![WichiTech Industries Inc. - Clearly Superior]

HB2 DUAL ZONE

OPERATION, MAINTENANCE AND ILLUSTRATED PARTS MANUAL

Version *<3.11>*

11/01/2013

VERSION HISTORY

Manual Version	Implemented By	Revision Date	Approved By	Approval Date	Reason
3.11	*Staff*	*2/4/2013*	*DEJ*		

TABLE OF CONTENTS

TABLE OF FIGURES & TABLES

1 INTRODUCTION

1.1 LAYOUT OF MANUAL

This manual provides important information necessary for the Operation and Maintenance of the WichiTech Industries, Inc. Heat Bonding (HB), Dual Zone (-2) Composite Repair Set. This manual consists of the following:

Chapter 1	Introduction
Chapter 2	Safety
Chapter 3	System Specifications
Chapter 4	Operation
Chapter 5	Maintenance
Chapter 6	Illustrated Parts Breakdown
Chapter 7	Appendices

1.1.1 Document Title
"**HB2 Dual Zone Operation, Maintenance & IPB Manual**"

©August 15, 2013 WichiTech Industries, Incorporated   all rights reserved.

1.1.2 Document Number
"**D1HB2005_307_20130921**"

©August 15, 2013 WichiTech Industries, Incorporated   all rights reserved.

1.1.3 Related Publications

Part Number	Title
D1HB2005	"HB2 Dual Zone Operation, Maintenance & IPB Manual"
D1HB2007	"HB2 Single Zone Operation, Maintenance & IPB Manual"
D1HB2CAL	"HB2 Dual Zone Calibration Manual"
D1HB2COM	"HB2 Dual Zone Communications Manual"

1.1.4 Contact Information
WichiTech Industries, Incorporated
1120 North Charles Street
Suite 103
Baltimore, Maryland 21201
410 244 1966 (phone)
410 244 1968 (facsimile)
800 776 4277 (toll-free)

www.WichiTech.com (website)
WichiTech@WichiTech.com (email)

1.1.5   Reporting of Manual Deficiencies

Every effort has been made to ensure accuracy of the information contained herein. However, if discrepancies are found please notify us at 1-800-776-4277. Contents are subject to change without notice.

1.2   DESCRIPTION OF HB2 CAPABILITIES

The WichiTech Industries HB-2 Composite Repair Set and bonding system is a portable, self-contained unit designed to monitor and control composite cure temperatures while providing and monitoring vacuum to a cure area. The HB-2 may be used to cure composite and metal-to-metal structures that require heat application with or without vacuum. The HB-2 can be connected to many different heating application devices including ovens. The HB-2 was designed for maximum portability, with a built-in vacuum pump; the HB2 only requires a power input cable to operate.

1.2.1   Input Power

The HB-2 (A4HB2005) runs on universal AC; 85-265 VAC, 47-440 hertz. The HB-2 automatically adjusts to run on any input power source within this range. A built in self-test executes at power-on and verifies that the input power is within this range. Voltages or frequencies outside of this range will cause a self- test failure. Input power is routed to the output connector as "120" VAC or as "240" VAC. The power is routed in this manner for more precise temperature control. Any detected voltage below 180 VAC is considered "120" VAC. Any voltage above is considered "240" VAC.

1.2.2   Internal Electric Vacuum Pump

The standard configuration HB-2 contains a built-in, two headed electric vacuum pump. The dual headed pump with two separate thumb valves allow for operation of two independently adjustable vacuum sources. As an option the pump heads can be re-configured to operate as a positive pressure source. Contact WichiTech for more information about the pressure configuration.

1.2.3   Displays

The standard configuration HB-2 has separate displays for independent two zone operation. The operator does not have to switch between zones to observe real-time cure data. The displays are color coded by zone; RED and YELLOW. Both displays are high output led displays and are readable in direct sunlight. Multiple informational views are available via one-key selection.

1.2.4   Real-Time Communications

By default, both zones send out complete bonder and cures status messages every 10 seconds. This data is easily captured by standard RS-232 communication software and hardware. Most 3rd party vendor systems are directly compatible with the HB-2. The HB-2 also accepts command requests via the RS-232 port. With RS-485 adapters each zone on an HB-2 can become part of a larger hot bonder network. Please refer to the Communications Manual D1HB2COM for details.

NOTE

The default "10second" data transmission can be toggled ON
and OFF using the "AUTO DATA" command ; ascii string
">0o<"

1.3   CONFIGURATIONS

The HB2 is fully contained within a suitcase style enclosure. The enclosure provides for many different configurations of the HB2. These configurations are accomplished by implementing a different number of thermocouples, different current ratings, display changes and several vacuum/pressure options.

Part Number	Configuration Description
F4HB2000	Dual Zone, 16Tcs, no Pump, shared RED power
F4HB2001	Dual Zone, 16Tcs, no Pump, RED&YELLOW power
F4HB2002	Dual Zone, 16Tcs, 1HdPump, RED&YELLOW power
F4HB2003	Dual Zone, 20Tcs, 2HdPump, RED&YELLOW power
F4HB2004	Dual Zone,16Tcs, Pump, shared RED power
F4HB2005	Dual Zone,16Tcs, 2HdPump, RED&YELLOW power
F4HB2005E	Dual Zone,16Tcs, 2HdPump, RED&YELLOW power, Ex-Proof
F4HB2006	Single Zone, 16Tcs, no Pump, RED power only
F4HB2007	Single Zone, 16Tcs, Pump, RED power only
F4HB2007E	Single Zone, 16Tcs, Pump, , RED power only, Ex-Proof
F4HB2008	Dual Zone, 16Tcs, 2Pwr-In,Pump, RED&YELLOW pwr,1000degF

Table 1-3: HB2 Configurations

NOTE

Details about the Dual Zone HB2 configurations are provided
in this manual (D1HB2005). Details about the Single Zone
HB2 configurations are provided in manual D1HB2007

1.3.1 Furnished Equipment

Every HB-2 ships with a complete set of accessories needed to run a cure. The exact type and number of accessories are specific to each HB2 configuration. For example the following table shows all of the accessory items provided with the F4HB2005 Composite Repair Set.

F4HB2005 Sub-assemblies and included accessories		
PART NO,	DESCRIPTION	Quantity
A4HB2005	ASSY,ENCL, F4HB2005	1 each
A4APA007	PKG, ACCESS, A4HB2005	1 each / zone
	One(1) Accessory Package includes:	
	A4BLA009 ASSY,BLKT, 10"X10", 120VAC	1 each / zone
	A4BLA011 ASSY,BLKT, 8"X8", 120VAC	1 each / zone
	A4PIC001 ASSY,CABLE,GFCI,POWER IN	1 each / zone
	A4VSS001 ASSY,SUCKER,VACUUM	1 each / zone
	A6PIC002 ASSY,CABLE,110 CNVTR	1 each / zone
	A6POC004 ASSY,CABLE,PWR OUT,RED	1 each / zone
	A6POC005 ASSY,CABLE,PWR OUT,YEL	1 each / zone
	P1TCC001 ASSY,CABLE,TC,J	8 each / zone
	P1VHS001 ASSY, HOSE, VAC, 10'	1 each / zone
D1HB2005	MANUAL, HB-2, OPERATION, MAINTENANCE & IPB	1 each
D1HB2CAL	MANUAL, HB-2, CALIBRATION	1 each
D1HB2COM	MANUAL, HB-2, COMMUNICATIONS	1 each

Table 1-3.1: F4HB2005 Sub-Assemblies and Accessory Items

1.4 WARRANTY

WARRANTY STATEMENT

Every WichiTech Composite Repair System is thoroughly inspected and tested before leaving the factory. It is warranted to be free of defects from workmanship and materials for the period of THREE (3) YEARS from the original date of purchase. Return only the bonder, freight prepaid, to the factory if any trouble develops during this three-year warranty period. WichiTech will repair (or replace, at our option) the system, without charge, where factory inspection shows that the trouble was caused by defective workmanship or materials.

This warranty does not apply where:
- Repairs to the system have been made or attempted by others
- Repairs are required because of normal wear and tear
- The system has been abused, misused or improperly maintained
- Alterations have been made to the system

In no event shall WichiTech be liable for any indirect, incidental or consequential damages from the sale or use of the product. This disclaimer applies both during and after the term of the warranty.

WichiTech disclaims liability for any implied warranties, including implied warranties of "merchantability" and "fitness for a special purpose" after the three-year term of this warranty.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. Some states do not allow limitation on how long an implied warranty lasts, so the above limitation may not apply to you.

2 SAFETY

2.1 GENERAL

This manual contains "WARNINGS", "CAUTIONS" and "NOTES". The information under these headings should be strictly observed. In addition to these specific items, common sense and good general safety practices must be followed.

NOTE

Highlights an operating or maintenance procedure, practice, condition, statement.

WARNING

Highlights an operating or maintenance procedure, practice, condition, statement, etc. which, if not strictly observed, could result in injury to, or death of, personnel and/or damage to the equipment.

CAUTION

Highlights an operating or maintenance procedure, practice, condition, statement, etc. which, if not strictly observed, could result in injury to, or death of, personnel and/or damage to, or destruction of equipment, or loss of mission effectiveness or long-term health hazards to personnel.

2.2 WARNINGS

The following WARNINGS appear in the text and are repeated here for emphasis.

WARNING

Improper installation of repair materials, heating elements, bagging devices and sensors or incorrect vacuum or temperature settings could result in injury to user and/or physical damage to equipment.

WARNING

A minimum of two thermocouples should be used. Failure to use two or more thermocouples could result in injury to user and/or physical damage to equipment and/or materials.

WARNING

Failure to place the thermocouples between the heating
blanket and the target surface could result in injury to the user
and/or physical damage to equipment and/or materials.

2.3   HEAT HAZARDS

Because of the high temperatures used during the repair of composite materials, serious
injury to the user and/or equipment damage can occur.

WARNING

The TC HOT alarm condition is a critical condition. If this
alarm is not corrected, a fire hazard could exist. When this
alarm occurs, the temperature controller will immediately
reduce power to the heating blankets until the alarm condition
is corrected.

CAUTION

Dangerous temperatures can be present when power is
connected to the heating device. These high temperatures
could result in injury to, or death of, personnel and/or damage
to, or destruction of equipment, or loss of mission
effectiveness or long-term health hazards to personnel.

2.4   POWER INPUT

If a power input other than the recommended voltage is used, serious injury to the user
and/or equipment damage can occur. The bonding system operates on AC voltage, 85-
265 volts with frequency range 47 to 440 hertz. Cables are provided to connect with
standard 120VAC and 240VAC outlets. Other connector types are available as options.
For safety, connector types must match available facility receptacles.

WARNING

Failure to verify that the facility power is voltage, current and
ground/neutral compatible with the bonding system could
result in injury to user and/or physical damage to equipment.

WARNING

When running two cures, it is always recommended that the
RED and YELLOW zones be plugged into separate facility
zoned receptacles. If each output device requires near 20
amps then separate facility circuit breaker power receptacles
will be required.

3 SYSTEM SPECIFICATIONS

3.1 TWO INDEPENDENT ZONES

The HB2 hot bonding system provides independent zone operation of two zones. The zones are color coded; RED and YELLOW. Each zone has separate power input, power output, thermocouple and vacuum sensor inputs, communication ports, power meters and displays. Duplication of the hardware and operational independence provide capabilities not available on other equipment. For example, the dual display allows the HB2 to show the status of all of the sensor inputs, thermocouples and vacuum sensors on both zones simultaneously.

For ease of use, the zones share control of an audible alarm and a keypad and the power for the internal electronics is provided via the RED zone. All other functions are completely independent. The total independence of the two zones, allows this manual to describe the operation of the HB2 by detailing the operation of one zone.

NOTE

Power for the internal HB2 electronics is supplied from the
RED zone AC power input. In order to use the YELLOW zone,
the RED zone power cord must be connected.

There are common functions. Support for the common functions is provided through SETUP mode. These include the system clock, the hardware and software revision, SERIAL number, 500/1000 degree configuration, the output device type and the Library cure functions.

3.2 OPERATIONAL & ENVIRONMENTAL SPECIFICATIONS

CHARACTERISTIC	F4HB2007-SINGLE ZONE	F4HB2005-DUAL ZONE
Zones Input Output	1 1	2 2
Physical Dimensions Weight Configuration Lid Enclosure	21 X 14 X 8 inches (closed) 35 pounds 90, 180 degrees Non-detachable ABS plastic, un-dentable	21 X 14 X 8 inches (closed) 35 pounds 90, 180 degrees Non-detachable ABS plastic, un-dentable
Power Voltage Frequency Current – input Breaker Current	85-265 VAC 47-440 Hertz 20Amps[A] 20Amps[A]	85-265 VAC 47-440 Hertz 20Amps[A] (per zone) 20Amps[A] (per zone)
Operating Humidity Temperature	20% to 70% (non-condensing) -25 to +70 deg C	20% to 70% (non-condensing) -25 to +70 deg C
Storage Humidity Temperature	10% to 95% -40 to +85 deg C	10% to 95% -40 to +85 deg C
Programmable Features Control Method Active TCs Control TCs Soaks Ramp Rate Soak Temperature Soak Duration Ramp Temp Hi/Lo Alarms Soak Temp Hi/Lo Alarms Cool Down Rate Final Temperature Minimum Vacuum Print Interval Print Data Options AUX Tc Overlimit	[1,2,Hot,Cold,Median,HotPlus] [1 to 8] [1 to # of Control TCs] [1 to 6] [1 to 15 ºF] [70 to 500 ºF] [B] [1 to 999 minutes] [0 to +99 ºF] /[0 to -99 ºF] [C] [0 to +99 ºF] /[0 to -99 ºF] [C] [1 to 15 ºF] [70 to 150 ºF] [0 to 30 "Hg] [C] [0 to 30 minutes] [C] [All TCs or Control TCs only] [0 to +99 ºF] [C]	[1,2,Hot,Cold,Median,HotPlus] [1 to 8] [1 to # of Control TCs] [1 to 6] [1 to 15 ºF] [70 to 500 ºF] [B] [1 to 999 minutes] [0 to +99 ºF] /[0 to -99 ºF] [C] [0 to +99 ºF] /[0 to -99 ºF] [C] [1 to 15 ºF] [70 to 150 ºF] [0 to 30 "Hg] [C] [0 to 30 minutes] [C] [All TCs or Control TCs only] [0 to +99 ºF] [C]
Pneumatic Source ….Electric Pump(internal) Available Ports	0.95 CFM, 27.0 "Hg 3 (shared manifold)	0.95 CFM, 27.0 "Hg [D] (per zone) 3 (shared manifold)
Sensor Parameters Resolution-Display Resolution-Program Accuracy	1ºF / 1"Hg 1ºF / 1"Hg ±1ºF / ±1"Hg	1ºF / 1"Hg 1ºF / 1"Hg ±1ºF / ±1"Hg
Resource Display Keypad/Overlay Zone Select Audible Alarm Library Memory Power Recovery Communications	LED display, sunlight readable 16 keys, paperfeed(1) n/a 93db (adjustable) 32 6-stage cures Auto<2mns,select<2hrs, reset all else Real-time RS232, status & rmt control	LED display, sunlight readable(per zone) 16 keys, paperfeed(2) 1 (enables active keypad zone) 93db (adjustable) 32 6-stage cures Auto<2mns,select<2hrs, reset all else Real-time RS232 (per zone)

Table 3-2: Technical Specifications

[A] - 30 amp service is available for customers with appropriate installations

[B] - Operation to 1000 def Fahrenheit is available as an option

[C] - When set to "0"; this parameter is sizable or turned OFF

[D] - dual-head internal electric pump provides independent vacuum or pressure per zone

4   OPERATION

The WichiTech Industries HB2 Composite Repair Set and bonding system is a portable self-contained unit designed to monitor and/or control composite cure temperatures while providing and monitoring vacuum to a cure area. The HB2 is used for the curing of composite and metal-to-metal structures that require heat application with or without vacuum.

4.1   THEORY OF OPERATION

The HB2 was designed and created to provide a flexible alternative for performing cures outside of an autoclave. After final assembly, a lot of equipment will not fit into the OEM autoclave. The HB2 was designed to be a portable autoclave or "hot bonder" requiring a minimum of external connections to operate. In accordance with this concept, the unit contains an internal, dual-headed, electric vacuum pump. Since the HB2 can generate its own vacuum, the only required external facility connection is an input power cable. Since the HB2 has two independent zones, a second power input is necessary if it is desired to run two cures at the same time. The HB2 shares a minimum of resources between the two (2) zones; this includes the central processor, the processor's power supply and the 16-key control panel.

At the core of each unit is a solid state relay (SSR) that is turned on and off to send power to the output device. The central processor determines whether the SSR should be on or off based on the difference between the program target temperature and the measured temperature at the tips of the control thermocouples (TCs). The HB2 uses a Proportional-Integral-Derivative (PID) algorithm to determine the specific output setting.

The WichiTech Hot Bonding system is used to cure adhesive resins within composite materials and metal bond repairs. The repair system is a two zone unit with one keypad, two sunlight readable displays, two printers, two power-in receptacles, two power-out receptacles, sixteen thermocouple receptacles, two vacuum manifolds, two power output meters and two communication ports.

The HB2 programming is menu driven. It can be programmed by using the keypad or by selecting a pre-set program from the system library. A paper printout of the program is produced at the start of the cure. A revised program printout is produced upon modification of the program during the cure process. Any screen requiring operator intervention is provided with a prompt that specifies the allowable and appropriate response. Any attempted response outside of these prompt is not allowed by the central processor.
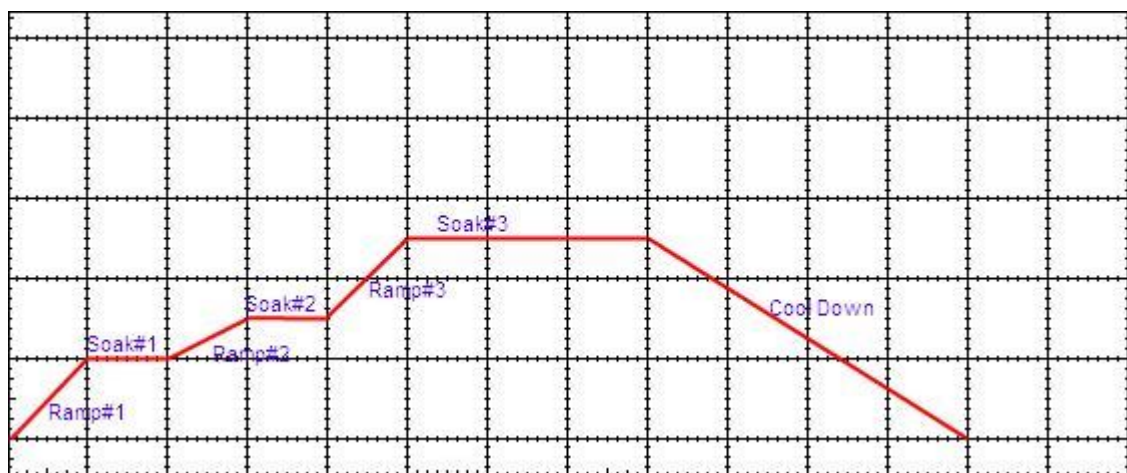
Figure 4-1: Typical Temperature Profile

The Heat Bonding system controls the conditions of time and temperature in steps or stages. The figure shows a typical three (3) stage temperature profile. Each stage has a ramp rate specified in degrees per minute and a soak temperature. The HB2 supports multiple stage cures with up to six stages.

'J' type thermocouples are used to monitor temperatures within the cure area. Vacuum is measured using vacuum sucker assemblies (WichiTech P/N A4VSS001) connected to the HB2 with a coiled vacuum hose. The HB2 provides two independently adjustable vacuum sources from an internal electric vacuum pump. Alternatively, "shop air" may be used to generate vacuum using a venture device. The vacuum source and measurements are routed through separate manifolds. Each manifold acts as a vacuum source and measurement port.

The HB2 system has a built-in alarm processing system. If a deviation from the program occurs, the alarm system will activate. An audible alarm will sound, an alarm message will be printed and an alarm message will appear on the control display. If a problem occurs during the curing process, the control display will change from the real-time cure process display screen to the ALARM screen. The source of the alarm is displayed on the ALARM screen. A message is also printed to document the alarm. To proceed, the operator must acknowledge the alarm by pressing the "E" key. This will silence the alarm and the screen will revert to the running display with a flashing character that indicates the alarm condition. Acknowledging the alarm does not correct the alarm condition. The operator should take corrective action to remedy the cause of the alarm. After the alarm has been acknowledged, the alarm will stay active until corrected. If the actual cure parameters fall back within the program limits, the alarm is cleared and a message is sent to the printer.

If power is lost during a running cure, the HB2 will attempt to auto restart the cure when power is restored to the unit. The restart is governed by the amount of time that power was lost to the system:

- Less than two minutes – HB2 will restart after conducting a quick check of the thermocouples. If all of the control thermocouples have been removed, the cure will be prevented from restarting until at least one control TC is re-installed.

- Less than two hours – HB2 will prompt the operator. The operator must decide to proceed or kill the cure.
- More than two hours – HB2 automatically kills the cure.

The audible alarm is used to signify an alarm condition, changes in stages and the end of the cure. The alarm sounds for 1 second at each step change. The alarm sounds for 5 seconds at the end of a successful cure. Pertinent cure data is printed out every time the alarm sounds.

The central processor and equipment is protected by two internal watchdog timers. There is a traditional timer that the central processor needs to reset once every 1½ seconds. If the central processor fails to reset the timer, the system will automatically reset and the RESET count will be advanced. The RESET count is displayed and printed upon power up

---

NOTE

If the RESET count is anything but zero (0), then the internal
watchdog timer has been reset.

and in the ABOUT mode. The second watchdog timer is enabled when the power output of either zone has been at 100% for more than six seconds. Under normal circumstances, the central processor will cause the SSR to drop out for 1 line cycle once every six seconds. This timer is called the AC watchdog timer since it directly checks the output signal. It serves as a real-time test of the SSR; if the SSR fails in the closed position the ACWD will detect the failure and reset the unit in 6 seconds.

The HB2 uses an internal clock that is synced to the input power line cycle to trigger the SSR at the zero crossing. The central processor also uses a real time clock. These are independent functions.

NOTE

All HB2 timing controls are independent of the line cycle.

4.2   PREPARATIONS

To ensure a successful cure, the operator should prepare the cure area and the bonder equipment.

4.2.1   Thermocouples

The placement of the thermocouples is critical to a successful cure. Position the TCs by placing the tips of the TCs between the target surface and the heating blanket (i.e., "under the blanket") and away from the blanket edge by at least 2 inches. Another good practice is to use at least two TCs in case of TC failure. Remember that setup of a repair area can

---

be expensive in materials and time. It is easy to add a second or third extra TC before the cure area setup is finished and bagged.

NOTE

Large static voltages can be built up on the repair area when drawing a vacuum. These charges can cause damage to the sensitive measurement circuitry. Folding over a small piece of high temperature "flash-breaker" tape on each TC tip can prevent any damaging discharge.

4.2.2 Vacuum Source and Measurement

WichiTech provides through-the-bag, vacuum sucker assemblies to connect the vacuum pump and vacuum sensor to the cure area. When using a vacuum bag, disassemble the vacuum sucker and put a small slit in the bag. Line-up the bottom of the assembly with the top half and position over top of the slit in the bag. Secure the assembly by twisting the two halves together. Be careful to not introduce "wrinkles" in the vacuum bag.

4.2.3 Output Device

Different pins on the output connector are used depending on the input power voltage detected during power up. If a 120 VAC output device is connected when the detected input power was 240VAC, power will be applied to the wrong set of pins. The input voltage must match the rated voltage for the output device.

4.3 QUICK START

To quickly get a cure started, perform the operating modes in numerical order:

- First, select TEST mode by typing "1" from the MAIN MENU.

  In TEST mode, the operator should verify that the correct operation of all of the thermocouples and the vacuum sensor are operating correctly.

  Sub-Modes available in TEST mode

  - **Print-On-Demand (press ↓ arrow)**

    All sensor (thermocouples & vacuum) data is printed with time-data

  - **Monitor Mode (press ↑ arrow)**

    Operator is prompted for a time interval. Once a non-zero value has been entered, the bonder acts as a monitoring device where all sensor data is repetitively printed at that time interval (include time-date). No heat controls are active in MONITOR mode.

  - **Real-Time Communications**

    Several bonder-to-computer, real-time communication modes are available. By default, the HB2 will transmit all program data once every 10 seconds from both the RED and YELLOW zone communication ports. More detail is available is a separate manual; D1HB2COM, "HB2 COMMUNCATIONS".

- Second, select ASSIGN mode by typing "2" from the MAIN MENU.

In ASSIGN mode, the operator should setup the active and control TCs as verified in TEST mode. The method of temperature control is also programmed; available methods include control by TC01, TC02, Hottest, Coldest, Median and Hot Plus.

Sub-Mode available in ASSIGN mode

- o Once a cure has been started, the operator can re-enter and change any ASSIGN parameters by pressing '2' from the RUN/START CURE mode. If ASSIGN has been accessed from the RUN cure mode, the program will return to RUN after the operator advances through all of the parameters or by pressing the "M" key

- Third, select PROGRAM mode by typing "3" from the MAIN MENU.

In PROGRAM mode, the operator sets the system cure parameters to match the desired cure specification. This can be done by selecting a pre-programmed library cure or by setting all new parameters for a CUSTOM cure

Sub-Modes available in PROGRAM mode

- o Once a cure has been started, the operator can re-enter and change any PROGRAM parameters by pressing 'M' from the RUN/START CURE mode
- o PROGRAM mode can be "locked out" via the SETUP/LOCKOUT menu. If edits are locked, the operator can not change any parameter during a running cure. The operator can still select a cure from the library, but he can not change any of the parameters. If PROGRAM has been accessed from the RUN cure mode, the program will return to RUN after the operator advances through all of the parameters or by pressing the "M" key

- Fourth, select START CURE mode by typing "4" from the MAIN MENU.

In START CURE mode, the operator can optionally enter his identity code and a job number. After these two prompts, the cure process begins automatically. The internal processor executes the cure per the parameter settings that were established earlier in the ASSIGN and PROGRAM modes. The program will progress until its programmed completion or can be cancelled at any time by the operator.

Sub-Modes available in START/RUN CURE mode

- o **Print-On-Demand** (press ↓ arrow)

  All sensor (thermocouples & vacuum) data is printed with time-data
- o **Display All Sensors** (press "1")

  All sensor (thermocouples & vacuum) data is displayed is a screen similar to the TEST and MONITOR screens except with the letter "R" prefix. Toggle back to the traditional screen by pressing "1" again. All normal RUN functions are enabled when the "All Sensors" screen is displayed
- o **HOLD Mode**(press "→" right arrow)

  While in HOLD mode, the HB2 stops the program timer and waits. In a RAMP step the temperature actively holds at the current temperature. In a SOAK step, the ETA stops advancing. To indicate that the HB2 is in HOLD, all of the display characters will flash. Exit HOLD by pressing the "→" left arrow again.
- o **Re-Enter ASSIGN** (press "2")

Program re-enters the ASSIGN menu. Any parameter may be changed or viewed. Return to RUN by advancing through all of the parameters or by pressing "M".

o **Re-Enter PROGRAM** (press "M" arrow)

HB2 re-enters the PROGRAM menu. Any "<u>incomplete</u>" parameter may be changed or viewed. For instance, if the 1st and 2nd stages of a 3 stage cure have already completed, the program will not allow any changes to stage 1&2. Return to RUN by advancing through all of the parameters or by pressing "M".

o **Cancel Cure** (press "E" arrow)

The operator can cancel the cure at any time. After pressing the "E" key, the operator will be prompted to confirm that the cure should be cancelled to protect against an inadvertent key press.

o **Power Loss Recovery**

Upon loss of power during a running cure, the HB2 will attempt to restart the cure when power is re-established. For power recovery, the HB2 follows these guidelines:

- Automatically restart if the power has been off for less than 2 minutes
- Prompt the operator to restart if the power has been off for less than 2 hours
- If power has been off more than 2 hours, the cure is automatically cancelled and the HB2 resets to the MAIN MENU

In all cases, the HB2 will re-run the selftest BIT and reprint the last cure parameters. In order to successfully restart, the selftest must PASS and at least one of the control TCs must still be in place!

o **Real-Time Communications**

Several bonder-to-computer, real-time communications are available. By default, the HB2 will transmit all program data once every 10 seconds from both the RED and YELLOW zone communication ports. More detail is available is a separate manual; D1HB2COM, "HB2 EXTERNAL COMMUNCATIONS".

o **Second Zone Operation**

With both the RED and YELLOW zones powered ON, the HB2 can run simultaneous, independent cures. Also, different power inputs can be used on the RED and YELLOW as long as the NEUTRAL and GROUND connections are compatible.

NOTE

If the output devices when connected at the same time will require more than 20 amps, the RED and YELLOW zones must be connected to separately breakered 20Amp facility receptacles. .

Further, most of the HB2 system parameters in SETUP mode may be accessed and modified while a cure is running in the other zone with the following exceptions:

- System Clock
- Units of measurement
- Upper Temperature Range of thermocouples

4.4 DETAILED SYSTEM OPERATION

The HB2 hot bonding system has eight principle/top level modes of operation. All eight modes are accessed from the MAIN MENU screen, however only four modes are primary operational modes. Only the primary operational
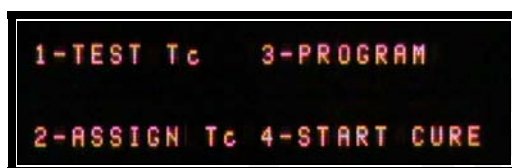

Figure 4-1: Main Menu Display

modes are displayed on the screen. The SETUP, ABOUT, LASTCURE and MANUAL modes provide secondary support functions and are not displayed. Each mode and include the following:

1	TEST	Verifies all thermocouples and vacuum sensor inputs
2	ASSIGN	Sets number of active TCs, control TCs and control method
3	PROGRAM	Establishes running cure parameters
4	START CURE	Starts the cure process
5	SETUP	Sets system data; clock, calibrations, units of measure, etc. NOTE: password is required to enter SETUP mode.
6	ABOUT	Provides information about current settings/status of the HB2
7	LASTCURE	Allows reprint of the last cure NOTE: not available this version.
8	MANUAL	Operates the bonder manually without automatic control

---

NOTE

Flashing characters are used to highlight the parameter
currently under edit or to bring attention to a critical event or
situation. It is not possible to show the flashing aspect in
printed media.

The HB2 is menu driven and user programmable. Within the entire system, each screen provides a parameter to be modified and the acceptable range of values for that parameter. The operator can only select a value that is within the displayed ranges of values. After a value is selected, the display will advance to the next logical entry. This process continues until each required parameter setting has been completed.

The operator is free to access any mode in any order. However, to run a cure, the recommended operational sequence is to start with TEST mode and then advance through each primary mode.

4.4.1   Initial Power Up

Connect the input power cord to the RED receptacle marked "POWER IN 1". Connect the other end of the power input cable to an appropriate facility receptacle. Using the "110 CONVERTER CABLE" to connect to a 110-120V receptacle. Remove the converter to run the HB2 on 220-240VAC.

NOTE
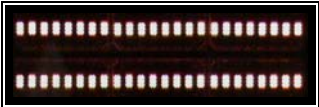
Make sure that the GFCI switch is enabled. The GFCI is part
of the power input cable. Press the ON switch on the
assembly. An led on the GFCI will confirm that it is ON.

The standard HB2 (A4HB2005) runs on universal AC; 85-265VAC, 47-440 hertz. The HB2 senses the power input and automatically adjusts to run on any input power source within this range. The built-in-selftest (BIT) that runs at every power up, verifies that the input power is within this range. The BIT also verifies that all of the internal HB2 circuitry is operational. Input power is routed to the output connector as "120 VAC" or "240 VAC" to support either 120VAC rated heating devices or 240VAC heating devices for more precise temperature control. The central processor routs the output voltage as "120VAC" when the input voltage is measured as 180VAC or lower. Higher voltages are routed as "240VAC".

NOTE

"120 VAC" devices are hooked up to pins 1 & 2 of the output
connector. "240 VAC" devices are hooked up to pins 1 & 3 on
the output connector.

Turn on power to the HB2 RED zone by pressing the MAIN POWER switch. The switch will illuminate when power has been applied and the HB2 will start the power up process.

Display	Printer	Description
		Power has been applied. BIT is executing to verify all circuitry is operational and ready to use.
	SRAM RESET!: NEW S/W!	This display only occurs upon a hardware reset or change in software revision.
	WICHITECH "HB20134" 05-23-13 H1.02 S3.01 P001/R000/ET0000:00.00 !PASSED!(110V/060Hz)	Selftest has passed Successful selftest is displayed and printed. The printout includes unit serial number, date of last revision, hardware version, software version , number of power-ups, number of resets, elapsed time, the measured input voltage and frequency. Upon BIT success, bonder advances to MAIN MENU.
	WICHITECH "HB20000" 08-01-13 H1.04 S3.11 P007/R000/ET0000:11.51 [0001] AC CLOCK FAILURE	Selftest failed; either the voltage or frequency test on the input power source.
	WICHITECH "HB20000" 08-01-13 H1.04 S3.11 P007/R000/ET0000:11.51 [0002] DISPLAY FAILURE	Selftest failed; at least one display circuit has failed.
	WICHITECH "HB20000" 08-01-13 H1.04 S3.11 P007/R000/ET0000:11.51 [0004] PRINTER FAILURE	Selftest failed; printer driver not responding.
	WICHITECH "HB20000" 08-01-13 H1.04 S3.11 P007/R000/ET0000:11.51 [0008] A/D D/A FAILURE	Selftest failed; analog sensor circuitry.
	WICHITECH "HB20000" 08-01-13 H1.04 S3.11 P007/R000/ET0000:11.51 [0016] SSRRELAY FAILURE	Selftest failed; SSR either failed to turn ON or to turn OFF.
	WICHITECH "HB20000" 08-01-13 H1.04 S3.11 P006/R000/ET0000:10.59 [0032] WDTIMER FAILURE	Selftest failed; six(6) second ACWD protection circuit either stuck open or closed.
	WICHITECH "HB20000" 08-01-13 H1.04 S3.11 P006/R000/ET0000:10.59 [0064] KEYPAD FAILURE	Selftest failed; keypad test indicated that a key was pressed during power up.

|  | ```
WICHITECH  "HB20000"
08-01-13 H1.04 S3.11
P006/R000/ET0000:10.59
   [0036] MULTIPLE FAILS
``` | When there is more than one failure, the BIT code is a logical bitwise AND of the failure codes. |
| | ```
!!!!!!!!!!!!!!!!!!!!!!!!
 SELFTEST:: OVERRIDE !!
!!!!!!!!!!!!!!!!!!!!!!!!
``` | Failed BIT; it is possible to override a failing selftest. Contact WICHITECH ! |
| | | MAIN MENU screen. Each HB2 zone stops at this screen upon a successful power-up sequence. |

Table 5.4.1: Power-Up and BIT Selftest

4.4.2 TEST Mode

The first step in using the HB2 should be to verify that the sensor inputs are working. Enter TEST mode by pressing "1" from the MAIN MENU. TEST mode shows that status of all thermocouples and the vacuum source. Possible thermocouple displays include:

- "***"; indicates an open thermocouple
- "HHH"; indicates that temperature exceeds 999 degrees
- "123"; any number indicates a valid temperature in Fahrenheit or Centigrade depending upon the last SETUP/UOM setting.

An easy test of the correct polarity and operation of a thermocouple can be accomplished by rubbing the thermocouple tip between the fingertips. The temperature should increase from about room temperature (70º F) to body temperature (90º F). If the temperature decreases the TC wires are probably backwards in the connector. If there is not change in the temperature, there is probably a short in the connector or TC block.

Display	Printer	Description
		MAIN MENU; press "1"
|  | ```
*======= TEST =========*
 T1-4 075 076 075 075 P
 T5-8 075 *** *** *** P
 VAC=00"Hg   13:18.45 P
*=====================*
``` | TC01 thru TC05 are installed, TC06 thru TC08 are open. |
|  | ```
*== START MONITOR TC ==*
* PRINTS EVERY 01 MINS *
*=====================*
 T1-4 075 076 075 075
 T5-8 075 *** *** ***
 VAC=00"Hg   13:18.48
``` | Enter Monitor Mode from Test Mode by pressing the Up "↑" arrow key.

Select print interval and press "E". Monitor settings are printed along with first sensor status. |

M1-5 083 079 079 080 *** M6-8 *** *** *** VAC=00	T1-4 075 076 075 075 P T5-8 075 *** *** *** P VAC=00"Hg 13:18.49 P *=== END MONITOR TC ===*	This screen is displayed when in MONITOR mode. Press "1" to change interval or "M" to exit to MAIN MENU.

Table 5.4.2: TEST Mode

NOTE

The default real-time communications link is active in
TEST, MONITOR, MANUAL & START/RUN CURE
modes. In default mode, the bonder transmits full status
information once every 10 seconds.

4.4.3   ASSIGN Mode

ASSIGN mode is accessed by typing "2" from the MAIN MENU. There are three operations associated with assigning thermocouples;

- The control method or algorithm
- The number of active or installed TCs
- The number control TCs

ASSIGN mode does not print when called directly from the MAIN MENU. The TC assignments are printed as part of the program header when a cure starts. ASSIGN will also print any changes that are accomplished if ASSIGN mode is re-entered during a running cure.

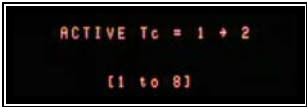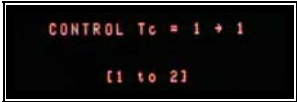| Display	Printer [A]	Description
1-TEST Tc 3-PROGRAM 2-ASSIGN Tc 4-START CURE		MAIN MENU; press "2"
TEMP CONTROL = MEDIAN [0 to 5,E=SAVE,M=MENU]		The temperature control method is selected by typing one of the following single digits: • "0": use TC01 only • "1": use TC02 only • "2": MEDIAN, uses average of the hottest and coldest • "3"; HOTTEST, uses hottest TC only • "4"; COLDEST, uses coldest TC only • "5"; HOTPLUS, uses hottest TC during RAMP

		stages but will not enter SOAK until all TCs are within HI/LO settings
ACTIVE Tc = 1 → 2 [1 to 8]	``` *********************** * PROGRAM CHANGED * * DURING CURE AT * * 03/00/11 13:41.57 * * NEW CURE PARAMETERS * *=====================* * ACTIVE TCs = 05 * *********************** ```	Set the number of active TCs by typing in single digit.
CONTROL Tc = 1 → 1 [1 to 2]	``` *********************** * PROGRAM CHANGED * * DURING CURE AT * * 03/00/11 13:38.37 * * NEW CURE PARAMETERS * *=====================* * TEMP METHOD = HOT * * CONTROL TCs = 03 * *********************** ```	Set the number of control TCs. Starts with TC01 and must be less than or equal to number of active TCs.

Table 5.4.3: Assign Modes

A – only printed if accessed from a running cure

NOTE

All TC assignments start with TC01.

The bonder will check that all ACTIVE TCs are installed before allowing a cure to start.

Once a cure has started, the cure will continue as long as there is at least one control TC installed and working. With no control TCs, the running cure will removed all output power, stop advancing the cure and wait for a control TC to be re-installed.

Upon power interruption, the cure will not resume unless on control TC is installed and working.

4.4.4   PROGRAM Mode

PROGRAM mode can be accessed from the MAIN MENU, the LIBRARY menu and during a running cure. Any change to the program will remain in place until the next program change or selection of a different cure from the system LIBRARY. PROGRAM mode single-steps through all adjustable cure related parameters in sequence. At the end of the sequence, the bonder automatically exits to the mode that was running when PROGRAM was first entered. After adjusting a PROGRAM entry, "E" must be pressed to save the change. Press "M" to exit without saving the change. In all of the PROGRAM

---

screens, the allowable range of values is presented on the second display line. To proceed, a value within the prescribed range must be selected.

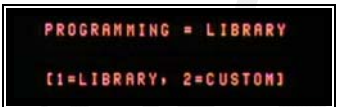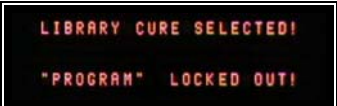---

NOTE

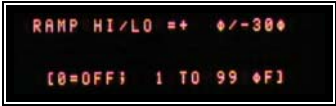Mulit-digit selections, might require the operator to enter
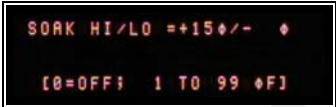"0" as the first digit.

The EDIT LOCKOUT setting as established in SETUP
mode, affects PROGRAM mode operation. If program
editing is locked out, the operator will not be able to modify
any PROGRAM setting. If locked, the operator will be able
to select a cure from the LIBRARY (but only if the
LIBRARY contains at least one cure).

By default, EDIT lockout is disabled and the operator is
allowed to modify all program parameters.

Normally, nothing is printed while in PROGRAM mode. However, if PROGRAM mode is accessed from the START CURE/RUN mode and a parameter has been changed and saved, notification of the parameter change is printed. The Printer column in the following table shows examples of the printout for parameters changed during a running cure.

Display	Printer [A]	Description
1-TEST Tc 3-PROGRAM 2-ASSIGN Tc 4-START CURE		MAIN MENU; press "3"
PROGRAMMING = LIBRARY [1=LIBRARY, 2=CUSTOM]		When there is at least one cure in the LIBRARY and edits are enabled, the operator must choose to enter all CUSTOM parameters or to run a preset cure from the LIBRARY.
ID-01:"1SK " UP/DN=CHNG,E=SAVE,M=EXIT		When selecting a cure from the LIBRARY, the operator can use the keypad to scroll through the cure names in the LIBRARY.
		NOTE
		The operator is not allowed to change the LIBRARY cure when PROGRAM mode is accessed from START CURE
LIBRARY CURE SELECTED! "PROGRAM" LOCKED OUT!	```************************ * LIBRARY IS EMPTY. * ENTER CURE IN LIB SETUP! ************************```	If edits are LOCKED out, the operator can select a library cure but cannot make any changes to it.

NUMBER OF SOAKS = 2 [1 to 6]	``` ************************ * PROGRAM CHANGED * * DURING CURE AT * * 03/00/11 13:43.53 * * NEW CURE PARAMETERS * *=====================* * #STEPS = 2 STAGE(S) * * RAMP 1 = 15øF/MIN * * SOAK 1 = 150øF * * TIME 1 = 005 MINUTES * * RAMP 2 = 10øF/MIN * * SOAK 2 = 200øF * * TIME 2 = 010 MINUTES * * EST RUNTIME = 000:41 * ************************ TIME CYCLE PGM PRI VAC ===== ===== === === === 13:43 PROG 124 134 00 ```	Operator must press "1", "2", "3", "4", "5", or "6". The number selected is the number of soak stages. A soak stage is defined by three parameters; ramp rate, dwell temperature and dwell time. Depending on the number of soak stages, the following three parameters will repeat to uniquely set values for each of these parameters. The current soak stage is shown in the parameter windows.
RAMP RATE 1 = [1 to 15øF / MINUTE]		Requires a two digit keypad entry of 1 to 15 when units of measurement are in Fahrenheit.
SOAK TEMP 1 – 150 [070 to 500øF]		Requires a three digit keypad entry of 70 to 500 when units of measurement are in Fahrenheit
SOAK TIME 1 = [001 to 999 MINUTES]		Requires a three digit keypad entry of 1 to 999. Units are in minutes.
COOLING RATE = [1 to 15øF / MINUTE]	``` ************************ * PROGRAM CHANGED * * DURING CURE AT * * 03/00/11 13:44.45 * * NEW CURE PARAMETERS * *=====================* * COOL = 15øF/MIN * * EST RUNTIME = 000:26 * ************************ ```	Requires a two digit keypad entry of 1 to 15 when units of measurement are in Fahrenheit. The cool down stage is the final segment of a cure. The bonding system does not have any "active" cooling capability. The cool down occurs passively. Normally, no heat is applied during the cool down as the repair area is allowed to cool. However, if the area cools faster than the prescribed rate, power will be applied to match the specified rate.
FINAL TEMP = 100 [070 to 150øF]	``` ************************ * PROGRAM CHANGED * * DURING CURE AT * * 03/00/11 13:44.58 * * NEW CURE PARAMETERS * *=====================* ```	Requires a three digit keypad entry of 70 to 150 when units of measurement are in Fahrenheit. When this temperature is reached during the cool down, the cure completes.

| | ```
*  FINAL  = 125øF      *
* EST RUNTIME = 000:26 *
************************
``` | The Final temperature may be set as high as 150 degrees. This will seem quite warm to the touch when the cure is broken down. |
| ```
RAMP HI/LO =+  ø/-30ø

[0=OFF; 1 TO 99 øF]
``` | ```
************************
*   PROGRAM CHANGED    *
*    DURING CURE AT    *
*  03/00/11  13:45.16  *
* NEW CURE PARAMETERS  *
*====================*
* SOAK HI/LO = +10/-10 *
************************
``` | This screen supports two program parameters, each requiring a two digit keypad entry of 0 to 99 (Fahrenheit). The first parameter establishes when a high temperature alarm will sound during a RAMP stage. The alarm will sound if the TC temperature is above the PROGRAM temperature plus this value. The alarm can be turned OFF by setting to zero. The second parameter provides for a similar setting for TC temperatures that fall below the PROGRAM temperature. NOTE: COOLDOWN is a RAMP stage. |
| ```
SOAK HI/LO =+15ø/-  ø

[0=OFF; 1 TO 99 øF]
``` | ```
************************
*   PROGRAM CHANGED    *
*    DURING CURE AT    *
*  03/00/11  13:45.16  *
* NEW CURE PARAMETERS  *
*====================*
* SOAK HI/LO = +10/-10 *
************************
``` | These parameters are similar to the previous RAMP HI/LO settings, except that these settings only affect the bonder when operating in a SOAK stage. |
| ```
VACUUM LEVEL = 15

[0=OFF; 1 TO 27"Hg]
``` | ```
************************
*   PROGRAM CHANGED    *
*    DURING CURE AT    *
*  03/00/11  13:45.31  *
* NEW CURE PARAMETERS  *
*====================*
* VACUUM  = 00"Hg      *
************************
``` | This screen requires a two digit keypad entry of 0 to 27 (for Nigh). This example shows the bonder working in kilo-Pascal mode. Setting to zero turns the vacuum alarm OFF, otherwise an alarm occurs when the measured vacuum level falls below this value. |
| ```
PRINT INTERVAL =

[0=OFF; 1 TO 30MIN]
``` | ```
************************
*   PROGRAM CHANGED    *
*    DURING CURE AT    *
*  03/00/11  13:45.57  *
* NEW CURE PARAMETERS  *
*====================*
* PRINT TCOPTION = ALL *
************************
``` | The printer may be set to print current status information at regular intervals. |
| ```
PRINT TC OPTION = CTL

[0=CTL TC  1=ALL TC]
``` | ```
************************
*   PROGRAM CHANGED    *
*    DURING CURE AT    *
``` | Selecting CTL will print a minimum of information at the prescribed timer interval. ALL |

| | ```
*  03/00/11  13:45.57  *
* NEW CURE PARAMETERS  *
*=====================*
* PRINT TCOPTION = ALL *
***********************
``` | will print all of the sensor data. |
| AUX OVERLIMIT =<br><br>[0=OFF; 1 TO 99 ◊F] | ```
***********************
*    PROGRAM CHANGED    *
*    DURING CURE AT     *
*  03/00/11  13:46.07   *
* NEW CURE PARAMETERS   *
*=====================*
* OVERLIMIT   = 99øF    *
***********************
``` | The operator may use the Auxiliary Overlimit parameter to make an alarm on the secondary TCs operate differently than a control TC. This value is added to the RAMP HI/LO & SOAK HI/LO limits. |

Table 4.4.4: Program Modes

A – only printed if accessed from a running cure

NOTE

All TC assignments start with TC01.

The bonder will check that all ACTIVE TCs are installed before allowing a cure to start.

When PROGRAM mode is accessed from START CURE/RUN mode, only the uncompleted or unspecified parameters may be changed. For instance, once the 1st stage has completed it is impossible to change RAMP1, TEMP1 or TIME1. Alternatively, a soak stage can be added; up to five additional stages can be added to a 1-stage cure. Also, the SOAK time cannot be reduced to less than the time that has already lapsed.

4.4.4.1 PROGRAM EDIT LOCKOUT

The screen below is displayed whenever the EDIT LOCKOUT parameter is set to ON and an attempt to edit any PROGRAM parameter is made.

Figure 4.4.4.2: Edits Locked Out Display

When enabled, the operator can not make any changes to the programmed cure; either during a cure or prior to running a cure. If there is at least one cure in the system LIBRARY, the operator is allowed to select a cure from the library.

4.4.5   START CURE/RUN Mode

The HB2 initiates running the programmed cure by selecting START CURE from the MAIN MENU. Once started, the HB2 uses the TC settings as saved in ASSIGN mode and follows the preset parameters as setup in PROGRAM mode. Both the ASSIGN mode and PROGRAM mode may be re-entered after a cure has been started. Any change to the original TC assignment or cure parameter is printed.

After START CURE is selected, the HB2 runs two system checks in the early part of the cure:

- Open TC check – The bonder checks that each of the active TCs (as set up in ASSIGN mode) are plugged in and functional. If any TC has a problem, the cure is immediately terminated so that the problem can be fixed before the cure proceeds.

- NO HEAT/FALLING TEMPERATURE checks – These two tests occur during the first 60 seconds of a cure. When the cure starts, the bonder applies a fixed initial output based on the type of output device selected (refer to RESERVED under SETUP mode). With this initial output, the output device (usually a blanket) should begin to heat up. The TCs installed for the cure are used to sense when the blanket starts to heat up. This phase of the cure is called WAIT FOR HEAT DETECTION. If no temperature increase is detected at the end of 60 seconds, the cure is terminated with either a NO HEAT or FALLING TEMPERATURE alarm. The NO HEAT alarm occurs when the temperature is the same temperature as it was when the cure started. The FALLING temperature alarm occurs if the temperature decreases when heat is begin applied. This usually signals a TC that is wired backwards.

- GRADUAL POWER APPLICATION – As soon as the cure starts, power is applied at 5%. It increases by 2% every three seconds until a temperature rise is detected in the blanket. If no temperature rise is detected, the cure will fail with either a NO HEAT or FALLING TEMPERATURE alarm.

Display	Printer	Description

1-TEST Tc 3-PROGRAM 2-ASSIGN Tc 4-START CURE		MAIN MENU; press "4" to start
## ATTENTION ## TC 4 OPEN		Upon initial start, if any of the active TCs are not properly installed, the failing TC is identified and the cure is terminated.
OPR ="1235 " ENTER OPERATOR ID		If active TCs are OK, then operator is prompted for his ID. This can be bypassed by pressing "E"
JOB ="ZY_ " ENTER JOB ID	```*************************
*   CURE PROGRAM   *
* OPR: "   "   *
* JOB: "Z   "   *
* LIB: n/a   *
* 02/16/03 08:39.18 *
----
* POWER = (110V/060Hz) *
* ACTIVE TCs = 02   *
* CONTROL TCs = 01   *
* TEMP METHOD = MEDIAN *
* #STEPS = 1 STAGE(S) *
* RAMP 1 = 10øF/MIN *
* SOAK 1 = 150øF   *
* TIME 1 = 005 MINUTES *
* COOL = 05øF/MIN   *
* FINAL = 100øF   *
* RAMP HI = +30øF   *
* RAMP LO = -30øF   *
* SOAK HI = +15øF   *
* SOAK LO = -15øF   *
* VACUUM = 15"Hg   *
* PRINT INTERVAL = 01 *
* PRINT TCOPTION = CTL *
* OVERLIMIT = 20øF   *
* EST RUNTIME = 000:22 *
****
TIME CYCLE PGM PRI VAC
===== ===== === === ===
08:39 WAIT 072 071 19```	The operator is also prompted for a JOB ID. This can be bypassed by pressing "E" NOTE Use the "↑" and "↓" arrow keys for alphabet characters
## ATTENTION ## LOW VACUUM [00"Hg]	`12:06 !ALM-LOVAC[00"Hg]`	After entering the JOB ID, the cure is running and all ALARMS are now active. If a non-zero low VACUUM limit is set and the pump was not turned on, there will be an immediate VACUUM alarm

`WAIT   VAC=00  ETA=000`
 	
`PGM=082 PRI=082 Tc3=080`
		Waiting for heat detection

At this point, the bonder is waiting 60 seconds for HEAT DETECTION. Failure to detect a rise in the cure area temperature is typically caused by

- Bad TC placement; TCs must be in the output device heat path
- Power output cable is not connected
- There is a bad mismatch between the output device and the amount of heat necessary to increase the temperature of the cure area (i.e., using a very small blanket on a repair with a very large heatsink

`## ATTENTION ##`
 	
`NO HEAT! [073°F]`
		No temperature rise was detected, alarm is turned ON and the bonder is waiting for acknowledgement from the operator

`## ATTENTION ##`
 	
`\ NO HEAT: EXITING \`
		Operator has acknowledged the alarm by pressing "E" and the program is terminating.

`## ATTENTION ##`
 	
`TEMP FALLING [074°F]`
		A temperature decrease was detected, alarm is turned ON and the bonder is waiting for acknowledgement from the operator

`## ATTENTION ##`
 	
`- FALLTEMP:EXITING -`
		Operator has acknowledged the alarm by pressing "E" and the program is terminating.

The bonder has successfully applied heat and detected a small temperature rise in cure area through the control TCs. Bonder is now in the RAMP1 phase ….

`RAMP1   VAC=00  ETA=006`
 	
`PGM=082 PRI=084 Tc2=082`
 	
`R1-5 086 081 081 081 ***`
 	
`R6-8 *** *** *** VAC=00`
	`08:39 RAMP1 072 078 19`
	`08:40 RAMP1 080 083 19`
	`08:41 RAMP1 090 094 19`
	`08:42 RAMP1 100 103 19`
	`08:43 RAMP1 110 112 19`
	`08:44 RAMP1 120 125 19`
	`08:45 RAMP1 130 134 19`
	`08:46 RAMP1 140 140 19`
	
	`TIME  CYCLE PGM PRI VAC`
	`===== ===== === === ===`
	`08:47 SOAK1 150 150 19`
	`08:48 SOAK1 150 154 19`
	`08:48 SOAK1 150 154 19  P`
	`08:49 SOAK1 150 150 19`
	`08:50 SOAK1 150 151 19`
	`08:50 !HOLD-INIT 150F`
	`08:50 !HOLD-EXIT 150F`
	`08:51 SOAK1 150 151 19`
	`08:52 SOAK1 150 151 19`
		If no alarms are detected, the bonder performs its routine tasks including:
		
		- Print current status at the prescribed time interval
		
		- Process keypresses:
		  - "↑" – switch to all sensors display
		  - "↓" – print status on demand; these printouts are signified by a "P" in the rightmost printer column
		  - "→" – enter/exit HOLD mode. Line is printed on start and end of HOLD
		
		The rest of this example shows a typical printout with

| | ```
TIME  CYCLE PGM PRI VAC
===== ===== === === ===
08:52 WAIT  150 151 19
08:52 COOL  150 151 19
08:53 COOL  146 151 19
08:54 COOL  141 143 19
08:55 COOL  136 138 19
08:56 COOL  131 131 19
08:57 COOL  126 127 19
08:58 COOL  121 121 19
08:59 COOL  116 117 19
09:00 COOL  111 114 19
09:01 COOL  106 112 19
09:02 COOL  101 103 19
09:02 DONE  100 103 19
 PROGRAM   *-----------*
 COMPLETE  |           |
           |           |
           *-----------*
OPR: "     "
JOB: "Z    "
MODEL/SN="HB10000"
END DT 02/16/03 09:02.10
ACTUAL RUNTIME = 000:22
************************
``` | no alarms and successfully completing the programmed cure. |
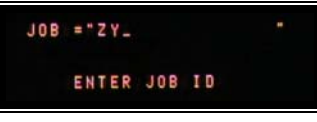| ## ATTENTION ## <br> TC 5 COLD [053°F] | ```
12:01 !ALM-TC1 LO[140C]
12:01 !CLR-TC1 LO[152C]
``` | Cold Alarm |
| ## ATTENTION ## <br> TC 5 HOT [213°F] | ```
23:01 !ALM-TC5 HI[231F]
24:01 !CLR-TC5 HI[200F]
``` | Hot Alarm |
| The following steps can occur during the middle of a running cure | | |
| ## WARNING ##
 E=RESUMES M=CANCELS CURE | | Press "E" to initiate canceling the cure. |
| ## ATTENTION ## <br> \ CURE CANCELLED \ | ```
10:12 RAMP1 072 077 18
10:12 RAMP1 073 094 18
CURE CANCELLED
************************
``` | Press "E" again to go back to running the cure <br> Press "M: to confirm the cancellation. Screen does not advance until printout is complete |
The following screen will appear with an internal failure of the Solid State relay.		
## ATTENTION ## !!ACWD TRIPPED!!		
The following screen sequence occurs when the power is cutoff		

| | ```
************************
* LOST POWER IN RAMP1! *
*   AUTO RESUMING CURE  *
* PWR OFF FOR 00034 SEC*
*======================*
* RESUME PROGRAM PARAM  *
*       FOR ZONE 1      *
* OPR:"              "*
* JOB:"              "*
* LIB: n/a             *
*  09/00/26  12:07.42   *
*----------------------*
* POWER = (110V/060Hz) *
``` | When power is lost, nothing happens until power is restored. Selftest is rerun and must PASS before cure can resume.

The amount of time that power was off is calculated. If OFF for less that 2 minutes, the sure will automatically resume. |
| | ```
************************
* LOST PWR IN RAMP1 !! *
   PWR OFF FOR 1630 SEC
   OPERATOR EXIT CURE
************************
``` | If OFF for more than 2 minutes, the operator will be asked if the cure should resume. |
| The following printout shows another example of a parameter changed during a cure | | |
| | ```
************************
*    PROGRAM CHANGED    *
*    DURING CURE AT     *
*  07/02/13  10:24.09   *
* NEW CURE PARAMETERS   *
*======================*
* TEMP METHOD = HOT     *
* ACTIVE TCs  = 05      *
* CONTROL TCs = 04      *
************************
 TIME  CYCLE PGM PRI VAC
 ===== ===== === === ===
``` | |

Table 5.4.5: Run Modes

NOTE

The default real-time communications link is active in
TEST, MONITOR, MANUAL & START/RUN CURE
modes. In default mode, the bonder transmits full status
information once every 10 seconds.

This communication is also active from ASSIGN and
PROGRAM modes if re-entered while running a cure.

NOTE

Both positive and negative ramps are possible. A positive

ramp occurs when the current temperature is lower that the next programmed step temperature. While in a positive ramp, the display will show 'RAMP'. A negative ramp occurs when the current temperature is higher than the next step temperature and is indicated on the display as "DOWN".

4.4.6   SETUP Mode / System Administration

Setup mode system administration is for use by the person(s) or department responsible for maintenance activities of the bonder such as programming preset cures into the on-board library. A factory preset password is required to enter into SETUP mode. This password will be made available at the time of delivery to the person responsible for the calibration/maintenance of the unit.

The SETUP mode has eight (8) sub menu functions:

- SET CLOCK
- CALIBRATE TC
    - o PERFORM TC CALIBRATION
    - o RESET FACTORY VALUES
    - o EXIT
- CALIBRATE VACUUM
    - o RUN AIR CALIBRATION
    - o RESET FACTORY VALUES
    - o EXIT
- UPDATE CURE LIBRARY
    - o EDIT
    - o SAVE
    - o DELETE
    - o PRINT
    - o LIST CURES IN LIBRARY
    - o RESET LIBRARY
    - o EXIT
- LOCKOUT CHANGE MENU
    - o EDIT LOCKOUT
    - o MANUAL LOCKOUT
- SET UNITS OF MEASUREMENT (UOM)
    - o DEGREES (TEMPERATURE)
    - o AIR (VACUUM)
- RESERVED
    - o POWER METER LED
    - o TCBLOCK TEMPERATURE
    - o OUTPUT DEVICE

> o   NETWORK ADDRESS
> o   SERIAL NUMBER
- EXIT

Each sub menu option is explained below. In general, to save the changes made to any of these settings, press "E" (ENTER), or "M" (MENU) to escape without saving. If after pressing "E" (ENTER), the program does not advance to the next screen, check that the input field is within the prescribed limits provided on the second line of the display. It is not possible to save a value outside of the prescribed range.

NOTE

After making a change, the "E" (ENTER) must be pressed to enter the changes. The "M" (MENU) is used to return to the previous screen without making a change.

4.4.6.1 SETUP PASSWORD

Enter SETUP from the MAIN MENU. Most

NOTE

A battery with a 10-year life is used to retain settings in the processor memory. If the bonder does not appear to hold a revised setting after powering off, contact WichiTech about the battery.

Display	Printer	Description
1-TEST Tc 3-PROGRAM 2-ASSIGN Tc 4-START CURE		MAIN MENU; press "5"
******** ENTER SETUP PASSWORD		Enter PASSWORD or press "M": to return to MAIN MENU

Table 4.4.6.1: Setup: Password

4.4.6.2 SET CLOCK

Set Clock is used to adjust the system real-time clock. It is set for Eastern Standard Time (EST) at the factory. A correction is necessary for a different time zone.

To set the clock to the correct date and time, type "1" from the SETUP menu. To advance between the fields, press "E". Pressing "E" also saves the value on the screen but the changed values are not kept permanently until after the SECONDS parameter has been

saved. This allows the operator to exit without saving by pressing "M" at anytime before saving the SECONDS parameter. The current field will flash as new values are being typed. The days of the month are adjusted by the month and leap year days in February.
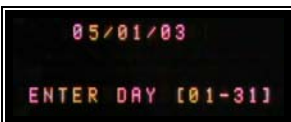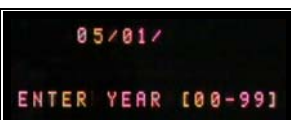
1 SET CLOCK 2 CALIBRATE Tc		SETUP MENU; • "1" to adjust Date/Time
/01/03 ENTER MONTH [01-12]		Month: enter 2 digit value from [01-12]
05/01/03 ENTER DAY [01-31]		Day: enter 2 digit value from [01-31]. The high limit will differ for each month.
05/01/ ENTER YEAR [00-99]		Year: enter 2 digit value from [00-99]
12:51.21 ENTER HOUR [00-23]		Hour: enter 2 digit value from [01-24]
12: .21 ENTER MINUTE [00-59]		Minutes: enter 2 digit value from [00-59]
12:51.21 ENTER SECOND [00-59]	# 06/27/13 08:01.39 #	Seconds: enter 2 digit value from [00-59]. New Date/Time prints out after last parameter is adjusted

Table 4.4.6.2: Setup: Clock Settings

4.4.6.3 CALIBRATE TC

Calibrate TC is used to make corrections to the thermocouple readings. Details on all sensor calibration can be found in a separate manual; D1HB2CAL, "HB2 CALIBRATION MANUAL". There are two options in calibration; there is a global reset of the calibration table or individual thermocouple calibration.

2 CALIBRATE Tc 3 CALIBRATE VACUUM		From the SETUP MENU; • "2" to calibrate TCs
1 PERFORM TC CALIBRATION 2 RESET FACTORY VALUES		TC Options Menu • "1" calibrate settings in inches of Hg, every 5"Hg • "2" resets internal table to factory (pre-calibration)

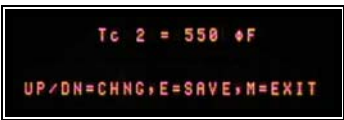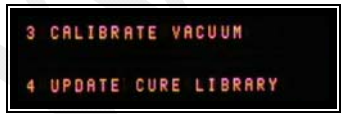|		settings
		NOTE
		Calibration on all TCs should be rerun after FACTORY RESET for maximum precision and resolution.
Tc 2 = 550 ◦F UP/DN=CHNG,E=SAVE,M=EXIT		Use TC calibrator source to supply reference input from 50ºF to 1000 ºF and press "E" to calibrate. Use up "↑" and down "↓" arrows to select TC
	# TC FACTORY RESET! #	After selecting the reset option, an acknowledgement of the reset is printed.

Table 4.4.6.3: Setup: Calibrate TC

NOTE

Using the FACTORY RESET option is a quick way to restore the internal calibration table to its initial settings. RESET can be used to quickly fix a corrupted table to within +/- 5 degrees of the standard. IMPORTANT: The individual calibration mode should be run after RESET for maximum precision with the sensor.

4.4.6.4 CALIBRATE VACUUM

Calibrate VACUUM is used to make corrections to the measurements made by the internal digital vacuum sensor. Details on all sensor calibration can be found in a separate manual; D1HB2CAL, "HB2 CALIBRATION MANUAL". There are two options in calibration; there is a global reset of the calibration table or individual thermocouple calibration. An external source or the HB2 can be used as the variable vacuum source needed to calibrate at the non-zero settings

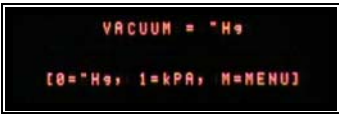|		
3 CALIBRATE VACUUM 4 UPDATE CURE LIBRARY		From the SETUP MENU; • "3" to calibrate Vacuum
1 RUN AIR CALIBRATION 2 RESET FACTORY VALUES		Air Options Menu • "1" calibrate settings in inches of Hg, every 5"Hg • "2" resets internal table to factory (pre-calibration) settings NOTE

		Vacuum calibration should be rerun after FACTORY RESET for maximum precision and resolution.
VACUUM = "Hg [0="Hg, 1=kPA, M=MENU]		Adjust vacuum source for 15"hg and press "E" to calibrate at 15"Hg
	# AIR FACTORY RESET! #	After selecting the reset option, an acknowledgement of the reset is printed.

Table 4.4.6.4: Setup: Calibrate Vacuum

4.4.6.5 UPDATE CURE LIBRARY

The HB-2 contains a storage area called the cure library. The library is typically programmed by an administrator to contain frequently run cure programs. There are several functions that support the creation, editing and maintenance of the library. All library functions are accessed as the fourth option in the SETUP mode. These functions include:

1. EDIT CURE
2. SAVE CURE
3. DELETE CURE
4. PRINT CURE
5. LIST ALL CURES
6. RESET LIBRARY
7. EXIT

These functions are all part of the LIBRARY SETUP menu and are visible two at a time by using the UP & DOWN arrows to scan through the menu.

Library EDIT mode uses the same steps as PROGRAM mode. Selecting EDIT from the LIBRARY menu allows the administrator to program a cure with all the same steps as PROGRAM mode. After exiting edit mode, the administrator would typically enter SAVE mode to record a working, pneumonic name for the cure just edited.

SAVE mode presents the administrators with a fifteen (15) character field for recording the cure name. Numbers are entered using the keypad numerals and alphanumeric and some special characters can be added to the name by using the UP and DOWN arrow keys.

The LIBRARY has a limited amount of memory. When full a library cure can be deleted by using DELETE mode to make room for a new cure. Alternatively, the entire LIBRARY can be reset by using the reset option. RESET clears all cures from the LIBRARY.

PRINT CURE will allow the administrator to print a listing of the cure details.

LIST CURES will print a table of the cures in the library with the curenames.

4 UPDATE CURE LIBRARY 5 LOCKOUT:PROGRAM/MANUAL		Select "4" from the SETUP menu to access the UOM menu.
1 LIBRARY: EDIT CURE 2 LIBRARY: SAVE CURE		
2 LIBRARY: SAVE CURE 3 LIBRARY: DELETE CURE	ADDED "1SK "	
3 LIBRARY: DELETE CURE 4 LIBRARY: PRINT CURE		
4 LIBRARY: PRINT CURE 5 LIBRARY: LIST CURES		
## ATTENTION ## \ PRINTING LIBCURE \	``` *********************** * CURE PROGRAM * *LIB:"1SK " * *----------------------* * #STEPS = 1 STAGE(S) * * RAMP 1 = 10øF/MIN * * SOAK 1 = 150øF * * TIME 1 = 005 MINUTES * * COOL = 05øF/MIN * * FINAL = 100øF * * RAMP HI/LO = +30/-30 * * SOAK HI/LO = +15/-15 * * VACUUM = 15"Hg * * PRINT INTERVAL = 01 * * PRINT TCOPTION = CTL * * OVERLIMIT = 20øF * * EST RUNTIME = 000:22 * *********************** ```	
5 LIBRARY: LIST CURES 6 RESET LIBRARY		
SETUP: UPDATE LIBRARY ...PRINTING CURELIST	``` *********************** * NUMBER OF CURES: 01 * * NM CURE DESCRIPTION * * == ================ * * 01 "1SOAK " * *********************** ```	

ID-01:"1SK " UP/DN=CHNG,E=SAVE,M=EXIT		
6 RESET LIBRARY 7 EXIT TO SETUP MENU	* LIBRARY: FULL RESET! *	

Table 4.4.6.5: Setup: Library

4.4.6.6 LOCKOUT SETTINGS

There are two lockout settings in the HB-2; the program edit lockout and the MANUAL mode lockout. The program edit lockout allows the administrator to program a cure into the HB2 and then prevent an operator from changing an of the cure parameters. In this way an administrator will know that a cure has run as programmed with no variance from the original setup. By default, the PROGRAM EDIT LOCK is OFF and any operator is allowed to make changes to the program.

The MANUAL mode lockout controls the availability of MANUAL mode operations. By default, MANUAL mode is locked out because it allows the HB-2 to be operated without any automatic feedback control. In MANUAL mode the HB-2 is set to a percentage of full power output; 10% is 10 percent ON, 99% is ninety-nine percent ON. The HB-2 will maintain the operator prescribed output until it is changed or the operator exits MANUAL mode. When unlocked, the default power level in MANUAL mode is 50%.

The AC Watchdog Timer is the only safety feature that is active during MANUAL mode. The ACWD is a hardware function and cannot be turned OFF. The ACWD becomes active when the HB2 is running at 100% output power. If the HB-2 is set to 100% power in MANUAL mode, after six (6) seconds the HB-2 will trip and sound an alarm, indicating that the power output level had not changed in the last six (6) seconds. The ACWD is always active.

CAUTION

The HB-2 must be actively monitored while operating in
MANUAL mode. No automatic control is operating except the
ACWD timer function while in MANUAL mode.

The operator can quickly check the status of both LOCKOUT settings by using ABOUT mode.

5 LOCKOUT:PROGRAM/MANUAL 6 SET UNITS OF MEASURE		Select "5" from the SETUP menu to access the LOCKOUT menu.

PROG EDIT LOCK = OFF 1=OFF,2=ON,E=SAVE,M=EXIT	# PROG EDIT LOCK = ON # # PROG EDIT LOCK = OFF #	
MANUAL LOCKOUT = ON 1=OFF,2=ON,E=SAVE,M=EXIT	# MANUAL LOCKOUT = ON # # MANUAL LOCKOUT = OFF #	

Table 4.4.6.6: Setup: Lockout Settings

4.4.6.7 UNITS OF MEASUREMENT (UOM)

The UOM setup menu can be used to change the operational temperature and pneumatic readings. By default, the HB-2 measures temperature in degrees Fahrenheit. By selecting the TEMP option on the UOM menu, an administrator can changes to degrees Centigrade. In a similar way, an administrator can change the pneumatic scales from inches-of-mercury to kilopascals. Inches of mercury is the default setting.
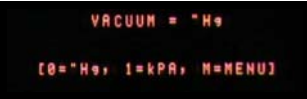
6 SET UNITS OF MEASURE 7 RESERVED		Select "6" from the SETUP menu to access the UOM menu.
VACUUM = "Hg [0="Hg, 1=kPA, M=MENU]	# VACUUM NOW kPA! #	
DEGREES = °F [0=°F, 1=°C, M=MENU]		

Table 4.4.6.7: Setup: Units Of Measure (UOM) Settings

4.4.6.8 RESERVED SETTINGS

The SETUP RESERVED menu provides access to several hardware related programmable parameters. These settings should be changed by qualified personnel only.

7 RESERVED 8 EXIT TO MAIN MENU		Select "7" from the SETUP menu to access the UOM menu.
1-LEDS 3-OUTPUT 5-S/N 2-BLOCK 4-ADDR		There are seven options: 1-LEDS; accommodates a change in the Power Meter PWB 2-BLOCK; accommodates 500 or 1000 degree thermocouples 3-PID_K; proportional setting for PID

		4-PID-I; integral setting for PID
		5-PID_D; derivative setting for PID
		6-ADDRESS; allows for changes in network address
		7-S/N: type in serial number of unit.
LED SETTING = NEW 0=LEGACY, 1=NEW, M=MEN	# TCNUMBER NOW 08! #	
	# TCBLOCK NOW "1000ø" #	
OUTPUT DEVICE=BLKT 0=GUN,1=LMP,2=BLN,M=MENU	# OUTPUT DEVICE = LAMP # # K=[02] I=[00] D=[02] #	
NETWORK ADDR= 0 RANGE=[0..9], M=MENU	# ADDRESS = "0" #	
SERIALNUM = 0258 ENTER SERIAL NUMBER	# SERIALNUM = 0258 #	

Table 4.4.6.8: Setup: Reserved

4.4.7 ABOUT Mode

ABOUT mode is used to display current settings and status of the bonder. Most of the settings were established via SETUP mode

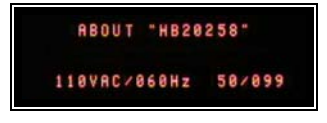| Display	Printer	Description
1-TEST Tc 3-PROGRAM 2-ASSIGN Tc 4-START CURE		MAIN MENU; press "6"
ABOUT "HB20258" TC=08 0500ØF UOM=ENG	************************ ABOUT "HB20258" 08-99-13 H1.04 S3.11 TC=08 0500øF UOM=ENG QUEUE=001 LIB=01/12 LED=NEW ADDR="0" ELOCK=OFF MLOCK=OFF 110VAC/060Hz 50/099	Hardware/Software Settings: • TC= number of TCs per zone; default is 8, option is 10 • Maximum temperature; default is 0500 ºF, 1000 ºF is optional • Units of measure default

	P009/R000/ET0003:07.54 **********************	is English
ABOUT "HB20258" QUEUE=001 LIB=01/12		Library\Libcure Settings: • Max number of Lastcure lines • Library: number of cures in library / maximum number of library cures
ABOUT "HB20258" LED=NEW ADDR="0"		Power Meter Rev/Network Address • LED; hardware change affected power meter • ADDR: single digit [0//9' identifies this unit of pc network
ABOUT "HB20258" ELOCK=OFF MLOCK=OFF		Lockout Settings • ELOCK; program edit lock • MLOCK; manual mode
ABOUT "HB20258" 110VAC/060Hz 50/099		PowerLevel Settings • Input power settings that were detected at powerup • Initial power setting / maximum power setting
ABOUT "HB20258" P009/R000/ET0003:04.15		Software Debug • P009: number of times that unit has been powered up • R000; RESET count number of times the processor watchdog timer has reset the unit • ET; elapsed time of unit operation hours:mins.secs
ABOUT "HB20258" 08-99-13 H1.04 S3.07		Revisions • Date of last software rev • H1.04: hardware rev • S3.11: software rev

Table 4.4.7: About Modes

4.4.8 MANUAL Mode

The HB2 can be run in MANUAL mode without automatic control. In MANUAL, the output of the HB2 is set to a fixed percentage of ON cycles. MANUAL mode can be used to test the internal HB2 heat application circuitry and parts. MANUAL mode is disabled by default using the MANUAL LOCKOUT setting in SETUP mode. The HB2 should not be used in MANUAL without an operator observing the unit. The initial setting is 50% on. This setting may be changed from 0 to 100%; 0 is OFF, 100% is fully on. If set to 100%, the HB2 will

trip in approximately 6 seconds with an ACWD alarm. The alarm will sound and the output will be disconnected. After 3 seconds, MANUAL mode is re-entered with the output reset to 50%. MANUAL mode can be executed by pressing "M".

- - - - - - - - - -
WARNING
- - - - - - - - - -

Failure to monitor the HB2 while in MANUAL mode could result in injury to the user and/or physical damage to equipment and/or materials. The automatic temperature controls (except for the ACWD trip) are **NOT** active in MANUAL mode.

Display	Printer	Description
1-TEST Tc 3-PROGRAM 2-ASSIGN Tc 4-START CURE		MAIN MENU; press "7"
## ATTENTION ## MANUAL MODE IS LOCKED!		By default, MANUAL mode is locked out. Attempting to enter MANUAL while the MANUAL lockout is enabled displays this message. Enter SETUP, and use the LOCKOUT submenu to unlock MANUAL mode.
MPRCNT=050 T6=**** VAC=00 [PRESS M FOR MAINMENU]	MANUAL: PERCENT=050 ON! T1-4 097 087 087 097 VAC=18"Hg 08:05.13	This is the MANUAL mode running screen. Use the numeric keys to set output to a different percentage then press "E" to change the new setting.
## ATTENTION ## !!ACWD TRIPPED!!	08:05 !ACWD TRIP! P=050! MANUAL: PERCENT=050 ON! 08:05 !ACWD TRIP! P=050!	Setting the ON percentage to 100%, should result in an ACWD trip. If not trip occurs, contact WichiTech!

Table 4.4.8: Manual Modes

_____
NOTE
_____

The default real-time communications link is active in TEST, MONITOR, MANUAL & START/RUN CURE modes. In default mode, the bonder transmits full status information once every 10 seconds.

4.4.9   LASTCURE Mode { n/a with Version 3.11)

With sufficient memory, the HB2 records all of the printout statements from a running cure. These statements generated from the last running cure will be retained in memory until another cure is started. The LASTCURE mode provides a mechanism to reprint these recorded printouts. However, older versions of the HB2 do not have sufficient resources to record a usable number of printout statements. For these units the HB2 will display a "not available" message when LASTCURE mode is selected,
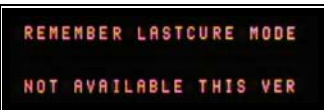
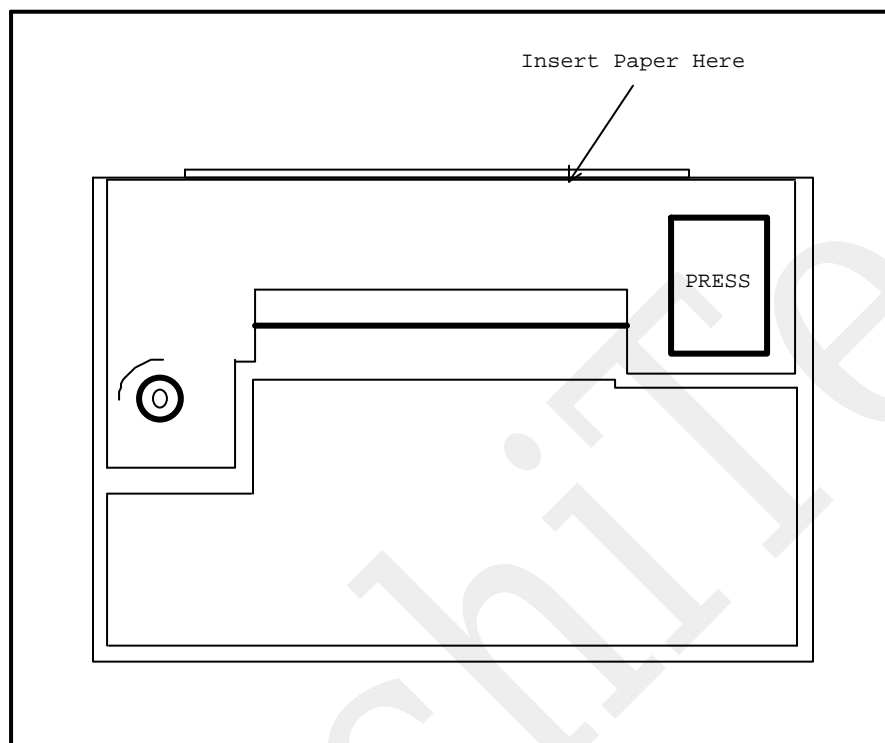| Display	Printer	Description
1-TEST Tc 3-PROGRAM 2-ASSIGN Tc 4-START CURE		MAIN MENU; press "8"
REMEMBER LASTCURE MODE NOT AVAILABLE THIS VER		

Table 4.4.9: Remember LastCure Mode

5   MAINTENANCE

5.1   PRINTER MAINTENANCE

Paper Feed Switch

With the HB2 powered on, pressing the PAPER FEED switch (located below each printer) advances additional paper.

Insert Paper Here

PRESS

Replacing the ribbon

The ribbon may be removed by pushing lightly on the right side of the ribbon cassette. Replace by inserting the right side first and gently "snapping" into place. To tighten the ribbon, turn the dial in a clockwise direction

Replacing the paper

The printer uses 2-1/4 inch wide paper, which is available at all office supply stores. The paper is available in various diameter rolls. If the small diameter roll is not available, pull sufficient paper off the roll until the roll will fit into the paper well.

Feed the paper through the print head by pushing the paper into the slot in rear of the printer while pressing down on the paper feed switch. Continue feeding the paper until sufficient paper is available to feed the paper through the slot in the printer door.

6 ILLUSTRATED PARTS BREAKDOWN

The following paragraphs include pairs of images and tables. Each pair provides visual and part number identification for the parts used on the HB2. Each part is identified by a unique part number and quantity.
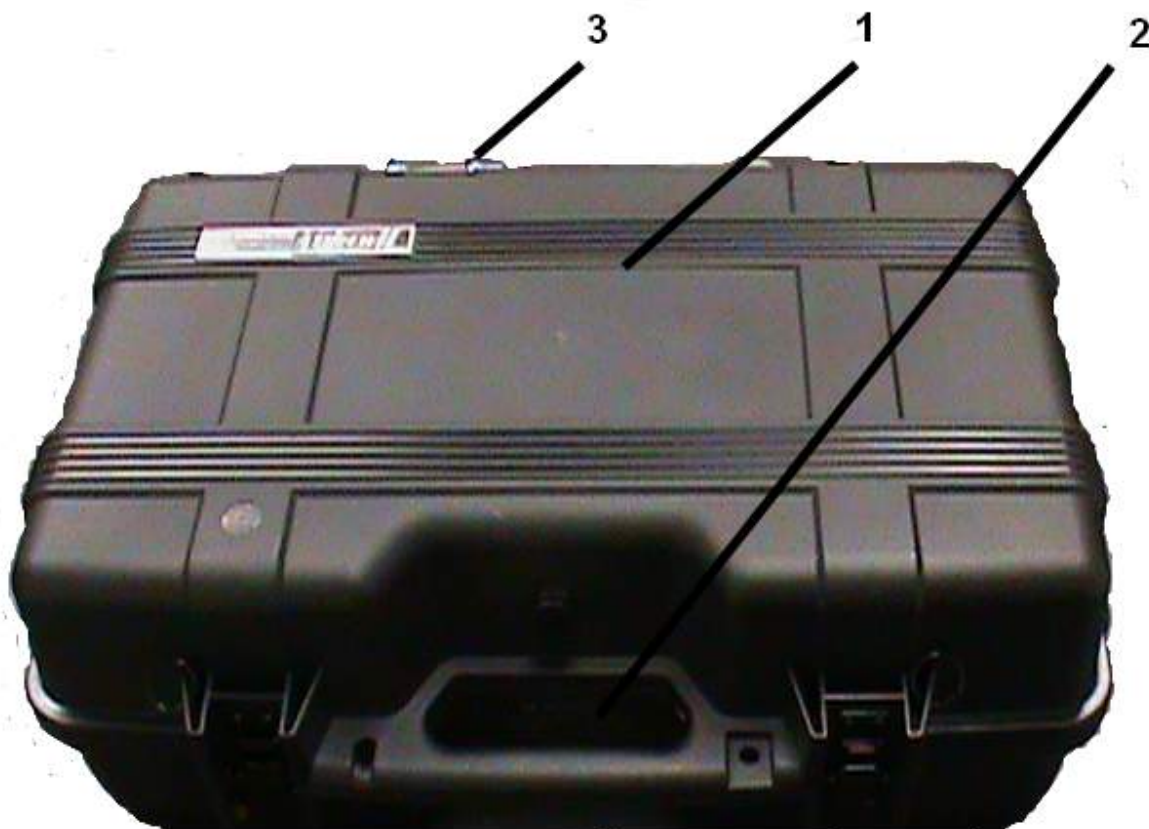

Figure 9-1:: HB-2 Enclosure Parts

Find No	WichiTech P/N	Nomenclature	QTY Per Unit
1	A4CAS002	CASE ASSY, HB-2	1
2	P0PLA010	PLATE,S/N,WICHITECH	1
3	P1STD001	STAND,LID	1

Table 9-1:: HB-2 Enclosure Parts

Figure 9-2: HB-2 Accessories

Find No	WichiTech P/N	Nomenclature	QTY Per Unit
1	A4BLA009	ASSY,BLANKET,10"X10",120V [A]	2
2	A4 BLA011	ASSY, BLANKET,8"X8",120V [A]	2
3	A4PIC001	CABLE,PWR INPUT,GFCI	2
4	A4VSS001	ASSY,SUCKER,VACUUM	2
5	A6PIC002	ASSY,CABLE,120V CONVERTER	2
6	A6POC004	ASSY,CABLE,PWR OUT,RED,6'	1
7	A6POC005	ASSY,CABLE,PWR OUT,YELLOW,6'	1
8	A6VHS001	ASSY,HOSE,VACUUM,COILED,10'	2
9	P1PAP001[B]	PAPER,PRINTER	2
10	P1RIB001 [B]	RIBBON,PRINTER	2
11	P1TCC001	ASSY,CABLE,THERMOCOUPLE,J,6'	16

Table 6-1:: HB-2 Accessories

[A] — **120VAC and 240Vac blankets are both available with this part number**

[B] — **Not shown in picture**

Figure 6-3:: HB-2 Operator Interface Parts

Find No	WichiTech P/N	Nomenclature	QTY Per Unit
1	P1ALM001	ALARM,SONIC	1
2	P0LEN001	LENS,DISPLAY.HB2	1
3	P0DOR005	DOOR,STORAGE,HB2	1
4	S0DOR001	ASSY,DOOR,PRINTER	1
5	P1CON014	CONNECTOR,PLG,17-3	2
6	P1CON20	CONNECTOR,SKT,17-3	2
7	A4TCB002	ASSY,TC BLOCK,ZONE 1	1
8	A4TCB003	ASSY,TC BLOCK,ZONE 2	1
9	P1BRE005	CIRCUIT BREAKER,20A	2
10	A4ZSS003	ASSY,SWITCH,ZONE SEL	1
11	P1VGA002	GAUGE,VACUUM,HB2	2
12	P1SWI012	SWITCH,TAP HAMMER	2
13	P0OVL001E	OVERLAY,DUALHD,HB2	1
14	A4PMR001	PWA,PWR MTR,ZONE 1	1
15	A4PMR002	PWA,PWR MTR,ZONE 2	1

Table 6-1:: HB-2 Operator Interface Parts

Figure 6-4:: HB2 Internal Assemblies

Find No	WichiTech P/N	Nomenclature	QTY Per Unit
1	A4BED006	ASSY,BEDPAN,UPPER	1
2	P1PWR009	POWER SUPPLY,12V	1
3	P1PWR008	POWER SUPPLY,5V	1
4	A4PRN002	ASSY,PRINTER,HB2	2
5	A4ZNC001	PWA,ZONE CONTROL	1
	A4PDB002	PWB,PRINTER DRIVER	1
6	A4VPA001	ASSY,VACUUM PUMP	1
7	P1REL004	ASSY,SSR	2
8	A4BED005	ASSY,BEDPAN,LOWER	1
9	A4TDR002	PWA,ACWD	2
10	A4FAN001	ASSY,FAN	2

Table 6-4:: HB2 Internal Assemblies

7 APPENDIX

7.1 KEY TERMS, ACRONYMNS & ABBREVIATIONS

The following table provides definitions for terms relevant to this document.

Term	Definition
BIT	Built-In Test
CFM	Cubic Feet per Minute
COTS	Commercial Off The Shelf
CPU	Central Processor Unit
FM	Factory Mutual - testing agency
Hz	Hertz
InHg	Inches Of Mercury; used for vacuum measurement
LED	Light Emitting Diode
MS	Mine Safety - testing agency
NEC	National Electric Code
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
OEM	Original Equipment Manufacturer
PID	Proportional Integral Derivative
SRM	Shop Repair Manual
Tc or TC	Thermocouple (usually "J" type herein)
UL	Underwriter's Laboratory - testing agency
VAC	Voltage – Alternating Current
VDC	Voltage – Direct Current
HOT BONDER	Common name for equipment that provides heat for composite repairs
ACWD	AC Watchdog Timer; standard hardware safety circuit function

Table C-1:: Key Terms, Acronyms & Abbreviations

7.2 REFERENCE DOCUMENTS

The following table summarizes the documents referenced or related to items in this document.

Document	Description	Date
A-A-59240	*Commercial Item Description, Composite Repair Set, Aircraft, Dual Zone, Class 1, Div 2*	*13 June 2003*

7.3   TROUBLESHOOTING

The following table summarizes the most common

Defective Thermocouples

Thermocouples are analog devices. This means that there is an infinite variety of unique responses from thermocouples. These responses depend upon simple things such as a broken wire to arcane things such as the variance in the extruded diameter of the +wire in relation to the –wire. The HB2 addresses these responses in two stages; prior to running a cure and during a cure. The principal method of checking thermocouples prior to a cure is accomplished via the TEST Screen. In TEST, the operator should verify that each TC to be used actually displays a temperature that approximates the temperature at the tip of the TC.

The TEST mode can also be used to quickly check for thermocouples with "backwards wiring". Simply rub the tip of the thermocouple between your fingertips. The temperature should rise to approximately 90-100 degrees. If the temperature does not rise but decreases, the wires in the thermocouple connector plug are backwards (i.e., connected in reverse polarity).

As you get ready to run a cure, the bonder initially checks that all of the "control" TC's specified in the Program screen are installed. If any of the control TC's are open, the bonder will display an appropriate message and not allow the cure to proceed.

It is possible for a thermocouple to fail during a cure even after passing all of the previous checks. If the TC fails open, the bonder displays an OPEN TC alarm and depending upon the number of control TC's will either continue the cure or suspend the cure at zero power until at least one control TC is available.

Overtemperature

The bonder looks at the temperature of each control TC and compares it to the pre-programmed requirements of the cure at all stages of the cure. If the temperature of a TC exceeds the pre-programmed temperature by the value set by the HI-LO limit, the bonder will sound an alarm and immediately back-off the power output. The rate of backup depends on how far above the alarm limit the deviation occurred.

NOTE

In order to prevent a fast re-occurrence of alarms, the bonder looks at the HI/LO settings differently after an alarm has triggered. There is a hysteresis in effect after a sensor alarm has triggered; it is not enough for the temperature to fall back to the original alarm limits. The temperature must fall a couples of points below the original limit before the alarm will clear.

Undertemperature

Under-temperature is probably the most dangerous of all of the alarm conditions for a bonder to handle. An easily created scenario that will cause the undertemperature alarm to occur is accomplished by connecting a blanket to a repair area, installing the TC's but failing to install the TC's near the repair area. In this case, the bonder will

---

continue to advance the power while monitoring the TC which will always display room temperature until it is placed under the heat blanket. All bonders, except the WichiTech bonders, will continue to advance (or hold in some equipment) full power to the blanket while the repair is being exposed to full power. The HB2 has a built-in capability of monitoring the actual power output of the HB2. The HB2 will remove all output power if the monitored output power is on steady for more than a fixed interval (typically 6 seconds).

Power Interruption and Recovery

Situations sometimes occur when the power to the HB2 is disrupted.

If power is removed while the HB2 is not running a cure, the effect is minimal. Assuming that the power disruption did not damage the HB2, simply restoring power and turning the unit on will re-initialize the HB2. If the HB2 was damaged, the self-test will fail and display the cause of failure.

When power is removed while the HB2 is running a cure, the next time power is restored the HB2 will attempt to re-start the cure it was running when power was removed. In this case, the HB2 will still run the self-tests before re-starting the cure. If the self-test fails, you will not be allowed to complete the cure. If the self-test passes, the HB2 will resume operation according to the stage it was in when power was removed; if in a ramp stage it will attempt to resume from that ramp stage, if in a soak stage it will attempt to resume from the ramp just prior to the soak stage, if the HB2 was in the final cooling stage the HB2 will either resume cooling or terminate the cure depending on how long power had been removed from the cure area.

When attempting to resume a cure, the HB2 will time how long the power was off. If the outage is two (2) minutes or less, the HB2 will always try to resume the cure. If the outage is greater than two minutes, the HB2 will prompt the operator to resume the cure. In some cases, the operator may decide that resuming the cure does not make sense. For instance, if power has been off for too long it may not be possible to "save" the repair. In this case, the cure will have to be cancelled by the operator.

Common Troubles

Trouble	Check	Corrective Action
Unit will not start	Power switch on GFCI	Press ON switch and verify that the LED illuminates
Low Vacuum	Check valve	All WichiTech bonders use pneumatic connectors that have integral check valves. If dirty they can cause the port to leak. Try pushing up/down on plastic sleeve on port
Printer not working	Print Interval setting	The printer is turned OFF by setting Print Interval in PROGRAM mode to zero(0)
ETA is "000" and PGM temp is not changing	No Heat is getting to the control TCs	• TCs under blanket ? • Output cable connected to bonder ? • Control TCs mixed up

		with auxiliary TCs • 120VAC output device connected to bonder running on 240VAC
Blanket is not heating up	No Heat is getting to the control TCs	See above

INDEX