HF2 – 2kHz HIGH FREQUENCY
RESISTANCE WELDING POWER SUPPLY

ADVANCED RS-485 DATA COMMUNICATIONS

USER MANUAL

990-058 Rev G

Revision Record

Revision	EO	Date	Basis of Revision
A	None	3/95	Original edition.
B	19146	01/02	Updates + add Unitek Peco™ Name
C	42861	11/13	Updated to Miyachi America name and logo.
D	43481	11/14	Updated to Amada Miyachi America name and logo.
E	45804	04/20	Update Company Name (Amada Weld Tech) + Content Updates
F	46311	04/21	See ECO for Details
G	47208	01/24	Update Manual Title

FOREWORD

Thank you for purchasing an AMADA WELD TECH - HF2 – 2kHz High Frequency Inverter Welding Power Supply. For the rest of this manual, the HF2 will be referred to simply as the ***Power Supply***.

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

AMADA WELD TECH INC.
1820 South Myrtle Avenue
Monrovia, CA 91016

Telephone: **(626) 303-5676**

FAX: **(626) 358-8048**

e-mail: **info@amadaweldtech.com**

The purpose of this manual is to provide information on the external communications features of the HF2 Power Supply.

We have made every effort to ensure that the information in this manual is both accurate and adequate. The contents of this manual are subject to change without notice. Should questions arise, or if you have suggestions for improvement of this manual, please contact us at the above location/numbers.

AMADA WELD TECH is not responsible for any loss or injury due to improper use of this product.

The contents of this manual apply to the following models:

AMADA WELD TECH Model	AMADA WELD TECH P/N
HF2/230	1-264-0x
HF2/280	1-264-0x-01
HF2/460	1-264-0x-02
HF2/208	1-264-0x-03

HF2S/230	1-265-0x
HF2S/380	1-265-0x-01
HF2S/460	1-265-0x-02
HF2S/208	1-265-0x-03

CONTENTS

SAFETY NOTES

This instruction manual describes how to operate, maintain and service the HF2 Advanced Serial Data Communications and provides instructions relating to its SAFE use. A separate manual provides similar information for the Weld Head that is used in conjunction with the Power Supply. Procedures described in these manuals MUST be performed, as detailed, by QUALIFIED and TRAINED personnel.

For SAFETY, and to effectively take advantage of the full capabilities of the Weld Head and Power Supply, please read these instruction manuals before attempting to use them.

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

After reading these manuals, retain them for future reference when any questions arise regarding the proper and SAFE operation of the Power Supply.

Please note the following conventions used in this manual:

WARNING: Comments marked this way warn the reader of actions which, if not followed, might result in immediate death or serious injury.

CAUTION: Comments marked this way warn the reader of actions which, if not followed, might result in either damage to the equipment, or injury to the individual if subject to long-term exposure to the indicated hazard.

WARNINGS:

Lethal voltages exist within the HF2 unit. Do not perform any maintenance inside this unit.

Never perform any welding operation without wearing protective safety glasses.

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

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

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

3. Non-delivery.

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

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

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

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

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

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

7. Inspection and Rejection of Nonconforming Goods.

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

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

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

8. Price.

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

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

9. Payment Terms.

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

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

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

10. Intellectual Property; Software License.

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

(b) Buyer shall not copy, modify, or disassemble, or permit others to copy, modify, or disassemble, the Software, nor may Buyer modify, adapt, translate, reverse assemble, decompile, or otherwise attempt to derive source code from the Software. Buyer shall not transfer possession of the Software except as part of, or with, the Goods, and each such transfer shall be subject to the restrictions contained herein. Buyer may not sublicense, rent, loan, assign or otherwise transfer the Software or documentation, and Buyer shall retain on all copies of the Software and documentation all copyright and other proprietary notices or legends appearing therein or thereon. Seller may terminate this license upon written notice for any violation of any of the terms of this license or any material breach of any provision of this Agreement. Buyer shall immediately discontinue use of the Software upon any termination of this license or Agreement. This license shall terminate upon any termination of the Agreement.

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

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

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

12. Limited Warranty.

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

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

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

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

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

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

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

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

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

13. Limitation of Liability.

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

(b) **IN NO EVENT SHALL SELLER'S AGGREGATE LIABILITY ARISING OUT OF OR RELATED TO THIS AGREEMENT, WHETHER ARISING OUT OF OR RELATED TO**

(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).

CHAPTER 1
PURPOSE AND SCOPE

Purpose

The purpose of the HF2 serial communication is to enable remote programming control and remote data collection from a host computer. The implementation of this serial protocol is via the RS-485 communications line between the HF2 Welding Power Supply and a host computer. When the HF2 is installed with the Weld Sentry card, the implementation can be made using the RS-232 port on the Weld Sentry card. The communication protocol is implemented using printable ASCII characters to allow ease of protocol translation, comprehension, and debugging in control systems development.

Scope

Remote Data Collection

The HF2 data communication protocol includes the capability of collecting basic weld information for each individual weld. The HF2 stores weld information for the last 3000 welds. The host computer should periodically poll the HF2 to collect the weld data before 3000 welds are reached. Otherwise, data over-run occurs and weld data will be lost starting with the oldest data. The following information is included in the HF2 weld report.

1 The **schedule number** of the weld,

2 The average peak **current** of 1st weld period only,

3 The average peak **voltage** of 1st weld period only,

4 The **% control** capacity needed to reach the 1st weld period,

5 The average peak **current** of 2nd weld period only,

6 The average peak **voltage** of 2nd weld period only,

7 The % control capacity needed to reach the 2nd weld period,

8 The **status** of the weld. GOOD, NO CURRENT, NO VOLTAGE, FEEDBACK RANGE EXCEEDED, etc.

Example of a Weld Report

3,205,217,12,513,452,22,0

The above weld report represents the following information:

1 Schedule number: 3

2 Average peak current of the 1st weld period: 205 A

3 Average peak voltage of the 1st weld period: 217 mV

4 % control capacity of the 1st weld period: 12%

5 Average peak current of the 2nd weld period: 513 A

6 Average peak voltage of the 2nd weld period: 452 mV

7 % control capacity of the 2nd weld period: 22%

8 Status of the weld: 0 (good).

For a list of the weld status codes, see the Weld Status Number Section in Chapter 5, page 5-9.

Remote Programming Control

The HF2 data communication protocol includes the capability of downloading and uploading HF2 schedules, HF2 system parameters, and Weld Sentry programs if the Weld Sentry is installed. All the programmable parameters from the front panel can be modified from the host computer with the exception of the communication parameters.

CHAPTER 2
CONNECTIONS

RS-485 / RS-422 Connection

RS-485 / RS-422 Communication Options

To establish communication through the RS-485 Serial Port connector, the RS-485 communication options should be set to match the communication configuration of the host computer. The RS-485 communication options are set from the HF2 Welding Power Supply, OPTION 3 screen.

BAUD RATES:	The baud rate of the HF2 Welding Power Supply can be configured at 1200, 2400, 4800, 9600, 14.4K, 19.2K, or 28.8K. The baud rate is set using the OPTION 3 menu listed under the MAIN MENU. The default setting is 9600.
PARITY:	The HF2 always communicates in 8 bits with no parity and 1 stop bit.
DATA COMMUNICATIONS ROLE:	The HF2 can be configured as a HOST or CLIENT. When "HOST" is selected for the DATA COMMUNICATIONS ROLE, the HF2 sends out the weld report via the RS-485 Serial Port after each weld is made. When "CLIENT" is selected for the DATA COMMUNICATIONS ROLE, the HF2 sends out the weld report only if it is requested by the host computer. The default setting is CLIENT.
I.D. NUMBER:	To identify each HF2 Welding Power Supply connected to one RS-485 communication line, the host computer needs to know the identification number of each HF2. The I.D. Number can be any number from 0 to 99. The default setting of I.D. NUMBER is 1.

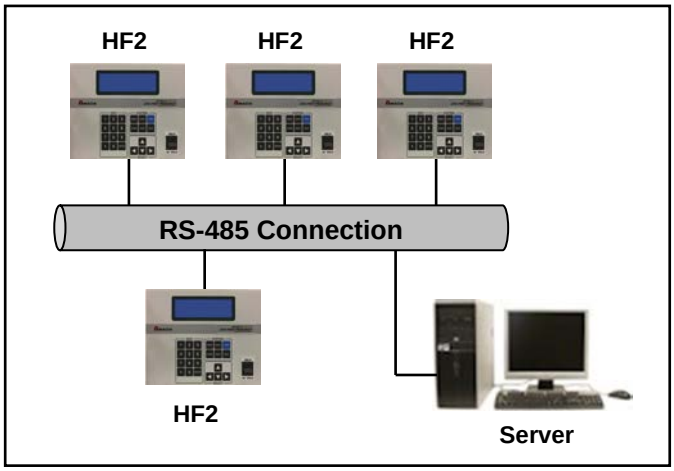
RS-485 / RS-422 Serial Port Connections

To implement RS-485 /RS-422 communications, use the following steps:

1 Connect the RS-485 Serial Port connector on the rear panel of each HF2 Welding Power Supply to the RS-485 connector on a host computer.

2 Set the baud rate of all HF2 Welding Power Supplies and the host computer to the same baud rate. The HF2 RS-485 communication baud rate setting is listed under the HF2 Welding Power Supply OPTION 3 menu.

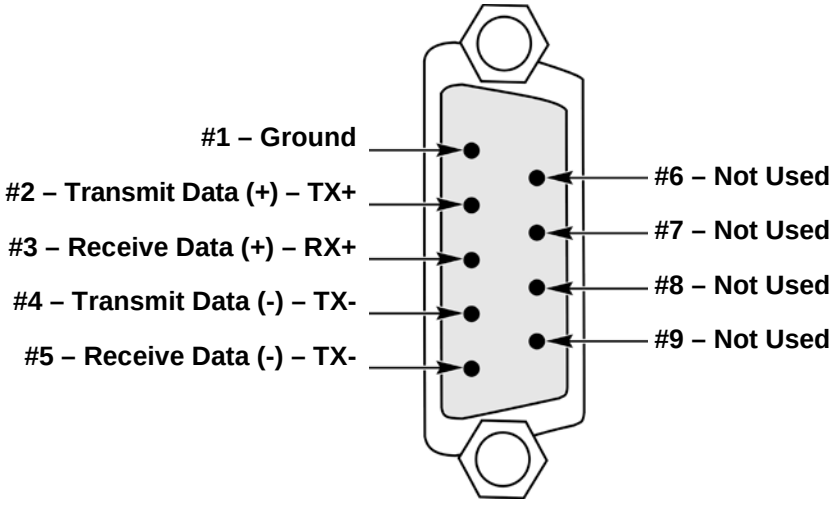
3 Set the unit ID number in the HF2 Welding Power Supply, OPTIONS 3 menu. Each HF2 unit should have its own unique ID number to be identified by the host computer.



RS-485 Pin Assignment

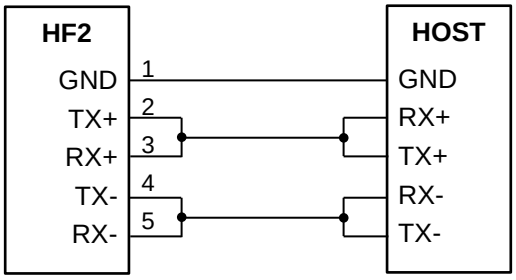
The RS-485 Serial Port pin assignment is shown as follows:

Pin	Name	Description
1	GND	Ground
2	TX+	Transmit Data (+)
3	RX+	Receive Data (+)
4	TX-	Transmit Data (-)
5	RX-	Receive Data (-)

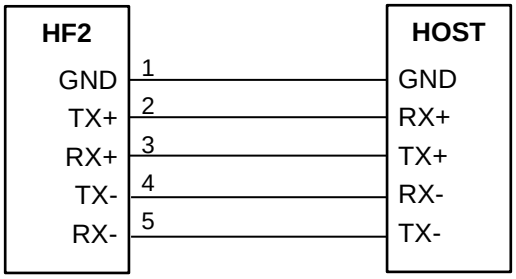


RS-485 Serial Port Connector on the HF2 Rear Panel

RS-485 communication is connected as follows:



The RS-422 communication is connected as follows:



RS-232 Connections

RS-232 Communication Options

To establish communication through RS-232 Serial Port connector, the RS-232 communication options should be set to match the communication configuration of the host computer. The RS-232 communication options are set by accessing, the HF2 Welding Power Supply MAIN MENU, WELD SENTRY option.

BAUD RATES:	The baud rate of the Weld Sentry can be configured at 1200, 2400, 4800, or 9600. The default setting is 9600.
PARITY:	The Weld Sentry always communicates in 8 bits with no parity and 1 stop bit.
DATA COMMUNICATIONS ROLE:	The Weld Sentry can be configured as a HOST or CLIENT. When "HOST" is selected, the Weld Sentry will send the regular Weld Sentry print output to the RS-232 Serial Port. In order to control the Weld Sentry's RS-232 Serial Port from a host computer, select "CLIENT" for the DATA COMMUNICATIONS ROLE. The default setting is HOST.
I.D. NUMBER:	To identify the HF2 Welding Power Supply connected to the RS-232 communication line, the host computer needs to know the identification number of the HF2. The I.D. Number can be any number from 0 to 99. The default setting of I.D. NUMBER is 0.

NOTE: Only ***one*** HF2 Welding Power Supply can be connected the RS-232 Serial Port.

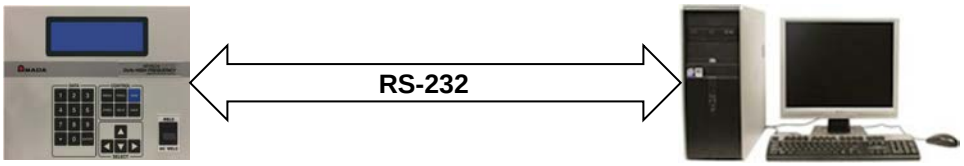
RS-232 Serial Port Connection

When the HF2 is installed with the Weld Sentry module, it is possible to use the RS-232 protocol to remote program the HF2. However, when using the RS-232 communication line, the host computer can be connected to only one HF2. To implement RS-232 communications, use the following steps:

1 Connect the RS-232 Serial Port connector on the HF2 Welding Power Supply rear panel to the serial connector on a host computer.

2 Set the baud rate of the Weld Sentry communication in the HF2 Welding Power Supply and the host computer to the same baud rare. The Weld Sentry communication baud rate setting is listed under the HF2 Welding Power Suppling WELD SENTRY/COMMUNICATIONS menu.

3 Set the unit ID number in the WELD SENTRY / COMMUNICATIONS menu. This ID number should be used by the host computer to identify the HF2.



RS-232 Serial Port Communication Speed

All the features implemented on the HF2's RS-485 communication are supported by the Weld Sentry's RS-232 communication. However, the RS-232 communication protocol is slower than the HF2's RS-485 communication since the Weld Sentry protocol is implemented on top of the existing HF2/Weld Sentry communication protocol. The HF2's RS-485 communication is recommended for the remote data collection and the remote programming of the HF2.

CHAPTER 3
REMOTE PROGRAMMING CONTROL

The portions of the protocol that include the physical layer (hardware electrical interconnect), the link layer (framing, data encoding, duplex control) the network layer (source-destination identification) and the transport layer (packet framing and token control) are implemented in the HF2. The HF2 must always be in the Client Mode to send data in a polled request-response synchronous operation utilizing a packetized token-passing-like control and accepting input commands.

The multi-drop signal synchronization control utilizing a token-passing-like algorithm uses the unit identification portion of the command screen as the token, which is the pound sign (#) followed by the unit ID number. When no information is being passed, the host passes an empty token, which is a packet consisting of the token followed by the end of packet sequence (<crlf><lf>). If the HF2 has a message to return, it sends the message along with the token to the host. Otherwise, if the HF2 has no message to return, it returns an empty token. A message consists of any command and its parameters or other data accompanying the command. Each token-message packet must conclude with an end of packet sequence. The HF2 ignores any packet beginning with a unit ID that does not match it's programmed value, up to the point that an idle line is detected. Thus, at least one character time of idle line is required between packets to wake up all HF2 Welding Power Supplies on the communication line in order to recognize any subsequent packet that may be addressed to them.

Command Summary

Packet format:

#ID **KEYWORD** parameters <crlf><lf>

unit identification & token	*#ID* (*ID* is any number from 0 to 255, must be left-justified or zero-padded to the left)
command keywords:	**BOLD**
variable to be replaced by literal:	*italics*
required parameters:	{enclosed in braces} (one required and only one parameter allowed)
optional parameters:	[enclosed in brackets] (zero or more allowed)
required/optional parameters:	{[enclosed in braces and brackets]} (one or more allowed)
choice of parameters:	separated by vertical bar "|" indicated one *OR* another of choices presented
range of parameters:	*low_end-high_end* (separated by hyphen)
end of parameter line:	<crlf> (carriage return followed by newline)
end of packet:	<lf> (new line – must be preceded by the end of parameter line <crlf>)

Each component (token, keyword, and parameters) will and must be separated by one or more non-printing characters (spaces or tabs) except the end of packet <lf> must follow the end of parameter line <crlf> immediately. Non-printing characters immediately preceding the end of parameter line <crlf> are ignored.

Helpful Hints

Simple Data Collection

In order to do the simple data collection, the host only needs to send #ID REPORT NEW number command. ID is the identification number of the HF2. ***number*** is a number greater than the number of welds made since the last data collection. Then the HF2 then sends all the weld reports since the last data collection and erases all the weld data sent from the weld data buffer. The host should parse the weld report. The weld reports are separated with <crlf>. The fields within the report are separated with a comma.

Examples of Remote Commands

#1 REPORT OLD 10 <crlf><lf>

Host is requesting the HF2 with ID number 1 to send 10 weld reports from the accumulated weld reports. The weld data counter in the HF2 is decremented by 10.

#1 REPORT NEW 1 <crlf><lf>

Host is requesting the HF2 with ID number 1 to send the latest weld reports. The weld data counter is reset to 0.

#5 SCHEDULE <crlf><lf>

Host is requesting the HF2 with ID number 5 to send the current schedule number selected.

CHAPTER 4
HOST ORIGINATED COMMANDS

These are the commands sent by the host computer, via RS-485 or RS-232 through the Weld Sentry card, to an HF2.

Command: **STATUS** <crlf><lf>
HF2 state: Any
Description: Requests the HF2 to report the status of the weld data buffer. HF2 returns **STATUS** with either "**OK**" or "**OVERRUN**".

Command: **COUNT** <crlf><lf>
HF2 state: Any
Description: Requests the HF2 to report the number of weld data accumulated since the last data collection. HF2 returns the **COUNT** even if there is no weld data available.

Command: **LOAD** *schedule_number* <crlf><lf>
HF2 state: RUN state
Description: Selects the *schedule_number* as the currently loaded schedule. *Schedule_number* may be any number from **0** to **127**. There must be a space between **LOAD** and *schedule_number*.

Command: **SCHEDULE** <crlf><lf>
HF2 state: Any
Description: Requests the HF2 to return the currently selected schedule number.

Command: **SAVE** *schedule_number* <crlf><lf>
HF2 state: PROGRAM
Description: Saves the modified schedule to *schedule_number*. *Schedule_number* may be any number from **0** to **127**. Commanding HF2 from PROGRAM state to RUN state after making modifications without **SAVE**ing will cause the selected schedule to be saved to schedule 0 and schedule 0 will be automatically loaded.

Command: **COUNTER** <crlf><lf>
HF2 state: Any
Description: Requests the HF2 to return the HF2 weld counter contents.

Command: **REPORT {OLD | NEW}** *number* <crlf><lf>

HF2 state: Any

Description: Requests the HF2 to send the weld report.

OLD: requests to send the number of oldest weld reports since the last data collection. The reported weld data will be erased.

NEW: requests to send the number of newest weld reports. All the weld data will be erased after reported.

number: the number of weld data to be sent. If the *number* is greater than the number of weld data in the buffer, less than the *number* of weld data will be sent. There must be a space between two fields.

Command: **ERASE** <crlf><lf>

HF2 state: Any

Description: Requests the HF2 to erase all the weld reports.

Command: **STATE {READ | RUN | PROGRAM | MENU}** <crlf><lf>

HF2 state: Any

Description: Commands sentry to identify its current state ("**READ**" keyword, see **STATE** in *Chapter 5, HF2 Originated Commands*) or go to either RUN state or PROGRAM state.

Command: **SECURITY {OFF | ON | LOCK}** <crlf><lf>

HF2 state: Any

Description: Allows control of the Sentry security mode. "**OFF**" sets sentry to "unprotected", "**ON**" sets sentry to "protected" mode without schedule lock, and "**LOCK**" sets sentry to "protected" mode with schedule lock.

Command: **COPY {*from_schedule_number*} {*to_schedule_number*}** <crlf><lf>

HF2 state: Any

Description: Allows one schedule to be copied to another schedule number. *From_schedule_number* and *to_schedule_number* may be any number from 0 to 127. Copying a schedule to itself has no effect other than to invoke a schedule printout when "**PRINT SCHEDULES/PROGRAMS**" is enabled.

Command: **SCREEN {TEXT | ATTRIBUTE | GRAPH *row*}** <crlf><lf>

HF2 state: Any

Description: Requests the HF2 to send screen dump. If TEXT is specified, the HF2 sends 320 bytes of the text screen dump. If ATTRIBUTE is specified, the HF2 sends 320 bytes of attribute screen dump. If GRAPH is specified, the HF2 sends 40 bytes of graphical screen dump at the row specified by *row*.

Command: **KEY** *key_code* <crlf><lf>

HF2 state: Any

Description: Process the *key_code* as if it was pressed from the front panel. The following are the *key_codes*:

Key	Dec	Hex
0	48	30
1	49	31
2	50	32
3	51	33
4	52	34
5	53	35
6	54	36
7	55	37
8	56	38
9	57	39
PERIOD	46	2E
MENU	23	17
PROG	20	14
RUN	15	0F
CHNG	18	12
HELP	19	13
SAVE	21	15
UP	30	1E
DOWN	31	1F
LEFT	17	11
RIGHT	16	10
ENTER	13	0D

Command: **ALARM {READ | CLEAR | SET** ***error_number*** | **DISPLAY** ***alarm_message_string*****}** <crlf><lf>

HF2 state: Any

Description: Provides access to the HF2 alarm logic. When used with the "**READ**" keyword, the current error condition value is returned (see **ALARM** in *Chapter 5, HF2 Originated Commands*). When the "**CLEAR**" keyword is used, all alarm conditions are canceled. When the "**SET**" keyword is used, the host may invoke an error identified by *error_number*. When the "**DISPLAY**" keyword is used, an error condition can be created with any message desired. The length of the error message must be limited to 40 characters or less. No help message will be available in connection with this created error message.

Command: **SCHEDULE {READ | SET** <crlf>
parameter_name value [<crlf>
parameter_name value <crlf>
…
]} <lf>

HF2 state: Any, except while welding

Description: Provides control over the HF2 schedule parameters. When used with the "**READ**" keyword, all parameters pertaining to the currently loaded schedule are returned (see SCHEDULE in *Chapter 5, HF2 Originated Commands*). When the "**SET**" keyword is used, the host may set (change) the value of one or more of the parameters pertaining to the currently loaded schedule. The following is a list of valid literal substitutions for the *parameter_name* and *value* variables:

FUNCTION	**{BASIC WELD | WELD/REPEAT | QUENCH/TEMPER | PRE/POSTHEAT | UP/DOWNSLOPE | BRAZE | ROLLSPOT | SEAM | DUAL PULSE | PULSATION}** function of the schedule	
NEXT	**{1 – 127, 255}**	Schedule number to be executed if chain feature is enabled
PULSATION	**{1 – 99}**	Pulsation Counter for pulsation function
FEEDBACK1	**{CURRENT | VOLTAGE | POWER}** Feedback type for pulse 1	
FEEDBACK2	**{CURRENT | VOLTAGE | POWER}** Feedback type for weld 2 in dual pulse	
STEPS	***{step_counter}***	Step counter if chain feature is enabled
SQUEEZE	***{weld_time}***	Squeeze cycles
P1TIME	***{weld_time}***	Period 1 time
P2TIME	***{weld_time}***	Period 2 time
P3TIME	***{weld_time}***	Period 3 time
P4TIME	***{weld_time}***	Period 4 time
P5TIME	***{weld_time}***	Period 5 time
P6TIME	***{weld_time}***	Period 6 time
HOLDTIME	***{weld_time}***	Hold time
OFFTIME	***{weld_time}***	Off time
ENG1	***{weld_energy}***	Energy amount for 1st weld period
ENG2	***{weld_energy}***	Energy amount for 2nd weld period
ENG3	***{weld_energy}***	Energy amount for 3rd weld period
HEAD	**{1 – 4}**	Head selection number for MA-600 if installed

weld_time is the parameter that defines the time for the given period in msec. Valid range is from 0 to 2,000 msec except the braze function which allows up to 20,000. 0 is not allowed in some periods.

weld_energy is the parameter that specifies the amount of weld energy. In the current feedback mode, *weld_energy* is in unit of 0.01 kA. In the voltage feedback mode, *weld_energy* is in units of 0.01 V. In the power feedback mode, *weld_energy* is in units of 0.01 kW.

step_counter is the parameter that specifies the number of welds for the given schedule before advancing to the next schedule when the CHAIN SCHEDULE feature is enabled. A valid number for *step_counter* is 1 through 99999 and 0 is for stop.

Command: **RELAY {READ | SET** <crlf>
parameter_name value [<crlf>
parameter_name value <crlf>
…
]} <lf>

HF2 state: Any, except while welding

Description: Provides control over the HF2 schedule parameters for relay settings. When used with the "**READ**" keyword, the relay settings of the currently loaded schedule are returned (see **RELAY** in *Chapter 5, HF2 Originated Commands*). When the "**SET**" keyword is used, the host may set (change) the value of one or more of the relay settings of the currently loaded schedule. The following is a list of valid literal substitutions for the *parameter_name* and *value* variables:

K1SQUEEZE	**{OFF | ON | RUN STATE | ALARM | NOT USED | AIR HEAD 2}**	
K1P1	**{OFF | ON}**	Relay 1 status at period 1
K1P2	**{OFF | ON}**	Relay 1 status at period 2
K1P3	**{OFF | ON}**	Relay 1 status at period 3
K1P4	**{OFF | ON}**	Relay 1 status at period 4
K1P5	**{OFF | ON}**	Relay 1 status at period 5
K1P6	**{OFF | ON}**	Relay 1 status at period 6
K1HOLD	**{OFF | ON}**	Relay 1 status at hold time
K1OFF	**{OFF | ON}**	Relay 1 status at off time
K2SQUEEZE	**{OFF | ON | RUN STATE | ALARM | NOT USED | AIR HEAD 2}**	
K2P1	**{OFF | ON}**	Relay 2 status at period 1
K3P2	**{OFF | ON}**	Relay 2 status at period 2
K4P3	**{OFF | ON}**	Relay 2 status at period 3
K2P4	**{OFF | ON}**	Relay 2 status at period 4
K2P5	**{OFF | ON}**	Relay 2 status at period 5
K2P6	**{OFF | ON}**	Relay 2 status at period 6
K2HOLD	**{OFF | ON}**	Relay 2 status at hold time
K2OFF	**{OFF | ON}**	Relay 2 status at off time

Command: **MONITOR {READ | SET** <crlf>
parameter_name value [<crlf>
parameter_name value <crlf>
…
]**}** <lf>

HF2 state: Any, except while welding

Description: Provides control over the basic weld monitor settings of the HF2 schedule. When used with the "**READ**" keyword, the basic weld monitor settings of the currently loaded schedule are returned (see **MONITOR** in *Chapter 5, HF2 Originated Commands*). When the "**SET**" keyword is used, the host may set (change) the value of one or more of the parameters of the basic weld monitor settings pertaining to the currently loaded schedule. The following is a list of valid literal substitutions for the *parameter_name* and *value* variables:

MONTYPE1 **{CURRENT | VOLTAGE | POWER | RESISTANCE}**
Monitor Type for weld 1 period
UPPER1 ***{limit_value}*** Upper Limit for weld 1 period
LOWER1 ***{limit_value}*** Lower Limit for weld 1 period
INHIBIT1 **{OFF | ON}** Inhibit Weld Power for weld 1 period
MONTYPE2 **{CURRENT | VOLTAGE | POWER | RESISTANCE}**
Monitor Type for weld 2 period
UPPER2 ***{limit_value}*** Upper Limit for weld 2 period
LOWER2 ***{limit_value}*** Lower Limit for weld 2 period
INHIBIT2 **{OFF | ON}** Inhibit Weld Power for weld 2 period

limit_value is the parameter that specifies the range of the valid readings. If the reading was within the range of the *limit-value,* no alarm will occur. If the reading was out of the valid range, an alarm will occur. If the monitor type is current, the *limit_value* is in unit of 1 A. If the monitor type is voltage, the *limit_value* is in unit of 1 mV. If the monitor type is power, the *limit_value* is in unit of 1 W. If the monitor type is resistance, the *limit_value* is in unit of 1 μΩ. The valid number for *limit_value* is 1 through 9999 and 0 is for none.

Command: **SYSTEM {READ | SET** <crlf>
[*parameter_name value* <crlf>
parameter_name value <crlf>
…
]**}** <lf>

HF2 state: Any

Description: Provides control over HF2 system parameters. When used with the "**READ**" keyword, all system parameters are returned (see **SYSTEM** in *Chapter 5, HF2 Originated Commands*). When used with the "**SET**" keyword, the host may set (change) the value of one or more of the system parameters. The following is a list of valid literal substitutions for the *parameter_name* and *value* variables:

PUSCH **{0 – 127, 250}** power-up schedule number
BUZZER **{OFF | ON}** end of cycle buzzer
CLICK **{OFF | ON}** key click on/off

CHAIN	**{OFF | ON}**	chain schedule
AUTOGAIN	**{OFF | ON}**	auto gain adjustment
BASICMON	**{OFF | ON}**	basic weld monitor status
HEADTYPE	**{AUTO | AIR | MANUAL | DUAL AIR}**	weld head type
FOOTSW	**{1-LEVEL | 2-LEVEL | AUTO | NONE}**	footswitch type
WELDABORT	**{OFF | ON}**	footswitch weld abort
FIRESW	**{2-WIRE | 3-WIRE | OPTO | NONE}**	
DEBOUNCE	**{0 | 10 | 20 | 30}**	switch debounce time in msec

These parameters pertain to the settings of the option menus available via the front panel user interface.

power-up schedule number is the schedule number to be selected at the power-up. Any number from 0 to 127 can be selected. To select the schedule number that was used before power down, use 250.

Command: **TRANS {READ | SET** <crlf>
[*parameter_name value* <crlf>
parameter_name value <crlf>
…
]**}** <lf>

HF2 state: Any

Description: Provides control over HF2 Transformer settings. When used with the "**READ**" keyword, all transformer settings are returned (see TRANSFORMER in *Chapter 5, HF2 Originated Commands*). When used with the "**SET**" keyword, the host may set (change) the value of one or more of the HF2 Transformer settings. The following is a list of valid literal substitutions for the *parameter_name* and *value* variables:

MULTIHEAD	**{OFF | ON}**	multiple heads
TR1TYPE	**{NONE | X3/4000-230 | X5/3000-230 | X11/4000-230 | X3/4000-380 | X3/4000-460 | OTHER}**	Transformer 1 type
TR1RATIO	**{25 – 150}**	Transformer 1 turns ratio
TR1CURRENT	**{1 – 99}**	Transformer 1 maximum current in 0.1kA
TR1VOLTAGE	**{1 – 99}**	Transformer 1 maximum voltage in 0.1V
TR2TYPE	**{NONE | X3/4000-230 | X5/3000-230 | X11/4000-230 | X3/4000-380 | X3/4000-460 | OTHER}**	Transformer 2 type
TR2RATIO	**{25 – 150}**	Transformer 2 turns ratio
TR2CURRENT	**{1 – 99}**	Transformer 2 maximum current in 0.1kA
TR2VOLTAGE	**{1 – 99}**	Transformer 2 maximum voltage in 0.1V
TR3TYPE	**{NONE | X3/4000-230 | X5/3000-230 | X11/4000-230 | X3/4000-380 | X3/4000-460 | OTHER}**	Transformer 3 type
TR3RATIO	**{25 – 150}**	Transformer 3 turns ratio
TR3CURRENT	**{1 – 99}**	Transformer 3 maximum current in 0.1kA
TR3VOLTAGE	**{1 – 99}**	Transformer 3 maximum voltage in 0.1V

TR4TYPE	**{NONE | X3/4000-230 | X5/3000-230 | X11/4000-230 | X3/4000-380 | X3/4000-460 | OTHER}** Transformer 4 type	
TR4RATIO	**{25 – 150}**	Transformer 4 turns ratio
TR4CURRENT	**{1 – 99}**	Transformer 4 maximum current in 0.1 kA
TR4VOLTAGE	**{1 – 99}**	Transformer 4 maximum voltage in 0.1 V

These parameters pertain to the settings of the transformer type menu available via the front panel user interface.

Command: **SYNC** <crlf><lf>

HF2 state: Any

Description: Provides synchronization of the commands. The HF2 return SYNC command back to the host computer.

Weld Sentry Related Commands:

The following commands are only valid when the weld sentry module is installed in the HF2.

Command: **PROGRAM {READ** *sub_program* | **SET** *sub_program* <crlf>
[*parameter_name value* <crlf>
parameter_name value <crlf>
…
]**}** <lf>

HF2 state: PROGRAM

Description: Provides control over Weld Sentry sub-program parameters. When used with the "**READ**" keyword, all parameters pertaining to the specified sub-programs of the currently loaded schedule are returned (see **PROGRAM** in *Chapter 5, HF2 Originated Commands*). When the "**SET**" keyword is used, the host may set (change) the value of one or more of the parameters pertaining to the specified sub-programs of the currently loaded schedule. The *sub-program* variable may be replaced by **"A", "B", "C", "D", or "E"** representing the sub-program desired to be read or modified. The following is a list of valid literal substitutions for the *parameter_name* and *value* variables:

PERIOD	**{1 – 5}**	period to measure
UOM	**{AMPSEC | VOLTSEC | WATTSEC | unit of measure OHMSEC | RMSAMPS | AMP-VOLTSEC | AMP2SEC | VOLT2SEC | PKAMPS | PKVOLTS |** (these available in extended mode only) **PKWATTS | OHMSTAPK}** " " "
DELAY	**{0 – 500}**	calculation delay time in msec
MEASURE	**{0.04 – 500}**	calculation time in msec
UPPER	**{*upper_limit*}**	upper limit in floating point format
LOWER	**{*lower_limit*}**	lower limit in floating point format
VGAIN	**{32 | 16 | 8 | 4 | 2 | 1 | 0.5 | 0.25}**	voltage gain setting
CGAIN	**{32 | 16 | 8 | 4 | 2 | 1 | 0.8 | 0.5 | 0.4 | 0.25 | 0.2 | 0.1}**	current gain setting
SEQUENCE	**{END | CONTINUE | REPEAT}**	sub-program sequence mode
STATUS	**{OFF | ON}**	sub-program status

The values allowed for any of these parameters are limited by various other factors, so that certain combinations may be disallowed. Floating point format may be any number in real number format that may include a decimal point (0.0000001 – 999999999) or in exponential format. Exponential format should take the form of "*n.nnn***E**±*ee*" The **DELAY** parameter reflects the time in ms of sample data to skip before calculation begins, and the **MEASURE** parameter reflects the time in ms of sample data to be included in the calculation (measurement time).

Command: **SENTRY {READ | SET** <crlf>
[*parameter_name value* <crlf>
parameter_name value <crlf>
…
]**}** <lf>

HF2 state: RUN state

Description: Provides control over Weld Sentry system parameters. When used with the "**READ**" keyword, all system parameters are returned (see **SYSTEM** in *Chapter 5, HF2 Originated Commands*). When used with the "**SET**" keyword, the host may set (change) the value of one or more of the system parameters. The following is a list of valid literal substitutions for the *parameter_name* and *value* variables:

EXTEND	**{OFF | ON}**	extended measurement modes
PRINTER	**{IBM | EPSON}**	printer type
RESULTS	**{NONE | REJECT | ALL}**	result output type
UNITS	**{ONE | ALL}**	which units of measure
GRAPHS	**{NO | YES}**	graph output
SCALE	**{X1 | X2 | X5 | X10}**	graph expansion scale
PROGRAM	**{OFF | ON}**	print schedule & program changes
K1	**{[HIGH | LOW | ACCEPT | MARGINAL | NOWELD | OVERLOAD | LINE | NONE]}**	
K2	**{[HIGH | LOW | ACCEPT | MARGINAL | NOWELD | OVERLOAD | LINE | NONE]}**	
K3	**{[HIGH | LOW | ACCEPT | MARGINAL | NOWELD | OVERLOAD | LINE | NONE]}**	
K4	**{[HIGH | LOW | ACCEPT | MARGINAL | NOWELD | OVERLOAD | LINE | NONE]}**	
INHIBIT	**{[HIGH | LOW | ACCEPT | MARGINAL | NOWELD | OVERLOAD | LINE | NONE]}**	
KDELAY	**{0 – 500}**	relay activation delay in ms
REMAIN	**{NEXT | 2 – 500}**	relay remain on in ms

These parameters pertain to the settings of the various menus available via the front panel user interface. The values for K1, K2, K3, & K4 may be any combination of one or more of the indicated possible values, or "NONE" (exclusive of other values), separated by spaces.

Command: **TIME {READ | SET** *mm-dd-yy HH:MM:SS***}**<crlf> <lf>

HF2 state: Any

Description: Provides access to Weld Sentry real-time clock / calendar. When used with the "**READ**" keyword, the current data and time are returned (see **TIME** in *Chapter 5, HF2 Originated Commands*). When the "**SET**" keyword is used, the host may set (change) the value of the current date and time.

Command: **COUNTERS {READ | SET** <crlf>
[*parameter_name value* <crlf>
parameter_name value <crlf>
…
]**}** <lf>

HF2 state: Any

Description: Provides control over Weld Sentry weld counters. When used with the "**READ**" keyword, the values of all weld counters are returned (see **COUNTERS** in *Chapter 5, HF2 Originated Commands*). When the "**SET**" keyword is used, the host may set (change) the value of one or more of the weld counters. The following is a list of valid literal substitutions for the *parameter_name* and *value* variables:

TOTAL	**{0 – 9999999}**	total number of welds
HIGH	**{0 – 9999999}**	number of rejects high
LOW	**{0 – 9999999}**	number of rejects low
ACCEPT	**{0 – 9999999}**	number of accepted welds

These parameters pertain to the settings of the WELD COUNTER menu available via the front panel user interface.

Command: **SPCCOUNT {READ | SET** <crlf>
[*sub-program count* [<crlf>
sub-program count <crlf>
…
]**}** <lf>

HF2 state: Any

Description: Provides control over Weld Sentry spc count parameters. When used with the "**READ**" keyword, the number of welds available in spc memory for all sub-programs of the currently loaded schedule and the percentage of unused SPC memory remaining are returned (see **SPCCOUNT** in *Chapter 5, HF2 Originated Commands*). When the "**SET**" keyword is used, the host may set the number of welds to be used for SPC calculations for one or more of the sub-programs of the currently loaded schedule. The *sub-program* variable may be **"A", "B", "C", "D", or "E",** but any value of *sub-program* higher than the highest valid sub-program of the currently loaded schedule will be ignored. The *count* variable may be any number 1 through the number of welds available for that sub-program. Values of *count* greater than the number of welds available will be truncated down to the number of welds available.

Command: **SPC {STATISTICS | REJECT} {*sub-program*}** <crlf> <lf>

HF2 state: Any

Description: Requests Statistical Process Control data from the Weld Sentry. When used with the "**STATISTICS**" keyword, the HF2 returns the average, maximum, minimum, and standard deviation of the welds calculated for *sub-program*. When the "**REJECT**" keyword is used, values representing the total number of welds, accepted welds, reject low, reject high, and total rejected weld, and the percentage of the total number of welds that each category represents are returned. (See **SPC** in *Chapter 5, HF2 Originated Commands*). The *sub-program* variable may be **"A", "B", "C", "D", or "E",** but any value of *sub-program* higher than the highest valid sub-program of the currently loaded schedule will be ignored.

Command: **SPC {XBAR | RANGE} {*sub-program*}** <crlf><lf>

HF2 state: Any

Description: Requests Statistical Process Control data from the Weld Sentry. Returns the subgroup count, average, upper control limit, and lower control limit for either group average (using the "**XBAR**" keyword) or the group range (using the "**RANGE**" keyword). (See **SPC** in *Chapter 5, HF2 Originated Commands*). The *sub-program* variable may by **"A", "B", "C", "D",** or **"E"**, but any value of *sub-program* higher than the highest valid sub-program of the currently loaded schedule will be ignored. The *subgroup_size* may be any number from 2 to 25, however, using a number different than the subgroup size used when using periodic sampling can produce misleading results.

Command: **SAMPLING {READ | CONTINUOUS | PERIODIC} {*subgroup_size*} {*sampling_period*}** <crlf> <lf>

HF2 state: Any

Description: Reads or sets the Sampling mode for the Weld Sentry's Statistical Process Control data collection. When the "**READ**" keyword is used, the *subgroup_size* and *sampling_period* variables are not used and will be ignored, but the currently set values they represent will be returned (see **SAMPLING** in *Chapter 5, HF2 Originated Commands*). The *subgroup_size* variable defines the group sample size and may be any number from 1 to 25. The *sampling_period* variable is used only with the "**PERIODIC**" keyword, and specifies the number of welds that define the interval between sampling groups; e.g., if *sampling_period* = 100 and *subgroup_size* = 5, then 5 welds will be sampled every 100 welds, leaving 95 weld unrecorded between groups or sampled welds. The *sampling_period* may be any number from *subgroup_size* to 999. The *sampling_period* variable will be ignored if the "**CONTINUOUS**" keyword is used, and will be set to equal *subgroup_size*.

Command: **SPCERASE {ALL | SCHEDULE *schedule_number* | LAST}** <crlf> <lf>

HF2 state: Any

Description: Erases all or portions of the Weld Sentry's Statistical Process Control weld history. When the "**ALL**" keyword is used, all history is erased. When the "**SCHEDULE**" keyword is used, history for all sub-programs of schedule *schedule_number* is erased. When the "**LAST**" keyword is used, the last weld made will be erased.

Command: **HISTORY [XBAR | RANGE] {*sub_program*} (*subgroup_size*}** <crlf> <lf>

HF2 state: Any

Description: Requests Statistical Process Control history data from the Weld Sentry. When no keyword is used, *subgroup_size* is assumed to be 1 and need not be included in the parameter list, and the values for all welds stored in history will be returned for the *sub_program* of the currently loaded schedule. When the "**XBAR**" keyword is used, the average value of every group of *subgroup_size* samples is returned for the *sub-program* of the currently loaded schedule. When the "**RANGE**" keyword is used, the range (difference of minimum and maximum) of every group of *subgroup_size* samples is returned for the *sub-program* of the currently loaded schedule. (See **HISTORY** in *Chapter 5, HF2 Originated Commands*). The *sub-program* variable may be **"A", "B", "C", "D", or "E",** but any value of *sub-program* higher than the highest valid sub-program of the currently loaded schedule will be ignored. The *subgroup_size* may be any number from 1 to 25, however, using a number different than the subgroup size used when using periodic sampling can produce misleading results.

CHAPTER 5
HF2 ORIGINATED COMMANDS

These are the commands sent from an HF2 to a host computer.

Command: **STATUS** *state_name* <crlf><lf>

HF2 state: Any

Description: Identifies the current status of the weld data buffer. May be in response with "**OK**" or "**OVERRUN**". "**OK**" means that the HF2 weld buffer did not over-run since the last data collection and all the data are intact. "**OVERRUN**" means that the HF2 weld buffer did over-run since the last data collection and only the latest 3000 weld data are available to report.

Command: **COUNT** *number* <crlf><lf>

HF2 state: Any

Description: Returns the number of weld data available in HF2. The total number of weld data that the HF2 holds in the buffer is 3000.

Command: **SCHEDULE** *schedule_number* <crlf><lf>

HF2 state: Any

Description: Returns the current schedule number to the host. *schedule_number* may be any number from **0** to **127**.

Command: **REPORT** *number_of_reports* <crlf>
report <crlf> report <crlf> . . . . *report* <crlf><lf>

HF2 state: Any

Description: Returns the requested number of weld reports. First field is the number of reports to be sent. Then follows the packets of report. One report pack hold all the information about a weld. Each report packet is separated by <crlf> and this command ends with <crlf><lf>.

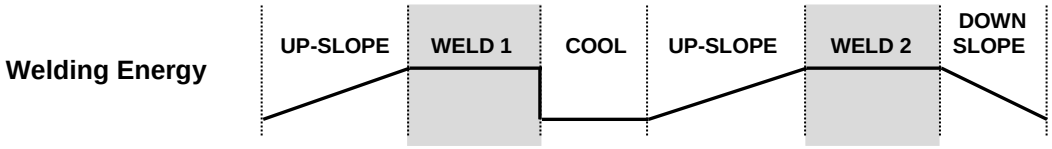
number_of_reports: This is the number of reports that shall be included in this command. If the host computer requests more weld data than is available in the weld data buffer, the HF2 sends only the weld reports in the weld buffer and the *number_of_reports* is the number of weld reports available in the weld data buffer. After the report is sent to the host computer, the HF2 erases the weld data sent to the host from the weld data buffer.

report: {*schedule_number, current_1, voltage_1, current_2, voltage_2, %_control_1, pulse_width, %_control_2, weld_status*}

The fields in the report packet are separated with a comma and all fields are in integer format. There are always 8 fields in a report packet.

schedule_number:	The schedule number of the weld
current_1:	The average peak current of 1st weld period (in A)
voltage_1:	The average peak voltage of 1st weld period (in mV)
%_control_1:	The % capacity control needed to reach the 1st weld period
current_2:	The average peak current of 2nd weld period for dual pulse (in A)
voltage_2:	The average peak voltage of 2nd weld period for dual pulse (in mV)
%_control_2:	The % capacity control needed to reach the 2nd weld period
weld_status:	The status of the weld.

Only the weld 1 and weld 2 periods are measured. Up-slope and down-slope periods are not measured.



Command: **STATE** *state_name* <crlf><lf>

HF2 state: Any

Description: Identifies the current state of operation of the sentry. May be in response to the **STATE READ** command sent by the host, or may be sent as a result of a state change from the sentry front panel. *state_name* may be any of "**RUN**", "**PROGRAM**", or "**MENU**".

Command: **SCREEN {TEXT | ATTRIBUTE | GRAPH** *row***}** <crlf>
screen_dump <crlf><lf>

HF2 state: Any state

Description: Returns the request screen dump from the HF2. If TEXT is specified, the HF2 is sending 320 bytes of the text screen dump. If ATTRIBUTE is specified, the HF2 is sending 320 bytes of attribute screen dump. If GRAPH is specified, the HF2 is sending 40 bytes of graphical screen dump at the row specified by *row*.

Command: **COUNTER** *number* <crlf><lf>

HF2 state: Any

Description: Returns the current HF2 total weld counter number.

Command:

SCHEDULE	*schedule_number* <crlf>
FUNCTION	*schedule_function* <crlf>
NEXT	*next_schedule_number* <crlf>
PULSATION	*number_of_pulsation* <crlf>
FEEDBACK1	*weld_period_1_feedback* <crlf>
FEEDBACK2	*weld_period_2_feedback* <crlf>
STEPS	*step_counter* <crlf>
SQUEEZE	*time_for_squeeze* <crlf>
P1TIME	*time_for_period_1* <crlf>
P2TIME	*time_for_period_2* <crlf>
P3TIME	*time_for_period_3* <crlf>
P4TIME	*time_for_period_4* <crlf>
P5TIME	*time_for_period_5* <crlf>
P6TIME	*time_for_period_6* <crlf>
HOLDTIME	*hold_time* <crlf>
OFFTIME	*off_time* <crlf>
END1	*energy_for_weld_period_1* <crlf>
END2	*energy_for_weld_period_2* <crlf>
END3	*energy_for_weld_period_3* <crlf>
HEAD	*weld_head_selection_number* <crlf><lf>

HF2 state: Any

Description: Reports the settings of the currently loaded HF2 schedule parameters. The *schedule_number* variable identifies which schedule is currently loaded, and may be any value from 000 to 127. The possible value for all variables listed after their parameter name correspond to the values listed under **SCHEDULE** in the HOST ORIGINATED COMMANDS section of this document.

Command:

RELAY	*schedule_number* <crlf>
K1SQUEEZE	*relay_1_status_at_squeeze_time* <crlf>
K1P1	*relay_1_status_at_period_1* <crlf>
K1P2	*relay_1_status_at_period_2* <crlf>
K1P3	*relay_1_status_at_period_3* <crlf>
K1P4	*relay_1_status_at_period_4* <crlf>
K1P5	*relay_1_status_at_period_5* <crlf>
K1P6	*relay_1_status_at_period_6* <crlf>
K1HOLD	*relay_1_status_at_hold_time* <crlf>
K1OFF	*relay_1_status_at_off_time* <crlf>
K2SQUEEZE	*relay_2_status_at_squeeze_time* <crlf>
K2P1	*relay_2_status_at_period_1* <crlf>
K3P2	*relay_2_status_at_period_2* <crlf>
K4P3	*relay_2_status_at_period_3* <crlf>
K2P4	*relay_2_status_at_period_4* <crlf>
K2P5	*relay_2_status_at_period_5* <crlf>

K2P6 *relay_2_status_at_period_6* <crlf>
K2HOLD *relay_2_status_at_hold_time* <crlf>
K2OFF *relay_2_status_at_off_time* <crlf><lf>

HF2 State: Any

Description: Reports the relay settings of the currently loaded HF2 schedule. The *schedule_number* variable identifies which schedule is currently loaded, and may be any value from 000 to 127. The possible value for all variables listed after their parameter name correspond to the values listed under **RELAY** in the HOST ORIGINATED COMMANDS section of this document.

Command: **MONITOR** *schedule_number* <crlf>
MONTYPE1 *monitor_type_for_weld_period_1* <crlf>
UPPER1 *upper_limit_for_weld_period_1* <crlf>
LOWER1 *lower_limit_for_weld_period_1* <crlf>
INHIBIT1 *inhibit_status_for_weld_period_1* <crlf>
MONTYPE2 *monitor_type_for_weld_period_2* <crlf>
UPPER2 *upper_limit_for_weld_period_2* <crlf>
INHIBIT2 *inhibit_status_for_weld_period_2* <crlf>
<lf>

HF2 State: Any

Description: Reports the settings of the basic weld monitor of the currently loaded HF2 schedule. The *schedule_number* variable identifies which schedule is currently loaded, and may be any value from 000 to 127. The possible value for all variables listed after their parameter name correspond to the values listed under **MONITOR** in the HOST ORIGINATED COMMANDS section of this document.

Command: **SYSTEM {READ | SET}** <crlf>
PUSCH *power_up_schedule_number* <crlf>
BUZZER *end_of_cycle_buzzer* <crlf>
CLICK *key_click* <crlf>
CHAIN *chain_schedule* <crlf>
AUTOGAIN *auto_gain_adjustment* <crlf>
BASICMON *basic_weld_monitor_status* <crlf>
HEADTYPE *weld_head_type* <crlf>
FOOTSW *footswitch_weld_abort* <crlf>
WELDABORT *footswitch_weld_abort* <crlf>
FIRESW *firing_switch_type* <crlf>
DEBOUNCE *switch_debounce_time* <crlf>
<lf>

HF2 State: Any

Description: Reports the current settings of the HF2 system parameters. The possible value for all variables listed after their parameter name correspond to the values listed under **SYSTEM** in the HOST ORIGINATED COMMANDS section of this document.

Command: **TRANS** <crlf>

MULTIHEAD	*multiple_heads* <crlf>
TR1TYPE	*tranformer_1_type* <crlf>
TR1RATIO	*tranformer_1_turns_ratio* <crlf>
TR1CURRENT	*tranformer_1_maximum_current* <crlf>
TR1VOLTAGE	*tranformer_1_maximum_voltage* <crlf>
TR2TYPE	*tranformer_2_type* <crlf>
TR2RATIO	*tranformer_2_turns_ratio* <crlf>
TR2CURRENT	*tranformer_2_maximum_current* <crlf>
TR2VOLTAGE	*tranformer_2_maximum_voltage* <crlf>
TR3TYPE	*tranformer_3_type* <crlf>
TR3RATIO	*tranformer_3_turns_ratio* <crlf>
TR3CURRENT	*tranformer_3_maximum_current* <crlf>
TR3VOLTAGE	*tranformer_3_maximum_voltage* <crlf>
TR4TYPE	*tranformer_4_type* <crlf>
TR4RATIO	*tranformer_4_turns_ratio* <crlf>
TR4CURRENT	*tranformer_4_maximum_current* <crlf>
TR4VOLTAGE	*tranformer_4_maximum_voltage* <crlf>

<lf>

HF2 State: Any

Description: Reports the current settings of the HF2 Transformer settings. The possible value for all variables listed after their parameter name correspond to the values listed under **TRANSFORMER** in the HOST ORIGINATED COMMANDS section of this document.

Command: **ALARM** *error_message* <crlf><lf>

HF2 State: any

Description: Identifies the current error condition of operation of the HF2. May be in response to the **ALARM READ** command sent by the host, or may be sent as a result of an error condition occurring in the HF2. *error_message* is a text string describing the error message, which is the same error message that is displayed to the screen.

Command: **SYNC** <crlf><lf>

HF2 State: Any

Description: The HF2 return **SYNC** command back to the host computer when the **SYNC** command is received from the host computer.

Weld Sentry Related Commands

The following commands are only valid when the weld sentry module is installed in the HF2.

Command: **TIME** *mm-dd-yy HH:MM:SS* <crlf><lf>

HF2 State: Any

Description: Returns the date and time from the Weld Sentry real-time clock / calendar in response to the host **TIME** command.

Command: **COUNTERS** <crlf>
TOTAL *total_weld_count* <crlf>
HIGH *rejects_high* <crlf>
LOW *rejects_low* <crlf>
ACCEPT *accepted_welds* <crlf>
<lf>

HF2 State:

Description: Reports the current settings of the Weld Sentry weld counters. The possible value for all variables listed after their parameter name are 0 –9999999. See **COUNTERS** in the HOST ORIGINATED COMMANDS section of this document.

Command: **SENTRY** <crlf>
EXTEND *extended_mode* <crlf>
PRINTER *printer_type* <crlf>
RESULTS *result_qualifier* <crlf>
UNITS *result_units* <crlf>
GRAPHS *graph_mode* <crlf>
SCALE *graph_scale* <crlf>
PROGRAM *print_programs_mode* <crlf>
K1 *relay_K1_output* <crlf>
K2 *relay_K2_output* <crlf>
K3 *relay_K3_output* <crlf>
K4 *relay_K4_output* <crlf>
INHIBIT *inhibit power supply* <crlf>
KDELAY *activation_delay* <crlf>
REMAIN *remain_on_time* <crlf>
<lf>

HF2 State: Any

Description: Reports the current settings of the Weld Sentry system parameters. The possible value for all variables listed after their parameter name correspond to the values listed under **SYSTEM** in the HOST ORIGINATED COMMANDS section of this document. Parameters **K1, K2, K3** and **K4** may contain any combination of the indicated possible settings, separated by spaces.

Command: **PROGRAM** *sub_program* <crlf>
PERIOD *period_number* <crlf>
UOM *unit_of_measure* <crlf>
DELAY *calculation_delay_time* <crlf>
MEASURE *calculation_measurement_time* <crlf>
UPPER *upper_reject_limit* <crlf>
LOWER *lower_reject_limit* <crlf>
VGAIN *voltage_gain* <crlf>
CGAIN *current_gain* <crlf>
SEQUENCE *sequence_mode* <crlf>
<lf>

HF2 State: Any

Description: Reports the Weld Sentry sub-program parameter settings for sub-program *"sub-program"* of the currently loaded schedule. *sub-program* may be **"A", "B", "C", "D",** or **"E".** The possible value for all variables listed after their parameter name correspond to the values listed under **PROGRAM** in the HOST ORIGINATED COMMANDS section of this document. Floating point numbers will be returned in exponential format.

Command: **SPCCOUNT** *schedule_number* <crlf>
A *count* <crlf>
B *count* <crlf>
C *count* <crlf>
D *count* <crlf>
E *count* <crlf>
<lf>

HF2 State: Any

Description: Returns the values of the Weld Sentry SPC counts for the currently loaded schedule. These *count* variables are the number of welds that are available (stored) in the SPC history memory for each sub-program. Only the sub-programs **"A" – "E"** that are active are reported by this command. In other words, if the currently loaded schedule has only two sub-programs **"A"** and **"B"** that are programmed to be used, then only the lines **"A"** and **"B"** will appear returned by this command. The *schedule_number* is the number of the schedule being reported.

Command: **SPC STATISTICS** *sub_program* <crlf>
AVERAGE *value* <crlf>
MINIMUM *value* <crlf>
MAXIMUM *value* <crlf>
STDDEV *value* <crlf>
<lf>

HF2 State: Any

Description: Returns the values of the Weld Sentry SPC statistics for the requested sub-program of the currently loaded schedule. The value variables are returned in exponential floating point format (i.e. *n.nnn***E**±*ee*).

Command: **SPC REJECT** *sub-program* <crlf>
WELDS *number* <crlf>
ACCEPT *number* *ppp.pp%* <crlf>
REJECT *number* *ppp.pp%* <crlf>
REJLOW *number* *ppp.pp%* <crlf>
REJHIGH *number* *ppp.pp%* <crlf>
<lf>

HF2 State: Any

Description: Returns the values of the Weld Sentry SPC reject history for the requested sub-program of the currently loaded schedule. The *number* variables are returned as 0 – 9999999 and *ppp.pp* is the percent of **WELDS** *number* that each parameter *number* represents.

Command: **SPC {XBAR | RANGE}** *sub-program* <crlf>
COUNT *count* <crlf>
AVERAGE *value* <crlf>
UCL *value* <crlf>
LCL *value* <crlf>
<lf>

HF2 State: Any

Description: Returns the values of the Weld Sentry SPC subgroup average (**XBAR**) or subgroup range (**RANGE**) for the requested sub-program of the currently loaded schedule. The *count* variable may by any number from 1 to 19999. The *value* variables are returned in exponential floating point format (i.e. *n.nnn***E**±*ee*).

Command: **SAMPLING {CONTINUOUS | PERIODIC}** *subgroup_size* *sampling_period* <crlf><lf>

HF2 State: Any

Description: Returns the Sampling mode for the Weld Sentry's Statistical Process Control data collection. The *subgroup_size* variable defines the group sample size and may be any number from 1 to 25. The *sampling_period* variable is returned only with the **"PERIODIC"** keyword, and specifies the number of welds that define the interval between sampling groups; e.g., if *sampling_period* = 100 and *subgroup_size* = 5, then 5 welds will be sampled every 100 welds, leaving 95 welds unrecorded between groups of sampled welds.

Command: **DATA** *data_string* <crlf>
[*data_string_line2* <crlf>
…
]<lf>

HF2 State: Any

Description: The **DATA** command allows a way for data that would normally be printed by the sentry to be packetized and transmitted over a multidrop network. The *data_string* and *data_string_line2*…is a line or multiple lines of data identical to those lines transmitted using the **PRINTER** role mode of operation, preceded by the token and the **DATA** command, and followed by the end of packet sequence.

Command: **HISTORY [XBAR | RANGE]** *sub-program* <crlf>
Value <crlf>
.
.
Value <crlf>
<lf>

HF2 State: Any

Description: Returns Statistical Process Control history data from the Weld Sentry. When no keyword is returned, values of weld results stored in history are returned for the requested *sub-program* of the currently loaded schedule. When the "**XBAR**" keyword is returned, the average value of every subgroup of samples is returned for the requested *sub-program* of the currently loaded schedule. When the "**RANGE**" keyword is returned, the range (difference of minimum and maximum) of every subgroup of samples is returned for the requested *sub-program* of the currently loaded schedule. The *sub-program* variable is one of **"A"**, **"B"**, **"C", "D",** or **"E"**. The *value* variables are returned in exponential floating point format (i.e. *n.nnn***E**±*ee*).

Weld Status Number

The last field in the report packet represents the status of the weld made. Status numbers are listed below.

Status #	Error Message	
0	No Error occurred	
1	Standby firing switch	
2	Standby stop command	
3	Firing switch closed before RUN state	
4	Firing switch didn't stay closed	
5	Transistor over heat	
6	Emergency stop	
7	Firing switch didn't close in 10 sec	
8	Transformer over heat	
9	Over current	
10	Sentry alarm	
11	Remote standby	
12	Low battery	
13	No current	
14	No voltage	
15	Feed-back range exceeded	
16	Chained to next schedule	
	- - - - -	
35	Weld Sentry reported REJECT	Weld Sentry error messages if the SENTRY is installed.
36	Weld Sentry reported OVERLOAD	
37	Weld Sentry reported NO WELD	
	- - - - -	
71	Basic weld monitor reported that the current is over the high limit	
72	Basic weld monitor reported that the current is lower than the low limit	
73	Basic weld monitor reported that the voltage is over the high limit	
74	Basic weld monitor reported that the voltage is lower than the low limit	
75	Basic weld monitor reported that the power is over the high limit	
76	Basic weld monitor reported that the power is lower than the low limit	
77	Basic weld monitor reported that the resistance is over the high limit	
78	Basic weld monitor reported that the resistance is lower than the low limit	
79	No limit	

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