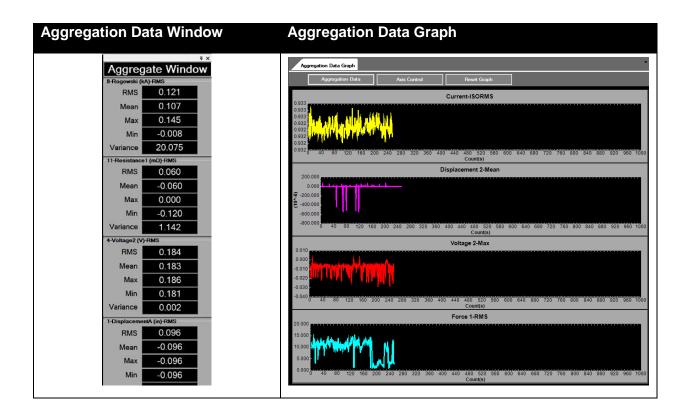
Run Screen versus Monitor Screen

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.



Configure Aggregation Data (Run Screen)

 9. On the Run Screen, Click the Aggregation Data button at the top of the Aggregation Data Graph 10. Select Principal Channel(s) and 	Aggregation Data Graph Aggregation Data
Aggregation Data to be	AggreChanWinSelectForm – — X Principal Channels/Aggregation Data Selection:
graphed.	Principal Channel Aggregation Data Show Graph
11. Check to have the data graphed	Current StdDev V
	Displacement 1 RMS \checkmark \checkmark
12. Click Close.	Voltage 2 Max 🗸 🗹
	Voltage 1 StdDev 🗸
13. Select Axis Control	Close
 14. Select Principal Channel 15. Set Y scale minimum and maximum values. 16. Click Apply. Click Close. 	Graph tion Data Axis Control Graph Options Principal Channel 2-DisplacementB (i • Auto Scale Y Y Min 0.000 • Y Max 1.000 • Apply Cancel

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.



Live Weld M	omtor Graph						
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Configure Live-Weld Display Settings (Monitor Screen)

Click here for more information on display settings.

 On the Monitor Screen, Click Display in the Tool Bar to launch the Display Settings window 	Status Display Job
9. Select the Display Graph Tab	Server Status Display Display Settings Display Graph Digital Filter Analog Filter
10. Select Channels to be displayed (Principal Channels are highlighted in blue)	Display Options- Stack Tile Display Channel(s): Image: Channel(s) Display Channel(s): Image: Channel(s) Display Channel(s): Image: Channel(s) Display Graph Layer(s): Image: Cursor / Cursor Values Image: Cursor / Cursor Values Image: Cursor / Cursor Values Values Image: Cursor / Cursor Values Values Displacement Thickness Limits
11. Select Graph Layers	Display Graph Layer(s) : Waveforms Trigger Position Line Cursor / Cursor Values Limit Lines Aggregation Window Violations Displacement Thickness Limits
12. Indicate any inverted inputs	Inverted Input(s): D1 D2 V1 V2 F1 F2 V3 I P1 P2 R1 R2
13. Select a channel from the dropdown menu and select a color and line type	Graph Options Channel Displacement 1 Plot Color Line Type V
14. Choose Auto Scale for the X and Y Axes or set the minimum and maximum vales for each axis.	Auto Scale Y Auto Scale X Y Max 1.491

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

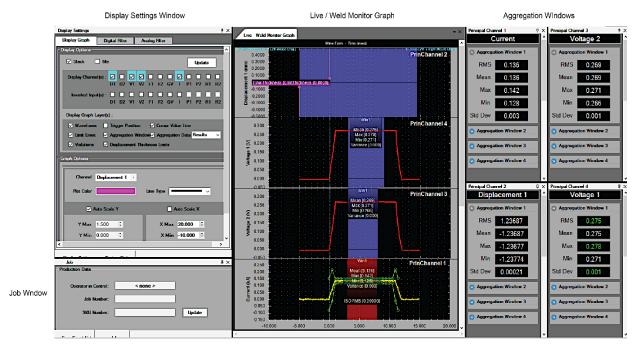


Figure 29: Monitor Screen Docker

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.

Display Graph	Digital Filter	Analog Filter	
- Display Options			
Stack] Tile		Update
Display Channe	l(s): □ □ <mark></mark> D1 D2 V1		
Inverted Inpu		□ □ □ □ V2 F1 F2 V3	I P1 P2 R1 R2
Display Graph L	ayer(s) :		
✓ Waveforms	✓ Trigger Posit	ion 🗹 Line Cur	sor / Cursor Values
✓ Limit Lines	Aggregation	Window 🔽 Aggrega	tion Data Results 🗸 🗸
Violations	🗹 Displacemen	t Thickness Limits	
Graph Options			
Channel	Displacement 1 🔻	•	
Plot Color		Line Type	~
A.	ito Scale Y		Auto Scale X
Y Max	1.491 븆	X Max	32.576 🚖
Y Min	-1.000 보	X Min	-24.690 호

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.

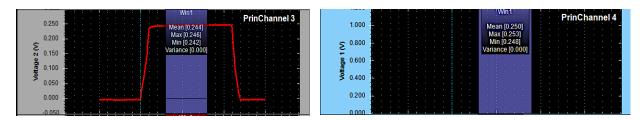
Display Options							
Stack	Tile			Update			
Display Channel(2 V3 I P1	□ □ □ P2 R1 R2			
Inverted Input(/1 V2 F1 F2		P2 R1 R2			
Display Graph Lay	yer(s) :						
✓ Waveforms	✓ Trigger Pos	sition 🗹 Lir	ne Cursor / Curso	r Values			
✓ Limit Lines	Aggregatio	n Window 🗹 Ag	gregation Data	Results v			
✓ Violations ✓ Displacement Thickness Limits							
C 1.0.1							

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).

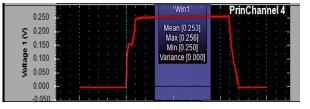


Waveform Shown

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.

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	0.200								t				X [0.										
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Voltage	0.100	-																					
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	-0.050																						



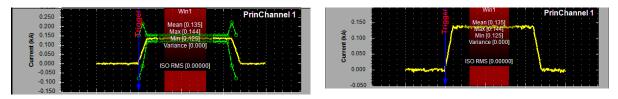
Trigger Position Shown



• 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.

-		
Drag]		
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-		1
-		1
-		1
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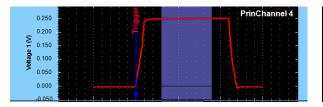
• Limit Lines: The upper and lower limits for a value of the input being monitored (e.g., resistance). These will only appear in the graph if an engineer has set them beforehand.



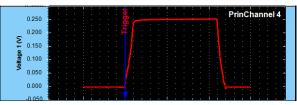
Limit Lines Shown

Limit Lines Not Shown

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

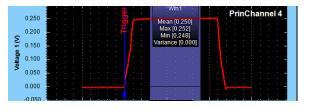


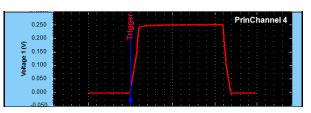
Aggregation Window Highlighted



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



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

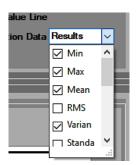


Figure 32: Results List

- 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

Graph Options			
Channel	Displacement 1 -		
Plot Color		Line Type	~
⊠ A	uto Scale Y	_ A	uto Scale X
Y Max	1.500 韋	X Max	26.962 🔹
Y Min	0.000 韋	X Min	-16.962 🔹

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.

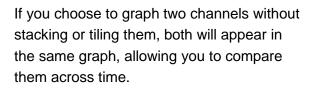
Managing the Graphic Display

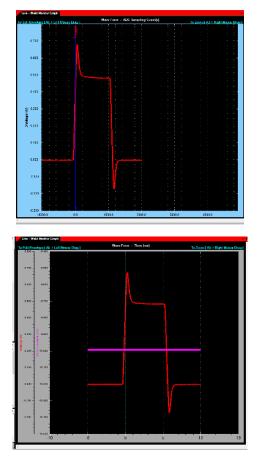
The top of the Display Options section of the Graph Settings window provides the option of stacking and/or tiling the channel graphs.

Display Options		
Stack	🗌 Tile	Update

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.

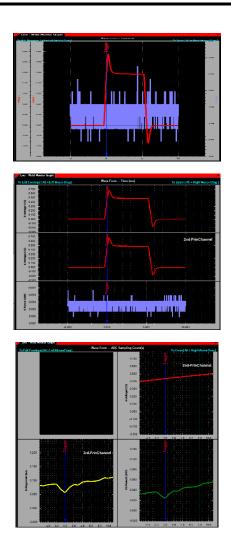
If you choose to graph just one channel, that graph will fill the Live – Weld Monitor Graph.





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.

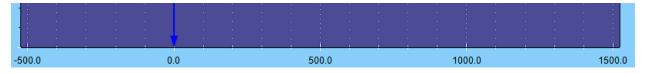
For more than two channels. You might prefer to stack the channels,



Or stack and tile them.

Time Scale in the Live – Weld Monitor Graph

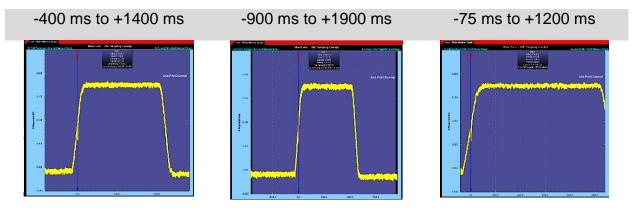
The vertical dotted lines in the Live – Weld Monitor Graph represent a time scale along the X axis. The values represented by the denser lines are shown at the bottom of the window. The lighter lines subdivide the time between the denser lines into five equal parts.



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.



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.

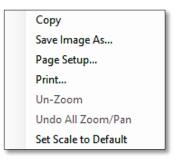


Figure 34: Live Weld Monitor Graph Sub-menu

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.

Channel		•	
Filter Type	No Filter	•	
Cutoff Frequency	1 kHz	•	Update

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.

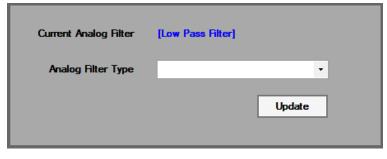


Figure 36: Analog Filter tab

- 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.

Job		Į Χ
Production Data		
Operator in Control:	< none >	
Job Number:		
SKU Number:		Update

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.

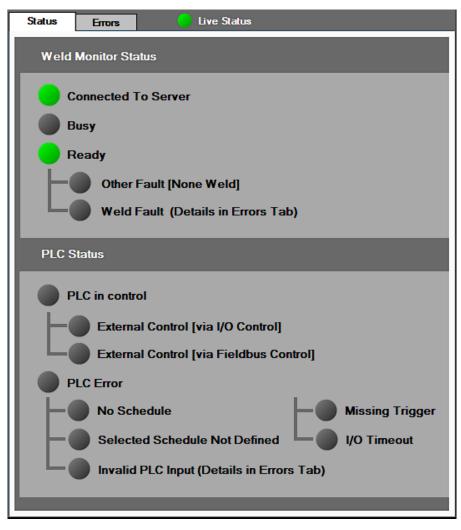


Figure 38: Status Tab

Error Tab

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

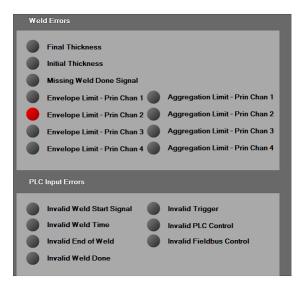


Figure 39: Error Tab

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.

Status Enux Counters Networked Weld Monitor: Basth UI ~97/D304EA-B8A7-440F-9F5D-45C712F2B001> Current Monitor: Schedule: denth15_B0_mms Current Monitor: Electrode - OK Total Weld Count 800891 Weld Count down to change Electrode 050332 Weld Passed 018750 Weld Passed 018750 Weld Passed 018750 Weld Failed 3/0 %/r Passed 107 %/r Passed 1/0 %/r Passed	System Status		зχ
Bashful <97D804EA-B6A7-44CF-9F5D-45C712F28001> Current Monitor Schedule: denthis_lso_tms Electrode - OK Total Weld Count change Electrode change Electrode Weld Count change Electrode Weld Passed 018750 030915 Read Passed 018750 030915 Read Passed 018750 030915 Read Passed 018750 030915 Read Passed 018750 030915 Read Passed 018750 030915 Read Passed 018750 030915 Control 018750 030915 Read Passed 018750 030915 Control 018750 030915 Control 018750 030915 Control 018750 030915 Control 018750 030915 Control Contro Control C	Status Errors	Counters	
dennis_loc_rms Electrode - OK Total Weld Count 800891 Weld Count down to change Electrode 050332 Peset Weld Court Down 018750 Weld Passed 018750			
Total Weld Count Weld Count down to change Electrode Weld Passed 018750 Weld Passed 030915 Read Paramet/Failed 0.7 % Passed 0.7 % Passe			
Weld count down to change Electrode 050332 Reset Weld Court Down Weld Passed 018750 030915 Reset Passed Weld Failed 030915 Reset Passed 37 %0 Passed 37 %0 Passed Brow Event Uat 3 X Trre Blamp Dhanel Env Type 4 X		Electrode - OK	
chango Electrodo USUU3.32 Reset Weld Couré Down Weld Passed U18750 U30915 Rund Failed U30915 Rund Failed U30915 Rund Failed U30915 Rund Failed U30915 Rund Failed U30915 Court Failed U30915 Rund Failed U30915 Court Failed U30915 Rund Failed U30915 Court Failed U30915 Rund Failed U30915 Court Failed U30915 Co	Total Weld Cou	* 800891	
Weld Passed 018750 Weld Failed 030915 Read Pared/Failed 37 % Pactored Env Event Ust u x Time Stamp Orunnel Env Type		5 USU33Z	
Weld Failed 030915 Read Parad/Failed A7 % Paragosi Error Event Ust a x Time Starto Orunnel Error Type		Reset Weld Count Down	
Rend Parend/Failed	Weld Passe	018750	
Enor Exercised Enor Type	Weld Faile	030915	
Enor Exert List 1 x x x x x x x x x x x x x x x x x x		Rend Parend/Falod	
Time Blanco Oriannol Error Type		37 % Passed	
Time Blanco Oriannol Error Type			
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<		Abara at Prove Free	- 1 X
	time stamp	criame Error type	
Clear Error Event List	<		,
		Clear Error Event List	

Figure 40: Counters Tab

WM-200A Network Resistance Welding Monitor System

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.

Weld Counter	д
Networked Weld Ma EricOffice	onitor: <97DB04EA-B6A7-44CF
Current Monitor Sch testing	edule:
A	lert — None
Total Weld Count	005394
Weld count down to change Electrode	009800
	Reset Weld Count Down
Weld Passed	000043
Weld Failed	000332
	Reset Passed/Failed
- 11	% Passed

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.

Time Stamp	Channel	Error Type	^
11/16/2021 5:00:07 PM	Voltage 1 (V)	{Instantaneous Limit Violations::[LowerEnvelope	
11/16/2021 5:00:07 PM	Voltage 1 (V)	{Aggregation Limit Violations:: [Win1::Max;]}	
11/16/2021 5:00:07 PM	Current (kA)	{Instantaneous Limit Violations::[LowerEnvelope	
11/16/2021 5:00:07 PM	Current (kA)	{Aggregation Limit Violations:: [Win1::Max;]}	
11/16/2021 5:00:07 PM	Power 1 (kW)	{Instantaneous Limit Violations::[LowerEnvelope	
11/16/2021 5:00:07 PM	Power 1 (kW)	{Aggregation Limit Violations:: [Win1::Max;]}	
11/16/2021 5:00:07 PM	Resistance 1 (mΩ)	{Instantaneous Limit Violations::[UpperEnvelope]	
11/16/2021 5:00:07 PM	Resistance 1 (mΩ)	{Aggregation Limit Violations:: [Win1::Mean;]}	
11/16/2021 5:00:03 PM	Voltage 1 (V)	{Instantaneous Limit Violations::[LowerEnvelope	
11/16/2021 5:00:03 PM	Voltage 1 (V)	{Aggregation Limit Violations:: [Win1::Max;]}	
11/16/2021 5:00:03 PM	Current (kA)	{Instantaneous Limit Violations::[LowerEnvelope	
11/16/2021 5:00:03 PM	Current (kA)	{Aggregation Limit Violations:: [Win1::Max;]}	
11/16/2021 5:00:03 PM	Power 1 (kW)	{Instantaneous Limit Violations::[LowerEnvelope	,
<		>	

Figure 42: Error Event List

WM-200A Network Resistance Welding Monitor System

Run Mode

Run Mode provides an operator with continuously updated aggregation data in both the <u>Aggregation Data Graph</u> and <u>Aggregation Data Window</u>. It also includes <u>System Status Window</u> and <u>Job Window</u>, 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.

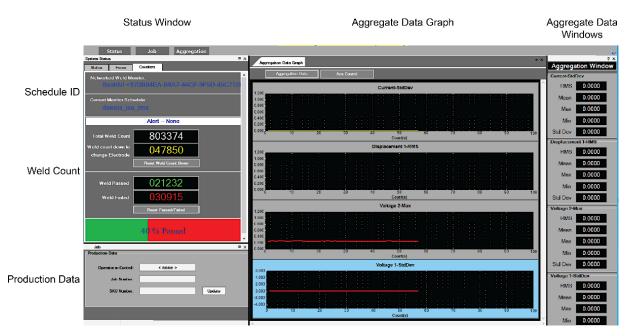


Figure 43: Run Mode Screen Docker

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 <u>Aggregation Data Graph</u> for designated channels.
- The System Status Window, described below.
- The Error Event List, a continuously updated error list.

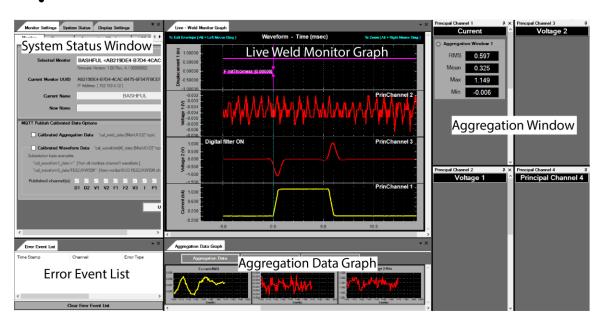


Figure 44: Default Developer Screen Docker

Create a Weld Monitor Schedule

(**Note:** The following assumes that the Central Server and Network Monitor have already been selected, as described <u>above</u>. 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.

Schedule			
Current Schedule:	2 <rev1100a> Checksum: [1039132</rev1100a>	•	Schedule Table
Undo Changes	Delete Schedule	Save Schedule	New / Save As
			Schedule Wizard

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 <u>Status Bar</u>.

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 <u>Envelope</u> <u>Tool</u>, below, for more information.

🖳 Create Schedule Wizard			\times
Displacement Channels			
Is there a Displacement 1 Sensor input ?	• Yes	O No	
What Displacement Guage Sensor is installed?	Heidenhain		~
Is there a Displacement 2 Sensor input ?	O Yes	. ● No	
What Displacement Guage Sensor is installed?	Heidenhain		
		_	
	< Back N	ext > Fin	nish Cancel

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	
 Click New / Save As in the Schedule Settings tab. The Save New Schedule window launches. Leave the Schedule field as <new>.</new> Type in the new schedule name in the New Name field. Click OK. A message will display indicating that the new schedule name was saved. Click on the Schedule Table button to 	Save New Schedule As: Schedule: <new> New Name: stephen_test1 OK Cancel</new>
6. Click on the downward arrow next to	Schedule: 1 <testschedule> Checksum: Schedule Table Undo Changes Delete Schedule Save Schedule New / Save As Schedule Save Schedule Schedule Wizard</testschedule>
an unassigned default schedule in the New Assigned Schedule column.	Networked Monitor Schedule List:
 The new schedule will appear at the bottom of the list of available schedules in the dropdown list. Select it. Note: The user can also replace the existing schedule with the new schedule. 	Schedule # Current Assigned Schedule New Assigned Schedule Active Schedule ^ 1 testschedule testschedule 2 sim_10ms_5usec_s sim_10ms_5usec_s 3 default_schedule default_schedule 4 default_schedule default_schedule grumpy5 </td
 Click Update and the new schedule will be added to the Current Assigned Schedule column for that schedule number. 	Schedule # Current Assigned Schedule New Assigned Schedule Active Schedule 1 testschedule testschedule ✓ 2 sim_10ms_5usec_s im_10ms_5usec_iiiii 3 default_schedule stephen_test 1

10. Check the Active Schedule check box to make the new schedule the active schedule.	Schedule # Current Assigned Schedule New Assigned Schedule Active Schedule 1 testschedule testschedule 2 sim_10ms_5usec_s sim_10ms_5use 3 default_schedule stephen_test 1
 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. 	Schedule Current Schedule: 3 <stephen_test 1=""> Checksum: [409965648] Undo Changes Delete Schedule Save Schedule New / Save As</stephen_test>
Create a New Schedule Based on an Existin	g Schedule
13. At step 1 above, select an existing schedule from the dropdown list.	Save New Schedule X
14. Enter a new name for the new schedule.15. Proceed as above.	Schedule: <new> <new> grumpy5 grumpy7 testschedule sim_10ms_5usec_sample stephen stephen stephen 2</new></new>

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.	Monitor Schedule Trigger
6.	Select the Principal Channels Tab	Principal Channels Data Capture Limits and Windows
7.	Use the dropdown menus for each channel to assign sources to channels. (It is not necessary to assign all four channels.) Click Update.	Principal Channel1 Principal Channel2 Principal Channel3 Principal Channel4 Current Resistance 1 Power 1 Voltage 1 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 Channels Principal Channel1 Current Unused Displacement 1 Displacement 2 Voltage 1 Voltage 2 Force 1 Force 2 Voltage 3 Current Power 2

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 <u>ISO</u><u>RMS/Cool Time</u> below.)

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

Define Capture Settings

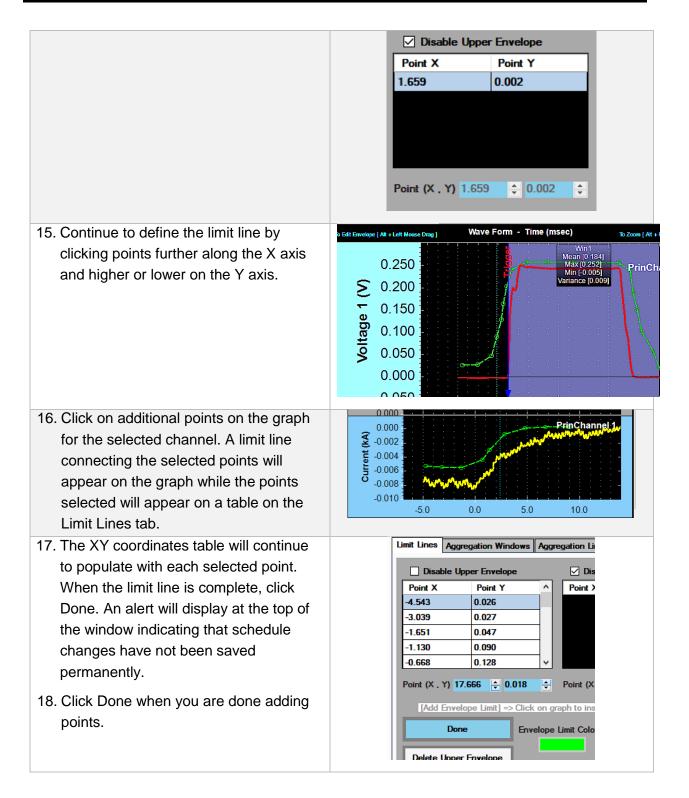
Define the capture interval by setting pre- and post-trigger intervals in milliseconds.

h)	Select Schedule from the Tool Bar	Monitor		Schedule	Trigger
i)	Select Capture Settings Tab	Principal Cha	nnels	Data Capture	Limits and Windows
j)	Enter values in the Pre- and Post-	Capture Settings			
	Trigger time fields (≤ the Max limit	Pre-	trigger	5	10.24 (msec) Max
	shown)	Post-	trigger	15	2600 (msec) Max
k)	Use the dropdown menu to select the	Samplin	gRate	5 µsec 🗸	Update
,	data capture sampling rate.				
D	Click Update.				
-7	Select a waveform send option	Fond Ontion	2 4		Ibdata
,	•	Send Option		ays send wav∢ ∨ ver send waveform	Update
n)	Click Update.			nd waveform on error	r
			2 - Alw	ays send waveform	

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	Monitor Schedule Trigger
9. Select the Limits and Windows tab	Principal Channels Data Capture Limits and Windows Displacement
10. Select the Limit Lines tab	Limit Lines Aggregation Windows Aggregation Limits
11. Deselect Disable Upper (or Lower) Envelope. (These are selected by default and must be deselected.)	✓ Disable Upper Envelope ✓ Disable Lower Envelope
 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. 	Add Upper Envelope Envelope Limit Color Add Lower Envelope Delete Upper Envelope Delete Lower Envelope
 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. 	 ▶ 0.050 0.000 -0.050



 Click Save schedule in the Schedule Settings header to save your changes. A message will display when your schedule has been saved successfully, and the alert about the graphic display will disappear. 	Point X 5.540 5.770 6.115 9.440 Point (X , Y) 5.7	Point Y 6.059 4.183 1.298 0.961 70	Point X -3.990 0.085 0.290 0.535 0.815 Point (X, Y)	Point Y -3.174 -3.174 0.673 9.329 8.367 85	▲
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.					
 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

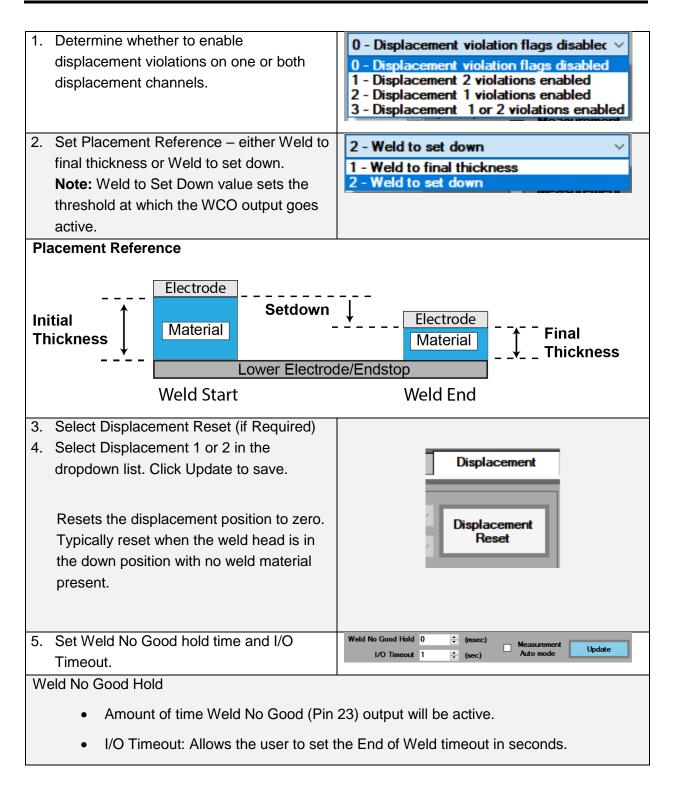
The Displacement tab allows the user to cause the system to flag violations when the displacement is outside the ranges of the initial and final thickness value.

13. Select Schedule Button	Monitor Schedule Trigger
14. Select a Schedule (Defaults to Current Schedule)	Schedule Current Schedule: 7 <grumpy2> Checksum: [2864192027]</grumpy2>
15. Select Displacement Tab.	Limits and Windows Displacement

Principal Channels	Channels Data Capture Limits and Windows		
Displacement Detection 0 - Displacement violation flags disablec Displacement Reference Displacement violation flags disablec Displacement violation flags disablec Placement Reference 2 - Weld to set down Displacement violation flags disablec Displacement violation flags disablec			Displacement Reset
Weld No Good Hold 0 (msec) I/O Timeout 1 (sec) Measurement Auto mode Update			
Displacement 1 Limits	,	Displacement 2 Limits	
Weld to set down	0.00000 ≑ (in)	Weld to set down	0.00000 🗧 (in)
Initial Thickness High	0.00000 ‡ (în) 0.00000 ‡ (în)	Initial Thickness High Low	0.00000 ‡ (in) 0.00000 ‡ (in)
	elete Update	Add/Modify Del	
Final Thickness High	0.00000 ‡ (in)	Final Thickness High	0.00000 ‡ (in)
Low	0.00000 ≑ (in)	Low	0.00000 ‡ (in)
Add/Modify De	elete Update	Add/Modify Del	ete Update

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.



- 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.
- Check Measurement Auto Mode to include the Cool Time measurement (See <u>ISO RMS/Cool Time</u>, above) if required.

Data Capture	Limits and Windows	Displacement
0 - Displacemen 2 - Weld to set (t violation flags disablec \vee down \vee	Displacement Reset

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.

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.

7.	Click Add/Modify button for either Initial Thickness or Final Thickness	Initial Thickness High 0.00000 (‡) (in) Initial Thickness High 0.00000 (‡) (in) Low 0.00000 (‡) (in) Low 0.00000 (‡) (in) Add/Modify Delete Update Add/Modify Delete Update Final Thickness High 0.00000 (‡) (in) Enal Thickness High 0.00000 (‡) (in) Low 0.00000 (‡) (in) Add/Modify Delete Update Final Thickness High 0.00000 (‡) (in) Low 0.00000 (‡) (in) Add/Modify Delete Update Final Thickness High 0.00000 (‡) (in) Low 0.00000 (‡) (in)
8.	Move cursor to the selected displacement channel. The cursor changes to a cross.	1.00000 1.00000 + PrinChannel 3 -

 Click on the displacement graph at two points to select high and low 	Displacement 1 Limits
displacement limits for the selected thickness value.	Weld to set down 0.00000 (in)
10. The selected values appear in the displacement window.	Initial Thickness High 0.50000 (in) Low -0.1100 (in) Cancel Delete Update
 11. Click Update. The selected range values display on the displacement graph in the Live – Weld Graph. 12. Click Update. 	C 100000 FinChannel 3 0.00000 FinChannel 3 0.00000 FinChannel 3 0.00000 FinChannel 3 0.00000 FinChannel 3 0.00000 FinChannel 3 FinChannel 3 Fin

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

7. Click the Monitor button in the Tool Bar	Server Monitor Schedule
8. Select the Aggregation Windows Tab	Sensors Aggregation Windows LCD Display
9. Select a Principal channel from the	Monitor Settings
dropdown menu.	Monitor Sensors Aggregation Windows LCD Display Fieldbus
	Principal Channel: Voltage 1
10. Check the type(s) of data to be	Show / Hide Aggregation Data
aggregated and displayed in the	Aggregation Window
Aggregation Window and Aggregation	Calculation 1 2 3 4
Data Graph.	Mean
11. Set data types for up to four windows of	Max 🗌 🗌 🗌
time for one or more of the selected	Min 🗌 🗌 🗌
principal channels.	Standard Deviation
a. Not all data types are available for all data	Select All
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.	
12. Click Update.	

Define Start and End Times for Aggregation Data Windows

10. Click the Schedule button on the Tool Bar.	Monitor Schedule Trigger
11. Select Limits and Windows tab.	Principal Channels Data Capture Limits and Windows Displacement
12. Select Aggregation Windows tab.	Limit Lines Aggregation Windows Aggregation Limits
13. Select a principal channel from the drop down menu.14. Click Add Window.	Selected Principal Channel: Current ✓ Limit Lines Aggregation Windows Aggregation Limits Start X End X Enable ISO RMS Fall Level 19.950 19.975 Image: Comparison of the start of
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).	Start X End X Enable ISO RMS Fall Level 19.950 19.975 IV IV 90 19.950 19.975 IV IV 90 5.450 9.210 IV IV 90 IV IV IV 90 IV IV IV IV 90 IV IV IV IV IV IV IV
 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. 	2.000 1.500 1.000 0.500 0.500 -5.0 0.0 5.0 10.0 ✓ Window (Start X, End X) Enable 4.984 ♀ 9.741 ♀

17. Click Update. The selected points are					
added to the list of aggregation windows.	Start X	End X	Enable	ISO RMS	Fall Level
	19.950	19.975			90
	19.950	19.975	ব	Г	90
	5.450	9.210	I	Г	90
	4.980	9.740	V	Γ	90
18. Click Save Schedule in the top (Schedule) portion of the Schedule Settings window.	Chec	appslest- team: [9112200] te Schedde Save	Schedule	Schedule Table New / Save As Schedule Wizard	,

Define Limits of Aggregation Values

10. Click the Schedule button on the Tool Bar.	Monitor Schedule Trigger			
11. Select Limits and Windows tab.	Principal Channels Data Capture Limits and Windows Displacement			
12. Select a principal channel from the	Selected Principal Channel: Current -			
dropdown menu.				
13. Select the Aggregation Limits tab.	Limit Lines Aggregation Windows Aggregation Limits			
14. Select an Aggregation Window from the				
dropdown list.	Aggregation Window Win1 •			
15. Click the box next to the Enable Lower	Enable Lower Limit Enable Upper Limit			
Limit or Enable Upper Limit for the	ISORMS 0.000 0.000			
aggregation value(s) for which you wish to	Mean 0.000 0.000			
set limits.	Max 1.000 1.500			
16. Enter limits for each value.	StdDev 0.000 0.000			
17. Click Update.				
	Update			

18. Click Save Schedule to Save	Schedule Current Schedule: 1 <appstest> Checksum: [1503779706] Undo Changes Delete Schedule Save Schedule New / Save As Schedule Wizard</appstest>
 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). 	Aggregation Window 1 RMS 3,357 Mean 3.067 Max 4.983 Min 0.000 Std Dev 1.365

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.	Status Display Job
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	Stack Tile Update Display Channel(s): ✓
8.	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.)) Click Update.	Display Graph Layer(s) : Vaveforms Trigger Position Line Cursor / Cursor Values Limit Lines Aggregation Window Aggregation Data Results V Volations Displacement Thickness Limits

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	Server Monitor Schedule
12) Select the Sensors tab	Monitor Sensors Aggregation Windows
 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). 	Sensor Settings Coil (1 : 1) (10 : 1) AC Mode Enabled AC Current Frequency 50 (50 500) Hz
 16) Set the sensor type for each displacement sensor (Heidenhain or Ono-Sokki) 17) Set the units (inches or millimeters) 	Displacement 1 Sensor Type Heidenhain (in) Displacement 2 Sensor Type Heidenhain (in)
18) Set the maximum input for each of the two force sensors.19) Set the display unit (lbf, N, or kgf)20) Click Update.	Force 1 Sensor Max Input (lbf) 25 (lbf) Force 2 Sensor Max Input (lbf) 25 (lbf)

Set Digital Filter

5. Click Display button in Tool Bar	Status Display Job
6. Select Digital Filter Tab	Display Settings Display Graph Digital Filter Analog Filter
7. Set Channel, Filter Type and Cutoff Frequency	Channel 3 •
8. Click Apply	Filter Type No Filter Cutoff Frequency 1 kHz

Set Analog Filter

5. Click Display button in Tool Bar	Status Display Job
6. Select Analog Filter Tab	Display Settings Display Graph Digital Filter Analog Filter
 7. Set Analog Filter Type 8. Click Update 	Current Analog Filter [Low Frequency (800Hz) Filter] Analog Filter Type Low Frequency (800Hz) Filter • Update

Set Fieldbus Connections

Use the Fieldbus tab to define the fieldbus connections settings.

6) Select Monitor in Tool Bar	Server Monitor Schedule
2) Select the Fieldbus tab	Aggregation Windows LCD Display Fieldbus
 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. 	Fieldbus Connection Settings IP address 0.0.0.0 Subnet mask: 0.0.0.0 Default Gateway: 0.0.0.0 Update Scan Rate Settings Scan Rate: 10 (msec) Update

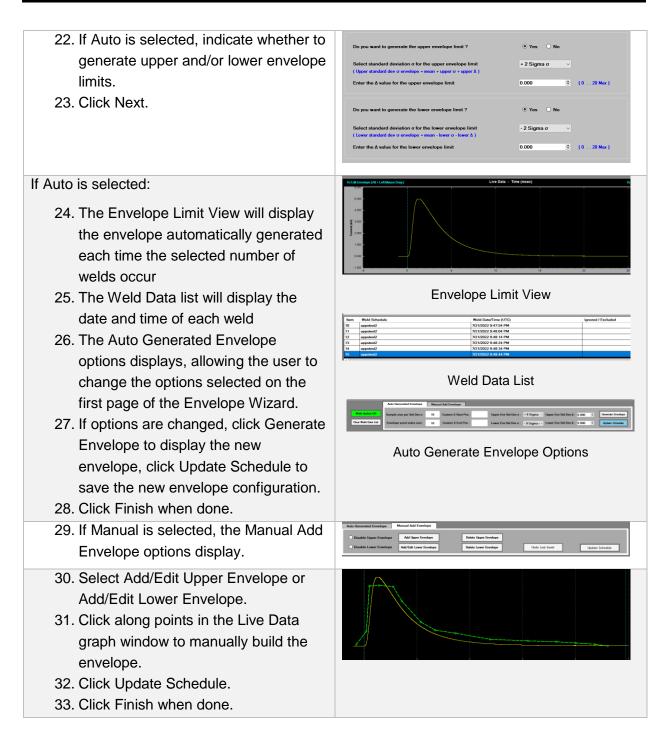
Set Envelope Limits

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.

18. Select Envelope on the Tool Bar to launch the Envelope Wizard.	Counter Envelope History
 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. 	Do you want to auto generate or manually draw the envelope limit(s) ?



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.)

Selected	Principal Chann	el: Vo	oltage 1		•				
Limit Lines	Aggregation V	lindows	Aggregatio	n Limits					
Start X	End X	Enable	ISO RMS	Fall Le	rel 🗹	Window (StartX.	EndX)	Enable
0.000	14.500			0		0.000	÷ 1	4.500	÷
٢					>	ISO RMS	Time Er usec)	vel nable 1000	 ✓ Z ÷ ✓
	ld Window ndow] => Click (elete Windo			odate tart/end po	-11	Window	r Color

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.

Aggregat	ion Window - Me	asureme	nt Rang	e:	
Measu	rement Start	Measu	irement	End	
1.0	≑ cycle	3	* *	cycle	

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 <u>Aggregation Windows</u> 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 <u>Sensors</u> tab.)

		asuremer			
Measure	ernent Start	Measu	rement	End	
1.0	🗘 cycle	3	* *	cycle	

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.

Start X	End X	Enable	ISO RMS	Fall Level	Window (Start)	, EndX) Enab
0.000	64.500	2	Г	30	16,667	50.000
16.667	50.000	9	Г	30		
					ISO RMS Fall L Cool Time I Duration (usec) Cool Time Level	Enable
< Add	Window	D	elete Windo	×	Update	Window Col

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).

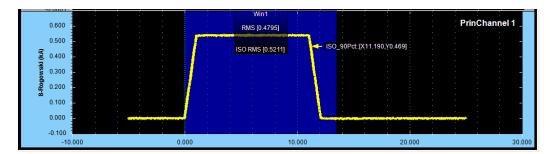


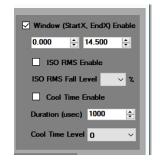
Figure 52: Aggregate window with ISO RMS

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.

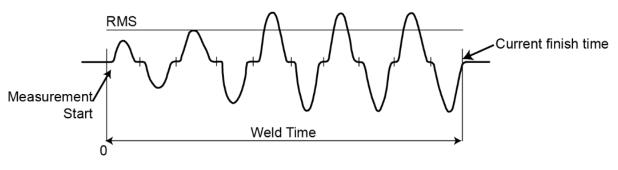


Figure 53: Single phase alternating current

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.

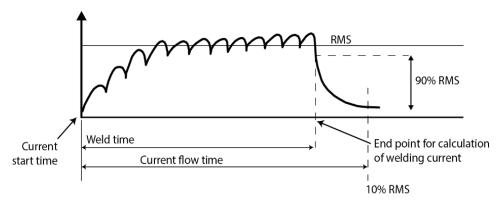


Figure 54: Direct Current Weld Time

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.

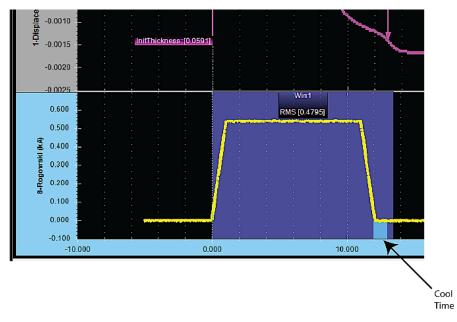
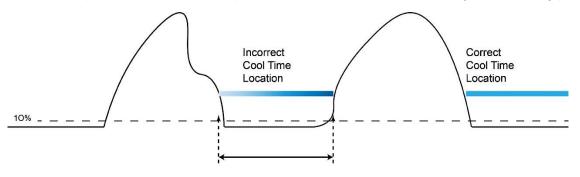


Figure 55: Cool Time and Auto Mode

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

Limit Lines Aggregation Windows Aggregation Limits						
Aggregation Wi	ndow Win1	•				
	Enable Lower Limit	Enable Upper Limit				
RMS	0.000	0.000				
Mean	0.000	0.000				
Max	0.000	0.000				
Min	0.000	0.000				
StdDev	0.000	0.000				
		Update				

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.

Weld Count	366,797
Current	
W1 RMS	0.000
W1 Mean	0.000
W1 Max	0.000
W1 Min	0.000
W2 Not Enabled	
W3 Not Enabled	
W4 Not Enabled	
Resistance 1	1
W1 Mean	0.000
Power 1	
W1 RMS	0.000
W1 Mean	0.000
Voltage 1	

LCD Aggregate Screen

6) Select Monitor in Tool Bar.	Server	Ма	onitor	S	chedule
7) Select the LCD Display tab.	Aggregation W	indows	LCD Dis	play	Fieldbus
8) Select a Principal Channel.	Principal Channel:	Current		•	
9) Select which calculations for each	Show / Hide Calculat	tions			
aggregation window for that channel.			Aggregation	Vindow	
10) Click Update.	Calculation	1	2	3	4
	RMS				
	Mean				
	Max				
	Min				
	Standard Deviation				
		Select All			
					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 p	arameters.
13) Click the History button in the Tool Bar	Envelope History Aggregation
14) Click Search Tab	Search Results
15) Define the time period to be search for previous welds.a. Chose Local Time or Universal Time Codeb. Define the start and end times for the search.	 Local Time ● UTC Start: 06/30/2022 21:30:08 ■▼ End: 06/30/2022 21:30:08 ■▼
16) Define the search. 17) Click Search.	Search By: All Records Monitor UUID: BashfulStandalone <97DB04EA-BE

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 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. 	Search Results Total Found: 150 Select All Results Item Weld Date/Time (UTC) Schedule Name Schedule Last Modified 1 6/30/2022 9:34:50 PM appstest 6/24/2022 3:47:17 AM 2 6/30/2022 9:34:54 PM appstest 6/24/2022 3:47:17 AM 3 6/30/2022 9:34:58 PM appstest 6/24/2022 3:47:17 AM 4 6/30/2022 9:35:02 PM appstest 6/24/2022 3:47:17 AM 5 6/30/2022 9:35:02 PM appstest 6/24/2022 3:47:17 AM 6 6/30/2022 9:35:10 PM appstest 6/24/2022 3:47:17 AM 7 6/30/2022 9:35:10 PM appstest 6/24/2022 3:47:17 AM
21) Select Show Waveform for waveforms in the results graph,22) Select the channels to be displayed.	Waveform View Options Show Waveform(s) Image: Constraint of the second seco
23) Select options on the View Options tab.	Waveform View Options Stack Waveform(s) Show Limits Aggregation Data Results Show Aggregation Windows
Adjust the limit lines and aggregation data f new weld.	or past welds to facilitate comparison to the
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.	Select All Results Edit Schedule Export To Excel

Schedule	
Selected Schedule: appstest	
Undo Changes Save Schedule S	ave Schedule As
Limits and Aggregates	
< < Enable Schedule Editor> Overwr	ite Historical Waveform Schedule
Principal Channel:	Current -
Limit Lines Aggregation Windows Aggrega	ation Limits
Aggregation windows Aggrega	suon cinius
Add Envelope Methods:	σ Above/Below Std Dev 🔹
Disable Upper Envelope	Disable Lower Envelope
Point X Point Y	Point X Point Y
Point (X , Y) 0.000 ÷ 0.000 ÷	Point (X , Y) 0.000 ÷ 0.000 ÷
[Add Envelope Limit] -> Click on gra	nh to insert envelope end points
p de Enterope Enter en gra	
Add/Edit Upper Envelope Envelope	Limit Color Add/Edit Lower Envelope
Delete Upper Envelope	Delete Lower Envelope
Undo Last Insert	Update
	Close

Historical Schedule Settings

WM-200A Network Resistance Welding Monitor System

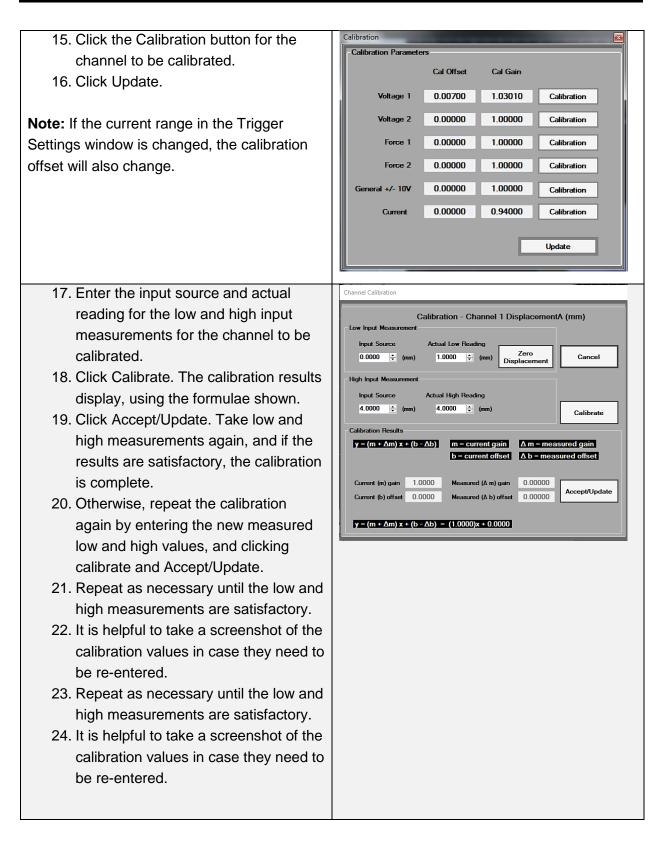
Sys Admin

Select Display Graph Options

Click Display button in Tool Bar	Status Display Job
Select Display Graph tab	Display Graph Digital Filter Analog Filter
Select channel, plot color and line type	Graph Options Channel Current Plot Color Line Type
Select auto scale for X, Y axes or set minimum and maximum limits for each axis	✓ Auto Scale Y Auto Scale X Y Max 1.500 ↓ X Max 14.483 ↓ Y Min 0.000 ↓ X Min -7.393 ↓
Click Update.	Display Options Stack Tile Update

Calibration

13. Click on Calibration button in the Tool Bar	History Aggregation Calibration
14. Click Yes on prompt to continue.	Networked Weld Monitor - Confirm Calibration Are you sure you want to change the Monitor Calibration ? Yes No



Job

Change Job or SKU number

4.	Click Job button in Tool Bar	Status	Job	Aggregation
5. 6.	Enter Operator name, Job number, SKU number (as required) Click Update	Production Data Operator in Control: Job Number: SKU Number:	< none	e > 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.

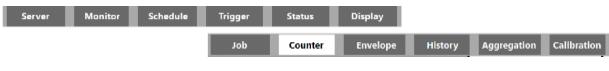


Figure 57: Engineer-Specific Links

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.

S	erver	Monito	or Sched	dule Tri	gger
Monitor S	ettings Syst	em Status	Display Settings	Job	Counter
Monitor	Sensors	Aggreg	ation Windows	LCD Display	Fieldbus
Principa	I Channel:	Current		•	
Show / H	lide Calculatio	ns			
			Aggregation W	lindow	
C	alculation	1	2	3	4
	RMS				
	Mean				
	Max				
	Min				
Standard	Deviation				
		Select A	UI		
				Updat	e

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.

Monitor Settings							
Monitor	Sensors	Aggregation Windows	LCD Display	Fieldbus			
- Monitor Sel	Monitor Selection						
Sel	ected Monitor	QA2 <e0608a54-c38f-< th=""><th>4FD2-B25A-D3C</th><th>11EEB •</th></e0608a54-c38f-<>	4FD2-B25A-D3C	11EEB •			
Current	Monitor UUID	E0608A54-C38F-4FD2-B25/	A-D3C11EEB5626				
	Current Name	(QA2				
	New Name						
MQTT Publish Calibrated Data Options							
Calibrated Aggregation Data							
			Update	-			

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	Server	Monitor Schedule
2.	Select the Monitor Tab	Monitor	Sensors Aggregation Windows
3.	Select a monitor from the dropdown list.	- Monitor Selection	
4.	Change the name of the monitor, if	Selected Mor	
	required.	Current Monitor U	Firmware Version: 1.00 Rev. A / 0000002 UUID AB219DE4-B7D4-4CAC-B475-6F547FBCEFD9 IP Address: [192.168.4.12]
		Current N	Name BASHFUL
		New N	Name

5.	Choose whether to publish Calibrated	MQTT Publish Calibrated Data Options
	Aggregation Data and/or Calibrated	Calibrated Aggregation Data "cal_weld_data/[MonUUID]" topic
	Waveform Data via MQTT.	Calibrated Waveform Data "cal_waveform[#]_data/[MonUUID]" topic Subscription topic examples:
	a. Published MQTT data can be	"cal_waveform1_data/+" [from all monitors channel1 waveform] "cal_waveform3_data/FE82UXW93K" [from monitorUUID FE82UXW93K channel8 waveform]
	read by a third party SPC tool	Published channel(s):
	that can receive MQTT	D1 D2 V1 V2 F1 F2 V3 I P1 P2 R1 R2
	messages. The third party SPC	Update
	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.	

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.

1) Select Monitor from the Tool Bar	Server Monitor Schedule
2) Select the Sensors tab	S. Monitor Sensors Aggregation Windows
 Select the ratio of the Rogowski coil being used 	Sensor Settings Coil (1 : 1) (10 : 1)
4) Indicate whether AC Mode in enabled.	AC Mode
 If AC Mode is enabled, set the AC Current frequency (within the range of 50 to 500Hz). 	AC Current Frequency 50 (50 500) Hz

6)	Set the sensor type for each		Display Unit
	displacement sensor (Heidenhain or	Displacement 1 Sensor Type	Heidenhain V (in) V
	Onosokki)	Displacement 2 Sensor Type	Heidenhain v (in) v
7)	Set the units (inches or millimeters)		
8)	Set the maximum input for each of the	Force 1 Sensor Max Input (lbf)	25 (bf) V
	two force sensors.		
9)	Set the display unit (lbf, N, or kgf)	Force 2 Sensor Max Input (lbf)	25 (lbf) ∨
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	Server		Monitor	s	chedule
2.	Select the Aggregation Windows Tab	Sensors	A	ggregation Window	rs L	CD Display
3.	Select a Principal channel from the	Monitor Settings				
	dropdown menu.	Monitor Sensor	s	Aggregation Windows	LCD Disp	play Fieldbus
		Principal Channel:		Voltage 1	۲	
4.	Check the type(s) of data to be	Show / Hide Aggrega	ition l	Data		
	aggregated and displayed in the	Calculation		Aggregation	Window 3	
	Aggregation Window and Aggregation	RMS	1	2	3	4
	Data Graph.	Mean				
5.	Set data types for up to four windows of	Max				
-	time for one or more of the selected	Min				
	principal channels. (The Select All option selects all data types for all windows for a	Standard Deviation		Select All		
	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.

Principal Channel:	Current		٠			
Show / Hide Calculations						
	Aggregation Window					
Calculation	1	2	3	4		
RMS						
Mean						
Мах						
Min						
Standard Deviation						
	Select All	I				
			Up	odate		

Figure 60: LCD Display Tab

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1.	Click the Monitor button in the Tool Bar	Server	N	Ionitor	So	hedule
2.	Select the Aggregation Windows Tab	Aggregation	Windows	LCD	Display	Fieldbus
3.	Select a Principal channel from the	Monitor Sensor	s Aggrega	ation Windows	LCD Displa	iy Fieldbus
	dropdown menu.	Principal Channel:	Current		٠	
4.	Click to select which data will appear on	Show / Hide Calcula	tions	Aggregatio	- Wi-d	
	the LCD display.	Calculation	1	Aggregatio 2	a window 3	4
5.	Click Update	RMS				
		Mean				
		Мах				
		Min				
		Standard Deviation				
			Select A	И		

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.

Fieldbus Connection Se	ttings	
IP address	192.168.100.3	
Subnet mask:	255.255.255.0	
Default Gateway:	192.168.100.1	Update
Scan Rate Settings		
Scan Rate:	10 (msec)	Update

Figure 61: Fieldbus Tab

CHAPTER 3: OPERATIONS

1)	Select Monitor in Tool Bar	Server Monitor Schedule
3)	Select the Fieldbus tab	Aggregation Windows LCD Display Fieldbus
4)	Set the IP address, subnet mask and	Fieldbus Connection Settings
	default gateway for the fieldbus.	IP address 0.0.0.0
5)	Click Update	Subnet mask: 0,0,0,0
6)	Set the scan rate in milliseconds	
7)	Click Update.	Default Gateway: 0.0.0.0 Update
-		
		- Scan Rate Settings
		Scan Rate: 10 Update

Trigger Tool

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

Trigger							
Trigger Settings							
Trigger Channel / Source	Voltage 1 V	Update					
Trigger Mode	Rising ~						
Trigger Level	0.20	(V)					
Current Sensitivity Level	990	(1 1000) Max Sensitivity					
Current Range	Very low : 2kA \sim	(kA)					
Trigger Control							
Current State [Continu	ious]	Force Trigger					
🔿 Off 💿 Continu	ious 🔿 Single	Update					

Tr	igger 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.
5)	

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.

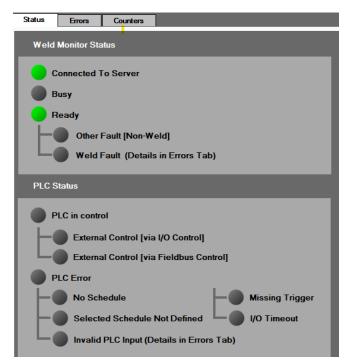


Figure 62: Status Tab

WM-200A Network Resistance Welding Monitor System

Error Tab

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

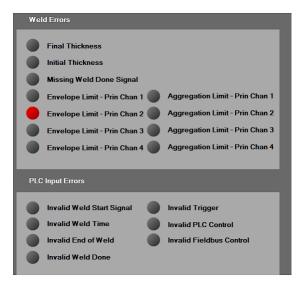


Figure 63: Error Tab

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.

Status Enus Counters Notworked Weld Monitor: Basth UI < 97 D304 EA-38A7-440 F-9F5D-45C712 F28001> Current Monitor: Schedule: denth15_bo_mms Current Monitor: Electrode - OK Total Weld Count 800891 Weld Count down to change Electrode 050332 Weld Passed 018750 Weld Passed 018750 Weld Passed 018750 Box Faited 3/0 %/r Facescold	System Status		зχ
Bashful <97D804EA-B6A7-44CF-9F5D-45C712F28001> Current Monitor Schedule: denthis iso mms Electrode - OK Total Weld Count Weld Count 800891 050332 Peset Weld Count Down Weld Passed 018750 030915 Read Passed Weld Passed 018750 030915 Read Passed UP Work Passed <t< th=""><th>Status Errors</th><th>Counters</th><th></th></t<>	Status Errors	Counters	
dennis_loc_rms Electrode - OK Total Weld Count 800891 Weld Count down to change Electrode 050332 Peset Weld Court Down 018750 Weld Passed 018750			
Total Weld Count Weld Count down to change Electrode Weld Passed 018750 Weld Passed 030915 Read Paramet/Failed 0.7 Weich Passed 0.7 Weich Pass			
Weld count down to change Electrode 050332 Head Weld Court Down Weld Passed 018750 030915 Road Parael/Failed Weld Failed 37 % Propriated ST % Propriated 3 % % Propriated		Electrode - OK	
chango Electrodo USUU3.32 Reset Weld Couré Down Weld Passed U18750 Weld Failed U30915 Rund Failed AV We Priceded Environment Like Avenue av	Total Weld Cou	* 800891	
Weld Passed 018750 Weld Failed 030915 Read Pared/Failed 37 % Pactod Env Event Ust u x Time Stamp Orunnel Env Type		5 USU33Z	
Weld Failed 030915 Read Parad/Failed A7 % Paragosi Error Event Ust 3 × Time Starto Channel Error Type		Reset Weld Count Down	
Rend Parend/Failed	Weld Passe	018750	
Enor Exercised Enor Type	Weld Faile	030915	
Enor Exert List 1 x x x x x x x x x x x x x x x x x x		Rend Parend/Falod	
Time Blanco Oriannol Error Type		37 % Passed	
Time Blanco Oriannol Error Type			
Time Blanco Oriannol Error Type	D 1 D m	c. o.	
<		Abara at Prove Free	- 1 X
	time stamp	criame Error type	
Clear Error Event List	<		,
		Clear Error Event List	

Figure 64: Counters Tab

WM-200A Network Resistance Welding Monitor System

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.

Weld Counter	<u></u> д				
Networked Weld Mo EricOffice	onitor: <97DB04EA-B6A7-44CF				
Current Monitor Schedule: testing					
A	lert — None				
Total Weld Count	005394				
Weld count down to change Electrode	009800				
	Reset Weld Count Down				
Weld Passed	000043				
Weld Failed	000332				
	Reset Passed/Failed				
- 11	% Passed				

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 <u>Display Settings</u> above for more information.

Server	Monitor	Schedule	Trigger	Status	Display		
Display Settings	Display Settings						
Display Graph Di	gital Filter Ana	alog Filter					
Display Options							
🗹 Stack 🗌 Tile	,		Update				
Display Channel(s) :	□ □ ☑ ☑ D1 D2 V1 V2	☑ □ □ ☑ F1 F2 GV I	✓ □ □ □ P1 P2 R1 R2				
Inverted Input(s) :	Image: Display state Image: Display state Image: Display state Image: Display state D1 D2 V1 V2	□ □ □ □ F1 F2 GV I	P1 P2 R1 R2				
Display Graph Layer(s	:):						
🗹 Waveforms 🗹	Trigger Position	Cursor Value L	ine				
🗹 Limit Lines 🗹	Aggregation Windo	w <mark>∕∕ Aggregation</mark> D	ata Results 🗸 🗸				
✓ Violations	Displacement Thick	kness Limits					
Graph Options				-			
Channel Currer	nt •						
Plot Color		Line Type	— ~				
Z Auto Sc	ale Y	🗌 Auto	Scale X				
Y Max 1.500		X Max 23					
Y Min 0.000	÷	X Min -13	3 <mark>.410 </mark>				

Job Tool

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

Server	Monitor	Schedule	Trigger	Status	Display	Job
Job						
- Production Data						
Operator in Control:	< none >	•				
Job Number:						
SKU Number:		L	lpdate			

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.

Weld Count Reset	1050005		Reset
Electrode Replacement Ale			nesei
	100000	•	

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.

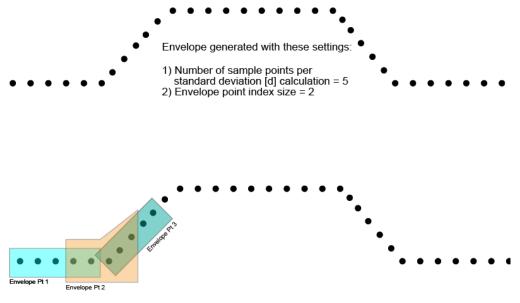
To create an envelope, begin by answering Yes to the final question in the Schedule Wizard or by clicking the Envelope Link in the Tool Bar.

• The Envelope Limit Wizard Setup window launches.

invelope Limit Wizard	
Envelope Upper/Lower Limit Setup	
Do you want to auto generate or manually draw the envelope limit(s)	? 🖲 Auto 🔿 Manual
Use the last number of welds for the envelope limit calculation	5 (2500 Max)
Number of sample points per standard deviation σ calculation	10 🗘 [5500 Max]
Envelope point index size (must be < = number of sample)	10 🔹 [2500 Max]
Custom Start / End envelope position	
Use custom X start position -1.00 🗘	Use custom X end position
Do you want to generate the upper envelope limit ?	● Yes ○ No
Select standard deviation σ for the upper envelope limit	+ 2 Sigma σ 🛛 🗸
(Upper standard dev σ envelope = mean + upper σ + upper Δ) Enter the Δ value for the upper envelope limit	0.000 🔹 [020 Max]
Do you want to generate the lower envelope limit ?	● Yes ○ No
Select standard deviation σ for the lower envelope limit (Lower standard dev σ envelope = mean - lower σ - lower Δ)	- 2 Sigma σ 🛛 🗸
Enter the Δ value for the lower envelope limit	0.000 🗘 [020 Max]
	< Back Next > Finish Cancel

Figure 67: Envelope Limit Wizard

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





- 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.

	nvelope L	imit View		
	Ivelope L		Graph last # of welds : 5	Principal channel : Current (kA) v
	t Envelope [Alt + Left]	Mouse Drag]	Live Data - Time (msec)	To Zoom [Alt + Right Mouse Drag]
0	0.140 0.140 0.120			
Current (kA	0.080 0.060 0.040			
0 -0	0.000 - 0.020 -	e po positivi integranda de la deserva da forma d Esta da compositivi da forma d		1 Annual and a second sec
<	-10			· · · · · · · · · · · · · · · · · · ·
Item	Schedule Name		Weld Date / Time	Ignored / Excluded
57 58	stephentest4 stephentest4		5/20/2021 5:53:59 PM 5/20/2021 5:54:01 PM	
59	stephentest4		5/20/2021 5:54:01 PM	
60	stephentest4		5/20/2021 5:54:05 PM	
61	stephentest4	5	5/20/2021 5:54:07 PM	
62	stephentest4		5/20/2021 5:54:09 PM	
<	Veld Update ON Clear SPC List			
			< Back Next > Finish Cancel	

• 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.

Auto Generated Envelope	Manu	al Add Envelope	
Sample size per Std Dev o:	10	Custom X Start Pos :	Upper Env Std Dev o: + 2 Sigma V Upper Env Std Dev A: 0.000 C Generate Envelope
Envelope point index size :	10	Custom X End Pos :	Lower Env Std Dev o: - 2 Sigma t > Lower Env Std Dev A : 0.000 Update Schedule

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.

	Auto Generated Envelope	Manual Add Envelope			
Weld Update ON	Disable Upper Envelope	Add/Edit Upper Envelope	Delete Upper Envelope		
Clear Weld Data List	Disable Lower Envelope	Add/Edit Lower Envelope	Delete Lower Envelope	Undo Last Insert	Update Schedule

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.

🔜 Historical Data Search			×
Search Results			
O Local Time O UTC Search By:	All Records *	Filter By: Results	Close
Start: 06/15/2021 19:50:56	Grumpy <46392BE9-2772-49E8-B7! -	Job Number:	
End: 06/15/2021 19:50:56 🕞 🗸 Schedule Name:	0 -	SKU Number:	
Operator:	0 -	Search	Include Ignored Weld Data

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. Determine whether the time expressed in the start and end times is in local time or UTC based on a 24 hour clock.	Search Results ○ Local Time ● UTC Start: 10/06/2022 20:33:20 □ ■ End: 10/06/2022 20:33:20 □ ■
1)	Define the scope of the search by	Search By: All Records
	selecting an option in the Search By field.	Monitor UUID: New_Device <049598D3-2928-4E5! -
	a) You can choose to search All	Schedule Name: 0
	Records, in which case other search	Operator: 0
	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. 	io po ar ai rc m	atior hoos aran baran I pro Ie m	nbina ou ch re pa se pa I will ilable	you ore ose id v aila	ml /or ore ose d ail	mk ore ose d v aili	nb ou re se wila	bi u e w la	in p vil	ha hai ba l p le	tic oc rai ra orc orc	n n m m	o et et id	ft o er ei	he s s, s a	ese th wi	e rc e II	be s be be	ara by ea ec	ame y o arch om wn	eter ne n fie ne a list	rs. or eld: acti of	s for ve
1)	Further define the scope of the results to	ə	ine t	defi	er c	er o	r c	d	de	e	fir	ne	th	ne	s	СС	pe	9 (of	th	e r	esı	ults	to
	be displayed by applying one or more filters. The default is to have no filter. You		-	-	-	-			-	-			-		-	-		-						V ~ · ·
	can choose to filter by:			-						-	-	-	-					19		eı	10	me	÷1.	rou
	a) Limit violations	ati	olatio	it vic	nit	nit	nit	it	t١	vi	ol	at	io	n	5									
	b) Aggregation violations	0	atior	grega	ggre	ıgr	gr	jre	re	eg	ja	tic	n	v	ol	at	io	าร	5					
	c) PLC IO violations	0	viol	010	.C	C	С		1	С) \	/ic	la	ti	on	s								
	d) Job number (enter Job number)	e	mbei	nun	b r	bı	o r	n	nı	u	m	be	er	(e	n	e	٢J	oł) I	nu	ımt	ber))	
	e) SKU number (enter SKU number)	b	ımbe	J nu	٢U	Û	U	J	۱r	nı	un	nb	e	r (er	nte	er	SI	K١	U	nur	nbe	ər)	
	f) Good Weld (No Violation)	lc	Veld	od W	000	00	00	bd	d	V	N	elo) k	N	0	Vi	ol	ati	io	n)				

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.)

Search	Results												
	chedule [DoubleClick or	n Graph - Sch	edule Editor]			Historical Data	- Time (msec)				т	o Zoom [Alt + Right	Mouse Drag]
1.200 					Historical	Data	ı Sear	ch Gra	aph				
0.000-													
0.0		. ().2	9. 	0.4		0.6		0.8		1.0		1.2
<		_											>
Search I	Results Total Fo	und:	300		Select All Results		Edit Sched	le	Export	To Excel			
Item	Weld Date/Tin	ne (UTC)	Schedule N	ame	Schedule Last Modified	Monit	or UUID	Operator Name	e Mar	k As Ignored	Weld UUID		^
1	4/28/2022 7:49:3		qa2newserven		4/27/2022 4:39:37 PM	QA2		< none >			626aefcb4f6ea9131		
2	4/28/2022 7:49:3	the second s	qa2newserven		4/27/2022 4:39:37 PM	QA2		< none >			626aefcc4f6ea9131		
3	4/28/2022 7:49:3		qa2newserven		Historical	Data	Soor	ch Gra	nh		626aefcf4f6ea9131 626aefd04f6ea9131		
5	4/28/2022 7:49:3	CONTRACTOR OF THE OWNER	qa2newserven qa2newserven	-	Historical	Dala	oear	GIGIa	apri		626aefd34f6ea9131		
6	4/28/2022 7:49:3		ga2newserven	-	4/27/2022 4:39:37 PM	QA2		< none >			626aefd44f6ea9131		
7	4/28/2022 7:49:4		qa2newserven		4/27/2022 4:39:37 PM	QA2		< none >			626aefd74f6ea9131		
					1030000 100 03 011	مىما					000 11040 0101	- 00000	<u> </u>
Sear	ch Progress:								Abor	Search			
Wavef	orm View Op	tions							_				
	Show Waveform(s)		_		Wavefo	orm \	/iew C	ptions	5			_	_
	Displacement 1	🗹 Volta	age 1 🗌 Fe	orce 1	Voltage 3	Powe	r 1 🗌 R	esistance 1	Displa	y <mark>Mu</mark> ltiple			_
	Displacement 2	Volta	age 2 🗌 Fi	orce 2	Current	Powe	r 2 🗌 R	esistance 2	Select	ed Results		Close	

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.

ltem	Weld Date/Time (UTC)	Schedule Name	Schedule Last Modified	Monitor UUID	Operator Name	Mark As Ignored	Weld UUID	
4	6/14/2021 7:49:06 PM	tomo	6/11/2021 4:42:52 AM	Grumpy	< none >		60c7b2b24f6ea92f24cb09	
5	6/14/2021 7:49:07 PM	tomo	6/11/2021 4:42:52 AM	Grumpy	< none >		60c7b2b34f6ea92f24cb09	
6	6/14/2021 7:49:08 PM	tomo	6/11/2021 4:42:52 AM	Grumpy	< none >		60c7b2b44f6ea92f24cb09	
7	6/14/2021 7:49:09 PM	tomo	6/11/2021 4:42:52 AM	Grumpy	< none >		60c7b2b54f6ea92f24cb09	
8	6/14/2021 7:49:10 PM	tomo	6/11/2021 4:42:52 AM	Grumpy	< none >		60c7b2b64f6ea92f24cb09	
9	6/14/2021 7:49:11 PM	tomo	6/11/2021 4:42:52 AM	Grumpy	< none >		60c7b2b74f6ea92f24cb09	
10	6/14/2021 7:49:12 PM	tomo	6/11/2021 4:42:52 AM	Grumpy	< none >		60c7b2b84f6ea92f24cb09	
	0 /4 / /0004 7 /0 40 DM		0 444 40004 4 40 50 444	_				

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.

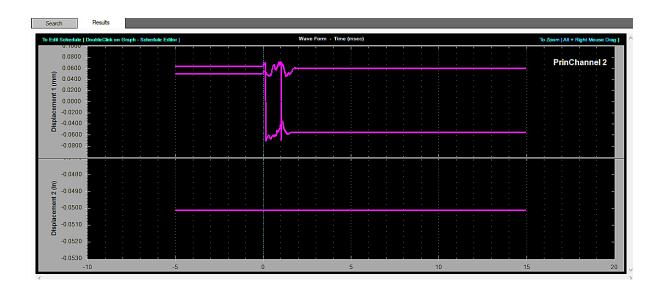
Waveform	View Op	tions			
Show	Waveform(s)				
🗹 Displa 🗹 Displa		✓ Voltage 1 ✓ Voltage 2	✓ Force 1 ✓ Force 2	General +/- 10V	Power 1 Power 2

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.

Waveform View Options				
✓ Stack Waveform(s) ✓ Aggregation Data Results ✓	Show Limits Show Aggregation Windows	Digital Filter: Cutoff Frequency:		Close

Stack Waveforms Stacks the waveforms selected in the Waveform tab.	L'enclose (restance) mort de la construction de la
Show Aggregation Windows Shows the Aggregation Windows for those waveforms which include them (highlighted in blue).	Vide and provide a long data of the long and
Aggregation Data Shows the aggregation data associated with the waveform, as selected from the dropdown list on the View Options tab.	Nite Statute (second state) Burders, Harring State (second state) Price Channel 3
Show Limits Shows the limits associate with a waveform, if established.	Visit binde (indexting in bind did) Non-left Tephenology 0000 Princhamel 2 0000 Princhamel 2 0000 Princhamel 2 0000 Princhamel 1 0000 Princhamel 1 0000 Princhamel 1 0000 Princhamel 1 0000 Princhamel 2 0000 Princhamel 2 0000 Princhamel 2 0000 Princhamel 1 0000 Princhamel 1 0000 Princhamel 2 0000 Princhamel 2 0000 Princhamel 3 0000 Princhamel 4 0000 Princhamel 3 0000 Princhamel 4 00000 Princhamel 4
Digital Filter Cutoff Frequency	Establishes whether a Butterworth filter is applied and the cutoff frequency for that filter.

Figure 74: Historical View Options

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.

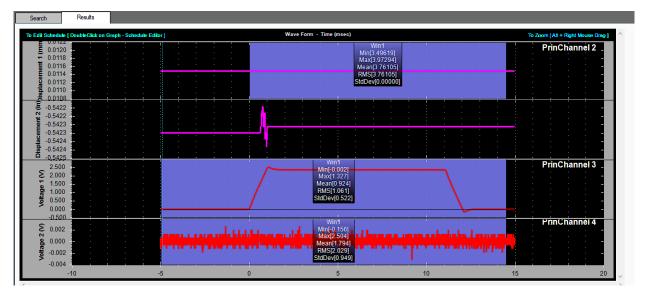
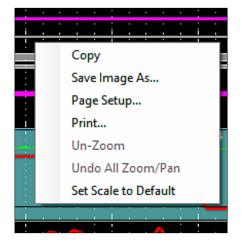


Figure 75: Historical Graph

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 <u>Live –</u> <u>Weld Monitor Graph window</u>. 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 <u>above</u>, the principal difference being the inclusion of an option to enable the schedule editor.

Limits and Aggregates			
<enable editor="" schedule=""> Overwri</enable>	te Historical Waveforr	n Schedule	
Principal Channel:	Current (kA)	•	

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

Schedule	
Selected Schedule: pwrcycletest	
Undo Changes Save Schedule Save Schedule As	

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.

Historical Schedule Settings
Schedule
Selected Schedule: slot5d
Undo Changes Save Schedule Save Schedule As
Limits and Aggregates
Schedule Editor> Overwrite Historical Waveform Schedule
Principal Channel: Current
Limit Lines Aggregation Windows Aggregation Limits
Add Envelope Methods: σ Above/Below Std Dev -
Disable Upper Envelope Disable Lower Envelope
Point X Point Y Point X Point Y
Point (X . Y) 0.000 0.000 Point (X . Y) 0.000 0.000 0.000 [Add Envelope Limit] => Click on graph to insert envelope end points Add/Edit Upper Envelope Envelope Limit Color Add/Edit Lower Envelope
Delete Upper Envelope Delete Lower Envelope
Undo Last Insert Update
Close

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.

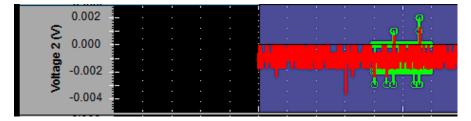
🔛 Generate Envelope Limit		×
# of samples per Std Dev o:	1 🔺	(Min: 1) (Max: 625)
Envelope point index size	1 🛓	(min: 2) (max: 500)
Use Custom Start / End Envelope Po	osition	
Start Position	nd Position	
-1.00 호	1.00 🗘	
Generate Upper Envelope σ: Upper Envelope Δ:		(x.xx ơ)
(Upper standard dev σ envelope = m	nean + x.xx o	r + upper∆)
Generate Lower Envelope σ: Lower Envelope Δ:	2.00 ‡ 0.000 ‡	(у.уу а)
(Lower standard dev σ envelope = π	nean - y.yy σ	-lower∆)
	Add	Cancel

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.

Disable Upper Envelope			Disable Lower Envelope		
Point X	Point Y	^	Point X	Point Y	^
-1.010	-2.025		-1.010	-2.029	
-1.000	-2.025		-1.000	-2.029	
-0.990	-2.025		-0.990	-2.029	
-0.981	-2.026		-0.980	-2.029	
-0.970	-2.025	~	-0.970	-2.029	~
Point (X , Y) -	0.980 😩 -2.026	* *	Point (X , Y)	0.000 ≑ 0.000)

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.

Disable Upper Envelope				
Point X	Point Y	>		
-5.000	-0.003			
-4.985	-0.001	1		
-4.970	-0.002			
-4.955	-0.003			
-4.940	-0.004	~		
Point (X , Y) 0.000 + 0.000 +				

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.

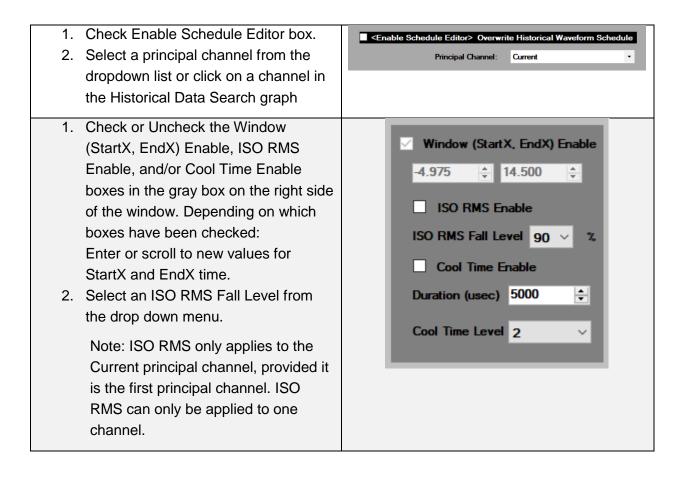
Edit Schedule - Aggregation Windows

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.

mits and Aggregates Schedule Editor> Overwrite Historical Waveform Schedule						
		Principa	al Channe	el: Currer	ıt	•
imit Lines	Aggrega	tion Windo	ws Ag	gregation Limit	s	
Start X	End X	Enable	ISO RMS	Fall Level	Cool Ti Enable	🧹 Window (StartX, EndX) Ena
-4.975	14.500	V	Г	90		-4.975 💠 14.500 💠
						ISO RMS Enable
						ISO RMS Fall Level 90 🗸
						Cool Time Enable
						Duration (usec) 5000
						Cool Time Level 2
<					>	2
Add	Window		Delete	Window		Jpdate Window Color

Figure 77: Edit Schedule - Aggregation Windows

To Edit an Aggregation Window



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.

To Add an Aggregation Window

1.	Check Enable Schedule Editor box.	Limits and Aggregates Imit Lines Aggregation Limits Start X Frind Find Enable Start X X Good Time Enable ISO RMS Fail Level 30 < Z Cool Time Level 2 Z Cool Time Level 2 Z Add Window Delete Window Update Window Color [Add Window] -> Click on graph to select aggregation window start/end points
2.	Select a principal channel from the dropdown list or by clicking on a channel in the Historical Data Search graph.	
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.	
4.	Click Update. The list of aggregation windows and the graph each update	

	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.

Limit Lines Aggregation Windows Aggregation Limits						
Aggregation Limit Settings						
Aggregation Window: Win1 -						
Enable Lower Limit Enable Upper Limit						
RMS 0.000 0.000						
Mean 0.000 0.000						
Min 0.000 0.000						
Max 0.000 0.000						
Std Dev 0.000 0.000						
Update						

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.

🔛 Export Data		- 🗆 ×
- Data Types		
Weld Data	Instantaneous Limit Violations	Production Data
Monitor UUID	Summary of Violations	Operator
Weld Date/Time	Individual Violations	Job Number
Schedule Name		SKU Number
Schedule Mod Date/Time	PLC I/O Violations	
	Summary of Violations	
Waveform Data Output Sampling Rate		
Displacement 2	Aggregation Limit Violations	Aggregation Data
Voltage 1	Summary of Violations	StdDev
Voltage 2	Individual StdDev Violations	RMS
Force 1 Power 1	Individual RMS Violations	ISO RMS
Force 2 Power 2	Individual Mean Violations	Mean
General +/- 10V Resistance 1	Individual Min Violations	🗌 Min
Current Coil Resistance 2	Individual Max Violations	🗌 Max
Select All Clear All	ОК	Cancel

Figure 78: Export Data Window

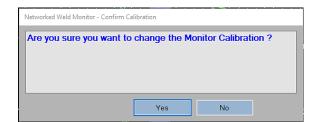
Once the data types have been selected, click OK to generate the Excel spreadsheet. A dialog box will display, naming the file as *Export*" *current date and time*." Click Save or change the name of the file to save.

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.

Calibration						
-Calibration Parameter	rs					
	Cal Offset	Cal Gain				
Voltage 1	0.00700	1.03010	Calibration			
Voltage 2	0.00000	1.00000	Calibration			
Force 1	0.00000	1.00000	Calibration			
Force 2	0.00000	1.00000	Calibration			
General +/- 10V	0.00000	1.00000	Calibration			
Current	0.00000	0.94000	Calibration			
			Update			

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

Channel Calibration				
Low Input Measurer Input Source 0.0000 ≑ (i	nent Actual	tion - Channel 1 Dis	Zero	A (mm)
High Input Measure	ment	High Reading	placement	
4.0000 ÷ (r	nm) 4.0	1000 韋 (mm)		Calibrate
<u>y = (m + Δm) x</u>	+ (b - Δb)	m = current gain b = current offset	Δ m = meas Δ b = meas	
Current (m) gain	1.0000	Measured (A m) gain	0.00000	
Current (b) offset	0.0000	Measured (∆ b) offset	0.00000	Accept/Update
$y = (m + \Delta m) x$	+(b-∆b) =	(1.0000)x + 0.0000		

- 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 reentered.

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

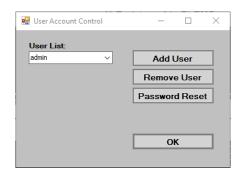


Figure 79: User Account Controls window

Ne	w User		-		×
	Name				
	Username				
	Password				_
	Role				0
	Operator (ReadOnly)			~	
		ок	Car	ncel	

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 <u>above</u>.

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

	Networked RW M	Ionitor		
Farms Opprave Settings	RW Monitor Info			
della	Data/Dense	2023-13-21 37:30;37		
Cathorn Salteran	1430	Generation 2028 4025 910C 6800A7020008 (Grunty)		
Arangan Setting) Emailipse anim	Data Drive	Macrited (7% must, 438548 MB from) (Storage Info]		
aggrithe-addings (d)	1075 (voe	strandisk		
	Uptonia	sap 2:20, low average: 1,07, 5:06, 1.95		
And the set of the set	Prinsien Weissen	E.3 Rev. R / 0000002		
	Webspp Version	6.000		
Galancos introda	development Version	1.027		
Setton 100	Rethon/WeldLogger Version	L012		
References (wrive, logger Wytolon	6.01		
Test Corpole	rpresp.provy Version	0.04		
Amer Proble				

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"

(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) $-0 \rightarrow 1$, after Start measure input is set high then it will record the weld activity until Weld Time (in) $-1 \rightarrow 0$.

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

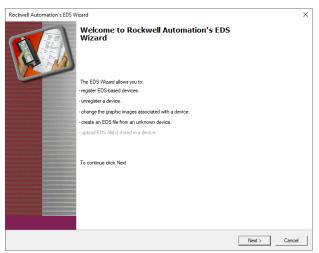
Section II: EtherNet/IP Configurations

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
 - 👸 RSLogix 5000 File Edit View Search Logic Communications Tools Window Help 🛛 🗸 🔲 RUN Options... No Controller No Forces Security 100\Backplane\0 a ∎ 1/0 No Edits Documentation Languages... Redundancy 0.0 Import ٠ Export . BDS Hardware Installation Tool Motion . Custom Tools... ControlFLASH
 - b) Select Tools \rightarrow EDS Hardware Installation Tool

c) Select Next to continue.



WM-200A Network Resistance Welding Monitor System

- Rockwell Automation's EDS Wizard
 X

 Options What task do you want to complete?
 Image: Complete and Complet
- 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**.

Rockwell Automation's EDS Wizard		×
Registration Electronic Data Sheet file(s) will be added to	o your system for use in Rockwell Automation applications.	
6.5		
Register a single file	_	
C Register a directory of EDS files	Look in subfolders	
Named:		
C:\NetworkedRWMonitor\NRWM.eds	Browse	
• If there is an icon file (ico) with the satisfies then this image will be associated with	ame name as the file(s) you are registering the device. To perform an installation test on the file(s), click Next	
	< Back Next >	Cancel

f) Select the "NRWM.eds" file and click on Next.

Rockwell Automation's EDS Wizard		×
EDS File Installation Test Results This test evaluates each EDS file for errors in the EDS file. This test does not guarantee f	EDS file validity.	Į.
□ Installation Test Results		
View file	< Back Next > Ca	ancel

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

Rockwell Automation's EDS Wizard	×
Change Graphic Image You can change the graphic image that is associated with a device.	
Product Types	
Change icon Vendor Specific Type Network Resistance Weld Monitor	
< Back Next > C	Cancel

h) On the Final Task Summary, select "NRWM" and click on Next.

Rockwell Automation's EDS Wizard			×
Final Task Summary This is a review of the task you want to complete.			
You would like to register the following device. Network Resistance Weld Montor			
	< Back	Next >	Cancel
	< DOUK	INCAL >	Cancer

i) Click on Finish to register the "NRWM.eds" file.

Rockwell Automation's EDS Wizard	\times
You have successfully completed the EDS Wizard.	
Finish	

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	UINT16	Weld results
			Good		0 = Within Limits
					1 = Not Within Limits
		0x03 (3)	Machine	UINT16	Machine Error Status
			Error		0 = No Error 1 = Error
		0x04 (4)	Weld Count	UINT16	Weld Counter Max Status
			Up		0 = Not active 1 = Active
		0x05 (5)	Displacement	UINT16	Displacement Cutoff Status
			Cutoff		0 = Not Active 1 = Active
		0x06 (6)	End	UINT16	Secondary Thickness OK
			Thickness Ok		(Not used)
		0x07 (7)	Init	UINT16	Initial Displacement Status
			Displacement		0 = Not Within Limits
			Ok		1 = Within Limits
		0x08 (8)	PLC Control	UINT16	PLC Control Status
			Out		0 = Not Active 1 = Active
		0x09 (9)	Ready Weld	UINT16	Ready for Weld Status
					0 = Not Active 1 = Active
		0x0A	Error Primary	UINT16	Primary Channel 1 Error
		(10)	Channel 1		Status 0 = No Error 1 = Error
		0x0D (44)			
		0x0B (11)	Error Primary	UINT16	Primary Channel 2 Error Status
			Channel 2		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	0x01 (1)	Weld Time	UINT16	Weld in progress
	(150)				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	UINT16	Reset Weld Counter
			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 0 = Not set 0 = Not set	ent
0x07 (7) Schedule 8 UINT16 Schedule # assignment 0x07 (7) Schedule 8 UINT16 Schedule # assignment 0 = Not set 0 = Not set	ent
bit 3 0 = Not set	ent
1 = Set	
0x08 (8) Schedule 16 UINT16 Schedule # assignm bit 4	ent
0 = Not set	
1 = Set	
0x09 (9) Schedule 32 UINT16 Schedule # assignment bit 5	ent
0 = Not set	
1 = Set	
0x0ASchedule 64UINT16Schedule # assignment(10)bit 6	ent
0 = Not set	
1 = Set	
0x0B (11) Schedule 128 UINT16 Schedule # assignment bit 7	ent
0 = Not set	
1 = Set	
0x0CResetUINT16Reset Displacement(12)DisplacementCounter	0
Counter 0 0 = No reset	
1 = Reset	
0x0D Reset UINT16 Reset Displacement	1
(13) Displacement Counter	
Counter 1 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

Dimensions

Height: 14 inches (356 mm)

Width: 6 inches (152 mm)

Depth: 13 inches (330 mm)

Weight: 14.0 lb. (6.35 kg)

SPECIFICATIONS



Electrical Requirements

In Line Fuse

Input power requirement: 90 - 264 VAC.

10A, 250VAC Time Lag Fuse size 5mm x 20mm (Qty 2)

Technical Parameters

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

APPENDIX A: TECHNICAL SPECIFICATIONS

Channel	Range	Minimum Displayed Resolution	Accuracy	Repeatability
		(16 bits)		
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.

APPENDIX A: TECHNICAL SPECIFICATIONS

Parameter	Specifications
Parameter Minimum Current Rise (Current Coil Applications) Elements Stored in Database	 Specifications 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 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
	 RMS voltage 1 & 2 Voltage result Peak power 1 & 2 RMS power 1 & 2 Power result Peak resistance 1 & 2 RMS resistance 1 & 2 RMS resistance result Force result 1 & 2 Initial thickness 1 & 2 Final thickness 1 & 2 Alternate Result Weld status
Waveforms	 Counter 1 & 2 Current Voltage 1 Voltage 2 Voltage 3 Force 1 Force 2 Displacement 1 Displacement 2 Resistance 1

APPENDIX A: TECHNICAL SPECIFICATIONS

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.

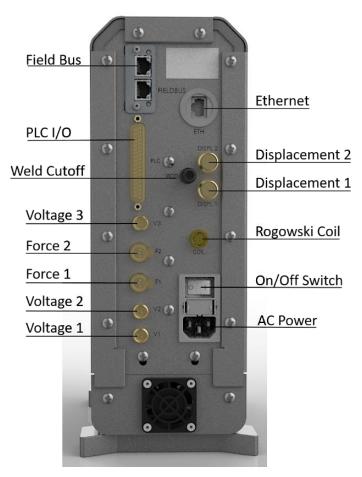


Figure 82: Monitor Rear Panel Connectors

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)

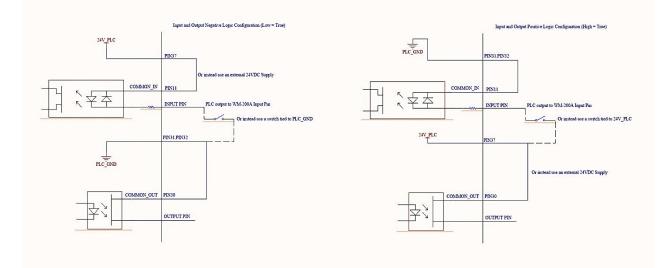
APPENDIX B: ELECTRICAL AND DATA CONNECTIONS

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	0	24 V	Primary Channel 1 Error Indicator	
20	RDY WELD	0	24 V	Monitor ready for weld to begin	
21	WELD GOOD	0	24 V	Weld results were within the defined limits	
22	NO WELD DET	0	24 V	No trigger was sensed during a weld	
23	WELD NO GOOD	0	24 V	Weld results were not within the defined limits	
24	MCH ERR	0	24 V	Machine Error Active when PLC control signals are out of sequence	
25	WELD CNT UP	0	24 V	Active when counter reaches its max	

APPENDIX B: ELECTRICAL AND DATA CONNECTIONS

Pin #	Name	IN/OUT	Voltage	Description	
26	DISP CUTOFF	0	24 V	Active when the displacement reaches the weld cutoff limit	
27	END THICKNESS OK	0	24 V	Secondary thickness OK(Unused)	
28	I DISP BAD	0	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	0	24 V	Active when Fieldbus is in control	
34	ERR PC4	0	24 V	Primary Channel 4 Error Indicator	
35	ERR PC3	0	24 V	Primary Channel 3 Error Indicator	
36	ERR PC2	0	24 V	Primary Channel 2 Error Indicator	
37	24 V	0	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.

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	In this mode external control is used, but Auto Mode and Cool Time,
Auto Mode	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 Requires that Auto Mode is enabled in Displacement tab. 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"

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

APPENDIX B: ELECTRICAL AND DATA CONNECTIONS

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	Suitable for manual use of WM-200A. May be used to configure and set up the unit.
Non- Auto Mode	 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.

APPENDIX B: ELECTRICAL AND DATA CONNECTIONS

I/O Mode	Description		
	Initial and Final Thickness limit errors reported		
Remote Control Auto Mode	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. 		

Displacement Connectors

Fifteen pin female connectors.



Pin#	Name	Direction	Voltage	
1	SIG1	0	0 to 5 V	
2	SIG 2	Ι	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

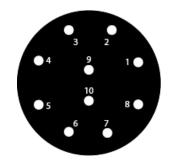
This connector is used to turn off a welder when a configured displacement distance has been reached. Four pin female connector.



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

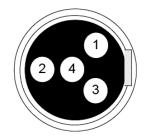
Ten pin female connector.



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

Force Channels (F1 and F2)

Four pin female connector.



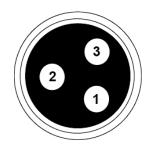
Pin#	Name	Direction	
1	24 V	0	
2	Sig+	I	plus 10 V to minus 10 V
3	GND		
4	Sig-	I	plus 10 V to minus 10 V

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

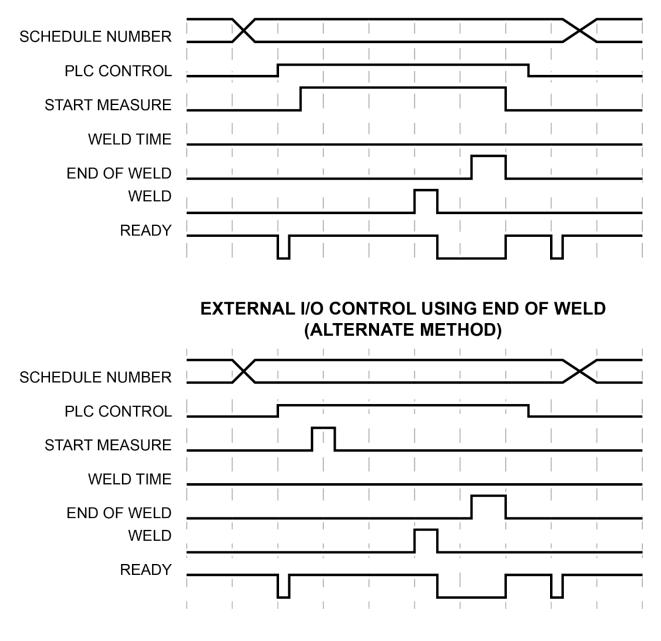
- PLC CNTL has a debounce period of 4ms. No other input signal should go active prior to that time except for those schedule signals which must be activated before PLC CNTL.
- PLC STRT MEASURE has a debounce period of 2ms. Any subsequent input signal relevant to the handshaking, such as End of Weld,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

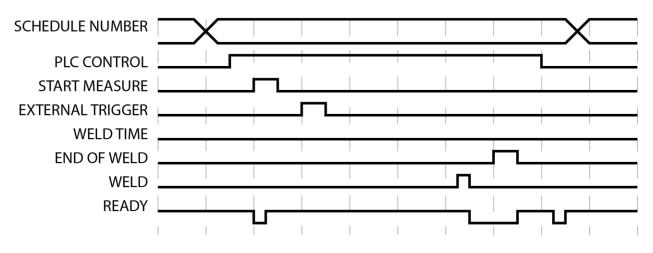
• All active status output signals (WG, NWeld, PCerr, InitDispBad, and EndDispOK, but not WNG) are asserted at the same time.

Commonly used acronyms

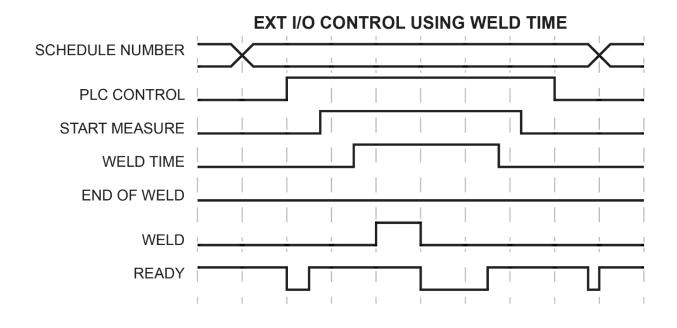
Acronym	Definition
EOW	End of Weld
EndDispOK	End Displacement OK
InitDispBad	Initial Displacement Bad
NWELD	No Weld
WG	Weld Good
WNG	Weld No Good

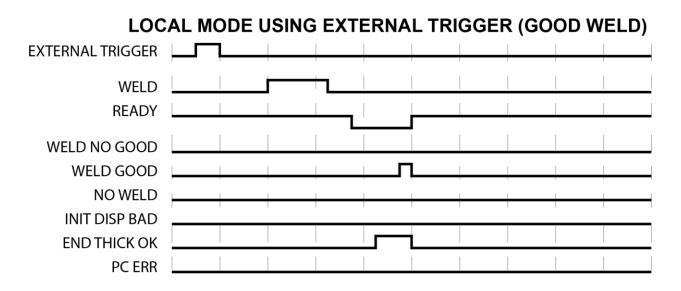


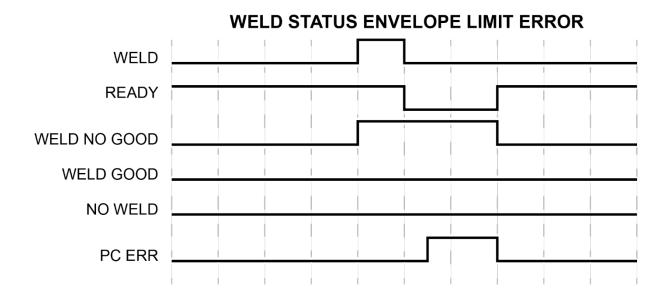
EXTERNAL I/O CONTROL USING END OF WELD



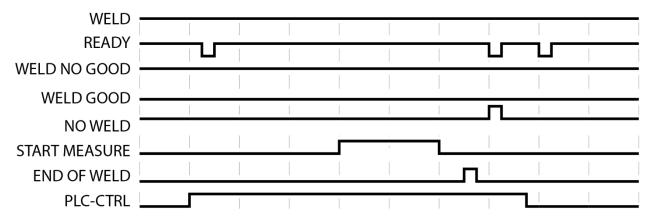
EXTERNAL I/O CONTROL USING END OF WELD AND EXTERNAL TRIGGER



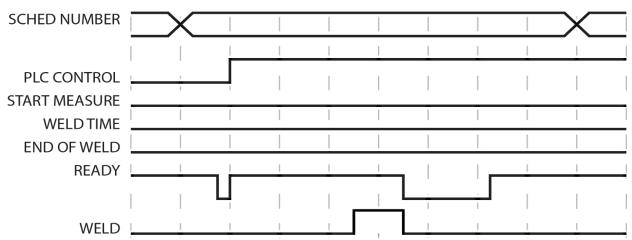


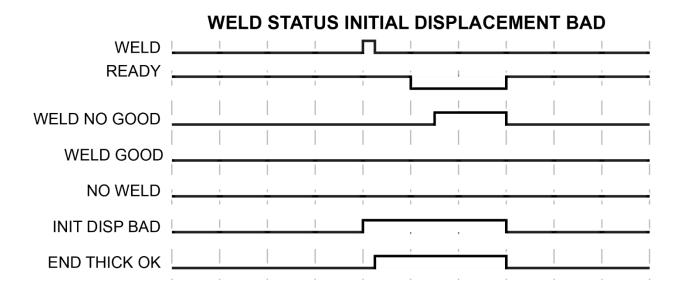


NO WELD DETECTED IN EXTERNAL MODE (NON-AUTOMODE)

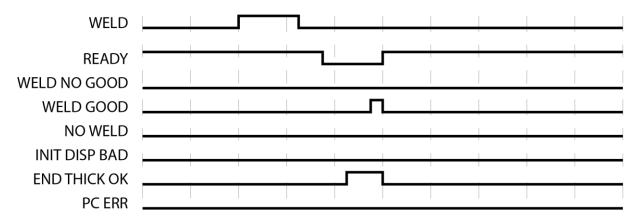


EXT I/O AUTOMODE





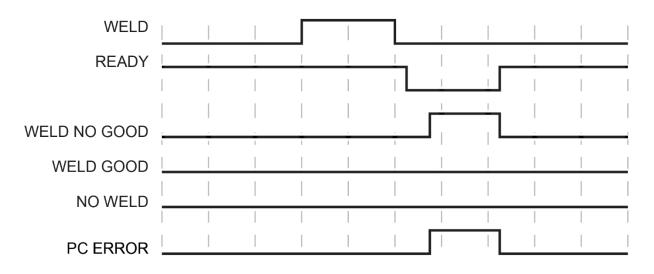
WELD STATUS (GOOD WELD)





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 <u>RestAPI End Point Request Tutorials</u> for examples on how to access these end points.

Definitions

1. <u>Get Active Device List</u>

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

Data Params: None

Success response:

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 <u>Data Structure: DeviceNameInfo</u> // unique UUID of device to register with

Success response:

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

Error response:

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

3. <u>Get Device Schedule List</u>

URL: /CDBRestAPI/GetDeviceSchedules/<device_uuid> Method: GET URL Params: device_uuid = Uuid of registered device

Data Params: None

Success response:

```
{
    "device_schedules": { see <u>Data Structure: Device Schedule Settings</u> },
    "response": {
        "status": "OK",
        "msg": ""
     }
}
```

Error Response:

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

4. <u>Get Schedule</u>

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:

Error response:

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

5. <u>Get Device Schedule Info List</u>

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 <u>Data Structure:</u>
    <u>Schedule Info List</u>},
    "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. <u>Get Schedule By Schedule UUID</u>

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:

}

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. <u>Get List of All Users</u>

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 " }

WM-200A Network Resistance Welding Monitor System

}

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. <u>Get Calibrations</u>

URL: /CDBRestAPI/GetCalibrations/<device_uuid>
Method: GET
URL Params: device_uuid = Uuid of registered device

Data Params: None

Success response:

```
{
    "channels_calparams": { see <u>Data Structure: Channel Calibration</u> },
    "response": {
        "status": "OK",
        "msg": ""
        }
}
```

Error response:

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

11. <u>Get Production Data</u>

URL: /CDBRestAPI/GetProductionData/<device_uuid> **Method:** GET

URL Params: device_uuid = Uuid of registered device

Data Params: None

Success response:

```
{
    "production_data": { see <u>Data Structure: Production Data Settings</u> },
    "response": {
        "status": "OK",
        "msg": ""
        }
}
```

Error response:

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

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12. Update Production Data

URL: /CDBRestAPI/UpdateProductionData

Method: POST

URL Params: None

Data Params: Production Data Settings // see <u>Data Structure: Production Data</u> <u>Settings</u>

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 <u>Data Structure: Display Aggregate Data</u>
             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 <u>Data Structure: Display Aggregate Data</u>
     <u>Fields</u> },
```

```
"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 <u>Data Structure: Display Aggregate Data</u> <u>Fields</u> },

Success response:

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

Error response:

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

16. <u>Get Central Server DateTime</u>

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": ""
        }
}
```

```
{
    "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 <u>Data Structure: Weld Data</u>},
              "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 <u>Data Structure: Weld Waveform2</u>},
    "response": {
        "status": "OK",
        "msg": ""
     }
}
```

```
{
    "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 <u>Data Structure: Weld Waveform3</u> },
    "response": {
        "status": "OK",
        "msg": ""
    }
}
```

21. Get Weld Waveform4 By ID

```
URL: /CDBRestAPI/GetRWWeldWaveform4ByID/id
```

Method: GET

```
URL Params: None
```

Data Params: None

Success 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 <u>Data Structure: Weld Waveform5</u> },
    "response": {
        "status": "OK",
        "msg": ""
     }
}
```

```
{
    "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": 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": 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": 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": 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": 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 <u>Data Structure: Weld Waveform11</u> },
    "response": {
        "status": "OK",
        "msg": ""
     }
}
```

```
{
    "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": 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-

APPENDIX C: NRWM CENTRAL SERVER RESTAPI

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 <u>Aggregate Limit Settings</u> data structure	
plc_io_settings	See PLC I/O Settings data structure	

Success response:

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

Error response:

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

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2. <u>Update Schedule</u>

URL: /CDBRestAPI/UpdateSchedule Method: POST URL Params: None

Data Params: Schedule Settings

Content type: application/json; charset=UTF-8

APPENDIX C: NRWM CENTRAL SERVER RESTAPI

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_schedul e	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_utctim e	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_settin gs	See Capture Settings data structure	
analyzer_setti ngs	See <u>Analyzer Settings</u> data structure	

Field Name	Description	Values
limit_settings	See Limit Settings data structure	
aggregate_limi t_settings	See <u>Aggregate Limit Settings</u> data structure	
plc_io_settings	See <u>PLC I/O Settings</u> data structure	

Success response:

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

Error response:

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

3. <u>Save Schedule</u>

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	64 characters
	(case insensitive, save as all lower case)	max string
sch_uuid	Schedule UUID	UUID string
temp_schedule	Flag indicating schedule has not been	bool
	permanently saved and can be edited.	
sch_index	Schedule index	Int32
	Auto increment index # on each copy of	
	modified schedule	
sch_status	Schedule Status (unused)	Int32
sch_chksum	Schedule Checksum	UInt32
created_utctime	Schedule UTC time when first original	"YYYY-MM-DD
	created.	HH:MM:SS"
	(value will be set by RestAPI	
	Service)	
last_modified	Schedule UTC time when last modified and a	"YYYY-MM-DD
	new schedule index copy get created (value	HH:MM:SS"
	will be set by RestAPI Service)	
modified_user	Name of user modified schedule	64 characters
		max string

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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. <u>Add User</u>

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. <u>Delete User</u>

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:

{

<code>"sch_name" : "<name of schedule>", // all schedule indexes under sch_name will be deleted</code>

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

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}

9. <u>Register Device</u>

URL: /CDBRestAPI/RegisterDevice

Method: POST

URL Params: None

Data Params: Device UUID // see <u>Data Structure: Device ID</u> // 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 <u>Data Structure: Device ID</u> // 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 <u>Data Structure: Device</u> <u>Schedule Name List</u>

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 <u>Data Structure: Device</u> <u>Current Schedule Number Info</u>

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

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

13. <u>Update Calibrations</u>

 $\label{eq:url:constant} \textbf{URL: /CDBRestAPI/UpdateCalibrations}$

Method: POST

URL Params: None

Data Params: Channel Calibration Settings // see <u>Data Structure: Channel</u> <u>Calibration Settings</u>

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	64 characters max
	(case insensitive, save as all lower case)	string
sch_uuid	Schedule UUID	UUID string
temp_schedule	Flag indicating schedule has not been	bool
	permanently saved and can be edited.	
sch_index	Schedule index	Int32
	Indexing on each copy of modified schedule	
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	"YYYY-MM-DD
	created. (value will be set by RestAPI	HH:MM:SS"
	Service)	
last_modified	Schedule UTC time when last modified and	"YYYY-MM-DD
	a new schedule index copy get created	HH:MM:SS"
	(value will be set by RestAPI Service)	
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_s	See Aggregate Limit Settings under Data	
ettings	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_filt	Coil type (1:1 or 10:1)	0 = 1 to 1 (1:1)
er		1 = 10 to 1 (10:1)
measurement_automode	Auto measurement of	0 = manual measurement
	displacement	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 <u>Channel Parameters</u> table
ch2params	Channel parameters	See <u>Channel Parameters</u> table
ch3params	Channel parameters	See <u>Channel Parameters</u> 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

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Field Name	Description	Values
tag	Channel Data	0 - Unused
	Tag to label the	1 - Displacement1 (mm)
	data type	2 - Displacement2 (mm)
	assignment on	3 - Voltage1
	each channel	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

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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 <u>RMS Limit Setting</u> 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

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Field Name	Description	Values
weld_to	Weld to thickness	Number, units TBD
initial_thickness	Initial thickness high/low limits	See <u>High/Low Settings</u> table
final_thickness	Final thickness high/low limits	See <u>High/Low Settings</u> table

Q. Displacement Settings

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	UUID string	
	monitor device		

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 "VDate(1574356022758)V" 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 1128

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

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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

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", "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",

CC. Device Schedule Name List Settings

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)
lso_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 (011) 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
х	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

Field Name	Description	Values
error_word		See Aggregation Limit Error Word
princhannel1	Principal1 Channel Aggregation Window Limit Violations	See <u>Aggregation Window Limit</u> <u>Violations</u>
princhannel 2	Principal 2 Channel Aggregation Window Limit Violations	See <u>Aggregation Window Limit</u> <u>Violations</u>
princhannel 3	Principal 3 Channel Aggregation Window Limit Violations	See <u>Aggregation Window Limit</u> <u>Violations</u>
princhannel 4	Principal 4 Channel Aggregation Window Limit Violations	See <u>Aggregation Window Limit</u> <u>Violations</u>

NN. Principal Aggregation 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	ld 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

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APPENDIX C: NRWM CENTRAL SERVER RESTAPI

Field Name	Description	Values
analyzer	Weld analyzer results	See <u>Weld Analyzer</u>
envelopes	Weld limit settings/results	See <u>Weld Envelope Limit</u> <u>Violations</u>
aggregate_limits	Weld aggregate limit settings/results	See <u>Weld Aggregation Limit</u> <u>Violations</u>
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")	Objectlo
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
minchannel_2	Resistance 1	String
minchannel_3	Power 1	String
princhannel_4	Voltage 1	String
💷 gain	[12 elements]	Array
**** [O]	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
······································	0.0	Double
····· [9]	0.0	Double
## [10]	0.0	Double
		DOUDIC

APPENDIX C: NRWM CENTRAL SERVER RESTAPI

🗸 🖾 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
<pre>### cool_time_x_final</pre>	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

				20
~		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
		eool_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
		example cool_time_x_final	0.0	Double
		cool_time_status	0	Int32

Comparison{4 fields }ObjectV Comparison{5 fields }ObjectV Comparison0.946739DoubleV Comparison0.0DoubleV Max53.862269DoubleV Max0.562044DoubleV Max0.761853841747221DoubleV Comparison0.761853841747221DoubleV Comparison0.0DoubleV Max0.0DoubleV Max0.0Double
rms0.946739Double### min0.0Double### max53.862269Double## mean0.562044Double### stddev0.761853841747221Double* * *********************************
##min0.0Double##53.862269Double##mean0.562044Double##stddev0.761853841747221Doublev vin2{5 fields }Object##min0.0Double##max0.0Double##mean0.0Double##mean0.0Double##mean0.0Double##stddev0.0Double##mean0.0Double##stddev0.0Double
max 53.862269 Double ## mean 0.562044 Double ## stddev 0.761853841747221 Double v vin2 {5 fields } Object ## min 0.0 Double ## max 0.0 Double ## mean 0.0 Double ## stddev 0.0 Double
mean 0.562044 Double ### stddev 0.761853841747221 Double vin2 { 5 fields } Object ### ms 0.0 Double ### max 0.0 Double ### mean 0.0 Double ### mean 0.0 Double ### stddev 0.0 Double Double Double Double Double Double Double Double Double Double
stddev 0.761853841747221 Double vin2 {5 fields } Object ### rms 0.0 Double ### min 0.0 Double ### max 0.0 Double ### mean 0.0 Double ### stddev 0.0 Double Double Double 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
rms0.0Double## min0.0Double## max0.0Double## mean0.0Double## stddev0.0Double
min 0.0 Double ## max 0.0 Double ## mean 0.0 Double ### stddev 0.0 Double
max 0.0 Double ### mean 0.0 Double ### stddev 0.0 Double
mean 0.0 Double ### stddev 0.0 Double
stddev 0.0 Double
V 🖸 win3 { 5 fields } Object
Item in the second seco
🗰 min 0.0 Double
🗰 max 0.0 Double
🗯 mean 0.0 Double
🗰 stddev 0.0 Double
✓ ☑ win4 { 5 fields } Object
It is the second
🗯 min 🛛 0.0 Double
🗰 max 0.0 Double
mean 0.0 Double
🗰 stddev 0.0 Double
<pre>/ Image: Princhannel_3 {4 fields } Object</pre>
V 🖾 win1 { 5 fields } Object
*** rms 0.03934 Double
min 0.0 Double
max 0.127114 Double
mean 0.012849 Double
stddev 0.0371825066261004 Double
V 💷 win2 { 5 fields } Object
ter in the second secon
Image: min 0.0 Double
ter max 0.0 Double
ter mean 0.0 Double
stddev 0.0 Double
✓ ☑ win3 { 5 fields } Object
🛲 rms 0.0 Double
min 0.0 Double
min 0.0 Double ### max 0.0 Double
min 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
✓	{ 3 fields }	Object
i channel	7	Int32
Y 🖾 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
IimitY	0.0	Double

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✓ ☑ princhannel_2	{ 3 fields }	Object
channel	10	Int32
V 🖸 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
imitY	0.0	Double
✓ ☑ princhannel_3	{ 3 fields }	Object
* channel	8	Int32
V 🖸 lower	{ 3 fields }	Object
*** violationY	0.0	Double
* X	0	Int32
IimitY	0.0	Double
🗸 🖾 upper	{ 3 fields }	Object
*** violationY	0.0	Double
# X	0	Int32
imitY	0.0	Double
✓ ☑ princhannel_4	{ 3 fields }	Object
# channel	2	Int32
V 🖸 lower	{ 3 fields }	Object
*** violationY	0.0	Double
* X	0	Int32
*** limitY	0.0	Double
V 🖸 upper	{ 3 fields }	Object
*** violationY	0.0	Double
# X ## limitY	0	Int32
	0.0	Double
 aggregate_limits violations 	{ 1 field }	Object Object
error_word	{ 5 fields } 0	Int64
✓ ☑ princhannel_1	{ 4 fields }	Object
✓ ☑ win1	{ 2 fields }	Object
V 🖸 lower	{ 5 fields }	Object
*** rms	0.0	Double
*** mean	0.0	Double
in 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
~		wir			{ 2 fields }	Object
	~	{ }			{ 5 fields }	Object
			#,#	rms	0.0	Double
			#,#	mean	0.0	Double
			#,#	min	0.0	Double
			#,#	max	0.0	Double
				stddev	0.0	Double
	~	{ }			{ 5 fields }	Object
			#,#	rms	0.0	Double
			#,#	mean	0.0	Double
			#,#	min	0.0	Double
			#,#	max	0.0	Double
				stddev	0.0	Double
~	{ }	wir	13		{ 2 fields }	Object
	~	{ }	low	/er	{ 5 fields }	Object
			#,#	rms	0.0	Double
			#,#	mean	0.0	Double
			#,#	min	0.0	Double
			#,#	max	0.0	Double
				stddev	0.0	Double
	~	{ }			{ 5 fields }	Object
			#,#	rms	0.0	Double
			#,#	mean	0.0	Double
			#,#	min	0.0	Double
			#,#	max	0.0	Double
				stddev	0.0	Double
~		wir			{ 2 fields }	Object
	~	{ }			{ 5 fields }	Object
				rms	0.0	Double
			#,#	mean	0.0	Double
				min	0.0	Double
				max	0.0	Double
				stddev	0.0	Double
	~	{ }			{ 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
Y 🖸 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

	·	1
✓ 🖸 win4	{ 2 fields }	Object
V 🚺 lower	{ 5 fields }	Object
*** rms	0.0	Double
*** mean	0.0	Double
## min	0.0	Double
## max	0.0	Double
*** stddev	0.0	Double
V 🖸 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
V 🖾 lower	{ 5 fields }	Object
*** rms	0.0	Double
*** mean	0.0	Double
*** min	0.0	Double
*** max	0.0	Double
*** stddev	0.0	Double
V 🖾 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
V 🖸 lower	{ 5 fields }	Object
*** rms	0.0	Double
*** mean	0.0	Double
*** min	0.0	Double
*** max	0.0	Double
*** stddev	0.0	Double
V 🖸 upper	{ 5 fields }	Object
**** rms	0.0	Double
*** mean	0.0	Double
*** min	0.0	Double
**** max	0.0	Double
**** stddev	0.0	Double

,		🖸 wi	n2		{ 2 fields }	Object
	•	~ 🖸		Ner		Object
				rms	0.0	Double
				mean		Double
				min		Double
				max		Double
				stddev		Double
		v 🖸				Object
				rms		Double
				mean		Double
				min		Double
				max		Double
				stddev		Double
,	~	🖸 wi		Studev		Object
		v 🖸		Ner		Object
				rms		Double
				mean		Double
				min		Double
				max		Double
				stddev		Double
		v 🖸				Object
				rms		Double
				mean		Double
			#,#	min	0.0	Double
			#,#	max		Double
			#,#	stddev	0.0	Double
× 8	()	princh	ann	el_4	{ 4 fields }	Object
	~	🖸 wi	n1		{ 2 fields }	Object
		¥ 🖸	lov	ver	{ 5 fields }	Object
			#,#	rms	0.0	Double
			#,#	mean	0.0	Double
			#,#	min	0.0	Double
			#,#	max	0.0	Double
				stddev	0.0	Double
		Y 🖸				Object
			#,#	rms		Double
			#,#	mean		Double
				min		Double
				max		Double
			#,#	stddev	0.0	Double

~		> wi		{ 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
~		> wi		{ 2 fields }	Object
	~	$\langle \rangle$	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
~		> wi		{ 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
Y ☑ 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
Y ☑ 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

	Objectld("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
	-904094	Int32
···· [14]	-904094	Int32
	-904094	Int32
	-904094	Int32
··· [17]	-904094	Int32
	-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
±± [201	004004	1~+33

TT. Weld Waveform2 Data

Field Name	Description	Values
_id	Weld data database id	ld 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
	-688937	Int32
	-688937	Int32
· [31]	-688937	Int32
III [32]	-688937	Int32
I [33]	-688937	Int32
···· [34]	-688937	Int32
	-688937	Int32
······································	-688937	Int32
······································	-688937	Int32
······································	-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	Objectld("62d9cf8cefe2e71680cded4c")	Objectld
** **		62d9cf8cefe2e71680cded4c	String
6	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
	III [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
		-153754	Int32
		-154379	Int32
		-154379	Int32
		-154379	Int32
		-153754	Int32
		-153129	Int32
		-152504	Int32
	···· [34]	-153754	Int32
	···· [35]	-154379	Int32
	······································	-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
_ 0	Array of double, voltage2 waveform values	Data array of double type points

Sample expanded schema of weld waveform4 data

	Objectld("62d9cf8cefe2e71680cded4c")	Objectld
···· welddata_uuid	62d9cf8cefe2e71680cded4c	String
🐷 utctimestamp	2022-07-21 22:13:32.301Z	Date
 Ch4_voltage2waveform 	[2003 elements]	Array
······································	-3125	Int32
······································	-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
	-3750	Int32
···· [12]	-4375	Int32
* [13]	-4375	Int32
* [14]	-4375	Int32
* [15]	-3750	Int32
* [16]	-3750	Int32
	-3750	Int32
	-3750	Int32
	-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] # 1201	-3125 -3125	Int32 Int32
· [30]	-3125	Int32
* [31] * [32]	-3750	Int32
······································	-3125	Int32
······································	-3750	Int32
_ [50]	5150	THUSE .

WW. Weld Waveform5 Data

Field Name	Description	Values
_id	Weld data database id	ld 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

	OL:	
	Objectld("62d9cf8cefe2e71680cded4c") 62d9cf8cefe2e71680cded4c	ObjectId
welddata_uuid		String
 utctimestamp utcti_force1waveform 	2022-07-21 22:13:32.301Z	Date
	[2003 elements] -4577	Array Int32
* [0]	-4577	Int32
* [1]	-4577	Int32
* [2]	-5340	Int32
* [3]	-5340	Int32
# [4] # [5]	-3540 -4577	Int32
* [6]	-4577	Int32
* [7]	-4577	Int32
* [7] * [8]	-4377 -3814	Int32
* [9]	-4577	Int32
* [10]	-3814	Int32
······································	-3814	Int32
····· [11]	-4577	Int32
* [13]	-5340	Int32
······································	-4577	Int32
······································	-3814	Int32
···· [15]	-4577	Int32
······································	-3814	Int32
·····]	-4577	Int32
······································	-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
	-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
	-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_force1wavef orm	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
in utctimestamp	2022-07-21 22:13:32.301Z	Date
 Charactering Chara	[2003 elements]	Array
	-2288	Int32
······································	-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
	-2288	Int32
	-3051	Int32
	-2288	Int32
	-2288	Int32
	-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] * [26]	-3051	Int32 Int32
* [36] * [37]	-3051 -2288	Int32
* [37] * [38]	-2288	Int32
[30]	-2200	IIILOZ

YY. Weld Waveform7 Data

Field Name	Description	Values
_id	Weld data database id	ld 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

№ welddata uuid 62/dsrt8cefe2/1680.cde4/c Sting ♥ Wrttimestamp 2022-07-21 221 332.201Z Date Ø 01/01-010000 In32 Ø 01/01-010000 In32 Ø 01/01-010000 In32 Ø 11 -400000 In32 Ø 12 -500000 In32 Ø 16 -400000 In32 Ø 16 -400000 In32 Ø 16 -400000 In32 Ø 16 -400000 In32 Ø 17 -400000 In32 Ø 12 -400000 In32 Ø 12 -400000 In32 Ø <	id	ObjectId("62d9cf8cefe2e71680cded4c")	ObjectId
C utclmextamp202-07-21 221332.301ZDate# 0 d7_vottag2waveform[203 element]Army# 101-000000Int32# 101-000000Int32# 121-000000Int32# 112-000000Int32# 112-000000Int32# 113-000000Int32# 114-000000Int32# 115-000000Int32# 115-000000Int32# 117-000000Int32# 118-000000Int32# 119-000000Int32# 119-000000Int32# 119-000000Int32# 120-000000Int32# 121-000000Int32# 122# 121-000000Int32# 123-000000Int32# 124-000000Int32# 125# 124-000000Int32# 126-000000Int32# 127-000000Int32# 128-000000Int32# 129-000000Int32# 129-000000Int32 <t< th=""><th></th><th></th><th></th></t<>			
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H 172 -500000 Int32 H 13 -400000 Int32 H 14 -300000 Int32 H 15 -200000 Int32 H 15 -200000 Int32 H 15 -200000 Int32 H 16 -300000 Int32 H 17 -200000 Int32 H 19 -400000 Int32 H 201 -400000 Int32 H 201 -400000 Int32 H 201 -400000 Int32 H 22 -300000 Int32 H 23 -4000000 Int32 H 24 -400000 Int32 H 25 -4000000 Int32 H 26 -3000000 Int32 H 29 -3000000 Int32 H 29 -3000000 Int32	# [10]	-3000000	Int32
III -400000 Int32 III -300000 Int32 III -200000 Int32 III -300000 Int32 III -300000 Int32 IIII -200000 Int32 IIII -200000 Int32 IIIII -200000 Int32 IIIII -200000 Int32 IIIIII -200000 Int32 IIIIII -200000 Int32 IIIIIII -200000 Int32 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	* [11]	-3000000	Int32
III -300000 Int32 III -200000 Int32 III -300000 Int32 III -200000 Int32 III -200000 Int32 III -200000 Int32 IIII -200000 Int32 IIII -200000 Int32 IIII -200000 Int32 IIII -200000 Int32 IIIII -200000 Int32 IIIIII -200000 Int32 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	· # [12]	-5000000	Int32
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H -300000 Int32 H 171 -200000 Int32 H 181 -300000 Int32 H 191 -400000 Int32 H 201 -400000 Int32 H 201 -400000 Int32 H 201 -200000 Int32 H 221 -300000 Int32 H 231 -400000 Int32 H 231 -400000 Int32 H 231 -400000 Int32 H 241 -400000 Int32 H 251 -400000 Int32 H 261 -300000 Int32 H 281 -300000 Int32 H 331 -500000	# [14]	-3000000	Int32
III -200000 Int32 III -300000 Int32 III -400000 Int32 III -200000 Int32 III -200000 Int32 III -200000 Int32 III -200000 Int32 IIII -200000 Int32 IIIII -200000 Int32 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	# [15]	-2000000	Int32
III -300000 Int32 III -400000 Int32 III -200000 Int32 IIII -200000 Int32 IIIIII -200000 Int32 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII		-3000000	Int32
III -400000 Int32 III 200000 Int32 III 200000 Int32 IIII -200000 Int32 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII		-2000000	Int32
IIII (20) -400000 Int32 IIII (21) -200000 Int32 IIII (22) -300000 Int32 IIII (23) -400000 Int32 IIII (24) -400000 Int32 IIII (25) -400000 Int32 IIII (26) -300000 Int32 IIII (26) -300000 Int32 IIII (27) -300000 Int32 IIII (28) -300000 Int32 IIII (28) -300000 Int32 IIII (28) -300000 Int32 IIII (28) -300000 Int32 IIII (30) -300000 Int32 IIII (30) -300000 Int32 IIII (31) -400000 Int32 IIII (32) -300000 Int32 IIII (32) -300000 Int32 IIII (33) -500000 Int32 IIII (34) -400000 Int32 IIII (35) -400000 Int32 IIII (36) -300000 Int32 IIIII (36) -3000000 Int32		-3000000	Int32
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Im [24] -400000 Int32 Im [25] -300000 Int32 Im [26] -300000 Int32 Im [27] -300000 Int32 Im [28] -300000 Int32 Im [29] -300000 Int32 Im [30] -300000 Int32 Im [30] -300000 Int32 Im [31] -400000 Int32 Im [32] -300000 Int32 Im [33] -500000 Int32 Im [34] -400000 Int32 Im [35] -400000 Int32 Im [36] -300000 Int32 Im [36] -300000 Int32 Im [36] -300000 Int32 Im [36] -300000 Int32 Im [37] -300000 Int32			
# [25] -400000 Int32 # [26] -300000 Int32 # [27] -300000 Int32 # [28] -300000 Int32 # [29] -300000 Int32 # [30] -300000 Int32 # [31] -400000 Int32 # [32] -300000 Int32 # [33] -400000 Int32 # [34] -400000 Int32 # [35] -400000 Int32 # [36] -300000 Int32 # [37] -300000 Int32			
# [26] -300000 Int32 # [27] -300000 Int32 # [28] -300000 Int32 # [29] -300000 Int32 # [30] -300000 Int32 # [30] -300000 Int32 # [31] -400000 Int32 # [32] -300000 Int32 # [32] -300000 Int32 # [32] -300000 Int32 # [33] -500000 Int32 # [34] -400000 Int32 # [35] -400000 Int32 # [36] -300000 Int32 # [36] -300000 Int32 # [37] -300000 Int32			
# [27] -300000 Int32 # [28] -300000 Int32 # [29] -300000 Int32 # [30] -300000 Int32 # [31] -400000 Int32 # [32] -300000 Int32 # [33] -500000 Int32 # [34] -400000 Int32 # [35] -400000 Int32 # [36] -300000 Int32 # [37] -300000 Int32			
# [28] -300000 Int32 # [29] -300000 Int32 # [30] -300000 Int32 # [31] -400000 Int32 # [32] -300000 Int32 # [33] -500000 Int32 # [34] -400000 Int32 # [35] -400000 Int32 # [36] -300000 Int32 # [37] -300000 Int32			
# [29] -300000 Int32 # [30] -300000 Int32 # [31] -400000 Int32 # [32] -300000 Int32 # [33] -500000 Int32 # [34] -400000 Int32 # [35] -400000 Int32 # [36] -300000 Int32 # [37] -300000 Int32			
# [30] -300000 Int32 # [31] -400000 Int32 # [32] -300000 Int32 # [33] -500000 Int32 # [34] -4000000 Int32 # [35] -4000000 Int32 # [36] -300000 Int32 # [37] -300000 Int32			
# [31] -400000 Int32 # [32] -300000 Int32 # [33] -500000 Int32 # [34] -400000 Int32 # [35] -400000 Int32 # [36] -300000 Int32 # [37] -300000 Int32			
# [32] -300000 Int32 # [33] -500000 Int32 # [34] -400000 Int32 # [35] -400000 Int32 # [36] -300000 Int32 # [37] -300000 Int32			
# [33] -500000 Int32 # [34] -400000 Int32 # [35] -400000 Int32 # [36] -300000 Int32 # [37] -300000 Int32			
# [34] -400000 Int32 # [35] -400000 Int32 # [36] -300000 Int32 # [37] -300000 Int32			
# [35] -400000 Int32 # [36] -300000 Int32 # [37] -300000 Int32			
# [36] -300000 Int32 # [37] -300000 Int32			
* [37] -3000000 Int32			
📖 [38] -3000000 Int32			
	<u>.</u> #∃ [38]	-300000	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	Objectld("62d9cf8cefe2e71680cded4c")	ObjectId
	welddata_uuid	62d9cf8cefe2e71680cded4c	String
	utctimestamp	2022-07-21 22:13:32.301Z	Date
Y 🖸	0 ch8_currentwaveform	[2003 elements]	Array
	· [0]	-649	Int32
	# [1]	-2761	Int32
	# [2]	974	Int32
	# [3]	4873	Int32
	· [4]	10884	Int32
		14133	Int32
	# [6]	13646	Int32
	# [7]	22906	Int32
	# [8]	22906	Int32
	· [9]	23068	Int32
		26642	Int32
		32328	Int32
	· [12]	40614	Int32
		38827	Int32
	··· [14]	41263	Int32
		51011	Int32
		54097	Int32
	··· [17]	58321	Int32
		64657	Int32
	··· [19]	68231	Int32
		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	ld 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

	Objectld("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
	-7875	Int32
	-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
	-19155	Int32
	-20000	Int32
	-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	ld 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

	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
	-390	Int32
	-408	Int32
# [32]	-523	Int32
III [33]	-447	Int32
# [34]	-523	Int32
III [35]	-550	Int32
III [36]	-574	Int32
# [37]	-567	Int32
III [38]	-561	Int32

CCC. Weld Waveform11 Data

Field Name	Description	Values
_id	Weld data database id	ld 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

	Objectld("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
	-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
	-1022332	Int32

DDD. Weld Waveform12 Data

Field Name	Description	Values
_id	Weld data database id	ld 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	Objectld("62d9cf8cefe2e71680cded4c")	Objectld
📟 welddata_uuid	62d9cf8cefe2e71680cded4c	String
a utclimestamp	2022-07-21 22:13:32.301Z	Date
 Internet in the second s	[2003 elements]	Array
····_·	4815100	Int32
······································	1358203	Int32
· [2]	-4491786	Int32
······································	-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
	-36294	Int32
# [26]	-30197	Int32
# [27]	-27677	Int32
* [28]	-26100	Int32
* [29]	-25959	Int32
	-24981	Int32
	-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:

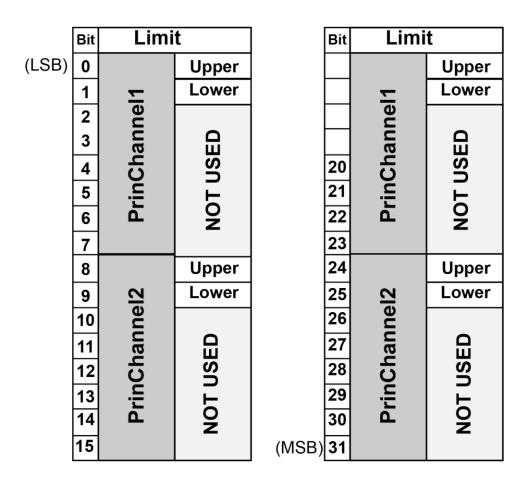
bit 0 : win1_rms	bit 10 : win3_rms
bit 1 : win1_mean	bit 11 : win3_mean
bit 2 : win1_min	bit 12 : win3_min
bit 3 : win1_max	bit 13 : win3_max
bit 4 : win1_ standard dev	bit 14 : win3_standard dev
bit 5 : win2_rms	bit 15 : win4_rms
bit 6 : win2_mean	bit 16 : win4_mean
bit 7 : win2_min	bit 17 : win4_min
bit 8 : win2_max	bit 18 : win4_max
bit 9 : win2_ standard dev	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



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			Bit		Limit	
(LSB)	0		101 4	Lower		32		10/5-0	Lower
	1		Win 1	Upper		33		Win 1	Upper
	2			Lower		34			Lower
	3		Win 2	Upper		35		Win 2	Upper
	4			Lower		36			Lower
	5		Win 3	Upper		37		Win 3	Upper
	6		Win 4	Lower		38		Win 4	Lower
	7	Mux 1	VVIII 4	Upper		39	Mux 3	VVIII 4	Upper
	8	IVIUA I	Win 5	Lower		40	IVIUX J	Win 5	Lower
	9		VIII 5	Upper		41		VVIII J	Upper
	10		Win 6	Lower		42		Win 6	Lower
	11		VVIII O	Upper		43		VVIN O	Upper
	12		Win 7	Lower		44		Win 7	Lower
	13		vviii 7	Upper		45			Upper
	14		Win 8	Lower		46		Win 8	Lower
	15			Upper		47			Upper
	16		Win 1	Lower		48		Win 1	Lower
	17		•••••	Upper		49			Upper
	18		Win 2	Lower		50		Win 2	Lower
	19		VVIII Z	Upper		51			Upper
	20		Win 3	Lower		52		Win 3	Lower
	21		vviii 0	Upper		53			Upper
	22		Win 4	Lower		54		Win 4	Lower
	23	Mux 2		Upper		55	Mux 4		Upper
	24		Win 5	Lower		56		Win 5	Lower
	25			Upper		57			Upper
	26		Win 6	Lower		58		Win 6	Lower
	27			Upper		59			Upper
	28		Win 7	Lower		60		Win 7	Lower
	29			Upper		61			Upper
	30		Win 8	Lower	-	62		Win 8	Lower
	31			Upper	(MSB)	63			Upper

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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	Ī	Bit	Error
(LSB)	0	Displacement A Final Thickness		16	Final Thickness
	1	Displacement A Initial Thickness	•	17	Initial Thickness
	2	Displacement B Final Thickness	•	18	
	3	Displacement B Initial Thickness	•	19	
	4			20	
	5			21	
	6			22	
	7			23	
	8			24	
	9			25	
	10			26	
	11			27	
	12			28	
	13			29	
	14		;	30	
	15		(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
- Displacement flags determine whether Displacement A or B get set: 001: Displacement B

010: Displacement A

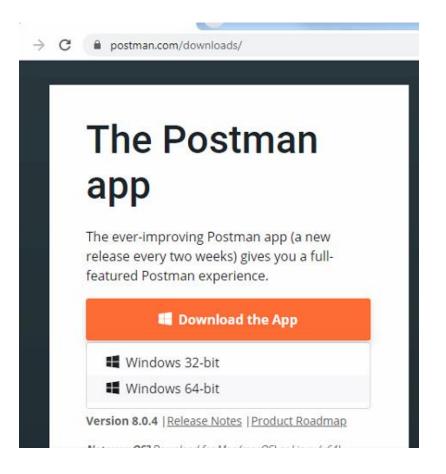
011: Both Displacement A/B

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.

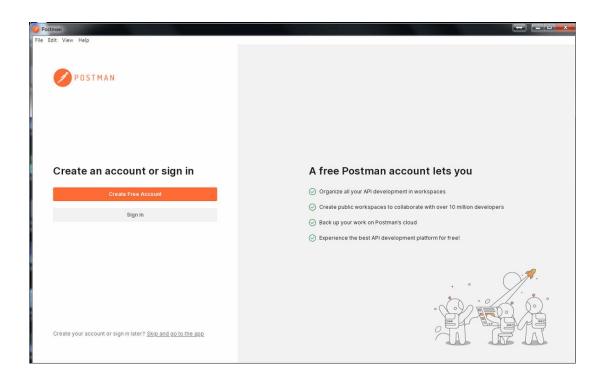
1. Download Postman from the link <u>https://www.postman.com/downloads/</u> and choose your Windows 32 bits or 64 bits OS platform.



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

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+ POSTMAN	Create Postman Account Sign In instead?
🔶 Why Sign Up?	<u>ji</u>
 Organize all your API development within Postman Workspaces 	Username
 Sync your Postman data across devices 	
ullet Backup your data to the Postman cloud $ullet$	Password SHOW
• It's free!	
+	
	Sign up to get product updates, news, and other marketing communications. Keep me signed in By creating an account, I agree to the Terms and Privacy Policy.
+ // +	Create free account
	or
	G Sign up with Google

5. Once sign on, select your profile preference and click on the 'Continue'

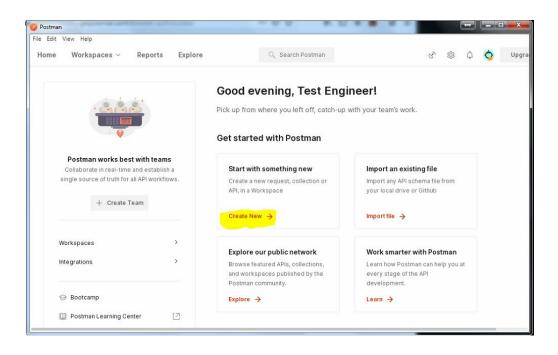
🤣 Postman		• ×
File Edit View Help		
	Welcome to Postman!	
	Tell us a bit about yourself so we can help you get the most out of Postman.	
	What's your name? Change profile photo	1
	Test Engineer	
	Which of these roles is closest to yours?	
	Support Engineer 👻	
	How do you plan to use Postman?	
	API documentation	
	Debugging and manual testing Designing and mocking APIs	
	Monitoring Publishing APIs	
	Continue	

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6. Click on the 'Continue Without a Team'

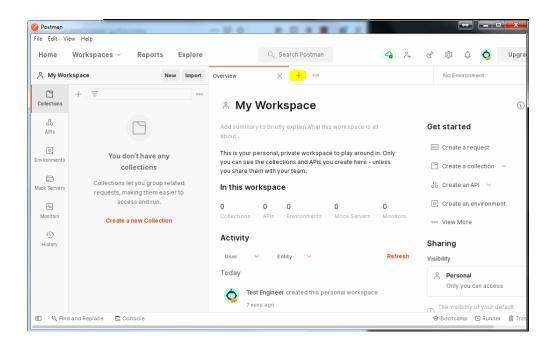
🥝 Postman			
File Edit View Help	o Collaborate Join an existing team, create a nev		
	Bring your team to Postman and supercharge your API development ✓ Discover and learn about the APIs your team's	Create your own team Team Name	
	building Stay up-to-date on the latest changes to how an API works	Team URL	.postman.co
	 Provide direct feedback to API developer Use API mocks to send requests and view responses without having to spin up a backend 	URL must have 6 - 64 characters, begin with a letter, and use only letters, numbers, and hyphens.	_
	Debug with automated tests or by manually inspecting the responses	→ Continue Wit	hout a Team

7. You will see the Startup Screen of your workspace. click on the the 'Create New -> '



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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

		-			
	kspace New Import	Overview GE	T Untitled Request 🛛 🗕	+ •••	No Environment
Collections	+ =	Untitled Request			🖺 Save 🗸 🥖
oo APis	2	GET v Enter req	uest URL		Send
D.		Params Auth • Headers (7) Body Pre-req. Te:	sts Settings	Cod
Environments	You don't have any collections	ТҮРЕ		parameters hold sensit king in a collaborative e	ive data. To keep this data >
Aock Servers	Collections let you group related	Basic Auth 🗸 🗸		g variables. Learn more	
Monitors	requests, making them easier to access and run.	The authorization header will be automatically generated when you	Username	Username	
£1)	Create a new Collection	eate a new conection	Password	Password	
History		more about authorization		Show Passwor	d
		Response	Hit Send to c	et a response	

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.

New Import	Overview	GET Untitled Request 0	+ 000	No Environment	
900	Untitled Request			🖺 Save 🗸 🥖	
	GET ~ Ente	r request URL		Send	
	Params Auth Heade	ers (7) Body Pre-req. Test	s Settings	c	ooki
ny	ТҮРЕ		se parameters hold sensitive data. To keep this data $ imes$		×
related	Basic Auth \sim		secure while working in a collaborative environment, we recommend using variables. Learn more about variables		
asier to	The authorization heade will be automatically generated when you	r Username	iotsupport		
tion	send the request. Learn		aM@daiot123	23	
	more about authorization	n	Show Passwo	sword	
	Response				

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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.

)verview GE	T http://192.168.4.4 •	+ 000	No Environment
http://192.168.4.49:80/CDBRe	estAPI/GetActiveDeviceList		🖺 Save 🗸 🌔
GET ~ http://192.	168.4.49:80/CDBRestAPI/Ge	tActiveDeviceList	Send ~
arams Auth • Headers (8)) Body Pre-req. Tests	s Settings	Cookie
ТҮРЕ	(!) Heads up! These	parameters hold sensitive	e data. To keep this data secure $ imes$
Basic Auth \sim	-	collaborative environmen nore about variables	nt, we recommend using
The authorization header will			
be automatically generated when you send the	Username	iotsupport	
request. Learn more about authorization	Password	aM@daiot123	
autionzation		Show Passwor	d
	. Vieweller	Ū.	
ody V Pretty Raw Preview	v Visualize JSON	Ū.	
Pretty Raw Preview		Ū.	27 ms 647 B Save Response
Pretty Raw Preview		Ū.	
Pretty Raw Preview	[e_name": "EricNRWM",	~ IP	n c
Pretty Raw Preview	[me_name": "EricNRWM", me_uuid": "DFE14976-7DC7	-4899-BEC1-1EB0C3CE65	n c
Pretty Raw Preview	[e_name": "EricNRWM",	-4899-BEC1-1EB0C3CE65	n c
Pretty Raw Preview 1 1 1 2 ·····fa 1 3 ·····fa 1 4 ·····fa 1 5 ······fa 1 6 ·······a ······a 7 ····································	[me_name": "EricNRWM", me_uuid": "DFE14976-7DC7 heartbeat": " <u>/Date(1612</u>	-4899-BEC1-1EB0C3CE65	n c
Pretty Raw Preview 1 1 1 2 ·····*"device_list": 3 3 ·····• 1 4 ·····• ·····* 5 ······* ·····* 6 ·····* ·····* 7 ·····* ·····* 8 ·····* ·····* 9 ······* ·····*	[me_name": "EricNRWM", me_uuid": "DFE14976-7DC7 heartbeat": "/Date(1612 me_name": "Bashful",	✓ → 2-4899-BEC1-1EB0C3CE65 2550111696)/"	₽2",
Pretty Raw Preview 1 1 1 2 ····*device_list": 3 3 ····• 1 4 ····• ····• 5 ····• ····• 6 ····• ····• 7 ····• ····• 8 ····• ····• 9 ·····• ······ 10 ·····• ······	[e_name": "EricNRWM", e_uuid": "DFE14976-7DC7 heartbeat": "/Date(1612 e_name": "Bashful", e_uuid": "97DB04EA-B6A7	2-4899-BEC1-1EB0C3CE65 2550111696)/"	₽2",
Pretty Raw Preview 1 1 1 2 "device_list": 3 3	[me_name": "EricNRWM", me_uuid": "DFE14976-7DC7 heartbeat": "/Date(1612 me_name": "Bashful",	2-4899-BEC1-1EB0C3CE65 2550111696)/"	₽2",
Pretty Raw Preview 1 1 1 2 ····*device_list": 3 3 ····{1 1 4 ····*device_list": 3 5 ····*device_list": 3 6 ·····*last_ 7 7 ·····*J, 8 9 ·····*device 10 10 ·····*device 11 12 ·····*J, 13 ·······{1	[e_name": "EricNRWM", e_uuid": "DFE14976-7DC7 heartbeat": "/Date(1612 e_name": "Bashful", e_uuid": "97DB04EA-B6A7 heartbeat": "/Date(1612	2-4899-BEC1-1EB0C3CE65 2550111696)/"	₽2",
Pretty Raw Preview 1 1 1 1 2 ····*device_list": 3 ····{1 3 ····{1 ····· 1 1 4 ··········· ······· ······ 1 ······ 5 ············ ······· ······· ······ ······ 6 ················ ········· ······· ······ ······· 7 ········· ········ ·········· ······ ······ 9 ·················· ················· ·········· ······ 10 ······························· ······················· ··············· ··················· 12 ····································	[e_name": "EricNRWM", e_uuid": "DFE14976-7DC7 heartbeat": "/Date(1612 e_name": "Bashful", e_uuid": "97DB04EA-B6A7 heartbeat": "/Date(1612 e_name": "Grumpy",	Y-4899-BEC1-1EB0C3CE65 2550111696)/" Y-44CF-9F5D-45C712F2B0 2550114364)/"	₽ C
Pretty Raw Preview 1 1 1 2 ····*device_list": 3 3 ····{1 1 4 ····*device_list": 3 4 ····*device_list": 3 5 ····*device_list": 3 6 ····*last_ 7 7 ····*last_ 1 9 ····*device 1 10 ····*device 1 12 ····*last_ 1 12 ····*last_ 1 13 ····*last_ 1 14 ····*device 1	[e_name": "EricNRWM", e_uuid": "DFE14976-7DC7 heartbeat": "/Date(1612 e_name": "Bashful", e_uuid": "97DB04EA-B6A7 heartbeat": "/Date(1612 e_name": "Grumpy", e_uuid": "05ADFB5D-67BC	Y-4899-BEC1-1EB0C3CE65 2550111696)/" Y-44CF-9F5D-45C712F2B0 2550114364)/" C-4C59-96E0-6235E460A2	₽ C
Pretty Raw Preview 1 1 1 2 ····*device_list": 3 3 ····{1 1 4 ····*device_list": 3 4 ····*device_list": 3 5 ····*device_list": 3 6 ····*last_ 7 7 ····>} 3, 8 ···· [9 ·····*device 11 10 ·····*device 11 12 ·····* 3, 13 ····· [14 ·····* "device 15 ····* "device 16 ····* "last_	[e_name": "EricNRWM", e_uuid": "DFE14976-7DC7 heartbeat": "/Date(1612 e_name": "Bashful", e_uuid": "97DB04EA-B6A7 heartbeat": "/Date(1612 e_name": "Grumpy",	Y-4899-BEC1-1EB0C3CE65 2550111696)/" Y-44CF-9F5D-45C712F2B0 2550114364)/" C-4C59-96E0-6235E460A2	₽ C
Pretty Raw Preview 1 1 1 2 ····*device_list": 3 3 ····{1 1 4 ····*device_list": 3 4 ····*device_list": 3 5 ····*device_list": 3 6 ····*last_ 7 7 ····*last_ 1 9 ····*device 1 10 ····*device 1 12 ····*last_ 1 12 ····*last_ 1 13 ····*last_ 1 14 ····*device 1	[e_name": "EricNRWM", e_uuid": "DFE14976-7DC7 heartbeat": "/Date(1612 e_name": "Bashful", e_uuid": "97DB04EA-B6A7 heartbeat": "/Date(1612 e_name": "Grumpy", e_uuid": "05ADFB5D-67BC	Y-4899-BEC1-1EB0C3CE65 2550111696)/" Y-44CF-9F5D-45C712F2B0 2550114364)/" C-4C59-96E0-6235E460A2	₽ C
1 1 2 "device_list": 3 { 4 "device 5 "device 6 "last_ 7 { 9 "device 10 "device 11 "device 12 { 13 { 14 "device 15 "device 16 "last_ 17 {	[e_name": "EricNRWM", e_uuid": "DFE14976-7DC7 heartbeat": "/Date(1612 e_name": "Bashful", e_uuid": "97DB04EA-B6A7 heartbeat": "/Date(1612 e_name": "Grumpy", e_uuid": "05ADFB5D-67BC	Y-4899-BEC1-1EB0C3CE65 2550111696)/" Y-44CF-9F5D-45C712F2B0 2550114364)/" C-4C59-96E0-6235E460A2	₽ C

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.

- 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

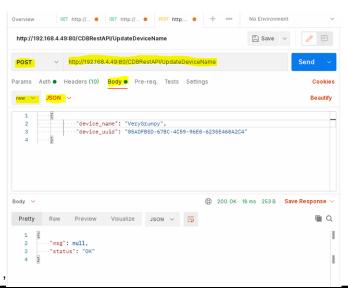
- 4. Switch to the Body tab
- 5. In the Body, click 'raw' and select 'JSON'

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



WM-200A Network Resistance Welding Monitor System

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