USER'S MANUAL **990-058**
Revision D **November 2014**

AMADA MIYACHI AMERICA, INC.

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

Model	Stock No.
HF2/230	1-264-XX
HF2/280	1-264-XX-01
HF2/460	1-264-XX-02
HF2/208	1-264-XX-03
HF2S/230	1-265-XX
HF2S/380	1-265-XX-01
HF2S/460	1-265-XX-02
HF2S/208	1-265-XX-03

Printed in the United States of America.

Revision Record

Revision	EO	Date	Basis of Revision
A	None	3/95	None. Original edition.
B	19146	01/02	1. Add Unitek Peco™ Name 2. Update manual.
C	42861	11/13	Updated to Miyachi America name and logo.
D	43481	11/14	Updated to Amada Miyachi America name and logo.

FOREWORD

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.

CONTENTS

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.:	HF2/230,HF2S/230,HF2/380,HF2S/380,HF2/208,HF2S/208, HF2/460,HF2S/460, X11/4000A, X11/4/460, X3/4/380, X3/4000A,X5/3000A,X3/4/460A

Authorized Representative Within European Community:	Weld Equip Sales BV Engelseweg 217 Postbus 164 5700 AD Helmond HOLLAND
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

Robert J. Wallish
Signature

Mark G. Rodighiero
Signature

Robert J. Wallish
Full Name

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Director of Quality Assurance
Title

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.

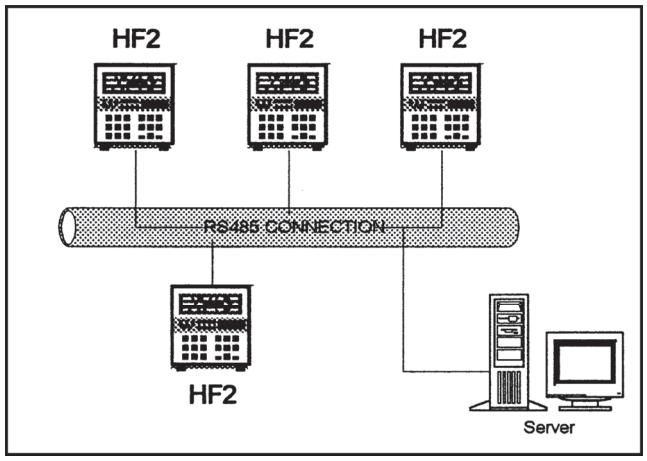
RS-485 Serial Port Connections

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.

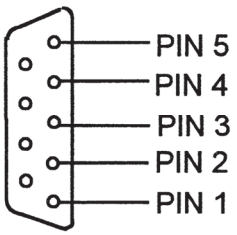
3 Set the unit ID number in the HF2 Weld Control, OPTIONS 3 menu. Each HF2 unit should have its own unique ID number to be identified by the host computer.



RS-485 Pin Assignment

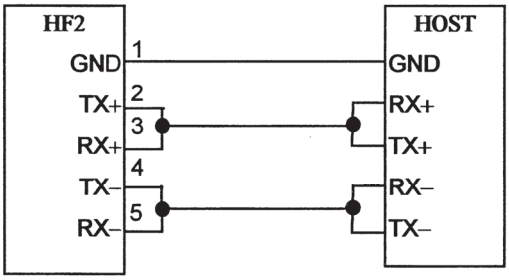
The RS-485 Serial Port pin assignment is shown as follows:

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

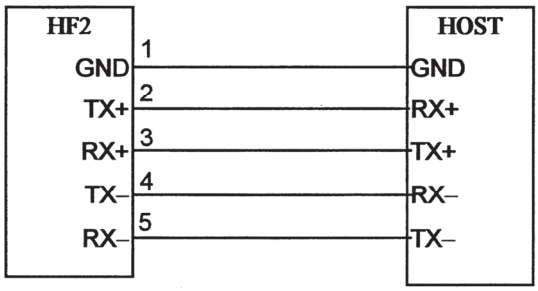


RS-485 SERIAL PORT CONNECTOR on the HF2 rear panel

RS-485 communication is connected as follows:



The RS-422 communication is connected as follows:



RS-232 Connections

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 the RS-232 Serial Port.

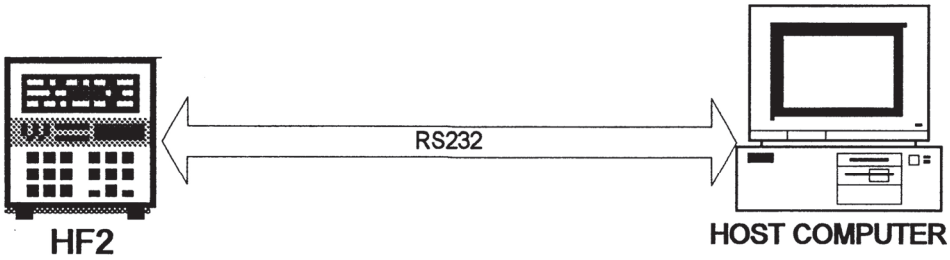
RS-232 Serial Port Connection

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 rare. 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 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 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**
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.

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** <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 SAVEing 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** 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*.

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** 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.

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, *weld_energy* is in units of 0.01KW.
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** under 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** 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

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 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
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 0.1KA
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

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.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** 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.

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.

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* 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** 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.

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>.

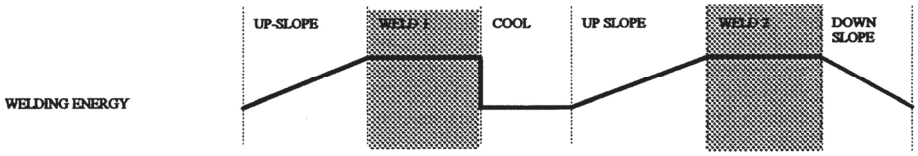
number_of_reports: This is the number of reports that shall be included in this command. If the host computer requests more weld data than is available in the weld data buffer, the HF2 sends only the weld reports in the weld buffer and the *number_of_reports* is the number of weld reports available in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

Weld Sentry error messages if the SENTRY is installed.