HB1 SINGLE ZONE

OPERATION, MAINTENANCE AND ILLUSTRATED PARTS MANUAL

Version *<3.05>*

03/06/2014

VERSION HISTORY

Manual Version	Implemented By	Revision Date	Approved By	Approval Date	Reason
3.05	*Staff*	*03/06/2014*			Added ability to turn off tests at start of cure

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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), Single Zone (-1) 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

"**HB1 Single Zone Operation, Maintenance & IPB Manual**"

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1.1.2 Document Number

"**D1HB1000_304_20140201**"

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1.1.3 Related Publications

Part Number	Title
D1HB1000	"HB1 Single Zone Operation, Maintenance & IPB Manual"
D1HB1CAL	"HB1 Dual Zone Calibration Manual"
D1HB1COM	"HB1 Dual Zone Communications Manual"

1.1.4 Contact Information

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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 HB1 CAPABILITIES

The WichiTech Industries HB-1 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-1 may be used to cure composite and metal-to-metal structures that require heat application with or without vacuum. The HB-1 can be connected to many different heating application devices including ovens. The HB-1 was designed for maximum portability in a minimum enclosure size. In spite of its small size, 9" X 5" X 4", the HB-1 can perform "full-size" cures.

1.2.1 Input Power

The A4HB1000 configuration of the HB1, runs on universal AC; 85-265 VAC, 47-440 hertz. The HB-1 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 Vacuum Generation

The HB-1 does not have an internal vacuum pump. The small size of the HB1 prevents the inclusion of a pump. However a venturi device ships with every HB-1 and can provide vacuum using a local compressed air source. In addition, WichiTech offers stand alone electric vacuum pumps in both 120VAC and 240VAC.

1.2.3 Display

The standard configuration HB-1 has one 8-character display. The display is a high output led display and is readable in direct sunlight.

1.2.4 Real-Time Communications

By default, the HB-1 transmits complete bonder and cure status messages once every 10 seconds. This data is easily captured by standard RS-232 communication software and hardware. Most 3rd party vendor system are directly compatible with the HB-1. The HB-1 also accepts command requests via the RS-232 port. With RS-485 adapters each zone on an HB-1 can become part of a larger hot bonder network. Please refer to the Communications Manual D1HB1COM 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 HB-1 is fully contained within a small footprint enclosure. The enclosure provides for many different configurations of the HB-1. 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
F4HB1000	Single Zone, AC, 4Tcs, 500F
F4HB1001	Single Zone, AC, 8Tcs, 2 Term Blocks, 500F
F4HB1002	Single Zone, AC, 10Tcs, 500F
F4HB1003	Single Zone, AC, 4Tcs, 500F, 15A, Ex-Proof
F4HB1004	Single Zone, AC, 5Tcs, EMI/RFI
F4HB1005	Single Zone, AC, 4Tcs, 500F, 20A, Ex-Proof
F4HB1006	Single Zone, DC, 8Tcs
F4HB1007	Single Zone, AC, 4Tcs, 500F, 30A
F4HB1008	Single Zone, AC, 8Tcs

Table 1-3: HB1 Configurations

NOTE

Details about the HB-1 configurations are provided in this manual (D1HB1000).

1.3.1   Furnished Equipment

Every HB-1 ships with a complete set of accessories needed to run a cure. The exact type and number of accessories are specific to each HB-1 configuration. For example the following table shows all of the accessory items provided with the F4HB1000 Composite Repair Set.

F4HB1000 Sub-assemblies and included accessories		
PART NO,	DESCRIPTION	Quantity
A4HB1000	ASSY,ENCL, F4HB1000	1 each
A4APA008	PKG, ACCESSORY, A4HB1000	1 each
	One(1) Accessory Package includes:	
	A4BLA009 ASSY,BLKT, 10"X10", 120VAC	1 each
	A4BLA011 ASSY,BLKT, 8"X8", 120VAC	1 each
	A4GEN001 ASSY,GENRATOR,VACUUM	1 each
	A4PIC001 ASSY,CABLE,GFCI,POWER IN	1 each
	A4VSS001 ASSY,SUCKER,VACUUM	1 each
	A6PIC002 ASSY,CABLE,110 CNVTR	1 each
	A6POC006 ASSY,CABLE,PWR OUT,HB1	1 each
	A6VHS001 ASSY, HOSE, VAC, 10'	1 each
	P1TCC001 ASSY,CABLE,TC,J	4 each
D1HB1000	MANUAL, HB-1, OPERATION, MAINTENANCE & IPB	1 each
D1HB1CAL	MANUAL, HB-1, CALIBRATION	1 each
D1HB1COM	MANUAL, HB-1, COMMUNICATIONS	1 each

Table 1-3.1: F4HB1000 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.

3 SYSTEM SPECIFICATIONS

3.1 SINGLE ZONE

The HB1 hot bonding system provides single zone operation. Operational features include power input, power output, thermocouple and vacuum sensor inputs, communication ports, power meter bar and an 8-character LED display. The HB1 also has an audible alarm and keypad.

The HB1 has many features in common with the HB2. The HB1 was designed so that an operator of the HB2 would be instantly be familiar with the HB1. 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.

Part Number	Tc's	Power	GFCI	Ex-Proof	EMI/RFI	RS-485	RS-232
F4HB1000	4	AC	Yes	No	No	Yes	Yes
F4HB1001	8(2TB's)	AC	Yes	No	No	Yes	Yes
F4HB1002	10	AC	Yes	No	No	Yes	Yes
F4HB1003	4	AC	No	Yes	No	Yes	No
F4HB1004	5	AC	No	Yes [A]	Yes [B]	Yes	Yes
F4HB1005	4	AC	No	Yes [A]	No	Yes	Yes
F4HB1006	8	DC	Yes	No	No	Yes	Yes
F4HB1008	8	AC	Yes	No	No	Yes	Yes

Table 3-1: HB1 Configuration Capability

[A] – designed for explosion-proor, testing in progress

[B] – designed for EMI/RFI, testing in progress

3.2 OPERATIONAL & ENVIRONMENTAL SPECIFICATIONS

CHARACTERISTIC	F4HB1000-SINGLE ZONE	F4HB1008 SINGLE ZONE
Zones 　Input 　Output	1 1	1 1
Physical 　Dimensions 　Weight 　Configuration 　Lid 　Enclosure	9 X 5 X 4 inches 3 pounds Table mounted n/a ABS plastic, un-dentable	9 X 5 X 4 3 pounds Table Mounted n/a 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] 20Amps[A]
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 4] [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 ….External Venturi 　Available Ports	0.95 CFM, 27.0 "Hg 2 (shared manifold)	0.95 CFM, 27.0 "Hg [D] 2 (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 5 keys n/a 93db (adjustable) 32 6-stage cures Auto<2mns,select<2hrs, reset all else Real-time RS232, status & rmt control, RS485 networking	LED display, sunlight readable 5 keys 1 (enables active keypad zone) 93db (adjustable) 32 6-stage cures Auto<2mns,select<2hrs, reset all else Real-time RS232, status & rmt control, RS485 networking

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

4   OPERATION

The WichiTech Industries HB1 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 HB1 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 HB1 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 HB1 was designed to be a portable autoclave or "hot bonder" requiring a minimum of external connections to operate. However, due to its small size its does not include an electric vacuum pump like the HB2 unit. The HB1 can generate its own vacuum, using a venturi device with facility provided compressed air. Other than the compressed air hose, the only required external facility connection is an input power cable.

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 HB1 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 single zone unit with one keypad, a sunlight readable display, one power-in receptacle, one power-out receptacle, four thermocouple receptacles, one 2-port vacuum manifold, a power output meter, an RS-232 port and an RS-485. Also, WichiTech offers an optional external serial printer.

The HB1 programming is menu driven. It can be programmed by using the keypad or by selecting a pre-set program from the system library. HB1's that are configured with a RS-232 port will transmit an ASCII character stream. This output can be sent to an external printer to produce a paper printout of the complete program. NOTE: It can also be used to connect to any 3-wire serial device such as a laptop. This serial port is used to record any program changes or disturbances that occur during a cure. Any screen requiring operator intervention is checked by the bonder. If a value is selected outside of the allowable range, the display entry is not allowed by the central processor.
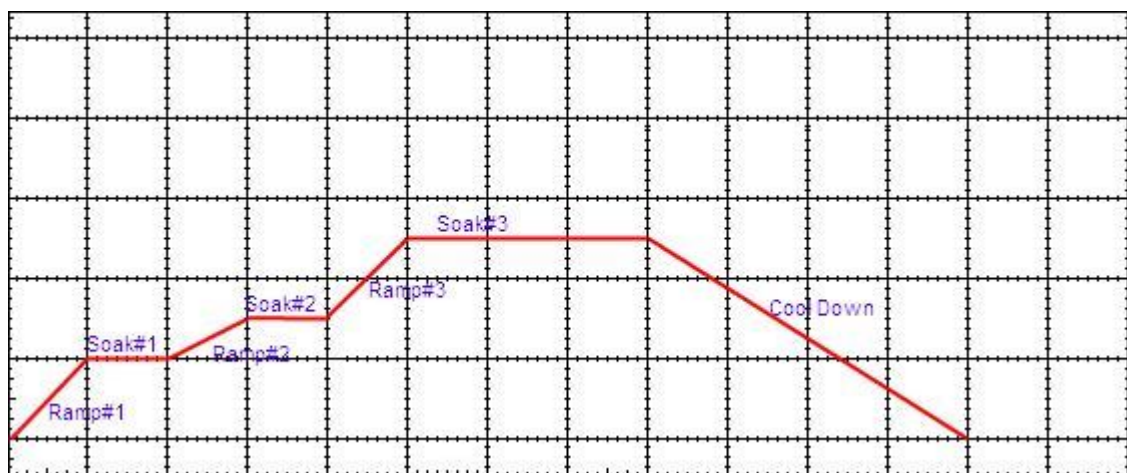
Figure 4-1: Typical Temperature Profile

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 HB1 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 HB1 with a coiled vacuum hose. The operator can used facility proved vacuum to setup his cure area. Alternatively, "shop air" may be used to generate vacuum using a venturi device. The vacuum source and measurements are routed through separate manifolds. Each manifold acts as a vacuum source and measurement port.

The HB1 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 HB1 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 – HB1 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 – HB1 will prompt the operator. The operator must decide to proceed or kill the cure.

- More than two hours – HB1 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 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 HB1 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 HB1 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 scrolling through the MAIN MENU screens and pressing "ENTER" when "TEST" appears on the screen.

NOTE

General Navigation Instuctions: Use the "↓" and "↑" arrow keys to navigate through the menu screens. Press the "ENTER" key to select the displayed item.

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

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

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

  o **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.

  o **Real-Time Communications**

    Several bonder-to-computer, real-time communication modes are available. By default, the HB1 will transmit all program data once every 10 seconds

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from the communication ports. More detail is available is a separate manual; D1HB1COM, "HB1 COMMUNCATIONS".

- From TEST, press the "↓**"** keys then press "ENTER" to select ASSIGN. ASSIGN is the mode directly following TEST mode.

  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 the combination of "ENTER", "↑" & "ON" 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.

- Select PROGRAM mode by scrolling through the MAIN MENU screens and pressing "ENTER" when "PROGRAM" appears on the screen. PROGRAM directly follows ASSIGN mode and is one down arrow "↓" keypress away..

  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 down arrow "↓" from the RUN/START CURE mode and following the program menu screens.

  - 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.

- Select START mode by scrolling the MAIN MENU. START Cure directly follows PROGRAM mode and is one down arrow "↓" keypress away

  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 OFF key)

    All sensor (thermocouples & vacuum) data is printed with time-data. In general, Print-On-Demand is accessed by pressing the "OFF" key.

  - o **Display All Sensors**

    All sensor (thermocouples & vacuum) data is automatically scrolled through and is visible on the display, one at a time.

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o **HOLD Mode**(press "ON" during a running cure)

While in HOLD mode, the HB1 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 HB1 is in HOLD, all of the display characters will flash. Exit HOLD by pressing "ON" again.

o **Re-Enter ASSIGN** (press the following keys all together; "↑","ON" and "ENTER" . You will need to use two hands)

Program re-enters the ASSIGN menu. Any parameter may be changed or viewed. Return to RUN by advancing through all of the parameters. After the last parameter is changed the bonder goes back into the running screens.

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

HB1 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 "OFF".

o **Cancel Cure** (press "↓" arrow)

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

o **Power Loss Recovery**

Upon loss of power during a running cure, the HB1 will attempt to restart the cure when power is re-established. For power recovery, the HB1 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 HB1 resets to the MAIN MENU

In all cases, the HB1 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 connected to the thermocouple measurement block.

o **Real-Time Communications**

Several bonder-to-computer, real-time communications are available. By default, the HB1 will transmit all program data once every 10 seconds from both the RS232 and RS485 serial ports. More detail is available is a separate manual; D1HB1COM, "HB1 EXTERNAL COMMUNCATIONS".

4.4   DETAILED SYSTEM OPERATION

The HB1 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. Each of the modes are displayed on the screen one-at-a-time and can

Figure 4-1: Main Menu Display

be easily viewed by using the up "↑" and down "↓" keys. The SETUP, ABOUT and MANUAL modes provide secondary support functions. 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	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 HB1
7	MANUAL	Operates the bonder manually <u>without</u> automatic control

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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 HB1 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 HB1. Connect the other end of the power input cable to an appropriate facility receptacle. Use the "110 CONVERTER CABLE" to connect to a 110-120V receptacle. Remove the converter to run the HB1 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. A led on the GFCI will confirm that it is ON.

NOTE

The GFCI switch is not rated for use in an explosive atmosphere. All explosion-proof units are shipped without a GFCI cable.

The standard HB1 (A4HB1000) runs on universal AC; 85-265VAC, 47-440 hertz. The HB1 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 HB1 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 2 & 3 on the output connector.

Turn on power to the HB1 zone by pressing the MAIN POWER switch. The switch will illuminate when power has been applied and the HB1 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 "HB10000" 02-05-14 H1.02 S3.05 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 "HB10000" 08-01-13 H1.04 S3.05 P007/R000/ET0000:11.51 [0001] AC CLOCK FAILURE	Selftest failed; either the voltage or frequency test on the input power source
	WICHITECH "HB10000" 08-01-13 H1.04 S3.05 P007/R000/ET0000:11.51 [0002] DISPLAY FAILURE	Selftest failed; at least one display circuit has failed
	WICHITECH "HB10000" 08-01-13 H1.04 S3.05 P007/R000/ET0000:11.51 [0004] PRINTER FAILURE	Selftest failed; printer driver not responding
	WICHITECH "HB10000" 08-01-13 H1.04 S3.05 P007/R000/ET0000:11.51 [0008] A/D D/A FAILURE	Selftest failed; analog sensor circuitry
	WICHITECH "HB10000" 08-01-13 H1.04 S3.05 P007/R000/ET0000:11.51 [0016] SSRRELAY FAILURE	Selftest failed; SSR either failed to turn ON or to turn OFF
WDT-0032	WICHITECH "HB10000" 08-01-13 H1.04 S3.05 P006/R000/ET0000:10.59 [0032] WDTIMER FAILURE	Selftest failed; six(6) second ACWD protection circuit either stuck open or closed
	WICHITECH "HB10000" 08-01-13 H1.04 S3.05 P006/R000/ET0000:10.59 [0064] KEYPAD FAILURE	Selftest failed; keypad test indicated that a key was pressed during powerup
	WICHITECH "HB10000" 08-01-13 H1.04 S3.05	When there is more than one failure, the BIT code is a logical

	P006/R000/ET0000:10.59 [0036] MULTIPLE FAILS	bitwise AND of the failure codes
	!!!!!!!!!!!!!!!!!!!!!!!! SELFTEST:: OVERRIDE !! !!!!!!!!!!!!!!!!!!!!!!!!	Failed BIT; it is possible to override a failing selftest. Contact WICHITECH !
		MAIN MENU screen. Each HB1 zone stops at this screen upon a successful power-up sequence.
		Network Communication – While in MAIN MENU with the TEST mode on the display, a flashing single digit signifies the successful receipt of a communication prompt its response. It is possible to see two(2) flashing digits; the leftmost show the RS-485 status and the right position show the RS-232 port status.

Table 5.4.1: Power-Up and BIT Selftest

4.4.2   TEST Mode

The first step in using the HB1 should be to verify that the sensor inputs are working. Enter TEST mode by pressing "ENTER" 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.
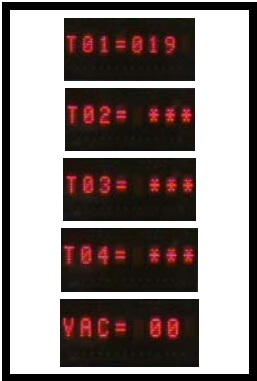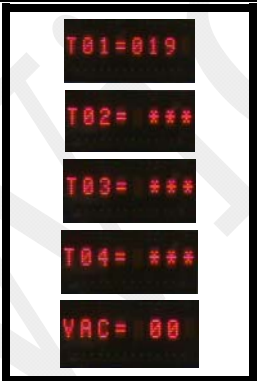
Display	Printer	Description
TEST		Scroll through the MainMenu and when "TEST" is on the screen, press "ENTER" to start TEST mode
T01=019 T02= *** T03= *** T04= *** VAC= 00	*======= TEST =========* T1-4 066 067 067 067 P VAC=00"Hg 15:06.59 P *=====================*	In TEST mode the display will scroll through all of the active inputs showing the current status of each input. The number of screens will vary with the HB1 configuration. The example shown indicates that the HB1 is a four Tc unit. It also shows that Tc#1 is reading 19degC, Tc#2, Tc33 and Tc#4 are open and the vacuum input is zero.
MTIME=29	*== START MONITOR TC ==* * PRINTS EVERY 01 MINS * *=====================* T1-4 075 076 075 075 T5-8 075 *** *** *** VAC=00"Hg 13:18.48	While in TEST, pressing the "ON" key will enter MONITOR mode. In MONITOR mode, select the desired print interval and press "ENTER". Monitor settings are printed along with first complete sensor status.
T01=019 T02= *** T03= *** T04= *** VAC= 00	T1-4 075 076 075 075 P T5-8 075 *** *** *** P VAC=00"Hg 13:18.49 P *=== END MONITOR TC ===*	After the print interval is set, the display cycles the same screens as shown in TEST mode. While in MONITOR: Press "OFF" to change interval the print interval. Setting print interval to "0" will exit MONITOR mode Press "OFF" to print the current sensor status "on-demand".

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 "ENTER" 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 <u>not</u> 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
ASSIGN		Scroll through the MainMenu and when "ASSIGN" is on the screen, press "ENTER" to start ASSIGN mode"
CTL=HOT+		The temperature control method is selected by scrolling through the available selections then pressing "ENTER": Available options include: • "ONE"; use TC01 only • "TWO"; use TC02 only • "MEDN"; uses average of the hottest and coldest • HOT"; uses hottest TC only • "COLD"; uses coldest TC only • "HOT+"; uses hottest TC during RAMP stages but will not enter SOAK until all TCs are within HI/LO settings
aTc=1→03	```*********************** * PROGRAM CHANGED * * DURING CURE AT * * 03/00/11 13:41.57 * * NEW CURE PARAMETERS * *=====================* * ACTIVE TCs = 05 * ***********************```	Set the number of using the "↑" and "↓" keys.
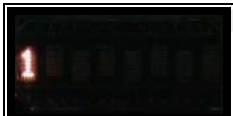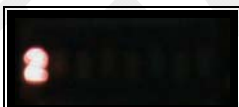
| cTc=1→01 | ```
************************
*   PROGRAM CHANGED    *
*   DURING CURE AT     *
*  03/00/11  13:38.37  *
* NEW CURE PARAMETERS  *
*=====================*
* TEMP METHOD = HOT    *
* CONTROL TCs = 03     *
************************
``` | Set the number of control TCs. Starts with TC01 and must 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, "ENTER" must be pressed to save the change. Press "OFF" 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

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
		Scroll through the MainMenu and when "PROGRAM" is on the screen, press "ENTER" to start PROGRAM mode"
		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.
		When selecting a cure from the LIBRARY, the operator can use the keypad to scroll through the cure names in the LIBRARY. The entire display is used for the library cure name. The example screens show two cures in the library, One is named "1 " and the other "2 ".
		NOTE
		The operator is not allowed to change the LIBRARY cure when PROGRAM mode is accessed from START CURE
| | ```
************************
* 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 |

#SOAKS=	```*********************** * 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```	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.
RAMP2=10		Requires a two digit keypad entry of 1 to 15 when units of measurement are in Fahrenheit. Set the number of using the "↑" and "↓" keys.
TEMP=150		Requires a three digit keypad entry of 70 to 500 when units of measurement are in Fahrenheit Set the number of using the "↑" and "↓" keys.
TIME=005		Requires a three digit keypad entry of 1 to 999. Units are in minutes. Set the number of using the "↑" and "↓" keys.
COOL= 05	```*********************** * 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 cooldown stage is the final segment of a cure. The bonding system does not have any "active" cooling capability. The cooldown occurs passively. Normally, no heat is applied during the cooldown 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.

| STOP=100 | ```
***********************
*   PROGRAM CHANGED    *
*   DURING CURE AT     *
*  03/00/11  13:44.58  *
* NEW CURE PARAMETERS  *
*=====================*
* FINAL  = 125øF       *
* EST RUNTIME = 000:26 *
***********************
``` | Requires a three digit keypad entry of 70 to 150 when units of measurement are in Fahrenheit. When this temperature is reached during the cooldown, the cure completes.<br><br>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. |
| RHI =+30<br><br>RLO =-29 | ```
***********************
*   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. |
| SHI =+15<br><br>SLO =-15 | ```
***********************
*   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. |
| VAC = 15 | ```
***********************
*   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 InHg). 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=01 | ```
***********************
*   PROGRAM CHANGED    *
*   DURING CURE AT     *
*  03/00/11  13:45.57  *
* NEW CURE PARAMETERS  *
``` | The printer may be set to print current status information at regular intervals. |

| | ```
*=====================*
* PRINT TCOPTION = ALL *
***********************
``` | |
| OPTN=CTL | ```
***********************
*    PROGRAM CHANGED    *
*    DURING CURE AT     *
*  03/00/11  13:45.57   *
* NEW CURE PARAMETERS   *
*=====================*
* PRINT TCOPTION = ALL *
***********************
``` | Selecting CTL will print a minimum of information at the prescribed timer interval. ALL will print all of the sensor data. |
| OVRLT=20 | ```
***********************
*    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 HB1 initiates running the programmed cure by selecting START CURE from the MAIN MENU. Once started, the HB1 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.

RAMP1 V PGM=143 PRI=142 ETA=007 VAC=00 T01=144 T02=135 T03=130 T04=148	This is a set of screens typical for a cure setup with four(4) active thermocouples. Each screen is displayed for two(2) seconds then automatically advances to the next screen. At the last screen the procession repeats.

Figure 4.4.5:Scrolling Screens in RUN mode

After START CURE is selected, the HB1 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.

Display	Printer	Description
START		Scroll through the MainMenu and when "START" is on the screen, press "ENTER" to start START/RUN mode"
T01 OPEN T02 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=▓		If active TCs are OK, then operator is prompted for his ID. This can be bypassed by pressing "E"
| JOB=Y | ```
***********************
*     CURE PROGRAM     *
* OPR: "      "        *
* JOB: "      "        *
* LIB: n/a             *
*  02/06/14  15:11.51  *
*---------------------*
* POWER = (110V/060Hz) *
* TEMP METHOD = MEDIAN *
* ACTIVE TCs  = 02     *
* CONTROL TCs = 01     *
* #STEPS = 1 STAGE(S)  *
* RAMP 1 =  09øF/MIN   *
* SOAK 1 = 149øF       *
* TIME 1 = 005 MINUTES *
* COOL  =  03øF/MIN    *
* FINAL = 098øF        *
``` | 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 |

| | ```
* RAMP HI/LO = +28/-28 *
* SOAK HI/LO = +14/-14 *
* VACUUM  = 15"Hg      *
* PRINT INTERVAL = 01  *
* PRINT TCOPTION = CTL *
* OVERLIMIT  = 19øF    *
* EST RUNTIME = 000:28 *
***********************
TIME  CYCLE PGM PRI VAC
===== ===== === === ===
``` | |
| LOVAC-00 | `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 V | | 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

NO HEAT		No temperature rise was detected, alarm is turned ON and the bonder is waiting for acknowledgement from the operator
DONE		Operator has acknowledged the alarm by pressing "E" and the program is terminating.
TEMPFALL		A temperature decrease was detected, alarm is turned ON and the bonder is waiting for acknowledgement from the operator
DONE		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 ….

| WAIT V<br><br>PGM=068<br><br>PGM=068<br><br>T01=067<br><br>ETA=000 | ```
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

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
***********************
``` | If no alarms are detected, the bonder performs its routine tasks including:<br><br>• Print current status at the prescribed time interval<br><br>• Process keypresses:<br>  ○ "↑" – switch to all sensors display<br>  ○ "↓" – print status on demand; these printouts are signified by a "P" in the rightmost printer column<br>  ○ "→" – enter/exit HOLD mode. Line is printed on start and end of HOLD<br><br>The rest of this example shows a typical printout with no alarms and successfully completing the programmed cure. |
| | ```
12:01 !ALM-TC1 LO[140C]
12:01 !CLR-TC1 LO[152C]
``` | Cold Alarm |
| | ```
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 | | |

		Press "E" to initiate canceling the cure.

	`10:12 RAMP1 072 077 18`
	`10:12 RAMP1 073 094 18`
	`CURE CANCELLED`
	`***********************`
		Press "E" again to go back to running the cure
		
		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.		
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 display will toggle between these two screens, until the "OFF" or the "ON" button is pressed. Pressing "OFF" kills the cure, pressing "ON" restarts the cure.

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.

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
- TC OPTIONS
  - CALIBRATE TC
  - FACTORY RESET
  - EXIT
- AIR OPTIONS
  - CALIBRATE VACUUM
  - FACTORY RESET
  - EXIT
- UPDATE CURE LIBRARY
  - EDIT
  - SAVE
  - DELETE
  - PRINT
  - LIST CURES IN LIBRARY
  - RESET LIBRARY
  - EXIT
- LOCKOUT MENU
  - EDIT LOCKOUT
  - MANUAL LOCKOUT

- SET UNITS OF MEASUREMENT (UOM)
    - DEGREES (TEMPERATURE)
    - AIR (VACUUM)
- RESERVED
    - TCNUMER
    - TCBLOCK
    - PID – K PARAMERER
    - PID – I PARAMERER
    - PID – D PARAMERER
    - NETWORK ADDRESS
    - SERIAL NUMBER
    - RUN INIT (on some versions)
- EXIT

Each sub menu option is explained below. In general, to save the changes made to any of these settings, press "ENTER", or "OFF" to escape without saving. If after pressing "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 "ENTER" must be pressed to enter the changes. The "OFF" key can be 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
SETUP		Scroll through the MainMenu and when "SETUP" is on the screen, press "ENTER" to start SETUP mode"

PASSWORD		Enter PASSWORD or press "ENTER" or "OFF" to return to the 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, scroll using the "↑" and "↓" keys until "CLOCK" is displayed then press "ENTER". 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 "OFF" 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.

CLOCK		Scroll through the Setup Menu and when "CLOCK" is on the screen, press "ENTER" to start CLOCK mode
02/06/14		Month: enter 2 digit value from [01-12] Day: enter 2 digit value from [01-31]. The high limit will differ for each month. Year: enter 2 digit value from [00-99]
14:57.05	# 06/27/13 08:01.39 #	Hour: enter 2 digit value from [01-24] Minutes: enter 2 digit value from [00-59] 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; D1HB1CAL, "HB1 CALIBRATION

MANUAL". There are two options in calibration; there is a global reset of the calibration table or individual thermocouple calibration.

		Scroll through the Setup Menu and when "Tc CAL" is on the screen, press "ENTER" to start Tc CAL mode
		TC Options Menu RUN TCAL: calibrate settings in inches of Hg, every 5"Hg FACTORY: resets internal table to factory (pre-calibration) settings NOTE Calibration on all TCs should be rerun after FACTORY RESET for maximum precision and resolution.
		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; D1HB1CAL, "HB1 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 HB1 can be used as the variable vacuum source needed to calibrate at the non-zero settings

VAC CAL		Scroll through the Setup Menu and when "VAC CAL" is on the screen, press "ENTER" to start VAC CAL mode
VAC CAL FACTORY		Air Options Menu
		VAC CAL calibrate settings in inches of Hg, every 5"Hg
		FACTORY: resets internal table to factory (pre-calibration) settings
		NOTE
		Vacuum calibration should be rerun after FACTORY RESET for maximum precision and resolution.
VAC= 00		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-1 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 by using the "↑" and "↓" keys 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 eight (8) character field for recording the cure name. Numbers, letters and some special characters can be added to the name by using the "↑" and "↓" 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 cure names.

CURE LIB		Scroll through the Setup Menu and when LIBRARY is on the screen, press "ENTER" to enter the library functions. There are six(6) library functons: • Edit • Save • Delete • Print • Listcure • Reset
EDIT		Edit provides a method to create a new cure profile or edit an existing one. Edit accesses the same items as PROGRAM mode. No edit s are permanent until they are saved,
	`ADDED "1SK        "`	Save allows the most recent edits to be stored for reuse under a eight(8) character name. A maximum of 32 cures can be saved.
DELETE		

PRINT	`*********************`
	`*   CURE PROGRAM    *`
	`*LIB:"1SK        "  *`
	`*-------------------*`
	`* #STEPS = 1 STAGE(S)  *`
	`* RAMP 1 =  10øF/MIN  *`	

PRNTNG -	`* 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 *`
	`***********************`	

LISTCURE	`***********************`
	`* NUMBER OF CURES: 01   *`
	`* NM CURE DESCRIPTION   *`
	`* == ================= *`
	`* 01 "1SOAK           " *`
	`***********************`	

LIB-RST ...RESET	`* LIBRARY: FULL RESET! *`	
ZY		

Table 4.4.6.5: Setup: Library

4.4.6.6 LOCKOUT SETTINGS

There are two lockout settings in the HB-1; the program edit lockout and the MANUAL mode lockout. The program edit lockout allows the administrator to program a cure into the HB1 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 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-1 to be operated without any automatic feedback control. In MANUAL mode the HB-1 is set to a percentage of full power output; 10% is 10 percent ON, 99% is ninety-nine percent ON. The HB-1 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 HB1 is running at 100% output power. If the HB-1 is set to 100% power in MANUAL mode, after six (6) seconds the HB-1 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-1 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.

LOCKOUT		Scroll through the Setup Menu and when "LOCKOUT" is on the screen, press "ENTER" to change the edit or manual mode lockout
EDITS		
EDIT=OFF	# PROG EDIT LOCK = ON # # PROG EDIT LOCK = OFF #	
MANUAL		
MANL=ON	# 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-1 measures temperature in degrees Fahrenheit. By selecting the DEGREES 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.

UNITS		Select "6" from the SETUP menu to access the UOM menu.
VACUUM		
VAC ="Hg VAC =kPA	# VACUUM NOW kPA! # # VACUUM NOW InHg #	
DEGREES		
TEMP= øF TEMP= øC	# DEGREES NOW øF! # # DEGREES NOW øC! #	

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.

RESERVED		Select "7" from the SETUP menu to access the UOM menu.
TCNUMBER		

#TCS= 04	```# TCNUMBER NOW 08! #```
	
	```# TCNUMBER NOW 04! #```	

TCBLOCK		

BL= 0500	```# TCBLOCK NOW "1000ø" #```
	
	```# TCBLOCK NOW "0500ø" #```	

OUTPUT K		
OUT K=03	```# OUTPUT PID P = 05 #``` ```# K=[05] I=[02] D=[05] #```	
OUTPUT I		
OUT D=05	```# OUTPUT PID I = 01 #``` ```# P=[05] I=[01] D=[05] #```	
OUTPUT D		
OUT D=05	```# OUTPUT PID D = 05 #``` ```# P=[05] I=[02] D=[05] #```	
ADDRESS		
ADDRESS		
SERIAL#	```# SERIALNUM = 0258 #```	
SN=1100		
RUN INIT		

RUNI=ON		

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
>>HB-1<<		Scroll through the MainMenu and when "ABOUT" is on the screen, press "ENTER" to start ABOUT mode"
02-05-14 BW =3.02 SW =3.05	``` *********************** * ABOUT "HB10000" * * 02-05-14 H1.02 S3.05 * * TC=04 0500øF UOM=ENG * * QUEUE=000 LIB=00/20 * * ADDR="0" RMTRPLY=OFF * * ELOCK=OFF MLOCK=ON * * 110VAC/060Hz 05/099 * *P001/R000/ET0000:04.25* *********************** ```	Revisions • Date of last software rev • H1.04: hardware rev • S3.05: software rev
TCs= 04 RNG=0500 UOM=METR	``` *********************** * ABOUT "HB10000" * * 02-05-14 H1.02 S3.05 * * TC=04 0500øF UOM=ENG * * QUEUE=000 LIB=00/20 * * ADDR="0" RMTRPLY=OFF * * ELOCK=OFF MLOCK=ON * * 110VAC/060Hz 05/099 * *P001/R000/ET0000:04.25* *********************** ```	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 is English
QLEN=000	``` *********************** * ABOUT "HB10000" * * 02-05-14 H1.02 S3.05 * * TC=04 0500øF UOM=ENG * * QUEUE=000 LIB=00/20 * * ADDR="0" RMTRPLY=OFF * * ELOCK=OFF MLOCK=ON * * 110VAC/060Hz 05/099 * *P001/R000/ET0000:04.25* ```	Library\Libcure Settings: • Max number of LastCure[B] lines Library: number of cures in library / maximum number of library cures

| | ```
***********************
``` | |
| ADDR="0"<br><br>RMTA=OFF | ```
***********************
*   ABOUT "HB10000"   *
* 02-05-14 H1.02 S3.05 *
* TC=04 0500øF UOM=ENG *
* QUEUE=000  LIB=00/20 *
* ADDR="0" RMTRPLY=OFF *
* ELOCK=OFF  MLOCK=ON   *
* 110VAC/060Hz  05/099 *
*P001/R000/ET0000:04.25*
***********************
``` | Network Address<br>• ADDR: single digit [0//9' identifies this unit of pc network |
| ELOC=OFF<br><br>MLOC=OFF | ```
***********************
*   ABOUT "HB10000"   *
* 02-05-14 H1.02 S3.05 *
* TC=04 0500øF UOM=ENG *
* QUEUE=000  LIB=00/20 *
* ADDR="0" RMTRPLY=OFF *
* ELOCK=OFF  MLOCK=ON   *
* 110VAC/060Hz  05/099 *
*P001/R000/ET0000:04.25*
***********************
``` | Lockout Settings<br>• ELOCK; program edit lock<br>• MLOCK; manual mode |
| 110V/060<br><br>INIT=039<br><br>MAX= 099 | ```
***********************
*   ABOUT "HB10000"   *
* 02-05-14 H1.02 S3.05 *
* TC=04 0500øF UOM=ENG *
* QUEUE=000  LIB=00/20 *
* ADDR="0" RMTRPLY=OFF *
* ELOCK=OFF  MLOCK=ON   *
* 110VAC/060Hz  05/099 *
*P001/R000/ET0000:04.25*
***********************
``` | PowerLevel Settings<br>• Input power settings that were detected at powerup.<br> o 110V: voltage below 180V<br> o 220V above 180V<br> o Detection works for three ranges: "50", "60" or "400" hertz<br>• Initial power setting / maximum power setting |
| PUPS=002<br><br>RSET=000<br><br>00000:21 | ```
***********************
*   ABOUT "HB10000"   *
* 02-05-14 H1.02 S3.05 *
* TC=04 0500øF UOM=ENG *
* QUEUE=000  LIB=00/20 *
* ADDR="0" RMTRPLY=OFF *
* ELOCK=OFF  MLOCK=ON   *
* 110VAC/060Hz  05/099 *
*P001/R000/ET0000:21.25*
***********************
``` | Software Debug<br>• P009: number of times that unit has been powered up<br>• R000; RESET count number of times the processor watchdog timer has reset the unit<br>• ET; elapsed time of unit operation hours:mins.secs |

Table 4.4.7: About Modes
B – LastCure not available this version

4.4.8 MANUAL Mode

The HB1 can be run in MANUAL mode without automatic control. In MANUAL, the output of the HB1 is set to a fixed percentage of ON cycles. MANUAL mode can be used to test the internal HB1 heat application circuitry and parts. MANUAL mode is disabled by default using the MANUAL LOCKOUT setting in SETUP mode. The HB1 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 HB1 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 "OFF".

WARNING

Failure to monitor the HB1 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
MANUAL		Scroll through the MainMenu and when "MANUAL" is on the screen, press "ENTER" to start MANUAL mode"
LOCKED ! MANL=ON		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. Display shows the locked state; to use MANUAL change to OFF

	`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.

MAN= 100	`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
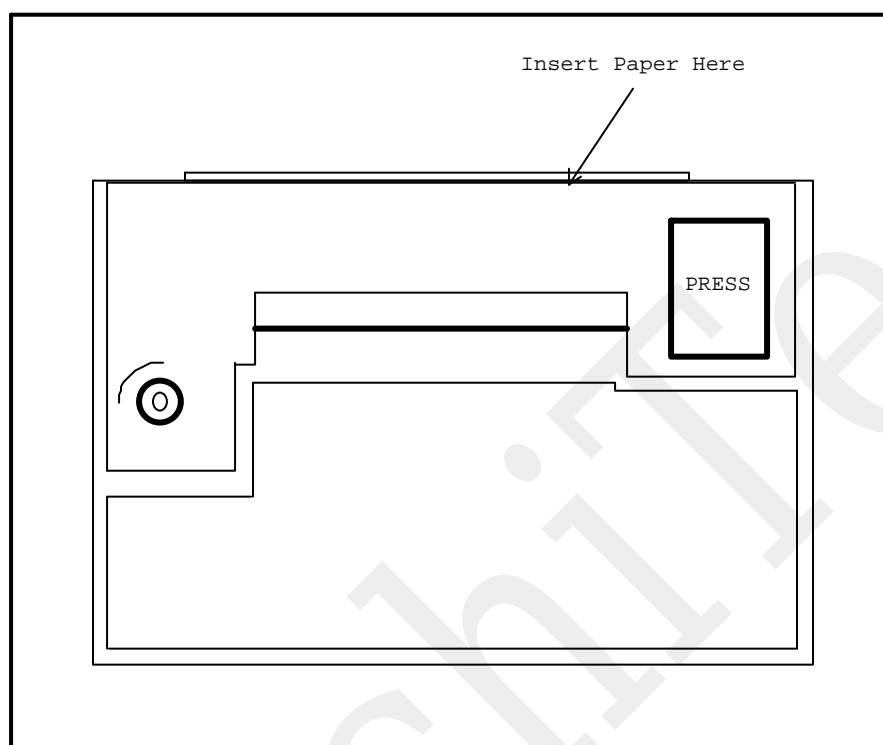

NOTE

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.

5 MAINTENANCE

5.1 PRINTER MAINTENANCE (OPTIONAL PRINTER)

Paper Feed Switch

With the HB1 powered on, pressing the PAPER FEED switch (located below each printer) advances additional paper.

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 HB1. Each part is identified by a unique part number and quantity.

Figure 9-1:: HB-1 Enclosure Parts(Left& Right Views)

Find No	WichiTech P/N	Nomenclature	QTY Per Unit
1	P7ENC003	ENCLOSURE,HB1,4TC,500F	1
2	P1ALM001	ALARM,SONIC	1
3	P1BRE005	CIRCUIT BREAKER,20A,W/GUARDS	1
4	P1CON014	CONNECTOR,PNL MNT,PLG,17-3	1
5	P1CON020	CONNECTOR,PNL MNT,SKT,17-3	1
6	P0MAN001	MANIFOLD,VACUUM,2-PORT	1

Table 9-1:: HB-1 Enclosure Parts

Figure 9-2: HB-1 Accessories

Find No	WichiTech P/N	Nomenclature	QTY Per Unit
1	A4BLA009	ASSY,BLANKET,10"X10",120V ^A	1
2	A4 BLA011	ASSY, BLANKET,8"X8",120V ^A	1
3	A4PIC001	CABLE,PWR INPUT,GFCI	1
4	A4VSS001	ASSY,SUCKER,VACUUM	1
5	A6PIC002	ASSY,CABLE,120V CONVERTER	1
6	A6POC006	ASSY,CABLE,PWR OUT,6'	1
7	A4GEN001	ASSY,GENERATOR,VACUUM	1
8	A6VHS001	ASSY,HOSE,VACUUM,COILED,10'	1
9	P1TCC001	ASSY,CABLE,THERMOCOUPLE,J,6'	4

Table 6-1:: HB-1 Accessories

^A − **120VAC and 240Vac blankets are both available with this part number**
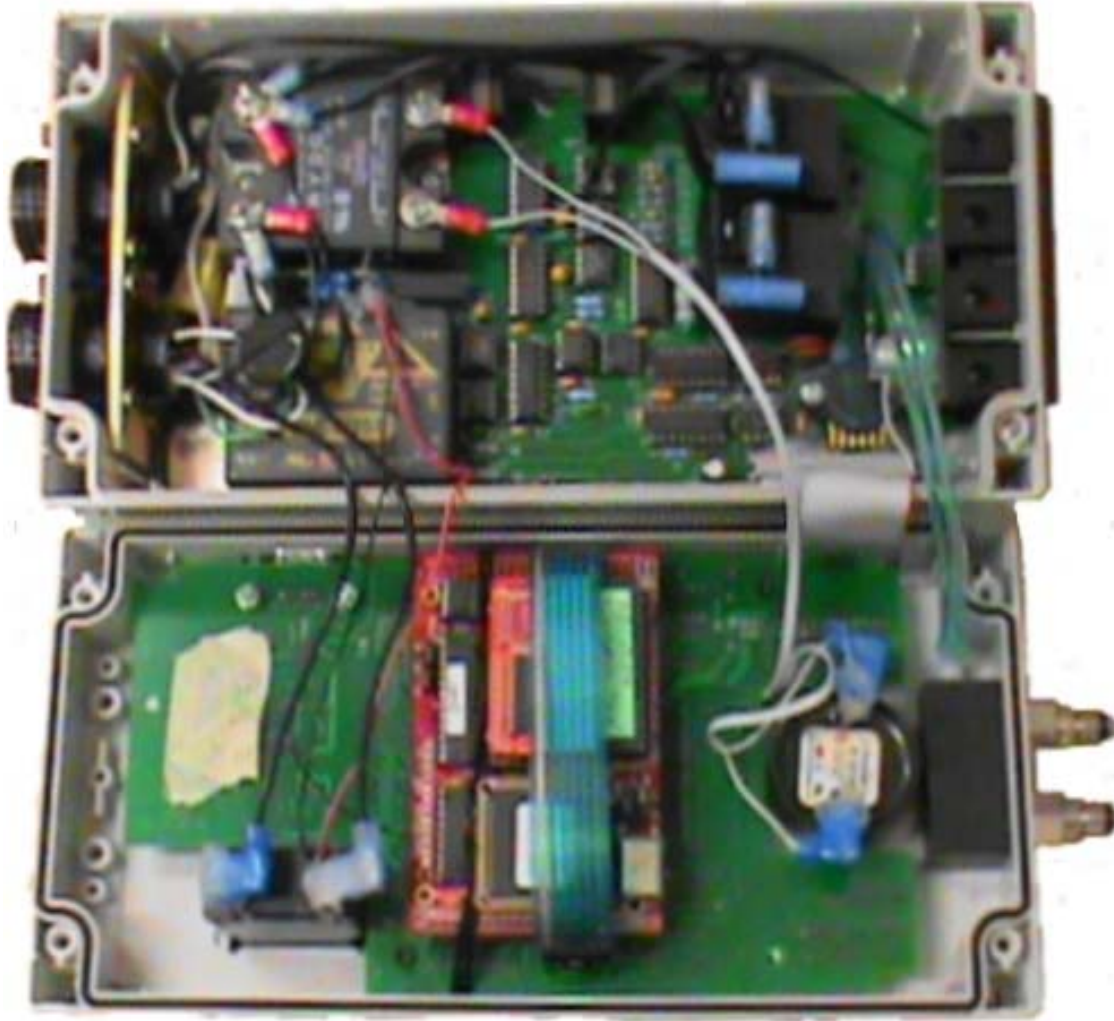
Find No	WichiTech P/N	Nomenclature	QTY Per Unit
1	A4ACO001	PWA,ANALOG CONTROL,HB1	1
2	A4TCB001	PWA,TCB CONNECT,HB1	1
3	A4ZNC002	PWA,ZONE CONTROL,HB1	1
4	A6CBA001	ASSY,CIRCUIT BREAKER,20A	1
5	P1CPU001	SBC,Z80,SMARTBLOCK	1
6	P1REL004	ASSY,SSR,AC,PUCK	1
7	P1ALM001	ALARM,SONIC	1

Table 6-4:: HB1 Internal Assemblies

Figure 6-4:: HB1 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 HB1 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 HB1 has a built-in capability of monitoring the actual power output of the HB1. The HB1 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 HB1 is disrupted.

If power is removed while the HB1 is not running a cure, the effect is minimal. Assuming that the power disruption did not damage the HB1, simply restoring power and turning the unit on will re-initialize the HB1. If the HB1 was damaged, the self-test will fail and display the cause of failure.

When power is removed while the HB1 is running a cure, the next time power is restored the HB1 will attempt to re-start the cure it was running when power was removed. In this case, the HB1 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 HB1 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 HB1 was in the final cooling stage the HB1 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 HB1 will time how long the power was off. If the outage is two (2) minutes or less, the HB1 will always try to resume the cure. If the outage is greater than two minutes, the HB1 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

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