Model 9000 and Model 9020

Infrared Thermometer

Technical Manual

CE

WelchAllyn

The CE mark on this product indicates it has been tested to and conforms with the provisions noted within the 93/42/EEC Medical Device Directive

CE 0050

European Regulatory Manager, Medical Division
Welch Allyn Ltd., Navan, Co. Meath
Republic of Ireland

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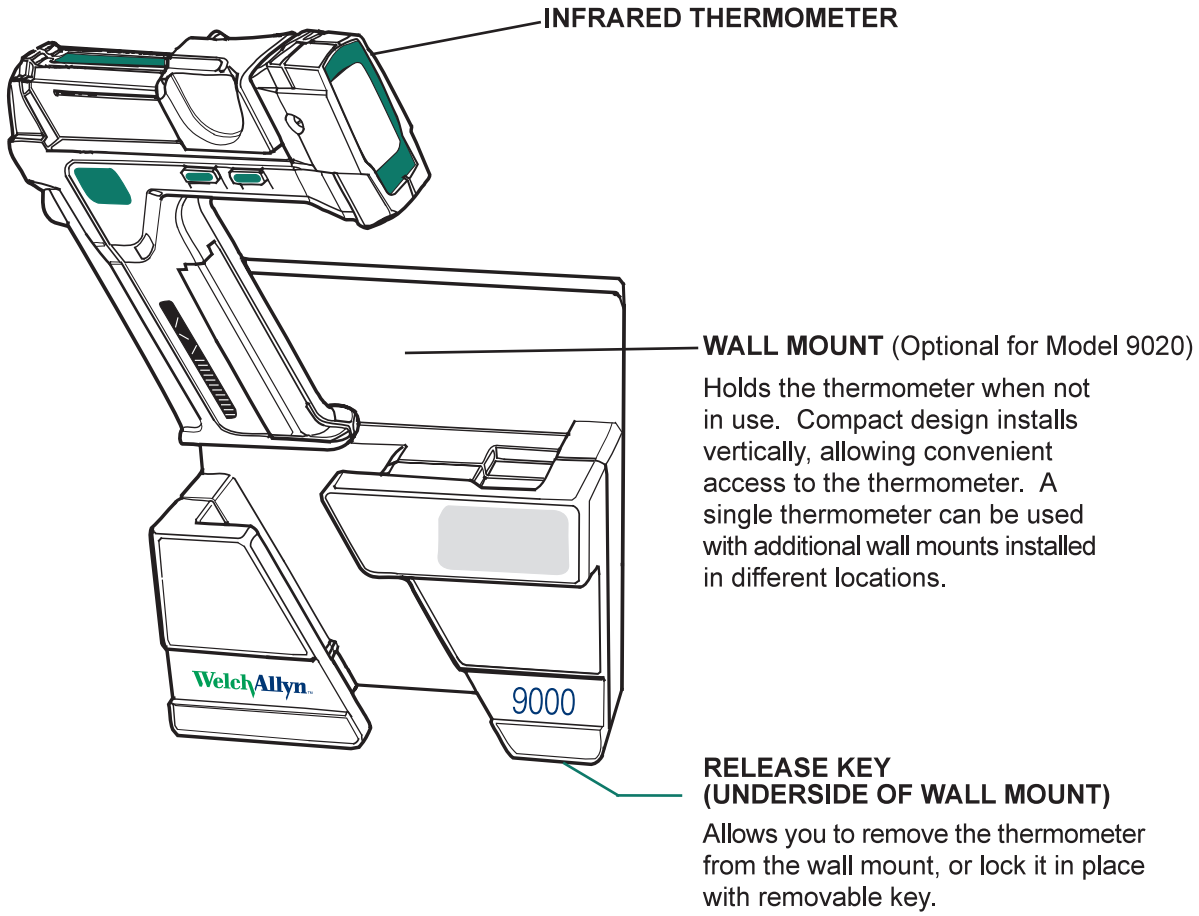
INTRODUCTION

This manual provides technical information about the electronic and mechanical operation of the Welch Allyn Model 9000 series infrared thermometers. It is intended for use by trained service representatives.

This manual is applicable for Model 9000 thermometers with serial numbers equal to and greater than 5262151 and for Model 9020 thermometers with serial numbers equal to and greater than 4160001. If you have an earlier serial number, please contact our Customer Service Department to obtain the correct technical manual.

Please refer to your *Users' Manual* supplied with your thermometer for operating instructions.



Changing the Probe Cover Dispenser

The thermometer handle will not slide if a dispenser is not installed or if it is empty. A vertical window in the handle of the thermometer allows you to see when the probe cover dispenser is empty. To replace the dispenser:

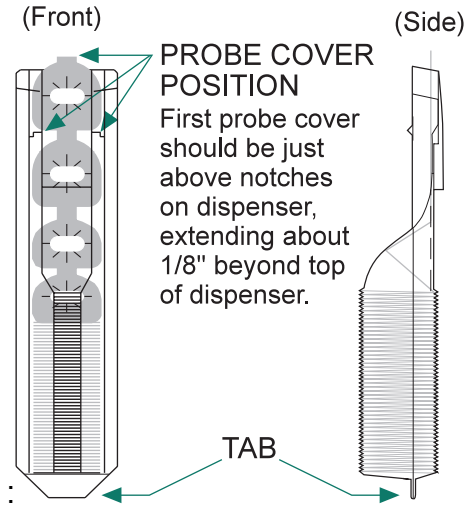


Figure A

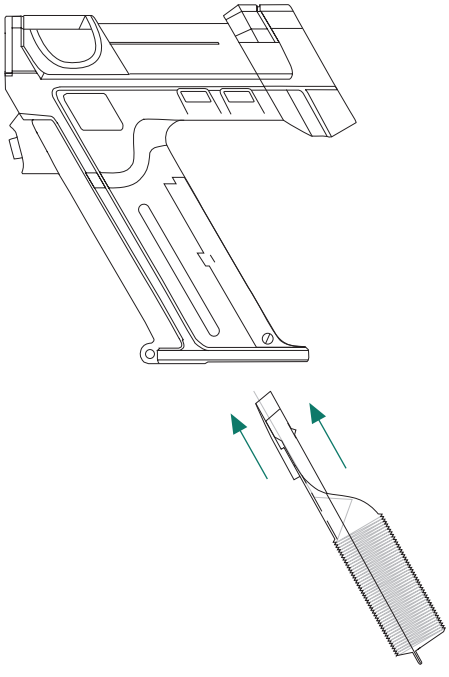


Figure B

1. Ensure that the probe is fully retracted, then remove the probe cover dispenser from the thermometer's handle by pulling on the tab at the end of the dispenser (Figure A). Discard the empty dispenser.

2. Check to see that the first probe cover in the new dispenser is positioned properly (Figure A).

3. Insert the new probe cover dispenser (flat end first) into the handle of the thermometer. Align the edges of the dispenser with the slots inside of the handle, then slide the dispenser upward until it snaps into place (Figure B). The thermometer is now ready for use.

   You should routinely take a moment to inspect the sensor lens for clarity and debris, and it is recommended that the sensor lens be cleaned as needed. Refer to "Cleaning the Probe Sensor Lens" on page 4.

CLEANING THE THERMOMETER

Routine Cleaning

Clean the exterior of both the thermometer and the wall mount as needed. Wipe all surfaces with a clean cloth, dampened with warm water and a mild detergent or germicidal cleaner (see the table below for acceptable cleaning agents).

- As some solutions may stain, try a small test area first.
- Make sure that the cloth is damp, but ***not*** wet.
- Do not allow cleaning solution to run inside of the thermometer.
- Never immerse the thermometer in the cleaning solution.

CLEANING AGENT	LENS	THERMOMETER	WALL MOUNT
Ammonium		✔	✔
Bleach (50%)		✔	✔
Cidex		✔	✔
Sporicidin®		✔	
MetriSpray™		✔	
Detergent (mild)		✔	✔
Isopropyl Alcohol	✔	✔	✔
Lysol		✔	✔

ETO Gas Sterilization Procedure

When no other form of decontamination such as a germicidal wipe is acceptable, a low temperature (not to exceed 130°F) ETO gas sterilization cycle may be used. Refer to your hospital standard operating procedure for length of ETO cycle.

This type of sterilization may cause some hazing of glossy plastic surfaces and should be used only when absolutely necessary.

1. Ensure that the probe is retracted, then remove the probe cover dispenser from the thermometer's handle.
2. Remove the screw that secures the battery compartment door, press the release notch to remove the door, then remove the batteries.

NOTE: Leaving batteries in the thermometer during the sterilization procedure may present an explosion hazard.

3. Wrap the thermometer in a standard sterilization type packaging, such as the Baxter Tower Dualpeel Sterilization Pouch.

4. ETO gas sterilize (temperature not to exceed 130°F) and aerate.
5. Remove the sterilization packaging.
6. Follow the steps for “Cleaning the Probe Sensor Lens – Method 2” described in the next section.
7. Insert the probe cover dispenser back into the thermometer’s handle.
8. Reinstall the batteries in the *exact* order and position as shown in the diagram inside of the battery compartment, then secure the battery compartment door.
9. Before use, allow the thermometer to stabilize to room temperature for at least *one hour,* then verify calibration using a Welch Allyn Model 9600 Calibration Tester.

Cleaning the Probe Sensor Lens

Dust and other minute particles of environmental debris can build up on the probe sensor lens during normal use of the thermometer.

The probe sensor lens should always be shiny and clear. Inspect the lens frequently and clean as necessary. The lens should also be cleaned as routine maintenance according to the two cleaning methods below.

NOTE: A dirty lens will affect the accuracy of temperature readings.

Method 1: Removing Light Dust

(Recommended every 24 hours)

1. Advance the slide to extend the probe tip.

2. Leave the probe cover in place. Using a dry cotton swab, hold the slide and gently press the probe cover against the sensor lens (Figure C). Loose debris on the lens will adhere to the probe cover.

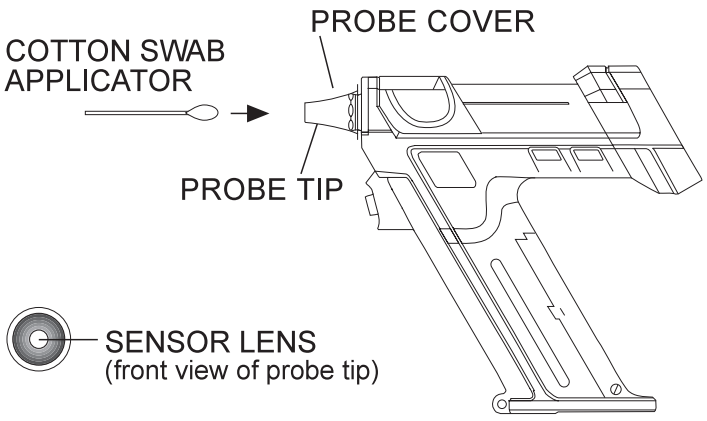


Figure C

3. Move the slide back to its original position to remove the probe cover and retract the probe tip. The thermometer is now ready for use.

Method 2: Removing Smudges or Excessive Debris

(RECOMMENDED AS NEEDED OR IF LOW TEMPERATURE READINGS PERSIST AFTER METHOD #1)

MATERIALS NEEDED

- Isopropyl Alcohol
- Cotton Swab

1. Advance the slide to extend the probe tip.
2. Manually remove the probe cover to expose the probe sensor lens.
3. Using a cotton swab slightly moistened with isopropyl alcohol, gently wipe the surface of the lens to remove debris (Figure D).
4. Wipe the lens with a dry cotton swab to absorb moisture and pick up any remaining debris (Figure D).
5. Move the slide back to its original position to retract the probe tip.
6. Allow 30 minutes before using the thermometer.

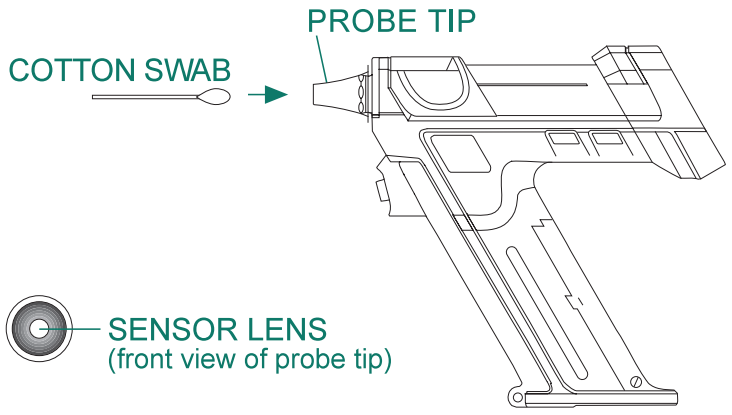


Figure D

CHANGING THE PROBE TIP

A damaged probe tip can tear the ultra-thin film in the probe covers. A temperature taken with a torn probe cover may result in a measurement that is higher than the actual temperature and cause debris to collect on the lens which may then result in lower temperature readings.

Periodically inspect the plastic probe tip for nicks or other damage, and replace if necessary.

MATERIALS NEEDED Probe Tip Replacement Kit (Welch Allyn Part #20688-000)

1. Advance the slide to extend the probe tip.
2. Manually remove the probe cover to expose the probe tip.
3. Remove the probe tip by turning it counterclockwise (Figure E). Discard the damaged probe tip.
4. Install the new probe tip by turning it clockwise, then hand-tightening (5 inch-lbs.) until it is positioned snugly against the base of the probe. Do not overtighten the tip.
5. As a precaution, clean the sensor lens to remove any dust or debris that may have adhered to the exposed lens during replacement of the probe tip.

   Follow the steps for “Cleaning the Probe Sensor Lens – Method 2” described earlier in this section of the manual.

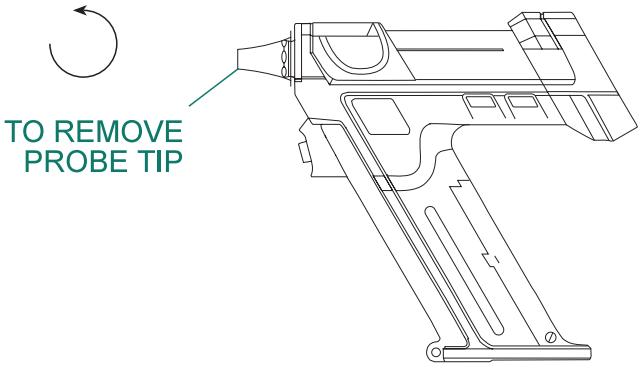


Figure E

REPLACING THE BATTERIES

By returning the thermometer to the wall mount after use, a set of batteries will provide power to the thermometer for up to 20,000 temperatures, or two years (this will vary with backlight usage and time outside of the wall mount). When battery power is low, a Battery symbol appears on the display and the thermometer cannot be used until they are replaced.

1. Remove the screw that secures the battery compartment door, then press the release notch to remove the door (see Figure F).
2. Remove the four depleted batteries and dispose of properly.
3. Press the SCAN button to reset the thermometer (this discharges the battery circuit capacitor C1).
4. Install four new AAA size Alkaline batteries in the *exact* order and position as shown in the diagram inside of the battery compartment.

   The thermometer will automatically perform a diagnostic self-test of the electronics (indicated by a segment cycling through the display). If not, reinstall the batteries to ensure correct positioning.

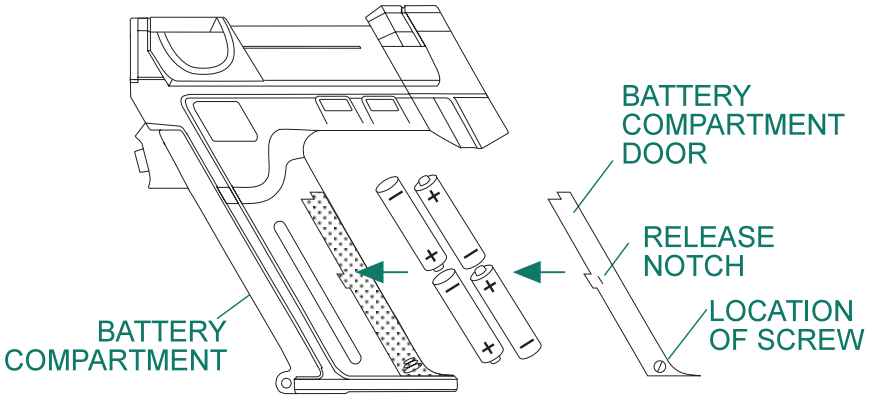


Figure F

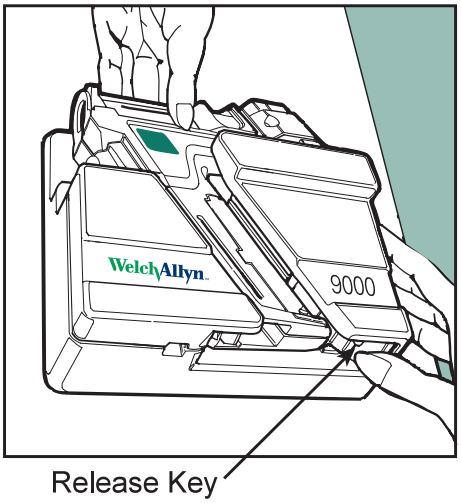
5. Replace the battery compartment door, then reinstall the screw to secure the door (Figure F).
6. Note that the Model 9000 will be in a security time-out condition when the Theft Protection System is enabled (“SEC” will appear on the display). Return the thermometer to the wall mount to reset the security timer, and resume normal operation.

THEFT PROTECTION SYSTEM

MODEL 9000 ONLY

The wall mount serves as a base for the Model 9000 when it is not in use. While in the wall mount, the thermometer remains in a “sleep” mode to preserve battery power.

Upon return to the wall mount, the 9000 “clicks” into place, held by a spring latch mechanism. To remove the Model 9000, move the latch mechanism’s release key to the right while lifting the thermometer out of the wall mount (as shown).



For additional theft protection, lock the Model 9000 into the wall mount by rotating the release key 90° to the right. Once in this position, the key can be removed by pulling downward.

An optional security cable (Welch Allyn Part #20796-000) may be added to the thermometer and wall mount for single area use.

Security Time-out function

The wall mount also includes a programmable time-out function. If the Model 9000 is not returned to the wall mount within a specified time period, the instrument enters a security time-out condition and ceases to function.

There is a 15-minute warning period prior to the security time-out condition. During this time, the Model 9000 continues to operate normally and “SEC” appears when a temperature is not displayed.

Once in a security time-out condition, when any button is pressed, “SEC” is displayed and the Model 9000 beeps rapidly to indicate a security status.

After the 9000 is returned to the wall mount, the security timer is reset and the thermometer is ready for use.

Programming the Security Timer

The built-in security timer may be programmed in one-hour increments from 0 to 8 hours. The timer is preset to 8 hours at the factory.

NOTE: Setting the timer to zero (0) disables the time-out function.

If you wish to change the current security time-out setting, follow these steps to initialize the security programming mode:

1. Place the thermometer into the wall mount, then advance the slide to extend the probe (the display will remain blank).
2. Simultaneously press the SCAN button and MODE switch (insert a small diameter object, such as a paper clip, into the small hole in the MODE switch).
3. Remove the thermometer from the wall mount to activate the display. The current time-out setting will be displayed.
4. The setting is incremented by one hour each time the °F/°C switch is pressed; it is decremented by one hour each time the PULSE TIMER button is pressed.
5. When the number of hours desired for security time-out is displayed, retract the probe and return the thermometer to the wall mount.

   The Model 9000 will automatically perform a diagnostic self-test of the electronics (indicated by a segment cycling through the display). Once this test is complete, the thermometer is ready for use.

TROUBLESHOOTING

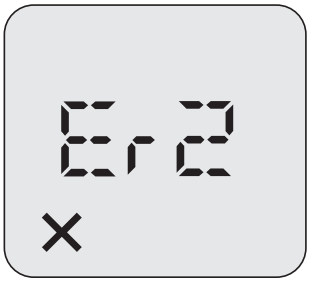
PROBLEM	SOLUTION
Low Temperatures	Debris on probe sensor lens. Clean lens. See “Maintenance” section of this manual for procedure Improper technique–refer to the Users’ Manual. Insert probe snugly into ear, completely closing off ear canal.. Check current Operation Mode . Oral mode obtains lower temperatures than core and rectal modes (test mode is used for calibration only). Probe tip not installed securely; hand tighten tip (clockwise) until snug against base of probe. See “Maintenance” section of this manual for procedure. Unit out of calibration. Refer to the Calibration Testing section of this manual.
High Temperatures	Check current operation mode. Core and rectal modes obtain higher temperatures than oral mode (test mode is used for calibration only). Improper technique–refer to the Users’ Manual. Insert probe snugly into ear, completely closing off ear canal. Detected warmer temperature prior to inserting probe into ear, or heat source (such as a heat lamp) nearby when taking temperature. Insert probe into ear, wait 2 seconds, then press SCAN button. Check integrity of probe cover prior to taking temperature. Damaged (or missing) probe cover can result in temperature reading up to 1.5°F higher than actual temperature.
Slide Will Not Move	Probe cover dispenser missing or empty. Check position of dispenser in thermometer’s handle. If empty, install new dispenser. Probe covers positioned improperly within probe cover dispenser. Remove dispenser from thermometer handle. Pull on first probe cover to remove any misaligned or bent covers. Reposition first probe cover to extend 1/8" beyond top of dispenser, then reinstall dispenser to thermometer handle. If problem persists, replace probe cover dispenser. See "Maintenance" section of this manual for procedure. Probe tip not installed securely and may be lodged against reference arm (shields lens when probe retracted). Looking into front of thermometer, press down on reference arm while moving slide forward. Hand tighten tip (clockwise) until snug against base of probe, then retract probe. See "Maintenance" section of this manual for procedure.
Inconsistent Results of Repeated Temperatures	Not enough time elapsed since last temperature taken (same ear). Insertion of probe results in slight “draw down” of ear canal temperature. Wait 2 minutes to allow temperature to stabilize between repeated temperature measurements in the same ear, or use patient’s opposite ear. Improper technique–refer to the Users’ Manual. Insert probe snugly into ear, completely closing off ear canal. If ear canal is curved significantly, sensor's view of the tympanic membrane may be obstructed. Gently pull up and back on external ear to straighten ear canal before inserting probe.

PROBLEM	SOLUTION
Improper Delivery of Probe Cover or Probe Cover Positioned Incorrectly on Probe	Probe covers positioned improperly within probe cover dispenser. Remove dispenser from thermometer handle. Pull on first probe cover to remove any misaligned or bent covers. Reposition first probe cover to extend 1/8" beyond top of dispenser, then reinstall dispenser to thermometer handle. If problem persists, replace probe cover dispenser. See “Maintenance” section of this manual. Obstruction between probe and probe cover dispenser. Remove dispenser, inspect thermometer handle and remove debris, if any. Ensure probe covers are properly positioned in probe cover dispenser, then reinsert dispenser into handle. Probe tip is damaged. Replace probe tip. See “Maintenance” section of this manual for procedure. Damaged probe covers. Replace probe cover dispenser.
Probe Cover Film Breakage	Probe tip is damaged. Replace with new probe tip. See “Maintenance” section of this manual for procedure. Slide moved forward too quickly. Probe covers positioned improperly within probe cover dispenser. Remove dispenser from thermometer handle. Pull on first probe cover to remove any misaligned or bent covers. Reposition first probe cover to extend 1/8" beyond top of dispenser, then reinstall dispenser to thermometer handle. If problem persists, replace probe cover dispenser. See "Maintenance" section of this manual for procedure.
Continuous or Intermittent Audible Tone	Probe is partially extended. Ensure slide is fully retracted. Improper operating condition. Check display for error status. See “Error Codes” section of this manual for explanation.
“SEC” Displayed	9000 locked in security time-out condition. Return thermometer to wall mount to reset Theft Protection timer, then resume normal operation.
Blank LCD Display	Probe extended for over 5 minutes. Retract probe. Remove thermometer from wall mount. Move the slide handle forward to activate the display. 9000 locked in security time-out condition. Return thermometer to wall mount to reset Theft Protection timer, then resume normal operation. Battery power depleted. Replace batteries. See “Maintenance” section of this manual for procedure. Ensure that all switch lines are at Vcc.
Unable to Remove the Thermometer from Wall Mount	Wall mount’s spring latch mechanism is engaged. Move release key (underside of wall mount) to the right while removing thermometer. Release key for spring latch mechanism (underside of wall mount) is missing or locked. Insert key into mechanism, then rotate key clockwise until tab is perpendicular to front panel of wall mount. Move release key to the right while removing thermometer.

ERROR CODES

When the thermometer detects an improper operating condition, the malfunction symbol (X) will appear with one of the numeric error codes (Er) below.

Set the thermometer aside for one hour to allow the electronics to stabilize to room temperature.



- If the thermometer is faulty, the error status will remain to indicate that the thermometer needs service.
- If the condition is transient in nature, the error status will disappear. The thermometer will then self-calibrate, and be ready for use.

ERROR	EXPLANATION
Er0 Er1 Er2 Er6	These error codes indicate possible thermistor reference circuit problems. 1 The resistance of the thermistor should read about 10k when measured from J2-2 to ground with power removed, thermometer requires service. 2. The voltage from J2-2 to ground with power applied and display test complete is about 1.2 volts with the thermistor in the circuit at room temperature, thermometer requires service.
Er3	Sensor pulse width is not between PTB and Hical values. Check PTB and Hical digital signals (U3-13, 12). Check C1 and C2. Internal error; thermometer requires service.
Er4	Sensor pulse width exceeding 95 milliseconds. Usually a basic A/D converter circuit fault (non-operating). Check 1.2 and 2.4 volt references. (U1-3, 4). Check U2 power (U2-7). Possible open IR sensor circuit or 4-conductor flex strip. Infrared sensor may be detecting nearby temperature source greater than 110°F. If not, thermometer requires service. A/D circuit voltages should be as follows after applying power and after the display test is complete: 1. Power @ U2-7 = Vcc Q1-C = Vcc J8-8 = 0 volts, U4-53 = 0 volts 2. Reference voltages U2-2 = 1.2 volts (C2) U2-3 = 1.2 volts (should be equal to U2-2) *U2-3 lower than U2-2 may indicate that C1 is bad* U3-2 = 2.4 volts U1-14 = 1.2 volts U4-56 = Vcc 3. U2 output reset prior to starting A/D conversions U2-6 = 2.4 volts (must be equal to 2.4 volt reference) U1-6 = 2.4 volts U1-5 = 1.2 volts 4. Microprocessor I/O prior to starting A/D conversions U1-7 = Vcc, U4-51 = Vcc U1-10 = Vcc, U4-13 = Vcc U1-11 = 0v, U4-18 = 0v

ERROR	EXPLANATION
Er5	Sensor resistance pulse width exceeding 95 milliseconds. Ambient temperature is above 110°F. If not, thermometer requires service.
Er6	Thermistor reference pulse width exceeding 95 milliseconds. Check thermistor reference circuit. If not, thermometer requires service.
Er7	Hical pulse width exceeding 95 milliseconds. Check probe switch circuit including 4-conductor flex cable. If not, internal error; thermometer requires service.
Er8	LoCal pulse width exceeding 95 milliseconds. Check probe switch circuit including 4-conductor flex cable. If not internal error; thermometer requires service.
Er9	Calibration self test is out of specification, thermometer requires service.
X only	Microprocessor or EEPROM test failed, thermometer requires service

In assembled thermometers with the probes extended, error codes 3-8 may be caused by a bad probe switch circuit. Check both the probe switch and the 4-conductor flex strip.

THERMOMETER DISASSEMBLY

NOTE: Extreme care must be taken at all times to prevent kinking or damage to the sensor or reference arm flex cables. Creases may cause premature failure of these cables.

Follow these steps to disassemble the thermometer (see Figure G at the back of this manual).

1. Remove the battery compartment screw (34), battery compartment cover (2), and batteries (1).
2. Remove the slide handle (35) by gently pulling outward on the bottom of one side of the slide.
3. Remove four labels (24) from the thermometer: the label on the slide, the label around the display window, the label below the SCAN button, and the diamond-shaped label on the left side of the case.
4. Remove the thermometer case screws. Using a flat surface, lay the thermometer on the left case half (8) and carefully separate the case halves (7) (8), keeping the internal thermometer components in the lower case half.
5. At this level, the ring gear (14), bell crank (6), pawl (28), actuating lever (57), and lever spring (36) may be inspected and replaced without total removal of the circuit board assemblies. The actuating lever and spring must be lifted out before removing the ring gear, bell crank, and pawl. The ring gear, bell crank, and pawl

can then be removed by lifting slightly on the front edge of the analog circuit board to allow the assembly to be lifted out.

6. The entire electronics assembly may be removed by gently lifting the display and analog boards out of the lower case half while also lifting the sensor assembly (52) and reference assembly (41), being careful not to stress or kink any of the connecting flex cables. The scan switch (38) and its flex cable may be removed by sliding the cable out from underneath the cable retainers along the groove and then lifting out the switch. The scan switch cable may be desoldered from the analog board and left in the lower case half.

THERMOMETER REASSEMBLY

NOTE: Extreme care must be taken at all times to prevent kinking or damage to the sensor or reference arm flex cables. Creases may cause premature failure of these cables.

Follow these steps to reassemble the thermometer (see Figures G, H).

1. Reassemble the thermometer into the left case (8). Install the scan switch assembly (38) into its cavity.
2. Route the connecting flex cable along the channel and under the cable retaining clips.
3. Assemble the ring gear (14), O ring (27), bell crank (6), pawl (28), and pawl spring (50) and install onto the case boss.
4. Install the actuating lever (51) and spring (36) onto the boss; position the straight spring end into the slot on the top of the boss as shown in Figure H.
5. Install the display and analog circuit board assemblies into the case, taking care to locate the board's positive battery contact in the case channel and ensuring that the 22 conductor flex strip is not being kinked by the rear analog PCB case stop.
6. Position the reference arm assembly (41) around the sensor assembly with the rear reference tabs located in the side grooves of the sensor slide body.
7. Insert the sensor and reference assemblies into the case (at its rear most position) making sure that the ratchet spring (49) is positioned as shown.
8. Locate the tabs on the reference assembly into the oval shaped guides in the case.
9. Install the window (17) into its cavity in the case.
10. While rotating the position of the lever arm as necessary to allow the reference arm to travel downward, move the slide assembly forward and locate the pawl into the position shown in Figure I.
11. Move the slide assembly back towards the display about 1/8" to cause the ratchet spring to ride against the left case half.

12. Install the right case half (7) applying gentle pressure until the two case halves are together. If the case does not close completely, carefully remove the right half and check the position of the PCB's, battery contacts, cables, and reference arm tabs.
13. Turn the thermometer over on the right case half. Install the two case fastening screws (33).
14. Install the slide handle (35) by spreading it slightly and pressing it down onto the tabs extending out of the thermometer case slide while lining them up with the matching recesses in the slide handle.
15. Install a probe cover dispenser with probe covers.
16. Test the thermometer slide action to ensure that it moves normally.
17. Install the four AAA batteries (1) according to the diagram on the inside of the battery compartment.
18. Install the battery compartment cover and screw (2, 34), then observe the power up display test.
19. Install new labels

THEORY OF OPERATION (ELECTRICAL)

Overview

(Refer To Schematic & Block Diagram)

The infrared temperature measuring circuitry consists of infrared detector SEN1, thermistor reference TH1, and an integrating A/D converter consisting of integrator U2, and various support circuitry including U1 and U3. The A/D control and display functions are performed by the microprocessor U4 and the display DS1. Calibration and additional thermometer characteristic data are stored in the nonvolatile EEPROM U5. The backlight system consists of an inverter circuit including Q2 and transformer T1 which provide drive for the electroluminescent panel DS2. The audible tones are created by a signal generated by microprocessor U4 driving horn LS1.

Microprocessor

The microprocessor U4 is an 8 bit low power CMOS microprocessor. It is a Mitsubishi type M38203 containing a custom proprietary program in its 16,384 [8192] byte ROM and 512 byte RAM. This device also contains several internal timers and the LCD driver.

Power Up Reset

The power up reset for the microprocessor is generated by C13, D1, and R19 which provides a low reset with about a 10 millisecond time constant to return high. This will occur each time batteries are installed. Following the reset, the microprocessor performs internal RAM and ROM, and external EEPROM checksum tests. A visual

display test is then initiated which sequentially activates and then deactivates each segment on the LCD.

Microprocessor Clocks

A 4 MHz resonator and r/c components are connected to U4-30, 31 to provide the primary system clock. This 4 MHz clock output can be monitored on U4-31. The clock is active during all analog conversion functions such as temperature taking and calibration. The clock will be seen to turn off between calibrations.

A 32.768 KHz resonator and r/c components are connected to U4-28,29 to provide a low frequency clock for timing and low power operation. This clock turns off only while the thermometer is in the security wall mount, which places all internal circuitry into a micropower sleep mode.

Display Circuit

The Diplex type liquid crystal display (DS1) is directly driven by the microprocessor segment outputs SEG0-SEG23 and common outputs COM0,COM1. The display operating voltages are generated by a voltage divider (R23, R24, and R25) which supplies 1/3 Vcc to U4-7, 8 and 2/3 Vcc to U4-6 when the display power is turned on by microprocessor output U4-49 being low.

EEPROM

The EEPROM U5 is nonvolatile memory which stores calibration and characteristics data that are entered during factory calibration. The constants contained in memory are unique to each thermometer and require programming for the thermometer to be functional. The EEPROM is also used to record the current operating mode, °F/°C setting, and security time-out setting. A change in operating mode, °F/°C, or security time-out is written to the EEPROM each time the thermometer is placed into the security wall mount. At power up (batteries installed), the EEPROM constants are copied into the microprocessor RAM for frequent use. Each time a temperature is to be taken, a test of the checksum for the EEPROM data transferred to the microprocessor is performed and, if an error has occurred, the data are reloaded into the microprocessor. To conserve battery power, the ground and all data and clock lines for the EEPROM are set high by the microprocessor when the EEPROM is not being read.

Analog IC U1

U1 is a Welch Allyn custom bipolar IC which contains a 1.2 and 2.4 volt reference, a low battery detector, and circuits associated with performing the A/D converter function. The A/D power line U1-14 is pulled to about 1.2 volts by microprocessor output U4-56 going high through R13 to activate this IC. The low battery detector output U1-12 goes low when the battery voltage drops below approximately 4.4 volts.

A/D Converter Circuit

Op amp U2 and capacitor C6 form an integrator which converts signal input currents into a variable length ramp at U2-6 which starts at approximately 2.4 volts and ends at 1.2 volts. The time required for the ramp to progress from the higher to lower voltage is measured by the microprocessor. Prior to a conversion taking place, power for the op amp is turned on by the microprocessor output U4-53 being set low which turns on a transistor switch (Q1) causing Q1-C to go high supplying Vcc to U2-7. An A/D conversion cycle is initiated by the microprocessor U4-51 setting the A/DTRIG line high which activates U1-7 causing current to be drawn through U1-6 forcing the op amp output to the 2.4 volt reference level. U1-10 is high at this point.

The A/D conversion is started when the microprocessor sets the A/DTRIG line low which allows the op amp to act as an integrator discharging C6 at a rate determined by signal currents being applied to the integrator inputs. When the A/DTRIG line goes low, U1-10 goes low and U2-6 ramps down from 2.4 volts until U2-6 reaches 1.2 volts, at which time U1-10 goes low, signaling the microprocessor that the measurement is complete. The length of time that U1-10 remains low is measured by the microprocessor to determine the value of the signal input.

Thermistor Reference Circuit

The reference arm is a simple blackbody containing a thermistor to measure its temperature. The thermistor TH1 is a 10K ohm value at 25°C $\pm$ 0.05°C (77°F $\pm$ 0.1°F). A resistor bridge circuit for TH1 has an output which is connected to the integrator input through an analog switch U3C.

Internal A/D Calibration Circuit

There is a resistor and analog switch (U3B) that, when activated, cause both a near maximum pulse width to be generated by the A/D converter to correct for any A/D converter pulse width drift. The microprocessor uses the calibration pulse width to normalize all other A/D measurements.

Calibration Check Circuit

There is a calibration resistor and analog switch, U3A, that when activated, cause a reference pulse width to be generated by the A/D calibration circuit normalization factor and compared to reference value. An error condition is generated if the normalized value is outside specified tolerances.

Thermometer Wakeup

While the thermometer is located in the security wall mount, reed switch S7 is closed, causing the microprocessor U4 to turn off all power to the analog and display circuitry and then enter a sleep mode to conserve battery power. Removal of the thermometer from the wall mount causes S7 to open, waking up the microprocessor to perform a complete calibration and prepare for temperature taking.

IR Temperature Measurement Cycle

The following sequence occurs when the thermometer has just been activated following removal from the security wall mount or upon completing a temperature taking cycle. The infrared sensor is exposed to the reference arm while the slide handle is retracted to allow calibration to take place. The output of SEN1 is monitored by the microprocessor through A/D conversions to check for thermal stability of the instrument. The nominal A/D pulse width is about 18 milliseconds at U1-10 during this stability check. The infrared sensor output is monitored until the signal is stable, at which time a calibration sequence is performed.

The calibration sequence begins with the microprocessor setting U3-12 high which connects the HIGH CAL resistor to the integrator input to generate the near maximum pulse width (HIGH CAL). The nominal HIGH CAL pulse width is about 60 milliseconds. After an A/D conversion is completed, U3-12 is returned low and the microprocessor sets U3-5 high to generate a reading of the thermistor reference. The thermistor pulse width varies with temperature and is typically about 18 milliseconds at 25°C. After an A/D conversion is completed for the thermistor reference, U3-5 is returned low and the microprocessor causes an A/D conversion to be performed while the infrared sensor is viewing the reference arm at a known temperature to be used as a baseline. The typical baseline pulse width is about 18 milliseconds.

At this point, the ready display is activated and a temperature may be taken. Up until the slide handle is pushed forward to take a temperature, a stability check of the sensor baseline is performed several times each minute to test for thermal stability with a calibration cycle being performed about once each minute. Pushing the slide handle forward causes the probe position switch S6 to force the microprocessor input U4-27 low indicating that a temperature is to be taken. Moving the handle forward also drops the reference arm from in front of the sensor. The IR sensor output is sampled about 3 times per second while the slide is forward and the last two seconds worth of temperatures is stored. When the scan switch S2 is pressed, additional temperatures are stored at the 3-second rate for about 3 seconds. The microprocessor then examines the two seconds of data stored prior to pressing the scan switch and the three seconds of data stored after pressing the scan switch and selects the highest reading detected for the final temperature display. The A/D values are compared to those taken during the calibration cycle and used to compute the difference between the reference arm temperature and the ear temperature. A time limit of 30 seconds to take a temperature is incorporated to prevent thermal changes to the exposed sensor. Retracting the handle opens S6 beginning the stabilization test and calibration cycle.

HORN CIRCUIT

The horn, LS1 is driven directly by the microprocessor output U4-23 which provides a square wave.

BACKLIGHT CIRCUIT

The backlight switch, S3, when pressed, provides a low input to the microprocessor U4-38. The microprocessor output U4-52 is then set high turning on the backlight inverter circuit contained in H1 and which drives transformer T1. The output of T1 is an AC waveform of about 150 volts P-P and 700 Hertz frequency which drives the electroluminescent backlight panel DS2.

Wall Mount Security Switch (Model 9000 Only)

The reed switch, S7, is normally open when the thermometer is away from the security wall mount. When the thermometer is placed into the security wall mount, a magnet located inside the wall mount closes S7 which is sensed by the microprocessor (U4-35) which then shuts down all thermometer circuits.

THEORY OF OPERATION (MECHANICAL)

The probe cover dispenser initially contains 100 covers and is inserted into the bottom of the thermometer handle. As the slide handle is pushed forward, the rack gear on the slide rotates the idler and ring gear assembly causing the pawl to drop below the top most probe cover in the dispenser and push the cover upward until the cover is fully seated in the window. The dispensing of the cover occurs within about the first half of the slide handle travel and the pawl is then stopped by a ledge on the window.

As the slide is pushed forward, the O ring/clutch assembly located between the ring gear and the bell crank slips to allow the slide and gears to continue moving without the pawl. As the probe tip is pushed through the probe cover and window, the plastic film of the probe cover stretches over the probe tip. When the slide is almost fully extended, the perforation connecting the stretched cover with the next cover in the dispenser is broken and the fully stretched cover and tip extend out of the thermometer case for temperature measurement.

The stretched probe cover is latched onto the probe tip at this point by the paper and plastic base of the cover which has been forced over the larger retainer of the probe tip.

As the slide is retracted, the used probe cover is peeled off as it passes through the window and then drops off the end of the retracting probe.

During the retracting of the slide, the gear and pawl motion is reversed causing the pawl to retract until it hits the pawl stop. This causes the pawl to pull away from the dispenser. The O ring/clutch then slips to allow the slide and gears to finish traveling without moving the pawl. The lifting of the pawl against its stop allows removal of the dispenser when the slide is in its retracted position. If the pawl does not lift away from the dispenser, probe covers will remain inside the instrument as the dispenser is removed.

The ratchet and ratchet spring ensure that complete slide strokes are performed when loading and unloading probe covers. The ratchet mechanism prevents the direction of slide travel from being changed until the slide is at one end of its travel.

The actuating lever and spring prevent the slide from moving forward if no probe cover is present. This is accomplished by the actuating lever spring moving the actuating lever forward which blocks the reference arm and prevents it from lowering. A probe cover dispenser with covers moves the actuating lever into a position to clear the reference arm and allows the actuating lever to again block the reference arm when a probe cover is not in the correct position to be loaded.

MODEL 9000 CALIBRATION CHECK & ADJUSTMENT

It is recommended that the thermometer be checked for proper calibration every six months. The calibration of the thermometer may be verified by using the Welch Allyn 9600 Calibration Tester. The following procedure allows for manual calibration adjustments of a Welch Allyn Model 9000 Series Thermometer which has failed the Troubleshooting Test described in the 9600 manual.

The thermometer can be placed into a special Test Mode for checking the calibration using the 9600 System.

The Test Mode is entered by simultaneously pressing PULSE TIMER and MODE switches and will display a “T” on the thermometer LCD.

The Test Mode will remain on as long as the “pulse timer” is active. Once in the Test Mode, the mode may be extended by repeatedly pressing the PULSE TIMER switch only. The Test Mode is exited automatically when the “pulse timer” times out. The thermometer mode will then change back to the thermometer mode prior to entering the Test Mode. The Test Mode may be exited before the “pulse timer” times out by pressing the MODE switch only. This will cause the thermometer mode to change to the ORAL mode.

Prior to calibration adjustment

The sensor lens must be absolutely clean. If the lens is not clean, perform the following cleaning procedure twice prior to calibration:

- Using a cleaning swab slightly moistened with isopropyl alcohol, clean the surface with a gentle circular motion. Immediately wipe the lens with a clean, dry swab using the same circular motion. Repeat the procedure.

After cleaning the lens, allow a minimum of 30 minutes for the sensor to stabilize before taking temperatures with the thermometer.

Set the Model 9600 Calibration Tester to the 106°F position and wait for Ready indicator to stay on.

Set the thermometer to be adjusted to the “T” Test Mode and Fahrenheit (F) display.

Establishing a baseline prior to making calibration

Take 5 temperatures into the 106°F opening of the 9600. The 5 readings are then averaged to compute the present thermometer calibration.

Setting the Thermometer to the calibration adjustment mode

1. Insert the thermometer into a wall mount.
2. Move the slide forward and then press the scan switch and activate the mode switch simultaneously.
3. Remove the thermometer from the wall mount and retract the slide. Move the slide forward and activate the mode switch *before display test ends*. The mode display should indicate “O”, and will display a number between -99 and 99. The up/down arrows will also be displayed in the upper left of the LCD display.
4. Use the F/C switch to increase the number and the Pulse switch to decrease the number according to the following table:

5 Temperature Average Reading with Probe Cover	New Calibration Number
105.6°F	Old number + 10
105.7°F	Old number + 8
105.8°F	Old number + 5
105.9°F	Old number + 3
106.0°F	Old number + 00
106.1°F	Old number - 03
106.2°F	Old number -05
106.3°F	Old number - 08
106.4°F	Old number - 10

5. Retract the slide and establish the Test Mode with probe cover “T” Mode. Retest the thermometer as described in “Establishing A Baseline Prior To Making A Calibration Adjustment”..

   The reading should be within specifications. If it is not, repeat the adjustment procedure.

MODEL 9020 CALIBRATION CHECK & ADJUSTMENT

It is recommended that the thermometer be checked for proper calibration every six months. The calibration of the Model 9020 may be verified by using a Diatek Model 9600 Calibration Tester. The following procedure allows for manual calibration adjustments of the Diatek Model 9020 Thermometer to correct for minor calibration deviations.

The Model 9020 Thermometer can be placed into a special Test Mode for checking the calibration using the Model 9600 Calibration Tester.

The Test Mode is entered by simultaneously pressing the PULSE TIMER and MODE switches, a “T” will be displayed in the upper right of the LCD.

The Test Mode will remain on as long as the “pulse timer” is active. Once in the Test Mode, the mode may be extended by pressing the PULSE TIMER switch before the pulse timer display has timed out. The Test Mode is exited automatically when the “pulse timer” times out and will change back to the mode set prior to entering the Test Mode. The Test Mode may be exited before the “pulse timer” times out by pressing the MODE switch only. This will cause the thermometer mode to change to the ORAL mode.

Prior to calibration adjustment

The sensor lens must be absolutely clean. Perform the following cleaning procedure twice prior to calibration:

- Using a cleaning swab slightly moistened with isopropyl alcohol, clean the surface of the lens with a gentle circular motion. Immediately wipe the lens with a clean dry swab using the same circular motion. Repeat the procedure.

After cleaning the lens, allow a minimum of 30 minutes for the sensor to stabilize before taking temperatures with the thermometer.

Set the Model 9600 Calibration Tester set to the 106 °F. position and wait for the Ready indicator to stay lighted.

Set the thermometer to be adjusted to the “T” Test Mode and “F” Fahrenheit display.

Establishing a baseline prior to making calibration adjustments

Take 5 temperatures at 106 °F. by inserting the thermometer probe assembly, with probe cover installed, into the large opening in the Model 9600. The 5 readings are then averaged to compute the present thermometer calibration. Note this average temperature.

Setting the Thermometer to the calibration adjustment mode

1. Open the battery compartment and remove 1 battery.
2. Press and release the Scan Switch. Re-install the battery. The display will start a segment self test.
3. Move the probe cover loading slide handle forward and press the MODE switch before the segment test ends. The LCD mode display should indicate “O”, and will display a number between -99 and 99. The up/down arrows will also be displayed in the upper left of the LCD display.
4. Use the F/C switch to increase the number and the PULSE TIMER switch to decrease the number according the following table.

5 Temperature Average Reading with Probe Cover	New Calibration Number
105.6°F	Old number + 10
105.7°F	Old number + 8
105.8°F	Old number + 5
105.9°F	Old number + 3
106.0°F	Old number + 00
106.1°F	Old number - 03
106.2°F	Old number -05
106.3°F	Old number - 08
106.4°F	Old number - 10

5. Retract the slide and let the thermometer complete its display test. Activate the Test Mode and re-test the thermometer as described in **“Establishing a baseline prior to making calibration adjustment”**.

The reading should be within specifications. If it is not, repeat the adjustment procedure.

FACTORY SERVICEABLE ONLY REPAIRS

Repairs are considered factory serviceable only if replacing the component(s) will require factory recalibration of the thermometer. Replacing any of the following components will require a factory recalibration to be performed:

R3, R4, R5, R6, R8, SEN1, U1, U2, U3, U5

FIELD SERVICEABLE REPAIRS

Repairs are considered to be field serviceable if the repair will not require total recalibration of the thermometer. Total recalibration requires a computer-based system and is normally performed at the factory.

The following component types may be field serviced without affecting the calibration of the thermometer:

ALL PLASTIC COMPONENTS (case, gear, slide, and LCD window)

ALL SWITCHES

ALL FLEX CABLES

ALL CAPACITORS

ALL RESISTORS

REFERENCE ASSEMBLY

DS1, DS2, LS1, Q1, Q2, T1, U4

Refer to the following Field Servicable Parts List for a comprehensive list of Welch Allyn part numbers.

FIELD SERVICEABLE PARTS LIST

REF.	ITEM	DESCRIPTION	WELCH ALLYN P/N
	1	AAA ALKALINE BATTERY	58313-000
	2**	BATTERY COMPARTMENT COVER	20694-020
	3	BATTERY CONTACT, POSITIVE	58318-000
	4	BATTERY CONTACT, NEGATIVE	58324-000
	5	BATTERY CONTACT, COMMON	58319-000
	6	BELL CRANK	20620-000
	7**	CASE HALF, RIGHT	20694-020
	8**	CASE HALF, LEFT	20694-020
C1, C2	9*	CAPACITOR 470pF 50V TANT	46118-000
C3, C4, C5, C9, C13, C16	10*	CAPACITOR 0.1 MF X7R 0805	46127-1040
C7	11*	CAPACITOR .047MF X7R 0805	46127-4730
	12*	CAPACITOR 1MF TANTCHIP 16V +\- 20%	46129-1050
	13	GEAR, IDLER	25137-000
	14	GEAR, RING	20621-000
DS1	15	LIQUID CRYSTAL DISPLAY	60020-000
DS2	16*	BACKLIGHT PANEL	60019-000
	17*	LCD FRAME (WINDOW)	25142-000
	18*	LCD CONTACT STRIP	58317-000
	19*	LCD FRAME SCREW	83134-000
	20*	FLEX CABLE-2 CONDUCTOR	80085-000
	21*	FLEX CABLE-4 CONDUCTOR	80125-0000
	22*	FLEX CABLE-22 CONDUCTOR	80124-0000
R6	23*	RESISTOR, 18.2K 1% 0805	40311-8220
	24	LABEL SET-STANDARD MODEL 9000	70371-110
	24	LABEL SET-MODEL 9000 - MEDIMEX (GERMAN)	70371-300
	24	LABEL SET-MODEL 9000 - IMEDA (FRENCH)	70371-400
	24	LABEL SET-MODEL 9020	70371-500

FIELD SERVICEABLE PARTS LIST (Continued)

REF.	ITEM	DESCRIPTION	WELCH ALLYN P/N
LS1	25*	MINIATURE SPEAKER	58315-000
	26	USERS' MANUAL-MODEL 9000 ENGLISH	70373-110
	26	USERS' MANUAL-MODEL 9000 - MEDIMEX (GERMAN)	70373-200
	26	USERS' MANUAL-MODEL 9000 - FRENCH	70373-400
	27	O RING	20617-000
	28	PAWL	25138-000
	29	PROBE TIP	25140-030
R1	30*	RESISTOR, 226K 1% 0805	40312-2630
R2	31*	RESISTOR, 150 OHM 1% 0805	40311-5000
R3	32*	RESISTOR, 40.2K 1% 0805	40314-0220
	33	SCREW, CASE	83158-000
	34	SCREW, BATTERY COVER	83135-000
	35	SLIDE HANDLE	25148-010
	36	SPRING, LEVER ARM	85217-000
S1, S3-S5	37*	SWITCH P.B. MOMENTARY	58314-000
S2	38	SCAN SWITCH	20429-010
S6	39*	PROBE SWITCH	58323-000
T1	40*	BACKLIGHT TRANSFORMER (MODEL 9000)	52012-000
TH1	41	THERMISTOR REFERENCE ARM	20447-020
R11-R13, R15-R17, R19, R21, R22, R26	33*	RESISTOR, 100K 5% 0805	40290-1040
	47	DISPOSABLE WINDOW	25155-010
	48	LABEL SET, SECURITY-MODEL 9000 - ENGLISH	70565-010
	48	LABEL SET, SECURITY- MODEL 9000 - GERMAN	70565-310

FIELD SERVICEABLE PARTS LIST (Continued)

REF.	ITEM	DESCRIPTION	WELCH ALLYN P/N
	48	LABEL SET, SECURITY- MODEL 9000 - FRENCH	70565-400
	49	RATCHET SPRING	85216-010
	50	PAWL SPRING	85169-000
	51	ACTUATING LEVER	25192-000
C6	52*	CAPACITOR, 0.068MF 63V 5%	46125-0000
S7	53*	REED SWITCH	58455-000
X1	54*	CRYSTAL, 32 KHz	47006-0000
X2	55*	RESONATOR, 6MHz	47017-000

* Item numbers are part of subassemblies, not referenced directly on drawing.

** These items are included under one Welch Allyn part number, 20694-020.

SUGGESTED SPARE PARTS (PER 100 UNITS)

WELCH ALLYN P/N	DESCRIPTION	QTY/100 UNITS
20429-000	SCAN SWITCH PC ASSY	2
20447-020	REFERENCE ASSY	2
20688-000	PROBE TIP REPLACEMENT KIT	1
20694-020	CASE	5
25142-000	LCD FRAME	5
52012-000	BACKLIGHT TRANSFORMER, MODEL 9000 ONLY	2
58314-000	MOMENTARY SWITCH	5
58317-000	ELASTOMERIC CONNECTOR	4
58323-000	PROBE POSITION SWITCH	2
58455-000	REED SWITCH	2
60019-000	ELECTROLUMINESCENT LAMP, MODEL 9000 ONLY	2
60020-000	LCD	2
70371-110	LABEL SET-STANDARD MODEL 9000	5
70371-300	LABEL SET-MODEL 9000 - MEDIMEX (GERMAN)	5
70371-400	LABEL SET-MODEL 9000 - IMEDA (FRENCH)	5
70371-500	LABEL SET-MODEL 9020	5
80125-0000	4 CONDUCTOR FLEX CABLE	5
85217-000	LEVER ARM SPRING	3

OPTIONS & ACCESSORIES

Welch Allyn 050 Probe Covers

Welch Allyn Part #05051

Box of 2 dispensers (100 probe covers/dispenser)

Packaged in quantities of 1,000 (Welch Allyn direct customers only) and 5,000 probe covers/carton

Probe Tip Replacement Kit

Welch Allyn Part #20688-000

12 replacement probe tips

Security Cable

Welch Allyn Part #20796-000

Lanyard cable attaches 9000 to wall mount for added security

Welch Allyn 9000 Wall Mount

Welch Allyn Part #20757-030 (English)

Welch Allyn Part #20757-110 (German)

Welch Allyn Part #20757-310 (French-Imeda)

Additional or replacement wall mount for the 9000

Welch Allyn 9020 Wall Mount

Welch Allyn Part #20757-400 (English)

Optional wall mount for the 9020

Portable Stand

Welch Allyn Part #08071-000 (requires Welch Allyn Wall Mount)

Rolling stand provides additional security without sacrificing mobility

Welch Allyn 9600 Calibration Tester

Welch Allyn Part #01800-210 (110V English)

Welch Allyn Part #01800-500 (220V English)

Welch Allyn Part #01800-700 (220V German)

Temperature reference for calibration testing of Welch Allyn thermometers (both infrared and thermistor types)

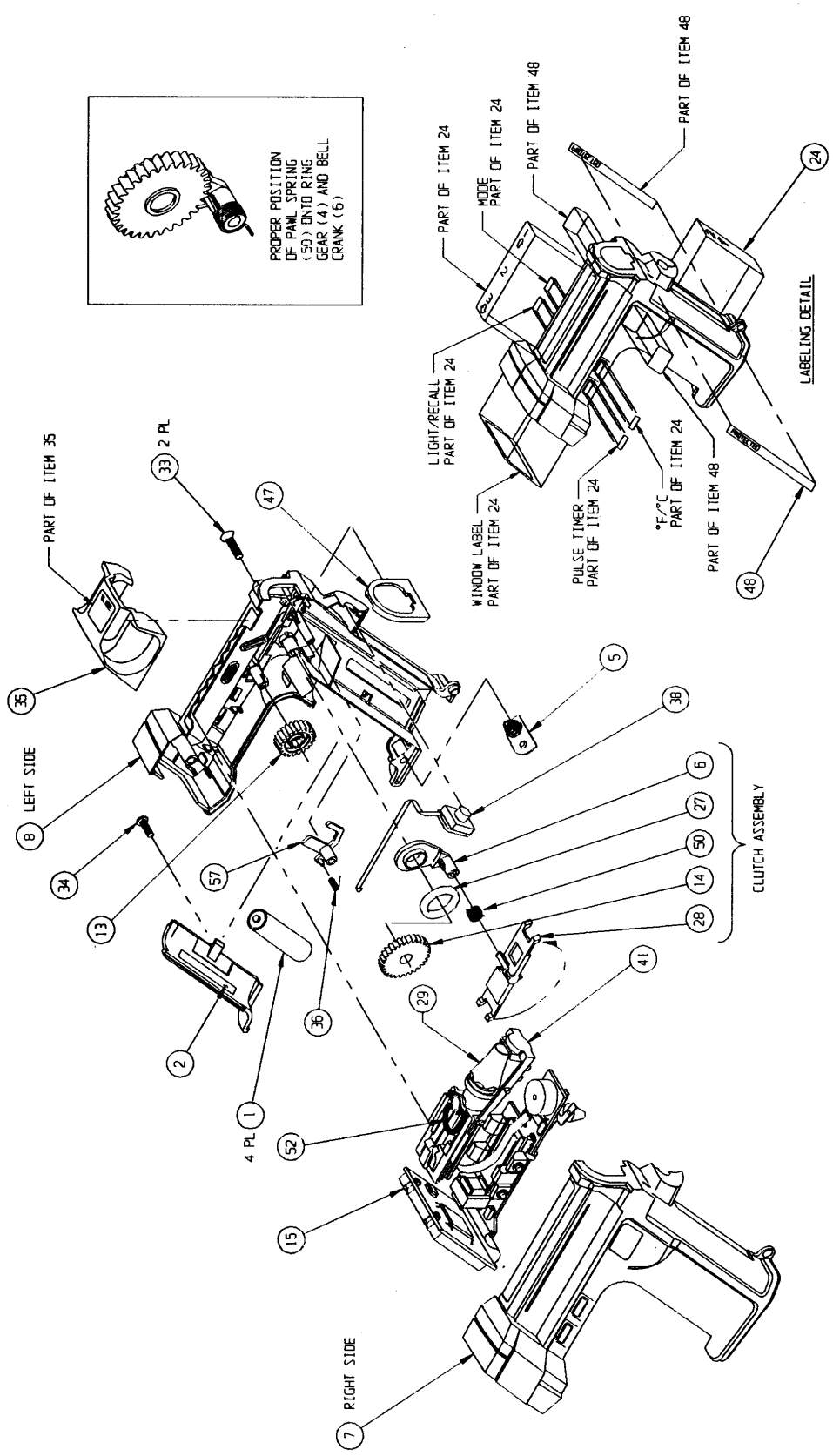


Figure G: Thermometer Assembly

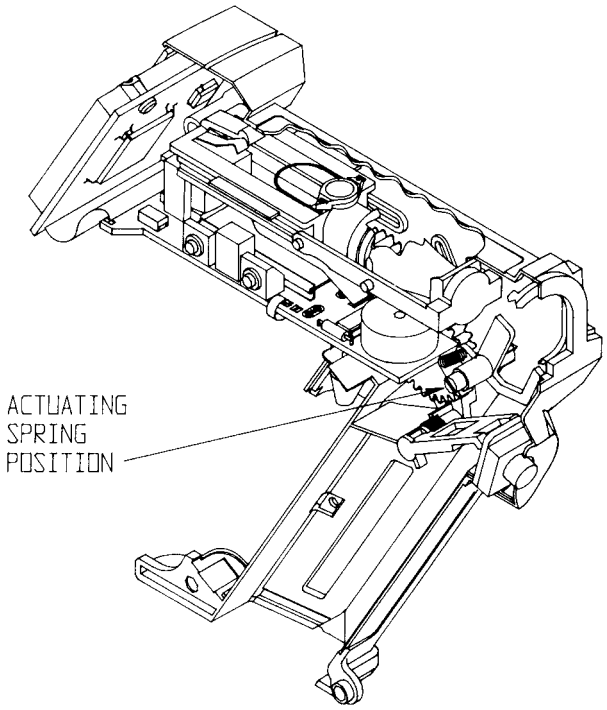


Figure H: Left Case Component Locations

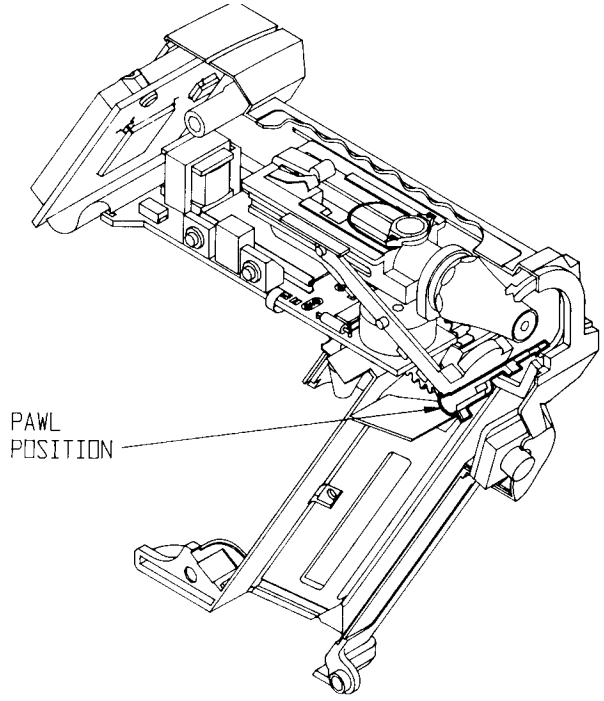


Figure I: Left Case Component Locations Prior to Final Assembly

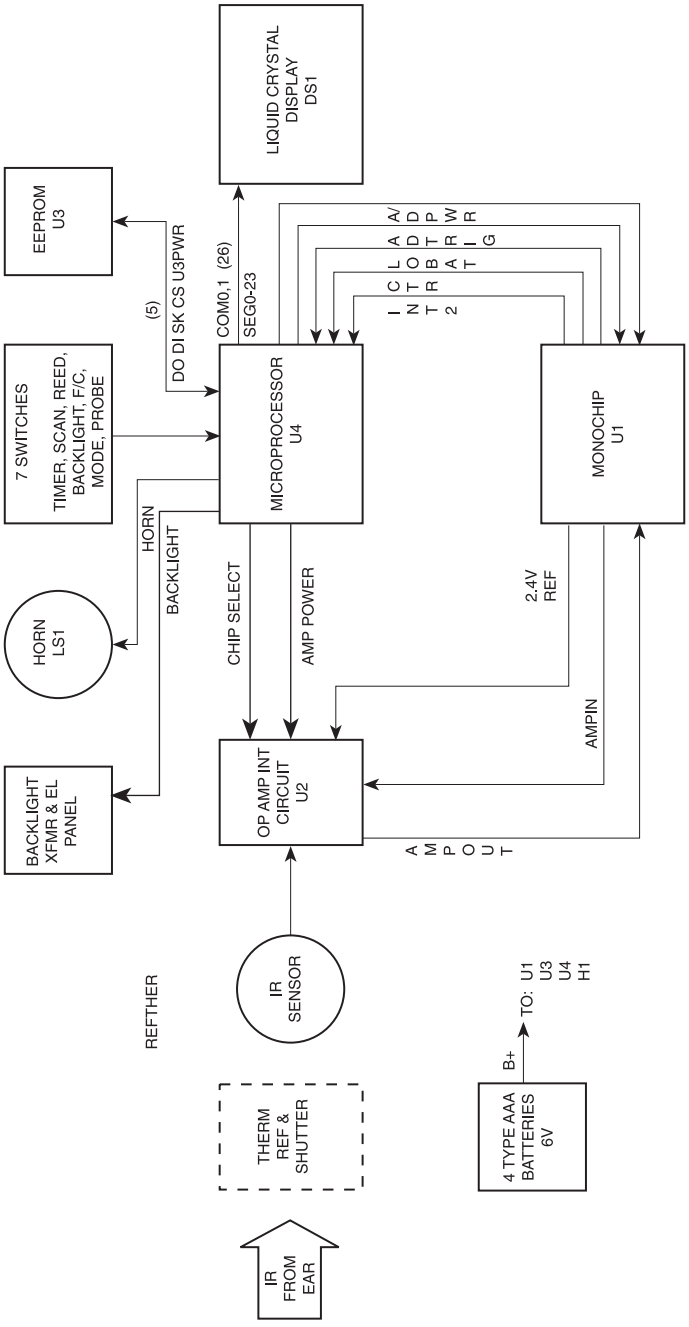


Figure J: Block Diagram and Signal Flow

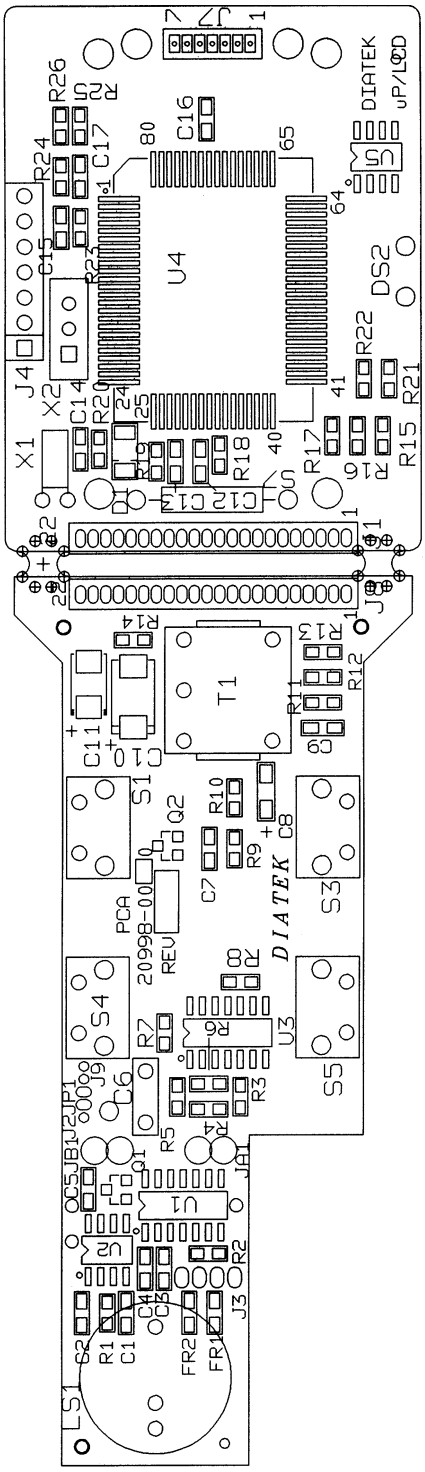
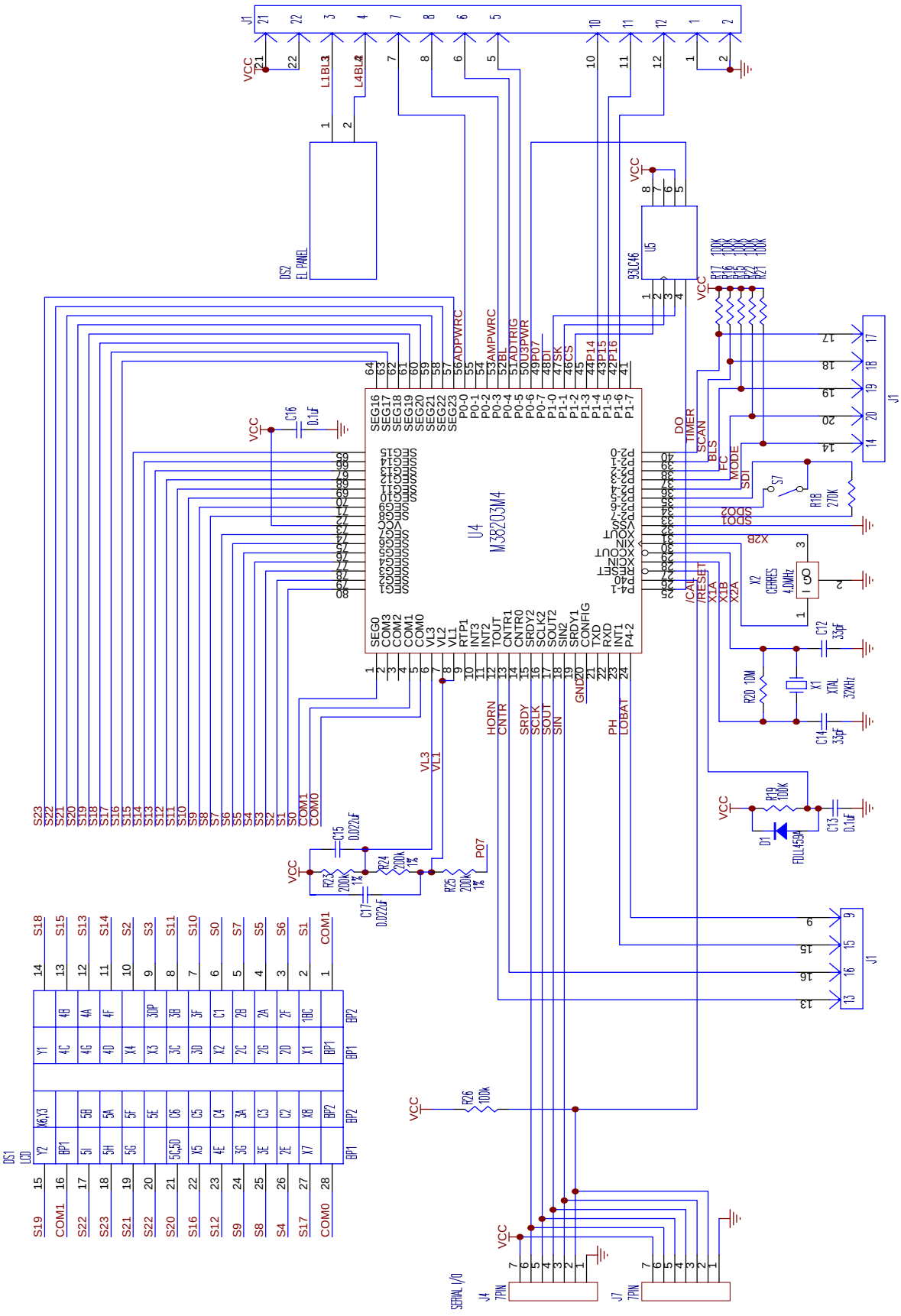
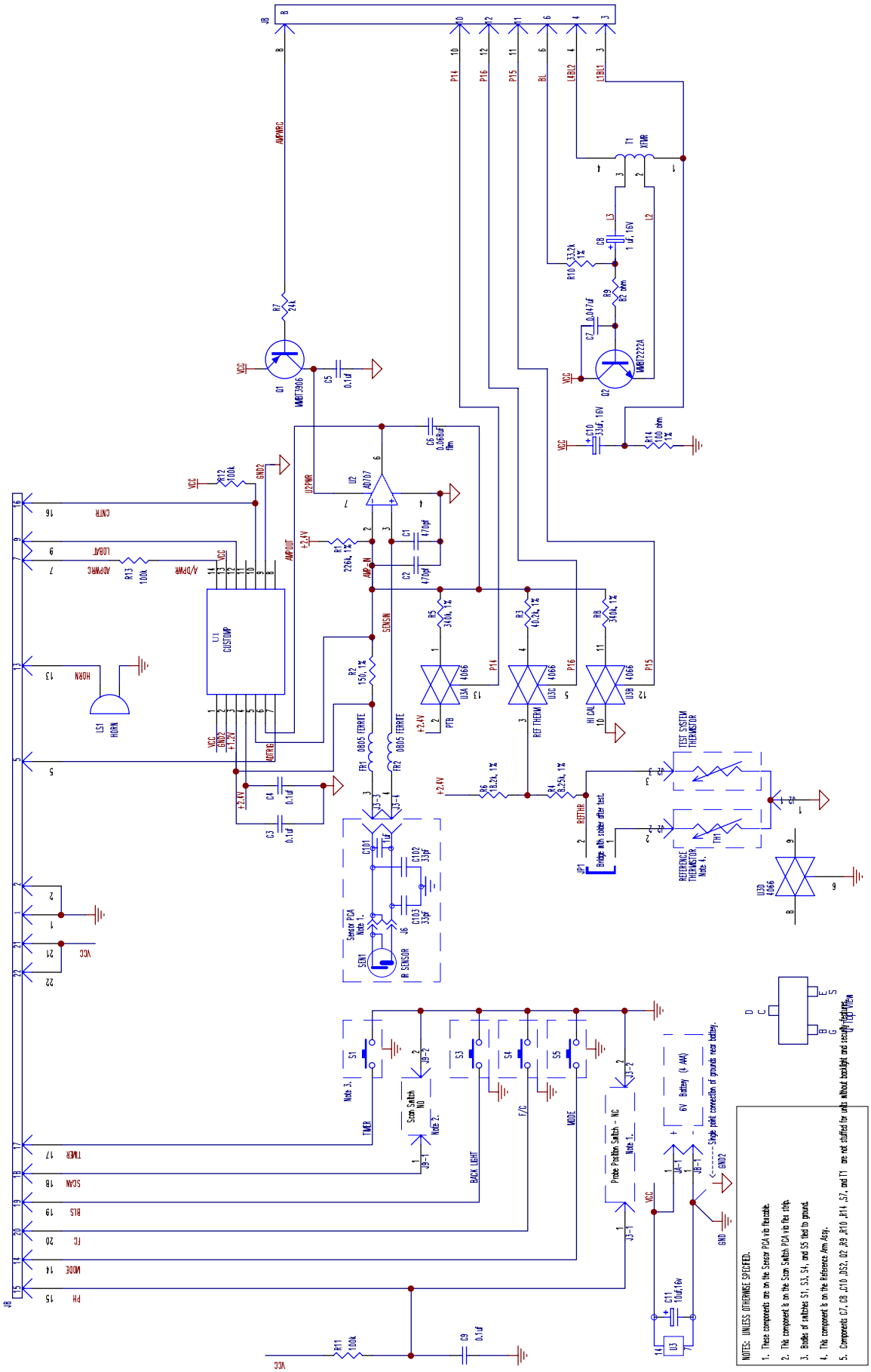


Figure K: PCB/Components




NOTES: UNLESS OTHERWISE SPECIFIED.
1. These components are on the Sensor PCA via flexcable.
2. This component is on the Scan Switch PCA via flex strip.
3. Diodes of switches S1, S3, S4, and S5 tied to ground.
4. This component is on the Reference Arm Assy.
5. Components D7, Q3, C10, D22, Q2, R9, R10, R14, S7, and T1 are not stuffed for units without backlight and security features.
Q1 (TOP View)
Sensor PCA Note 1.
IR SENSOR
Probe Position Switch - NC
Note 1.
Scan Switch NO
Note 2.
Note 3.
6V Battery (4 AAA)
<-- Single point connection of grounds near battery.
Bridge with solder after test.
REFERENCE THERMISTOR Note 4.
TEST SYSTEM THERMISTOR
HORN
LS1
CUSTOMP
U1
AD707
U2
MMBT3906
Q1
MMBT2222A
Q2
4066
U3A
U3C
U3B
U3D
TIMER
SCAN
BLS
FC
MODE
PH
BACK LIGHT
MODE
TIMER
VCC
GND
GND2
+2.4V
+1.2V
AMPOUT
AMP_IN
SENSIN
U2PWR
ADCTRIG
A/DPWR
ADPWRC
LOBAT
CNTR
REFTHR
HI CAL
REF THERM
PTB
P14
P15
P16
BL
LABL1
LABL2
XTAL
AMPWRC

LIMITED WARRANTY - MODEL 9000

WELCH ALLYN LIMITED WARRANTY: NEW UNITS–3 YEARS

REFURBISHED UNITS–1 YEAR

Welch Allyn, Inc. (“Welch Allyn”) warrants that each new Welch Allyn Model 9000 Thermometer (the “Product”) is free from defects in material and workmanship under normal use and service for a period of three years from the date of first shipment from Welch Allyn and one year for refurbished units. This Warranty shall be fulfilled by the repair or replacement by Welch Allyn or its authorized representative, at Welch Allyn’s discretion of any such defect, free of charge for parts and labor.

EXCLUSIONS FROM WARRANTY

This Welch Allyn Warranty shall be void, and Welch Allyn will not be responsible for any loss associated with, any of the following: (i) probe tips damaged or defective after delivery to Customer, (ii) not providing routine maintenance and calibration, (iii) missing, damaged, or discharged batteries after the first year, (iv) any product that (a) has had the serial number defaced, (b) has been repaired by anyone other than Welch Allyn or an authorized Welch Allyn service representative (c) has been altered or (d) has been used in any manner other than in accordance with instructions or shows evidence of abusive handling.

WARRANTY CLAIMS

If a Product requires service during the applicable warranty period, the Customer should immediately return the Product at Customer’s own expense to Welch Allyn, 7420 Carroll Road, San Diego, CA 92121. Any risk of loss or damage in shipment of the Product to Welch Allyn shall be borne exclusively by Customer. Repair or replacement will be made at Welch Allyn’s expense subject to the terms of this Warranty. Product repaired under warranty provisions will be returned to Customer at Welch Allyn's expense. Any damage in shipment from Welch Allyn is the responsibility of the delivery carrier.

LIMITATIONS

In no event shall Welch Allyn be liable for any incidental, indirect, or consequential damages in connection with the purchase or use of any Product.

This Warranty is in lieu of other obligations or liabilities on Welch Allyn’s part, and Welch Allyn neither assumes, nor authorizes, any representative or other person to assume for it any other liability in connection with the sale of the Product.

THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE, OR OTHER WARRANTY OF QUALITY, WHETHER EXPRESS OR IMPLIED, WELCH ALLYN WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

LIMITED WARRANTY - MODEL 9020

WELCH ALLYN LIMITED WARRANTY: NEW UNITS–1 YEAR
REFURBISHED UNITS–1 YEAR

Welch Allyn, Inc. (“Welch Allyn”) warrants that each new Welch Allyn Model 9020 Thermometer (the “Product”) is free from defects in material and workmanship under normal use and service for a period of one year for new units or 1 year for refurbished from the date of shipment from Welch Allyn. This Warranty shall be fulfilled by the repair or replacement by Welch Allyn or its authorized representative, at Welch Allyn’s discretion of any such defect, free of charge for parts and labor.

EXCLUSIONS FROM WARRANTY

This Welch Allyn Warranty shall be void, and Welch Allyn will not be responsible for any loss associated with, any of the following: (i) probe tips damaged or defective after delivery to Customer, (ii) not providing routine maintenance and calibration, (iii) missing, damaged, or discharged batteries after the first year, (iv) any product that (a) has had the serial number defaced, (b) has been repaired by anyone other than Welch Allyn or an authorized Welch Allyn service representative (c) has been altered or (d) has been used in any manner other than in accordance with instructions or shows evidence of abusive handling.

WARRANTY CLAIMS

If a Product requires service during the applicable warranty period, the Customer should immediately return the Product at Customer’s own expense to Welch Allyn, 7420 Carroll Road, San Diego, CA 92121. Any risk of loss or damage in shipment of the Product to Welch Allyn shall be borne exclusively by Customer. Repair or replacement will be made at Welch Allyn’s expense subject to the terms of this Warranty. Product repaired under warranty provisions will be returned to Customer at Welch Allyn's expense. Any damage in shipment from Welch Allyn is the responsibility of the delivery carrier.

LIMITATIONS

In no event shall Welch Allyn be liable for any incidental, indirect, or consequential damages in connection with the purchase or use of any Product.

This Warranty is in lieu of other obligations or liabilities on Welch Allyn’s part, and Welch Allyn neither assumes, nor authorizes, any representative or other person to assume for it any other liability in connection with the sale of the Product.

THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE, OR OTHER WARRANTY OF QUALITY, WHETHER EXPRESS OR IMPLIED, WELCH ALLYN WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

Welch Allyn

7420 Carroll Road, San Diego, CA • (619) 621-6600 • (800) 854-2904 • FAX (619) 621-6610

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