HF2 2kHz HIGH FREQUENCY
RESISTANCE WELDING POWER SUPPLY

ADVANCED RS-485 DATACOM OPERATION

Units with the built-in Weld Sentry Option also require User’s Manual No. 990-291

<table>
<thead>
<tr>
<th>Model</th>
<th>Stock No.</th>
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<tbody>
<tr>
<td>HF2/230</td>
<td>1-264-XX</td>
</tr>
<tr>
<td>HF2/280</td>
<td>1-264-XX-01</td>
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<tr>
<td>HF2/460</td>
<td>1-264-XX-02</td>
</tr>
<tr>
<td>HF2/208</td>
<td>1-264-XX-03</td>
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<tr>
<td>HF2S/208</td>
<td>1-265-XX-03</td>
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</table>

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Printed in the United States of America.

Revision Record

<table>
<thead>
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<th>EO</th>
<th>Date</th>
<th>Basis of Revision</th>
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<td>3/95</td>
<td>None. Original edition.</td>
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<td>19146</td>
<td>01/02</td>
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<td></td>
<td></td>
<td></td>
<td>2. Update manual.</td>
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<tr>
<td>C</td>
<td>42861</td>
<td>11/13</td>
<td>Updated to Miyachi America name and logo.</td>
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<tr>
<td>D</td>
<td>43481</td>
<td>11/14</td>
<td>Updated to Amada Miyachi America name and logo.</td>
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</table>
Thank you for purchasing a Miyachi Unitek HF2 Advanced Serial Datacom.

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 Miyachi America  
1820 South Myrtle Avenue  
P. O. Box 5039  
Monrovia, California  91016  
Phone: (626) 256-4128  
FAX: (626) 303-5396  
E-mail: info@amadamiyachi.com

The purpose of this manual is to supply operating and maintenance personnel with the information needed to properly and safely operate and maintain the Miyachi Unitek HF2 Advanced Serial Datacom.

We have made every effort to ensure that the information in this manual is accurate and adequate.

Should questions arise, or if you have suggestions for improvement of this manual, please contact us at the above location/numbers.

Amada Miyachi America is not responsible for any loss due to improper use of this product.
SAFETY NOTES

This instruction manual describes how to operate, maintain and service the HF2 Advanced Serial Datacom, and provides instructions relating to its SAFE use. A separate manual provides similar information for the Weld Head 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 this unit. Do not perform any maintenance inside this unit.

Never perform any welding operation without wearing protective safety glasses.
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UNITEK MIYACHI CORPORATION

Declaration of Conformity

Directive(s)  
EMC, LOW VOLTAGE, MACHINERY

Type of Equipment:  
Resistance Welding Power Supply Equipment

Applied Standards:  
EN-50081-2, EN50082-1, EN55011, IEC 801-2, IEC 801-3, IEC 801-4
EN 60204-1, EN50063

Model Nos.:  

Authorized Representative  
Weld Equip Sales BV
Engelsweg 217
Postbus 164
5700 AD Helmond HOLLAND

Within European Community:

Manufacturer’s Name and Address:  
UNITEK MIYACHI CORPORATION
1820 South Myrtle Avenue
Monrovia, CA  91017   U.S.A.

Based on the Declaration of Conformity Certificates issued by the test laboratories, I declare that the equipment specified above conforms to the listed directive and standards.

Place:  
Monrovia, CA

Date:  
December 16, 1996

Signature  
Robert J. Wallish
Full Name

Director of Quality Assurance  
Title

Signature  
Mark G. Rodighiero
Full Name

Vice President, Engineering  
Title
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 Weld Control 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 Connection

RS-485 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 Weld Control, OPTION 3 screen.

BAUD RATES: The baud rate of the HF2 Weld Control 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.

DATACOM ROLE: The HF2 can be configured as a MASTER or SLAVE. When “MASTER” is selected for the DATACOM ROLE, the HF2 sends out the weld report via the RS-485 Serial Port after each weld is made. When “SLAVE” is selected for the DATACOM ROLE, the HF2 sends out the weld report only if it is requested by the host computer. The default setting is SLAVE.

I.D. NUMBER: To identify each HF2 Weld Control 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 Serial Port Connections

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

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

2. Set the baud rate of all HF2 Weld Controls and the host computer to the same baud rate. The HF2 RS-485 communication baud rate setting is listed under the HF2 Weld Control OPTION 3 menu.
CHAPTER 2: CONNECTIONS

3. Set the unit ID number in the HF2 Weld Control, 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:

<table>
<thead>
<tr>
<th>Pin</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>2</td>
<td>TX+</td>
<td>Transmit Data (+)</td>
</tr>
<tr>
<td>3</td>
<td>RX+</td>
<td>Receive Data (+)</td>
</tr>
<tr>
<td>4</td>
<td>TX-</td>
<td>Transmit Data (-)</td>
</tr>
<tr>
<td>5</td>
<td>RX-</td>
<td>Receive Data (-)</td>
</tr>
</tbody>
</table>

RS-485 SERIAL PORT CONNECTOR on the HF2 rear panel
RS-485 communication is connected as follows:

![RS-485 Connection Diagram]

The RS-422 communication is connected as follows:

![RS-422 Connection Diagram]

RS-232 Connections

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 Weld Control 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.

DATACOM ROLE: The Weld Sentry can be configured as a MASTER or SLAVE. When “MASTER” 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 “SLAVE” for the DATACOM ROLE. The default setting is MASTER.

I.D. NUMBER: To identify the HF2 Weld Control 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 Weld Control can be connected to 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 Weld Control rear panel to the serial connector on a host computer.

2. Set the baud rate of the Weld Sentry communication in the HF2 Weld Control and the host computer to the same baud rate. The Weld Sentry communication baud rate setting is listed under the HF2 Weld Control 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 Slave 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 its 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 Weld Controls 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**
  - **italics**

- **variable to be replaced by literal:**
  - {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>
CHAPTER 3: REMOTE PROGRAMMING CONTROL

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.

Data Collection Software

The HF2 is shipped with the remote data collection program, DATACOM, on a 3 ½ floppy diskette. This program collects weld reports from one HF2 at a time using either the HF2’s RS-485 communication or the Weld Sentry’s RS-232. The program is written in C and the source code is also provided. Refer to the HF2 User’s Manual on how to use the DATACOM software.

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**
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**
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`
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**
HF2 state: Any
Description: Requests the HF2 to return the currently selected schedule number.

Command: **SAVE** `schedule_number`
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 SAVEing will cause the selected schedule to be saved to schedule 0 and schedule 0 will be automatically loaded.

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

Command: **REPORT** `{OLD | NEW } number`
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 under HF2 ORIGINATED COMMANDS at page 19) 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.
CHAPTER 4: HOST ORIGINATED COMMANDS

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*:

<table>
<thead>
<tr>
<th>Key</th>
<th>Dec</th>
<th>Hex</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>48</td>
<td>30</td>
</tr>
<tr>
<td>1</td>
<td>49</td>
<td>31</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
<td>32</td>
</tr>
<tr>
<td>3</td>
<td>51</td>
<td>33</td>
</tr>
<tr>
<td>4</td>
<td>52</td>
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<td>55</td>
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<td>8</td>
<td>56</td>
<td>38</td>
</tr>
<tr>
<td>9</td>
<td>57</td>
<td>39</td>
</tr>
<tr>
<td>PERIOD</td>
<td>46</td>
<td>2E</td>
</tr>
<tr>
<td>MENU</td>
<td>23</td>
<td>17</td>
</tr>
<tr>
<td>PROG</td>
<td>20</td>
<td>14</td>
</tr>
<tr>
<td>RUN</td>
<td>15</td>
<td>0F</td>
</tr>
<tr>
<td>CHNG</td>
<td>18</td>
<td>12</td>
</tr>
<tr>
<td>HELP</td>
<td>19</td>
<td>13</td>
</tr>
<tr>
<td>SAVE</td>
<td>21</td>
<td>15</td>
</tr>
<tr>
<td>UP</td>
<td>30</td>
<td>1E</td>
</tr>
<tr>
<td>DOWN</td>
<td>31</td>
<td>1F</td>
</tr>
<tr>
<td>LEFT</td>
<td>17</td>
<td>11</td>
</tr>
<tr>
<td>RIGHT</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>ENTER</td>
<td>13</td>
<td>0D</td>
</tr>
</tbody>
</table>

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** under 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.

HF2 ADVANCED SERIAL DATACOM

990-058  4-3
CHAPTER 4: HOST ORIGINATED COMMANDS

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 under HF2 ORIGINATED COMMAND). 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 2000 msec except the braze function which allows up to 20000. 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 0.01KA. In the voltage feedback mode, weld_energy is in
units of 0.01V. In the power feedback mode, \textit{weld\_energy} is in units of 0.01KW.

\textit{step\_counter} is the parameter that specifies the number of welds for the given schedule before advancing to the next schedule when the \textsc{CHAIN SCHEDULE} feature is enabled. A valid number for \textit{step\_counter} is 1 through 99999 and 0 is for stop.

**Command:**  
\begin{verbatim}
RELAY \{READ | SET\} <crlf>
  parameter\_name  value [crlf]
  parameter\_name  value [crlf]
  ...
  ]} <lf>
\end{verbatim}

**HF2 state:** Any, except while welding  
**Description:** Provides control over the HF2 schedule parameters for relay settings. When used with the “\textit{READ}” keyword, the relay settings of the currently loaded schedule are returned (see \textsc{RELAY} under HF2 ORIGINATED COMMANDS). When the “\textit{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 \textit{parameter\_name} and \textit{value} variables:

\begin{verbatim}
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
\end{verbatim}
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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 under 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 1A. If the monitor type is voltage, the limit_value is in unit of 1mV. If the monitor type is power, the limit_value is in unit of 1W. If the monitor type is resistance, the limit_value is in unit of 1µΩ. 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 under 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
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CHAIN {OFF | ON} chain schedule
AUTO_GAIN {OFF | ON} auto gain adjustment
BASIC_MON {OFF | ON} basic weld monitor status
HEAD_TYPE {AUTO | AIR | MANUAL | DUAL AIR} weld head type
FOOT_SW {1-LEVEL | 2-LEVEL | AUTO | NONE} footswitch type
WELD_ABORT {OFF | ON} footswitch weld abort
FIRE_SW {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 under 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
TR1_RATIO {25 – 150} Transformer 1 turns ratio
TR1_CURRENT {1 – 99} Transformer 1 maximum current in 0.1KA
TR1_VOLTAGE {1 – 99} Transformer 1 maximum voltage in 0.1V
TR2_RATIO {25 – 150} Transformer 2 turns ratio
TR2_CURRENT {1 – 99} Transformer 2 maximum current in 0.1KA
TR2_VOLTAGE {1 – 99} Transformer 2 maximum voltage in 0.1V
TR3_RATIO {25 – 150} Transformer 3 turns ratio
TR3_CURRENT {1 – 99} Transformer 3 maximum current in 0.1KA
TR3_VOLTAGE {1 – 99} Transformer 3 maximum voltage in 0.1V
TR4_RATIO {25 – 150} Transformer 4 turns ratio
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TR4CURRENT  {1 – 99}  Transformer 4 maximum current in 0.1KA
TR4VOLTAGE  {1 – 99}  Transformer 4 maximum voltage in 0.1V

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 under 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 ms
MEASURE  {0.04 – 500}  calculation time in ms
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

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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 (.0000001 – 999999999) or in exponential format. Exponential format should take the form of “n.nnE±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 under 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.
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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** under 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** under 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** under 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.
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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 under 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 under 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 under 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 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.
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Command:  HISTORY {XBAR | RANGE} {sub_program} (subgroup_size) <CR><LF><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 under
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.
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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)

electric_power_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.
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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>

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

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
MONTYPE1 monitor_type_for_weld_period_1
UPPER1 upper_limit_for_weld_period_1
LOWER1 lower_limit_for_weld_period_1
INHIBIT1 inhibit_status_for_weld_period_1
MONTYPE2 monitor_type_for_weld_period_2
UPPER2 upper_limit_for_weld_period_2
INHIBIT2 inhibit_status_for_weld_period_2

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}
PUSCH power_up_schedule_number
BUZZER end_of_cycle_buzzer
CLICK key_click
CHAIN chain_schedule
AUTOGAIN auto_gain_adjustment
BASICMON basic_weld_monitor_status
HEADTYPE weld_head_type
FOOTSW footswitch_weld_abort
WELDABORT footswitch_weld_abort
FIRESW firing_switch_type
DEBOUNCE switch_debounce_time

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.
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**Command:** TRANS

**MULTIHEAD**

**TR1TYPE**

**TR1RATIO**

**TR1CURRENT**

**TR1VOLTAGE**

**TR2TYPE**

**TR2RATIO**

**TR2CURRENT**

**TR2VOLTAGE**

**TR3TYPE**

**TR3RATIO**

**TR3CURRENT**

**TR3VOLTAGE**

**TR4TYPE**

**TR4RATIO**

**TR4CURRENT**

**TR4VOLTAGE**

**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**

**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

**HF2 State:** Any  
**Description:** The HF2 return SYNC command back to the host computer when the SYNC command is received from the host computer.
CHAPTER 5: HF2 ORIGINATED COMMANDS

Weld Sentry Related Commands

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

Command: TIME  
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
HF2 State: Any
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
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>

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>

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>

HF2 State:  
Any
CHAPTER 5: HF2 ORIGINATED COMMANDS

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. \( n.nnnE^{\pm e} \)).

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>
```

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>
```

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. \( n.nnnE^{\pm e} \)).

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.
CHAPTER 5: HF2 ORIGINATED COMMANDS

Command: **DATA**  *data_string>*crlf>*

  *[data_string_line2]*

  *

  ]<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.

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

Weld Sentry error messages if the SENTRY is installed.