6.6 Diagnostic codes

When a fault occurs, the software, records a six-digit alphanumeric diagnostic code in the System Diagnostic Log, if possible.

Diagnostic codes for some of the POST kernal test faults cannot be displayed by the GUI and are reported only by the diagnostic LED array on the applicable CPU PCB. The system is unable to record these particular faults in the System Diagnostic Log.

6.6.1 How to interpret diagnostic codes

The first letter of a diagnostic code in the System Diagnostic Log identifies the module (BD or GUI) where the fault was detected and whether it was minor or major. First letters in a diagnostic code of L and K denote BD CPU minor and major faults, respectively, while the letters Z and X denote GUI CPU minor and major faults.

The second letter in the six-digit code indicates where the fault occurred in the software. The last four diagnostic code characters can provide additional error code information.

XXXS below outlines the possible values of certain digits in the alphanumeric diagnostic code and provides top-level interpretations.

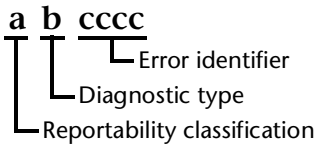


Table 6-1: Values of diagnostic code digits

where:	may be...	which means...
a	A	Alert (during SST/EST)
	D or H	BDU problem that resulted in soft reset during operation (as opposed to during POST)
	E	BDU user event (not an error)
	F	Failure (during SST/EST)
	G	BDU illegal instruction trap, watchdog reset, or illegal address trap that resulted in BDU soft reset
	J	BDU watchdog umpire (3 “strikes” in 24 hours) caused Safety Valve Open (SVO)
	K	BDU failure (during POST or background check) caused SVO
	L	POST or background check alert or communication error in BDU
	S	GUI user event
	U or V	GUI problem that resulted in soft reset during operation
	X	GUI failure (during POST or background check) caused GUI or ventilator inoperative condition
	Z	POST or background check alert or communication error in GUI

Table 6-1: Values of diagnostic code digits

where:	may be...	which means...
b	B	Background check
	C	Communications test
	E	EST
	N	Nonmaskable interrupt
	P	POST or initialization software
	S	SST
	T	Hardware-detected failure (trap)
	Y	GUI watchdog umpire (3 "strikes" in 24 hours) causes GUI inoperative condition
	(None)	Soft fault (assertion)
cccc	(Varies)	Other error identification information

6.7 Organization of diagnostic codes table

Table 6-2 is a comprehensive summary of the diagnostic codes that the *840* software can report. The organization of the information in this table is as follows:

- The first column lists, in alphanumeric order, the codes.
- The second column lists the accompanying message.
- The third column lists the part of software that was running when the error was detected.
- The fourth column lists the ventilator's response to the condition, as follows:

ALERT Test result not ideal, but not critical.

In POST: POST continues to end and ventilation starts. A DEVICE ALERT alarm is annunciated (Section 7).

In SST/EST: SST/EST continues to end. You can override the alert and start ventilation.

In a background check: Ventilation continues, and a DEVICE ALERT alarm is annunciated.

FAILURE Critical problem detected.

In POST: Ventilator inoperative condition is declared.

In SST/EST: You can continue trying to pass SST or EST, but if test does not pass, ventilator inoperative condition is declared.In a background check: Ventilator inoperative condition is declared.

BDU RESET Circuitry in the BDU is reset, which causes BDU POST to be rerun. If POST passes, ventilation continues. If POST fails, it generates an alert or failure.

GUI RESET Circuitry in the GUI is reset, which causes GUI POST to be rerun. If POST passes, GUI operation resumes. If GUI POST does not pass, it declares a GUI inop condition.

VENT INOP Ventilator is put into SVO state, permitting patient to breathe room air.

ALERT	Test result not ideal, but not critical. In POST: POST continues to end and ventilation starts. A DEVICE ALERT alarm is annunciated (Section 7). In SST/EST: SST/EST continues to end. You can override the alert and start ventilation. In a background check: Ventilation continues, and a DEVICE ALERT alarm is annunciated.
FAILURE	Critical problem detected. In POST: Ventilator inoperative condition is declared. In SST/EST: You can continue trying to pass SST or EST, but if test does not pass, ventilator inoperative condition is declared.In a background check: Ventilator inoperative condition is declared.
GUI INOP	The BDU alarms, ventilator settings are locked, and a message is displayed.
STATUS	Code/message listed for information only; requires no action.

- The fifth column provides additional information and/or identifies possible causes.
- The sixth column suggests how to correct the condition. These actions are sequenced to correct the most probable malfunction or to present the most efficient corrective action first. The proposed fixes listed, however, may not always correct the particular problem.

In addition to the actions suggested in the tables in this section, keep the following in mind when troubleshooting the ventilator:

- Verify secure connections of cables and ventilator modules.
- If possible, run full EST, bypassing any failures or faults that may occur, to further diagnose a problem.
- Replace BD or GUI CPU PCB only after all other remedies have been attempted. Contact Puritan-Bennett Technical Support for further assistance.
- Check for system leaks, particularly at the expiratory filter. Make sure the expiratory filter collector vial is secured tightly, the drain port is capped, and the filter is mounted securely to the ventilator. Make sure the test circuit is securely attached.
- Before running SST or EST, ensure that the unit has been warmed up for at least 10 minutes in ambient temperature. Failure to warm up the ventilator may result in false flow sensor or pressure transducer failures.

When troubleshooting SST or EST, always use a known good patient circuit or gold standard circuit and filter(s).

Table 6-2: *840* Ventilator diagnostic codes

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
AE0110	Unable to establish O_2 flow	EST Flow sensors cross check Test	Alert	Flow controller unable to establish and control oxygen flow at 120 L/min.	1. Make sure oxygen supply is connected and unrestricted. 2. Verify oxygen regulator pressure is set between 9-12 psi. 3. Switch PSOLs to see if failure transfers to the other gas side. If yes, return the air PSOL to its original position and replace the oxygen PSOL. 4. Run the leak test in EST to check for leaks/occlusions. 5. Perform a flow sensor calibration. 6. Replace Q1. 7. Replace the Inspiratory Electronics PCB. 8. Replace the AI PCB.
AE0111	Unable to establish air flow	EST Flow sensors cross check Test	Alert	Flow controller unable to establish and control air flow at 120 L/min.	1. Make sure air supply is connected and unrestricted. 2. Verify air regulator pressure is set between 9-12 psi. 3. Switch PSOL's to see if failure transfers to the other gas side. If yes, return Oxygen PSOL to its original position and replace the Air PSOL. 4. Run the leak test in EST to check for leaks/occlusions. 5. Perform a flow sensor calibration. 6. Replace Q2. 7. Replace the Inspiratory Electronics PCB. 8. Replace the AI PCB.
AE0213	Air PSOL leak	EST Gas Supply/SV Test	Alert	Air PSOL (PSOL2) forward leak was detected via excessive pressure buildup (> 50 cmH_2O but < 100 cmH_2O) in blocked inspiratory module.	1. Check for leaks around the Q2 O-rings. 2. Make sure air supply is connected and unrestricted. 3. Reseat Air PSOL. 4. Replace Air PSOL. 5. Replace AI PCB.
AE0214	O_2 PSOL leak	EST Gas Supply/SV Test	Alert	Oxygen PSOL (PSOL1) forward leak was detected via excessive pressure buildup (> 50 cmH_2O but < 100 cmH_2O) in blocked inspiratory module.	1. Check for leaks around the Q1 O-rings. 2. Make sure oxygen supply is connected and unrestricted. 3. Reseat oxygen PSOL. 4. Replace oxygen PSOL. 5. Replace AI PCB.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
AE0306	Test circuit not connected	EST Leak Test	Alert	Pressure not detected on expiratory side	1. Make sure test circuit is properly connected. 2. Replace expiratory bacteria filter. 3. Check for leaks around the Q3 flow sensor. 4. Check/replace the exhalation valve. 5. Replace the expiratory pressure transducer PCB.
AE0601	GUI High Alarm LED fails.	EST GUI Lamp Test	Alert	CLEAR key pressed to indicate LED not on.	1. Check/replace interconnect cable between the GUI LED PCB and the GUI CPU PCB. 2. Replace the GUI LED PCB.
AE0602	GUI Medium Alarm LED fails.	EST GUI Lamp Test	Alert	CLEAR key pressed to indicate LED not on.	1. Check/replace interconnect cable between the GUI LED PCB and the GUI CPU PCB. 2. Replace the GUI LED PCB.
AE0603	GUI Low Alarm LED fails.	EST GUI Lamp Test	Alert	CLEAR key pressed to indicate LED not on.	1. Check/replace interconnect cable between the GUI LED PCB and the GUI CPU PCB. 2. Replace the GUI LED PCB.
AE0604	GUI Normal LED fails.	EST GUI Lamp Test	Alert	CLEAR key pressed to indicate LED not on.	1. Check/replace interconnect cable between the GUI LED PCB and the GUI CPU PCB. 2. Replace the GUI LED PCB.
AE0605	GUI Batt Backup LED fails.	EST GUI Lamp Test	Alert	CLEAR key pressed to indicate LED not on.	1. Check/replace interconnect cable between the GUI LED PCB and the GUI CPU PCB 2. Replace the GUI LED PCB.
AE0606	GUI On Batt Pwr LED fails.	EST GUI Lamp Test	Alert	CLEAR key pressed to indicate LED not on.	1. Check/replace interconnect cable between the GUI LED PCB and the GUI CPU PCB. 2. Replace the GUI LED PCB.
AE0607	GUI Compressor Ready LED fails.	EST GUI Lamp Test	Alert	CLEAR key pressed to indicate LED not on.	1. Check/replace interconnect cable between the GUI LED PCB and the GUI CPU PCB. 2. Replace the GUI LED PCB.
AE0608	GUI Compressor Operating LED fails.	EST GUI Lamp Test	Alert	CLEAR key pressed to indicate LED not on.	1. Check/replace interconnect cable between the GUI LED PCB and the GUI CPU PCB. 2. Replace the GUI LED PCB.
AE0609	GUI 100% O_2 LED fails.	EST GUI Lamp Test	Alert	CLEAR key pressed to indicate LED not on.	1. Check/replace interconnect cable between the GUI LED PCB and the GUI CPU PCB. 2. Replace keyboard.
AE0610	GUI Alarm Silence LED fails.	EST GUI Lamp Test	Alert	CLEAR key pressed to indicate LED not on.	1. Check/replace interconnect cable between the GUI LED PCB and the GUI CPU PCB. 2. Replace the GUI LED PCB.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
AE0611	GUI Screen Lock LED fails.	EST GUI Lamp Test	Alert	CLEAR key pressed to indicate LED not on.	1. Check/replace interconnect cable between the GUI LED PCB and the GUI CPU PCB. 2. Replace the GUI LED PCB.
AE0702	Bad Vent inop LED	EST BD Lamp Test	Alert	CLEAR key pressed to indicate one or both ventilator inoperative LEDs not on.	Replace BD LED PCB.
AE0703	Bad SVO LED	EST BD Lamp Test	Alert	CLEAR key pressed to indicate one or both SVO LEDs not on.	Replace BDU LED PCB.
AE0704	Bad Loss of GUI LED	EST BD Lamp Test	Alert	CLEAR key pressed to indicate loss of GUI LED not on.	Replace BDU LED PCB.
AE1001	Air PSOL loopback current OOR	EST PSOL Loopback Test	Alert	Air PSOL (PSOL2) loopback current out of range of drive current.	1. Verify that the air supply is good. 2. Verify air regulator pressure set to between 9 and 12 psi. 3. Switch PSOLs to see if failure transfers to the other gas side. If yes, return oxygen PSOL (PSOL1) to its original position and replace PSOL2. 4. Switch Q1 and Q2, run a flow sensor calibration and rerun test. If the problem transfers to the other gas side, return Q1 to its original position and replace Q2. 5. Replace the AI PCB. 6. Replace the Inspiratory Electronics PCB.
AE1002	O_2 PSOL loopback current OOR	EST PSOL Loopback Test	Alert	Oxygen PSOL (PSOL1) loopback current out of range of drive current.	1. Verify that the oxygen supply is good. 2. Verify oxygen regulator pressure set to between 9 and 12 psi. 3. Switch PSOLs to see if failure transfers to the other gas side. If yes, return the air PSOL to its original position and replace PSOL1. 4. Switch Q1 and Q2, run a flow sensor calibration and rerun test. If the problem transfers to the other gas side, return Q2 to its original position and replace Q1. 5. Replace the AI PCB. 6. Replace the Inspiratory Electronics PCB.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
AE1104	Insp check valve test failed	EST Safety System Test	Alert	It took too little time to relieve excess pressure through open safety valve, indicating inspiratory check valve (CV3) may be damaged or incorrectly mounted.	1. Make sure test circuit is connected. 2. Make sure CV3 is not installed backward. 3. Replace CV3.
AE1201	Exp valve loopback current OOR	EST Exp Valve Loopback Test	Alert	Exhalation valve loopback current is out of range of drive current.	1. Verify that the system has no leaks or occlusions by running the leak test in EST. 2. Clean exhalation valve diaphragm. 3. Calibrate the exhalation valve. 4. Clean/replace the exhalation valve. 5. Replace the AI PCB.
AE1305	Seal test failed	EST Exp Valve Seal Test	Alert	Seal test Δ pressure is above alert level but below failure level.	1. Verify that the system has no leaks or occlusions by running the leak test in EST. 2. Clean the exhalation valve. 3. Calibrate exhalation valve. 4. Replace the exhalation valve. 5. Replace the AI PCB.
AE1600	Compressor Test - Not installed	EST Compressor Test	Status	Ventilator did not sense a compressor attached and skipped test.	No action required.
AE1601	Wall air pressure detected	EST Compressor Test	Alert	Wall air pressure switch (PS2) detected air after user was prompted to disconnect air.	1. Make sure air supply is disconnected. 2. Disconnect PS2 and rerun test. If test passes, replace PS2.
AE1602	ac power not connected	EST Compressor Test	Alert	System is still running on battery power after prompting user to connect ac power. Compressor can only run on ac (facility) power.	1. Plug in ventilator power cord and check the cord connection at the ventilator. 2. Check ac. 3. Disconnect BPS to isolate problem. 4. Replace power supply.
AE1603	Compressor pressure not detected	EST Compressor Test	Alert	Compressor pressure transducer (PC) indicates that compressor air is not present, although compressor motor is on.	1. Run compressor leak test to check for leaks. a. Use leak detector to check for leaks at the accumulator fittings and other tubing connections. b. Verify no leaks at CV2 within the ventilator by plugging the air inlet fitting. 2. Replace compressor PCB. 3. Contact Puritan-Bennett Technical Support.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
AE1604	Run mode time OOR	EST Compressor Test	Alert	Compressor timer is not running while compressor motor is on.	Listen for motor. If motor is on, replace compressor PCB. Otherwise, replace compressor.
AE1606	Compressor pressure detected	EST Compressor Test	Alert	Compressor pressure transducer (PC) indicates that compressor air is present after compressor motor is disabled and accumulator drained.	Replace compressor PCB.
AE1607	Disabled mode time OOR	EST Compressor Test	Alert	Compressor timer is running while compressor motor is off.	Replace compressor PCB.
AE1608	Unable to test standby mode	EST Compressor Test	Alert	Compressor standby mode check cannot be run, because of inability to verify timer functionality during compressor run and disabled tests.	1. Troubleshoot code AE1604 or AE1607, if present. 2. Replace compressor PCB.
AE1609	Standby mode time OOR	EST Compressor Test	Alert	Compressor motor is still running. During standby mode test phase, compressor motor should eventually turn off.	Replace compressor PCB.
AE1610	Unable to perform compressor load test	EST Compressor Test	Alert	Compressor load test cannot be run, because of inability to verify PC during compressor run and disabled tests.	Troubleshoot code AE1603 or AE1606.
AE1611	Compressor load test failed	EST Compressor Test	Alert	Compressor unable to maintain minimum pressure under worst-case breath delivery waveform.	1. Run compressor leak test to check for compressor leak. a. Use leak detector to check for leaks at the accumulator fittings and other tubing connections. b. Verify no leaks at CV2 within the ventilator by plugging the air inlet fitting. 2. Replace compressor. 3. Replace compressor PCB.
AE1700	Compressor Leak Test - Not installed	EST Compressor Leak Test	Status	Ventilator did not sense a compressor attached and skipped test.	No action required.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
AE1701	Unable to perform compressor leak test	EST Compressor Leak Test	Alert	Compressor leak test cannot be run, because of inability to verify timer functionality.	1. Troubleshoot accompanying code AE1604 or AE1607. 2. Replace compressor PCB.
AE1702	Wall air pressure detected	EST Compressor Leak Test	Alert	Wall air pressure switch (PS2) detected air presence after user was prompted to disconnect air.	1. Make sure air supply is disconnected. 2. Disconnect PS2 and rerun test. If test passes, replace PS2.
AE1703	Wall air pressure not detected	EST Compressor Leak Test	Alert	Wall air pressure switch (PS2) did not detect air presence after user was prompted to connect air.	1. Make sure air supply is connected. 2. Run Gas Supply/SV Test.
AE1704	Compressor leak detected	EST Compressor Leak Test	Alert	Compressor leak was detected using compressor timer to detect compressor turning on momentarily during test.	Troubleshoot compressor compartment or inspiratory module for leaks.
AE1901	GUI touch: Error	EST GUI Touch Test	Alert	Touch screen error occurred (e.g., blocked beam or low-level error), buffer cannot be read, or report is invalid.	1. Clean touch screen, removing any obstructions. 2. Replace touch frame PCB. 3. Replace GUI CPU PCB.
AE2001	Bad GUI serial port	EST GUI Serial Port Test	Alert	While in loopback mode, failed to verify received message was identical to transmitted message.	Replace GUI CPU PCB.
AE2101	Battery not charged	EST Battery Test	Alert	BPS not fully charged at start of test.	1. Allow BPS to fully charge, then repeat test. 2. Replace BPS PCB. 3. Replace battery pack. 4. Replace BD CPU PCB.
AE2102	Battery not discharging	EST Battery Test	Alert	BPS not discharging after ac power was disconnected.	1. Verify ac power is disconnected when prompted. 2. Replace BPS PCB. 3. Replace battery pack. 4. Replace BD CPU PCB.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
AE2103	Bad Backup Power Supply	EST Battery Test	Alert	While BPS was discharging, BPS voltage dropped below accepted level or dropped too quickly.	1. Ensure that the battery pack is fully charged by checking that the green LED on the BPS is lit prior to initiating an EST. If the amber LED is lit, allow the unit to charge the batteries prior to rerunning EST. 2. Replace the battery pack. 3. Replace the BPS PCB. 4. Replace the AI PCB. 5. Replace the power supply.
AE2104	Battery not charging	EST Battery Test	Alert	BPS not charging after ac power was reconnected.	1. Verify that ac power is reconnected when prompted and that ac is good. 2. Replace BPS PCB. 3. Replace the battery pack. 4. Replace the power supply. 5. Replace the BD CPU. 6. Replace the AI PCB.
AE2300	GUI Nurse Call Test - Not installed	EST Test	Status	User pressed CLEAR to indicate nurse's call device not installed. Test was skipped.	No action required.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
AS0010	Unable to establish O_2 flow	SST flow sensor test	Alert	Flow controller unable to establish and control oxygen flow at 120 L/min.	1. Make sure oxygen supply is connected and unrestricted. 2. Verify that the oxygen supply meets minimum pressure requirements. 3. Verify that the patient circuit system has no leaks or occlusions. If not sure, run the first four tests in EST to get to the leak test. If the leak test passes in EST, exit out of EST. Correct the leak or occlusion in the patient circuit used in SST and rerun or try another patient circuit. 4. Check the oxygen inlet filter assembly. 5. Verify that the oxygen regulator pressure is set between 9-12 psi. 6. Run a flow sensor calibration. 7. Switch Q1 and Q2. Rerun the flow sensor calibration and EST. If the failure transfers to the air side, return Q2 back to its original position and replace Q1. 8. Switch PSOLs to see if the failure transfers to the air side. If yes, return PSOL2 back to its original position and replace PSOL1.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
AS0011	Unable to establish air flow	SST flow sensor test	Alert	1. Flow controller unable to establish and control air flow at 120 L/min.	1. Make sure air supply is connected and unrestricted. 2. Verify that the air supply meets minimum pressure requirements. 3. Verify that the patient circuit system has no leaks or occlusions. If not sure, run the first four tests in EST to get to the leak test. If the leak test passes in EST, exit out of EST. Correct the leak or occlusion in the patient circuit used in SST and rerun or try another patient circuit. 4. Check the air inlet filter (F2). 5. Verify that the air regulator pressure is set between 9-12 psi. 6. Run a flow sensor calibration. 7. Switch Q1 and Q2. Rerun the flow sensor calibration and EST. If the failure transfers to the oxygen side, return Q1 back to its original position and replace Q2. 8. Switch PSOLs to see if the failure transfers to the oxygen side. If yes, return PSOL1 back to its original position and replace PSOL2.
AS0012	O_2 pressure not detected	SST flow sensor test	Alert	Oxygen pressure not detected via PS1. Only air available for SST.	Make sure oxygen supply is connected.
AS0013	Wall air pressure not detected	SST flow sensor test	Alert	Air pressure not detected via PS2 or PC. Only oxygen available for SST.	Make sure air supply is connected.
AS0202	Excessive leak	SST Circuit leak	Alert	Pressure drops to 85 cmH_2O in 10 s, then in 10 s more by $\geq$ 10 cmH_2O.	1. Make sure patient circuit is connected and is not leaking. 2. Check exhalation valve operation. 3. Verify connections of bacteria filters and humidifier are secure.
AS0305	Occluded expiratory filter	SST Expiratory filter	Alert	Pressure drop across filter > 2 cmH_2O, but < 3 cmH_2O.	Consider replacing expiratory filter.
AS0308	Occluded expiratory compartment	SST Expiratory filter	Alert	Exhalation compartment pressure > 3 cmH_2O but < 4 cmH_2O.	1. Check compartment for obstruction. 2. Verify exhalation valve operation by running EST.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
AS0311	Low expiratory filter ΔP	SST Expiratory filter	Alert	Pressure drop across expiratory filter < 0.4 cmH_2O, but > 0.1 cmH_2O.	1. Repeat test, following directions more closely. 2. Replace filter.
AS0403	Occluded inspiratory limb	SST Circuit Resistance	Alert	Inspiratory limb pressure > 8.5 cmH_2O (adult) or 5.5 cmH_2O (pediatric), but < 12.5 cmH_2O (adult) or 7.5 cmH_2O (pediatric), indicating occlusion.	Check for occluded patient tubing.
AS0406	Occluded exhalation limb	SST Circuit Resistance	Alert	Expiratory limb pressure > 8.5 cmH_2O (adult) or 5.5 cmH_2O (pediatric) but > 12.5 cmH_2O (adult) or 7.5 cmH_2O (pediatric), indicating occlusion.	Check for occluded patient tubing.
AS0407	Unable to reach min peak flow	SST Circuit Resistance	Alert	During characterization of total circuit resistance over a range of flows, peak flow < 80 L/min but > 60 L/min.	Check for kinked or occluded patient tubing.
AS0411	Unable to reach min peak flow	SST Circuit Resistance	Alert	During characterization of total circuit resistance over a range of flows, peak flow was less than alert threshold.	Check for kinked or occluded patient tubing.
AS0413	Insp limb resistance low	SST Circuit Resistance	Alert	Inspiratory limb pressure < 0.6 cmH_2O (adult) or 5.5 cmH_2O (pediatric), but > 0.2 cmH_2O.	1. Make sure inspiratory filter is installed. 2. Repeat test, following directions more closely. 3. Replace inspiratory filter. 4. Replace patient circuit.
AS0414	Exp limb resistance low	SST Circuit Resistance	Alert	Expiratory limb pressure < 0.6 cmH_2O (adult) or 0.5 cmH_2O (pediatric), but > 0.2 cmH_2O.	Replace patient circuit.
AS0505	Excessive compliance	SST Compliance calibration	Alert	High compliance >6 mL/cmH_2O (adult) or 4.5 mL/cmH_2O (pediatric), but <12 mL/cmH_2O (adult) or 9 mL/cmH_2O (pediatric).	1. Make sure correct patient tubing type was specified in SST. 2. Replace patient circuit.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
AS0507	Compliance low	SST Compliance calibration	Alert	High compliance falls below 1.56 mL/cmH_2O (adult) or 1.34 mL/cmH_2O (pediatric) but not lower than 1.05 mL/cmH_2O.	1. Make sure correct patient tubing type was specified in SST. 2. Replace patient circuit with a known good circuit and filter set. 3. Run EST to check the operation of PI and PE during the Circuit Pressure Test. Replace applicable pressure transducer. 4. Run Atmospheric Pressure Transducer calibration.
AS0509	Excessive compliance	SST Compliance calibration	Alert	Low compliance > 6 mL/cmH_2O (adult) or 4.5 mL/cmH_2O (pediatric), but < 12 mL/cmH_2O (adult) or 9 mL/cmH_2O (pediatric).	1. Make sure correct patient tubing type was specified in SST. 2. Replace patient circuit with a known good circuit and filter set. 3. Run EST to check the operation of PI and PE during the Circuit Pressure Test. Replace applicable pressure transducer. 4. Run Atmospheric Pressure Transducer calibration.
AS0511	Compliance low	SST Compliance calibration	Alert	Low compliance falls below 1.56 mL/cmH_2O (adult) or 1.34 mL/cmH_2O (pediatric), but not below 1.05 mL/cmH_2O.	1. Make sure correct patient tubing type was specified in SST. 2. Replace patient circuit with a known good circuit and filter set. 3. Run EST to check the operation of PI and PE during the Circuit Pressure Test. Replace applicable pressure transducer. 4. Run Atmospheric Pressure Transducer calibration.
Dxxxxx	Assertion	Background Checks (BD)	Failure that results in a POST or a reset	System generated a reset to correct a boundary check or possible data corruption of control variables.	Replace the BDCPU PCB.
DT0002	Bus error / Access fault	Background Checks (BD)	Failure that results in a POST or a reset	Hardware trap from an access fault due to a bad memory chip, bad control line, or a hardware timing issue.	Replace the BD CPU PCB.
Exxxxx	Varies	Background Checks (GUI)	Status	A status message indicating an event that was intentionally caused.	

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
NOTE: For all "FE" codes (failures reported during EST), diagnose the problem and perform the repair. Run a complete EST to reset the EST test failure in memory. If there is a failed EST test result in memory, normal operation is prevented until the failed EST test is rerun and passes.					
FE0001	Inspiratory autozero out of range	EST Circuit Pressure Test	Failure	Inspiratory pressure transducer ADC count at 0 cmH_2O is out of range.	1. Replace SOL1. 2. Replace Inspiratory Electronics PCB. 3. Replace AI PCB.
FE0002	Expiratory autozero out of range	EST Circuit Pressure Test	Failure	Exhalation pressure sensor ADC count at 0 cmH_2O is out of range.	1. Replace SOL2. 2. Replace exhalation transducer PCB. 3. Replace AI PCB.
FE0003	Failed to reach test pressure	EST Circuit Pressure Test	Failure	Unable to build pressure (air) to 10 cmH_2O at 5 L/min within time-out period.	1. Make sure that test circuit is installed and air supply or compressor is available and good. 2. Verify that the air regulator pressure is set between 9-12 psi. 3. Verify that the patient circuit system has no leaks or occlusions by running the first four tests in EST to get to the leak test.
FE0004	Cross-check failed	EST Circuit Pressure Test	Failure	Inspiratory/expiratory pressure transducer readings at 10 cmH_2O test pressure are too far apart.	1. Verify that the system has no leaks or occlusions. If not sure, run the first four tests in EST to run the leak test 2. If the leak test passes in EST, exit out of EST. Review the data for the Circuit Pressure Test to determine which pressure transducer is out of range: PI or PE. Replace applicable pressure transducer. 3. Replace AI PCB.
FE0005	Bad insp autozero solenoid	EST Circuit Pressure Test	Failure	Inspiratory pressure reading (taken after inspiratory pressure transducer autozero solenoid (SOL1) actuated) out of range (-0.60 to 0.60 cmH_2O).	1. Replace SOL1. 2. Replace Inspiratory Electronics PCB. 3. Replace AI PCB.
FE0006	Bad exp autozero sol	EST Circuit Pressure Test	Failure	Expiratory pressure reading (taken after expiratory pressure transducer autozero solenoid (SOL2) actuated) out of range (-0.60 to 0.60 cmH_2O).	1. Replace SOL2. 2. Replace exhalation transducer PCB. 3. Replace AI PCB.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
FE0007	Cross-check failed	EST Circuit Pressure Test	Failure	Inspiratory/expiratory pressure transducer measurements at 50 or 100 cmH_2O test pressure are too far apart.	1. Replace the expiratory bacteria filter. 2. Verify that the system has no leaks or occlusions. If not sure, run the first four tests in EST to run the leak test. 3. If the leak test passes in EST, exit out of EST. Review the data for the Circuit Pressure Test to determine which pressure transducer is out of range: PI or PE. Replace applicable pressure transducer. 4. Replace AI PCB.
FE0008	Failed to reach test pressure	EST Circuit Pressure Test	Failure	Unable to build pressure (air) to 50 or 100 cmH_2O at 5 L/min within time-out period.	1. Make sure air supply or compressor is available. 2. Check for system leak at the expiratory bacteria filter or O2 sensor. If not sure, run the first four tests in EST to run the leak test.
FE0010	ac power not connected	EST Circuit Pressure Test	Failure	System is still running on battery power after prompting user to connect ac power. EST can only run on ac (facility) power.	1. Plug in ventilator power cord. 2. Disconnect BPS to isolate problem. 3. Replace power supply.
FE0101	O_2 flow sensor cross check failed	EST Flow sensors cross check Test	Failure	Oxygen flow sensor (Q1) cross-check failed.	1. Make sure oxygen supply is connected and unrestricted. 2. Verify that the oxygen supply is good. 3. Verify that the system has no leaks or occlusions. If not sure, run the first four tests in EST to run the leak test. 4. Run a flow sensor calibration.6. Switch Q1 and Q2. Rerun the flow sensor calibration and EST. If the failure transfers to the air side, return Q2 back to its original position and replace Q1. 5. Switch PSOLs to see if the failure transfers to the air side. If yes, return PSOL2 back to its original position and replace PSOL1. 6. Replace exhalation flow sensor (Q3) 7. Replace AI PCB.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
FE0102	O_2 PSOL current out of range	EST Flow sensors cross check Test	Failure	Oxygen PSOL (PSOL1) current is out of range with respect to flow sensor (Q1).	1. Make sure oxygen supply is connected and unrestricted. 2. Verify that the oxygen supply is good. 3. Verify that the system has no leaks or occlusions. If not sure, run the first four tests in EST to run the leak test. 4. Switch PSOLs to see if the failure transfers to the air side. If yes, return PSOL2 back to its original position and replace PSOL1. 5. Run a flow sensor calibration. 6. Switch Q1 and Q2. Rerun the flow sensor calibration and EST. If the failure transfers to the air side, return Q2 back to its original position and replace Q1.
FE0103	Air flow sensor cross check failed	EST Flow sensors cross check Test	Failure	Inspiratory module air flow sensor (Q2) cross-check failed.	1. Make sure air supply is connected and unrestricted. 2. Verify that the air supply is good. 3. Verify that the system has no leaks or occlusions. If not sure, run the first four tests in EST to run the leak test. 4. Run a flow sensor calibration. 5. Switch Q1 and Q2. Rerun the flow sensor calibration and EST. If the failure transfers to the oxygen side, return Q1 back to its original position and replace Q2. 6. Switch PSOLs to see if the failure transfers to the air side. If yes, return PSOL back to its original position and replace PSOL2 7. Replace exhalation flow sensor (Q3). 8. Replace AI PCB.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
FE0104	Air PSOL current out of range	EST Flow sensors cross check Test	Failure	Air PSOL (PSOL2) current is out of range with respect to air flow sensor (Q2).	1. Make sure air supply is connected and unrestricted. 2. Verify that the air supply is good. 3. Verify that the system has no leaks or occlusions. If not sure, run the first four tests in EST to run the leak test. 4. Switch PSOLs to see if the failure transfers to the air side. If yes, return PSOL back to its original position and replace PSOL2 5. Run a flow sensor calibration. 6. Switch Q1 and Q2. Rerun the flow sensor calibration and EST. If the failure transfers to the oxygen side, return Q1 back to its original position and replace Q2.
FE0106	Unable to establish O_2 flow	EST Flow sensors cross check Test	Failure	Flow controller unable to establish and control oxygen flow at 60, 5, and 1 L/min.	1. Make sure oxygen supply is connected. 2. Check regulated oxygen pressure. 3. Replace PSOL1 or Q1. 4. Replace AI PCB.
FE0107	Unable to establish air flow	EST Flow sensors cross check Test	Failure	Flow controller unable to establish and control air flow at 60, 5, and 1 L/min.	1. Make sure air supply is connected. 2. Check regulated air pressure. 3. Perform flow sensor calibration. 4. Replace PSOL2 or Q2. 5. Replace AI PCB.
FE0108	O_2 zero flow check failed	EST Flow sensors cross check Test	Failure	Inspiratory flow > 0.153 L/min with oxygen PSOL (PSOL1) commanded to 0 (closed).	1. Verify no leaks at the Q1 O-rings. 2. Run EST Gas Supply Test to check for PSOL1 leak. Remove and then reseat PSOL1 3. Replace PSOL1. 4. Perform a flow sensor calibration. 5. Replace Q1.
FE0109	Air zero flow check failed	EST Flow sensors cross check Test	Failure	Inspiratory flow > 0.153 L/min with air PSOL (PSOL2) commanded to 0 (closed).	1. Verify no leaks at the Q2 O-rings. 2. Run EST Gas Supply Test to check for PSOL2 leak. Remove and then reseat PSOL2 3. Replace PSOL2. 4. Perform a flow sensor calibration. 5. Replace Q2.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
FE0204	Wall air pressure not detected	EST Gas Supply/SV Test	Failure	Wall air not detected initially and wall air still not detected after user was prompted to connect wall air.	1. Make sure air supply is connected. 2. Check PS2: Remove the wiring connectors from PS2 and jumper the connectors to each other. If the system now recognizes the air supply, replace PS2.
FE0205	O_2 pressure not detected	EST Gas Supply/SV Test	Failure	Oxygen pressure not detected initially and oxygen pressure still not detected after user was prompted to connect oxygen.	1. Make sure oxygen supply is connected. 2. Check PS1: Remove the wiring connectors from PS1 and jumper the connectors to each other. If the system now recognizes the air supply, replace PS1.
FE0206	O_2 pressure detected (O_2 not disconnected)	EST Gas Supply/SV Test	Failure	Oxygen pressure switch detected presence of oxygen after user was prompted to disconnect oxygen.	1. Make sure oxygen supply is disconnected. 2. Replace Inspiratory Electronics PCB. 3. Replace PS1.
FE0207	Air PSOL leak	EST Gas Supply/SV Test	Failure	Air PSOL (PSOL2) forward leak was detected via excessive pressure buildup (> 100 cmH_2O) in blocked inspiratory module.	1. Check for leaks around the Q2 O-rings. 2. Verify that the safety valve relieves pressures above 100 cmH_2O. Listen for the pressure relief while watching the numeric digital display of system pressure in the upper screen. If the safety valve does not crack open, replace the safety valve. 3. Replace PSOL2.
FE0208	Wall air pressure detected	EST Gas Supply/SV Test	Failure	Wall air pressure switch (PS2) detected wall air after user was prompted to disconnect it.	1. Make sure air supply is disconnected. 2. Replace Inspiratory Electronics PCB. 3. Replace PS2.
FE0209	O_2 PSOL leak	EST Gas Supply/SV Test	Failure	Oxygen PSOL (PSOL1) forward leak was detected via excessive pressure buildup (> 100 cmH_2O) in blocked inspiratory module.	1. Check for leaks around the Q1 O-rings. 2. Verify that the safety valve relieves pressures above 100 cmH_2O. Listen for the pressure relief while watching the numeric digital display of system pressure in the upper screen. If the safety valve does not crack open, replace the safety valve. 3. Replace PSOL1.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
FE0210	SV pressure relief failed	EST Gas Supply/SV Test	Failure	Safety valve cracking pressure and/or peak steady-state pressure is out of range.	1. Make sure *To patient* port is blocked. 2. Check for leaks at the O_2 sensor, SOL1 or PI. 3. Replace the safety valve. 4. Replace PI.
FE0211	O_2 pressure not detected	EST Gas Supply/SV Test	Failure	PS1 did not detect oxygen after user was prompted to connect it.	1. Make sure oxygen supply is connected. 2. Replace Inspiratory Electronics PCB.
FE0212	Compressor pressure detected	EST Gas Supply/SV Test	Failure	Compressor pressure transducer (PC) detected that compressor was pressurized.	Replace compressor PCB.
FE0215	Air zero flow check failed	EST Gas Supply/SV Test	Failure	During zero-flow check, air flow sensor (Q2) reads > 0.05 L/min.	1. Make sure gas supplies are disconnected. 2. Make sure compressor is not running. 3. Verify no leaks at the Q2 O-rings. 4. Check for PSOL2 leak. 5. Remove and then reseat PSOL2. 6. Perform a flow sensor calibration. 7. Replace PSOL2. 8. Replace Q2.
FE0216	O_2 zero flow check failed	EST Gas Supply/SV Test	Failure	During zero-flow check, oxygen flow sensor (Q1) reads > 0.05 L/min.	1. Make sure gas supplies are disconnected. 2. Make sure compressor is not running. 3. Verify no leaks at the Q2 O-rings. 4. Check for PSOL2 leak. 5. Remove and then reseat PSOL2. 6. Perform a flow sensor calibration. 7. Replace PSOL2. 8. Replace Q2.
FE0217	Exp zero flow check failed	EST Gas Supply/SV Test	Failure	During zero-flow check, exhalation flow sensor (Q3) reads > 0.1 L/min.	1. Make sure gas supplies are disconnected. 2. Make sure compressor is not running. 3. Verify no leaks at the Q3 O-rings. 4. Perform a flow sensor calibration. 5. Replace Q3.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
FE0301	Excessive leak	EST Leak Test	Failure	System pressure dropped below failure pressure level.	1. Make sure test circuit is connected and is not leaking. 2. Check for system leaks or occlusions especially at the O2 sensor and expiratory filter. 3. Verify secure connection of expiratory filter. 4. Check exhalation valve operation.
FE0305	Unable to establish pressure	EST Leak Test	Failure	System cannot attain leak test starting pressure using oxygen or air within time-out period.	1. Make sure test circuit is connected and is not leaking. 2. Check exhalation valve operation, and verify secure connection of expiratory filter.
FE0401	Accept key fails.	EST GUI Keyboard Test	Failure	Wrong key pressed or key not pressed within 15 s.	1. Repeat test. 2. Replace keyboard.
FE0402	Clear key fails.	EST GUI Keyboard Test	Failure	Wrong key pressed or key not pressed within 15 s.	1. Repeat test. 2. Replace keyboard.
FE0403	Insp. Pause key fails.	EST GUI Keyboard Test	Failure	Wrong key pressed or key not pressed within 15 s.	1. Repeat test. 2. Replace keyboard.
FE0404	Exp. Pause key fails.	EST GUI Keyboard Test	Failure	Wrong key pressed or key not pressed within 15 s.	1. Repeat test. 2. Replace keyboard.
FE0405	Man Insp fails.	EST GUI Keyboard Test	Failure	Wrong key pressed or key not pressed within 15 s.	1. Repeat test. 2. Replace keyboard.
FE0406	100% O_2/CAL key fails.	EST GUI Keyboard Test	Failure	Wrong key pressed or key not pressed within 15 s.	1. Repeat test. 2. Replace keyboard.
FE0407	Info key fails.	EST GUI Keyboard Test	Failure	Wrong key pressed or key not pressed within 15 s.	1. Repeat test. 2. Replace keyboard.
FE0408	Alarm Reset key fails.	EST GUI Keyboard Test	Failure	Wrong key pressed or key not pressed within 15 s.	1. Repeat test. 2. Replace keyboard.
FE0409	Alarm Silence key fails.	EST GUI Keyboard Test	Failure	Wrong key pressed or key not pressed within 15 s.	1. Repeat test. 2. Replace keyboard.
FE0410	Alarm Volume key fails.	EST GUI Keyboard Test	Failure	Wrong key pressed or key not pressed within 15 s.	1. Repeat test. 2. Replace keyboard.
FE0411	Screen brightness fails.	EST GUI Keyboard Test	Failure	Wrong key pressed or key not pressed within 15 s.	1. Repeat test. 2. Replace keyboard.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
FE0412	Screen contrast key fails.	EST GUI Keyboard Test	Failure	Wrong key pressed or key not pressed within 15 s.	1. Repeat test. 2. Replace keyboard.
FE0413	Screen lock key fails.	EST GUI Keyboard Test	Failure	Wrong key pressed or key not pressed within 15 s.	1. Repeat test. 2. Replace keyboard.
FE0501	Bad knob	EST GUI Knob Test	Failure	Knob was not turned in direction as prompted within 15 s.	1. Repeat test. 2. Replace keyboard.
FE0801	SAAS *(Safety Audible Alarm System)* test failed	EST GUI Audio Test	Failure	CLEAR key pressed to indicate GUI audio diagnostic failed.	1. Verify the GUI alarm cable connection to the GUI CPU PCB. 2. Replace GUI alarm assembly. 3. Replace GUI CPU PCB.
FE0901	Bad alarm cable	EST BDU Audio Test	Failure	Alarm cable voltage is out of range (< 3.5 or > 5.05 V).	1. Make sure BD alarm cable is connected. 2. Replace BD alarm. 3. Replace AI PCB. 4. Replace BD alarm cable.
FE0902	Bad power fail cap	EST BDU Audio Test	Failure	Power failure capacitor initial voltage is out of range (< 4.5 or > 5.05 V).	1. Make sure BD alarm cable is connected. 2. Replace BD alarm. 3. Replace AI PCB. 4. Replace BD alarm cable. 5. Replace Motherboard PCB.
FE0903	Bad power fail cap	EST BDU Audio Test	Failure	Power failure capacitor final voltage is out of range or RC constant < 60 s.	1. Make sure BD alarm cable is connected. 2. Replace BD alarm. 3. Replace AI PCB.
FE0904	Bad BD audio	EST BDU Audio Test	Failure	CLEAR key pressed to indicate user did not hear alarm, although alarm was active.	1. Make sure BD alarm cable is connected. 2. Replace BD alarm. 3. Replace AI PCB. 4. Replace BD alarm cable.
FE1101	Safety valve occluded	EST Safety System Test	Failure	Excessive safety valve back pressure when safety valve is open.	Replace safety valve.
FE1102	Bad safety valve driver or loopback	EST Safety System Test	Failure	Safety valve loopback current is out of range during one or more of timed test points.	1. Replace safety valve. 2. Replace AI PCB. 3. Replace Inspiratory Electronics PCB.
FE1103	Insp check valve test failed	EST Safety System Test	Failure	It took too long to relieve excess pressure through open safety valve, indicating inspiratory check valve (CV3) is occluded or test circuit is too large.	1. Make sure proper test circuit is used. 2. Make sure CV3 is not installed backward. 3. Replace CV3. 4. Replace Safety Valve (SV).

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
FE1105	Unable to establish flow	EST Safety System Test	Failure	Flow controller unable to establish and control gas flow at 60 L/min.	1. Make sure air supply is connected and unrestricted. 2. Check air regulator pressure. 3. Run flow sensor calibration. 4. Switch PSOLs to see if test passes. If it does, return PSOL1 to its original position and replace PSOL2. 5. Replace Q2.
FE1301	Seal test failed	EST Exp Valve Seal Test	Failure	Seal test Δ pressure is above failure level.	1. Clean exhalation valve. 2. Calibrate exhalation valve. 3. Run flow sensor calibration. 4. Replace exhalation valve. 5. Replace AI PCB. 6. Replace PE.
FE1302	Exp valve temp OOR	EST Exp Valve Seal Test	Failure	Exhalation valve magnet temperature out of range (10 to 100°C).	1. Ensure the unit has been warmed up at ambient temperature for at least 10 minutes. 2. Calibrate the exhalation valve (EV). 3. Replace exhalation valve (EV). 4. Replace AI PCB.
FE1303	Unable to establish exp flow	EST Exp Valve Seal Test	Failure	Flow controller unable to establish and control air flow measured by exhalation flow sensor (Q3).	1. Make sure proper test circuit it used and that there are no leaks or occlusions. 2. Make sure air supply is still connected. 3. Run flow sensor calibration. 4. Replace Q3. 5. Replace Q2. 6. Replace the exhalation valve.
FE1304	Exp valve not calibrated	EST Exp Valve Seal Test	Failure	Exhalation valve table checksum is not valid or last calibration performed was not completed successfully.	1. Check for leaks or occlusions. Correct and then run the exhalation valve calibration. 2. Replace the exhalation valve. 3. Replace the AI PCB. 4. Replace Q3. 5. Replace Q2.
FE1401	Bad calibration	EST Exp Valve Test	Failure	Measured system pressure at one or more test points is out of range.	1. Calibrate exhalation valve. 2. Replace exhalation valve. 3. Replace AI PCB. 4. Replace the Exhalation Pressure Transducer PCB.
FE1402	Exp valve not calibrated	EST Exp Valve Test	Failure	Exhalation valve table checksum is not valid or last calibration performed was not completed successfully.	1. Check for leaks or occlusions. Correct and then run the exhalation valve calibration. 2. Replace the exhalation valve. 3. Replace the AI PCB. 4. Replace Q3. 5. Replace Q2.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
FE1403	Unable to establish exp flow	EST Exp Valve Test	Failure	Flow controller unable to establish and control air flow measured by exhalation flow sensor (Q3).	1. Check for leaks or occlusions. Correct and then run the exhalation valve calibration. 2. Replace the exhalation valve. 3. Replace the AI PCB. 4. Replace Q3. 5. Replace Q2.
FE1501	Unable to establish air flow	EST Exp Heater Test	Failure	Flow controller unable to establish and control 60 L/min air flow.	1. Make sure air supply is connected and unrestricted. 2. Check air regulator pressure. 3. Run flow sensor calibration. 4. Switch PSOLs to see if test passes. If it does, return PSOL1 to its original position and replace PSOL2. 5. Replace Q2.
FE1502	Bad exp heater	EST Exp Heater Test	Failure	Exhalation heater temperature did not rise sufficiently when heater was turned on.	1. Replace exhalation heater. 2. Replace AI PCB. 3. Replace interconnect cable between exhalation compartment and motherboard.
FE1503	Bad exp heater	EST Exp Heater Test	Failure	Heater temperature did not drop sufficiently during an interval after heater was turned off.	1. Replace exhalation heater. 2. Replace AI PCB.
FE2201	Low exp ΔP	EV Velocity Transducer Test	Failure	Expiratory Δ P too low, indicating velocity transducer not responding properly.	1. Check for leaks or occlusions. Correct and then run the exhalation valve calibration. 2. Run flow sensor calibration. 3. Replace exhalation valve. 4. Replace Q3. 5. Replace Q2.
FE2301	Nurse call stuck on	EST GUI Nurse Call Test	Failure	CLEAR key pressed to indicate nurse's call (remote alarm) relay is stuck on when it should be off.	1. Make sure test equipment is connected properly to remote alarm port. 2. Replace GUI CPU PCB.
FE2302	Nurse call stuck off	EST GUI Nurse Call Test	Failure	CLEAR key pressed to indicate nurse's call (remote alarm) relay is stuck off when it should be on.	1. Make sure test equipment is connected properly to remote alarm port. 2. Replace GUI CPU PCB.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
NOTE: For all "FS" codes (failures reported during SST), if the corrective action indicated is to run an EST to further diagnose the problem, perform the repair after the EST, verify the fix in EST, and then rerun SST in order to enter normal ventilator operation. If there is a failed SST test result in memory, normal operation until is prevented until the failed SST test is rerun and passes.					
FS0001	O_2 flow sensor cross check failed	SST Flow Sensor Test	Failure	Oxygen flow sensor (Q1) cross-check failed.	1. Correct the leak or occlusion in the SST patient circuit and rerun or try known good patient circuit and filter set. 2. Verify that the ventilator system has no leaks or occlusions by running the first four tests in EST to run the leak test. a. If the leak test fails in EST, troubleshoot the expiratory filter or ventilator system for leaks or occlusions. b. If the leak test passes in EST, troubleshoot the SST patient circuit. 3. Run a flow sensor calibration. 4. Switch Q1 and Q2. Rerun the flow sensor calibration and EST. If the failure transfers to the air side, return Q2 back to its original position and replace Q1. 5. Replace Q3 6. Switch PSOLs to see if the failure transfers to the air side. If yes, return PSOL2 back to its original position and replace PSOL1.
FS0002	O_2 PSOL current out of range	SST Flow Sensor Test	Failure	Oxygen PSOL (PSOL1) command current is out of range with respect to oxygen flow sensor (Q1).	1. Make sure oxygen supply is connected and unrestricted. 2. Verify that the oxygen supply is good. 3. Verify that the system has no leaks or occlusions. If not sure, run the first four tests in EST to run the leak test. 4. Run a flow sensor calibration. 5. Switch Q1 and Q2. Rerun the flow sensor calibration and EST. If the failure transfers to the air side, return Q2 back to its original position and replace Q1. 6. Replace Q3. 7. Switch PSOLs to see if the failure transfers to the air side. If yes, return PSOL2 back to its original position and replace PSOL1.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
FS0003	Air flow sensor cross check failed	SST Flow Sensor Test	Failure	Air flow sensor (Q2) cross-check failed.	1. Correct the leak or occlusion in the SST patient circuit and rerun or try known good patient circuit and filter set. 2. Verify that the ventilator system has no leaks or occlusions by running the first four tests in EST to run the leak test. 3. If the leak test fails in EST, troubleshoot the expiratory filter or ventilator system for leaks or occlusions. 4. If the leak test passes in EST, troubleshoot the SST patient circuit. 5. Run a flow sensor calibration. 6. Switch Q1 and Q2. Rerun the flow sensor calibration and EST. If the failure transfers to the oxygen side, return Q1 back to its original position and replace Q2. 7. Replace Q3. 8. Switch PSOLs to see if the failure transfers to the oxygen side. If yes, return PSOL1 back to its original position and replace PSOL2.
FS0004	Air PSOL current out of range	SST Flow Sensor Test	Failure	Air PSOL (PSOL2) command current is out of range with respect to air flow sensor (Q2).	1. Make sure air supply is connected and unrestricted. 2. Verify that the air supply is good. 3. Verify that the system has no leaks or occlusions. If not sure, run the first four tests in EST to run the leak test. 4. Run a flow sensor calibration. 5. Switch Q1 and Q2. Rerun the flow sensor calibration and EST. If the failure transfers to the oxygen side, return Q1 back to its original position and replace Q2. 6. Replace Q3. 7. Switch PSOLs to see if the failure transfers to the oxygen side. If yes, return PSOL1 back to its original position and replace PSOL2.
FS0005	Gas not connected	SST Flow Sensor Test	Failure	No gas is available (neither PS1, PS2, nor PC detects pressure).	Connect gas supply.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
FS0006	Unable to establish O_2 flow	SST Flow Sensor Test	Failure	Flow controller unable to establish and control oxygen flow at 60, 5, and 1 L/min.	1. Make sure oxygen supply is connected and unrestricted. 2. Verify that the oxygen supply is good. 3. Check regulated oxygen pressure. 4. Verify that the system has no leaks or occlusions. If not sure, run the first four tests in EST to run the leak test. 5. Run a flow sensor calibration. 6. Switch Q1 and Q2. Rerun the flow sensor calibration and EST. If the failure transfers to the air side, return Q2 back to its original position and replace Q1. 7. Replace exhalation flow sensor (Q3). 8. Switch PSOLs to see if the failure transfers to the air side. If yes, return PSOL2 back to its original position and replace PSOL1.
FS0007	Unable to establish air flow	SST Flow Sensor Test	Failure	Flow controller unable to establish and control air flow at 60, 5, and 1 L/min.	1. Make sure air supply is connected unrestricted. 2. Verify that the air supply is adequate. 3. Check regulated air pressure. 4. Verify that the system has no leaks or occlusions. If not sure, run the first four tests in EST to run the leak test. 5. Run a flow sensor calibration. 6. Switch Q1 and Q2. Rerun the flow sensor calibration and EST. If the failure transfers to the oxygen side, return Q1 back to its original position and replace Q2. 7. Replace exhalation flow sensor (Q3). 8. Switch PSOLs to see if the failure transfers to the oxygen side. If yes, return PSOL1 back to its original position and replace PSOL2.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
FS0008	O_2 zero flow check failed	SST Flow Sensor Test	Failure	Inspiratory flow > 0.153 L/min with oxygen PSOL (PSOL1) commanded to 0 (closed).	1. Verify no leaks at the Q1 O-rings. 2. Run EST Gas Supply Test to check for PSOL1 leak. 3. Remove and then reseat PSOL1. 4. Replace PSOL1. 5. Perform a flow sensor calibration. 6. Replace Q1.
FS0009	Air zero flow check failed	SST Flow Sensor Test	Failure	Inspiratory flow > 0.153 L/min with air PSOL (PSOL2) commanded to 0 (closed).	1. Verify no leaks at the Q2 O-rings. 2. Run EST Gas Supply Test to check for PSOL2 leak. 3. Remove and then reseat PSOL2. 4. Replace PSOL2. 5. Perform a flow sensor calibration. 6. Replace Q2.
FS0101	Inspiratory autozero out of range	SST circuit pressure test	Failure	Inspiratory pressure transducer ADC count at 0 cmH_2O is out of range.	1. Replace Inspiratory Electronics PCB 2. Replace AI PCB.
FS0102	Expiratory autozero out of range	SST circuit pressure test	Failure	Expiratory pressure transducer ADC count at 0 cmH_2O is out of range.	1. Replace exhalation transducer PCB. 2. Replace AI PCB. 3. Replace SOL1.
FS0103	Failed to reach test pressure	SST circuit pressure test	Failure	Unable to build pressure (air) to 10 cmH_2O at 5 L/min within time-out period.	1. Verify that the patient circuit system has no leaks or occlusions or use a known good patient circuit and filter set. 2. Verify that the air supply or compressor is available and adequate. 3. Verify that the ventilator system has no leaks or occlusions. If not sure, run the first four tests in EST to run the leak test.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
FS0104	Cross-check failed	SST circuit pressure test	Failure	Inspiratory/expiratory pressure transducer readings at 10 cmH_20 test pressure are too far apart.	1. Verify that the patient circuit system has no leaks or occlusions or use a known good patient circuit and filter set. 2. Verify that the ventilator system has no leaks or occlusions. If not sure, run the first four tests in EST to run the leak test. 3. If the leak test passes in EST, exit out of EST. Review the data for the Circuit Pressure Test to determine which pressure transducer is out of range: PI or PE. Replace applicable pressure transducer. 4. Replace AI PCB.
FS0105	Bad insp autozero solenoid	SST circuit pressure test	Failure	Inspiratory pressure reading taken after actuating inspiratory pressure transducer autozero solenoid (SOL1) is out of range (-0.60 to 0.60 cmH_2O).	1. Replace SOL1. 2. Replace Inspiratory Electronics PCB. 3. Replace AI PCB.
FS0106	Bad exp autozero sol	SST circuit pressure test	Failure	Expiratory pressure reading taken after actuating expiratory transducer autozero solenoid (SOL2) is out of range (-0.60 to 0.60 cmH_2O).	1. Replace SOL2. 2. Replace exhalation transducer PCB. 3. Replace AI PCB.
FS0107	Cross-check failed	SST circuit pressure test	Failure	Inspiratory/expiratory pressure transducer readings at 50 or 100 cmH_2O test pressure are too far apart.	1. Replace the expiratory bacteria filter. 2. Verify that the system has no leaks or occlusions. If not sure, run the first four tests in EST to run the leak test. 3. If the leak test passes in EST, exit out of EST. Review the data for the EST Circuit Pressure Test to determine which pressure transducer is out of range: PI or PE. Replace applicable pressure transducer. 4. Replace AI PCB.
FS0108	Failed to reach test pressure	SST circuit pressure test	Failure	Unable to build pressure (air) to 50 or 100 cmH_2O at 5 L/min within time-out period.	1. Make sure air supply or compressor is available. 2. Check for system leak.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
FS0201	Excessive leak	SST Circuit leak	Failure	System pressure dropped below failure pressure level.	1. Make sure patient circuit is connected and is not leaking. 2. Check exhalation valve operation, and verify secure connections of bacteria filters, water traps, and humidifier.
FS0205	Unable to establish pressure	SST Circuit leak	Failure	Unable to attain leak test starting pressure within time-out period using oxygen or air.	1. Make sure patient circuit is connected and is not leaking. 2. Check exhalation valve operation, and verify secure connections of bacteria filters, water traps, and humidifier.
FS0301	Unable to establish flow	SST Expiratory filter	Failure	Flow controller unable to establish and control gas flow.	Make sure gas supply is still connected.
FS0303	Occluded expiratory compartment	SST Expiratory filter	Failure	Exhalation compartment pressure > 4 cmH_2O.	1. Check compartment for obstruction. 2. Verify exhalation valve operation by running EST.
FS0304	Occluded expiratory filter	SST Expiratory filter	Failure	Pressure drop across filter > 3 cmH_2O.	Replace expiratory filter.
FS0306	Patient circuit not disconnected	SST Expiratory filter	Failure	A test flow was used to verify that circuit was disconnected, and an expiratory flow was detected.	Make sure patient circuit is disconnected at expiratory filter.
FS0307	Patient circuit not reconnected	SST Expiratory filter	Failure	A test flow was used to verify that circuit was reconnected, and an expiratory flow was not detected.	Make sure patient circuit is connected at expiratory filter.
FS0310	Low expiratory filter ΔP	SST Expiratory filter	Failure	Pressure drop across expiratory filter < 0.1 cmH_2O.	1. Repeat test, following directions more closely. 2. Replace filter.
FS0401	Unable to establish flow	SST Circuit Resistance	Failure	Flow controller unable to establish and control gas flow.	Make sure gas supply is connected.
FS0402	Occluded inspiratory limb	SST Circuit Resistance	Failure	Inspiratory limb pressure > 12.5 cmH_2O (adult) or 7.5 cmH_2O (pediatric), indicating occlusion.	Check for occluded patient tubing.
FS0404	Unable to reach min peak flow	SST Circuit Resistance	Failure	During characterization of total circuit resistance over a range of flows, peak flow was less than failure threshold.	Check for kinked or occluded patient tubing.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
FS0405	Occluded exhalation limb	SST Circuit Resistance	Failure	Expiratory limb pressure > 12.5 cmH_2O (adult) or 7.5 cmH_2O (pediatric), indicating occlusion.	Check for occluded patient tubing.
FS0408	Insp limb resistance low	SST Circuit Resistance	Failure	Inspiratory limb pressure < 0.2 cmH_2O.	1. Make sure inspiratory filter is installed. 2. Repeat test, following directions more closely. 3. Replace inspiratory filter. 4. Replace patient circuit.
FS0409	Exp limb resistance low	SST Circuit Resistance	Failure	Expiratory limb pressure < 0.2 cmH_2O.	Replace patient circuit.
FS0410	Unable to reach min peak flow	SST Circuit Resistance	Failure	During characterization of total circuit resistance over a range of flows, peak flow was less than failure threshold.	Check for kinked or occluded patient tubing.
FS0412	Wye not blocked	SST Circuit Resistance	Failure	Unable to pressurize system within time-out period.	1. Block wye when prompted. 2. Check for circuit leaks.
FS0501	Unable to pressurize circuit	SST Compliance calibration	Failure	System cannot pressurize to one of the test pressure points.	Check patient circuit for leaks. Replace as necessary.
FS0502	Unable to pressurize circuit	SST Compliance calibration	Failure	System cannot pressurize to one of the test pressure points.	Check patient circuit for leaks. Replace as necessary.
FS0503	Compliance calculation failure	SST Compliance calibration	Failure	Out-of-range pressure ratio calculation.	1. Repeat test, making sure circuit is undisturbed during test. 2. Repeat SST to retest pressure transducers. 3. Run EST and verify all pneumatics tests pass.
FS0504	Excessive compliance	SST Compliance calibration	Failure	High compliance > 12 mL/cmH_2O (adult) or 9 mL/cmH_2O (pediatric).	1. Make sure correct patient tubing type was specified in SST. 2. Replace patient circuit.
FS0506	Compliance low	SST Compliance calibration	Failure	High compliance falls below 1.05 mL/cmH_2O	1. Make sure correct patient tubing type was specified in SST. 2. Replace patient circuit.
FS0508	Excessive compliance	SST Compliance calibration	Failure	Low compliance > 12 mL/cmH_2O (adult) or 9 mL/cmH_2O (pediatric).	1. Make sure correct patient tubing type was specified in SST. 2. Replace patient circuit.
FS0510	Compliance low	SST Compliance calibration	Failure	Low compliance falls below 1.05 mL/cmH_2O	1. Make sure correct patient tubing type was specified in SST. 2. Replace patient circuit.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
HN0001	Non-maskable interrupt (NMI): Dynamic random access memory (DRAM) Parity Error	Other (BDU)	BDU reset		Replace BD CPU PCB.
HN0002	NMI: Ethernet Parity Error	Other (BDU)	BDU reset		Replace BD CPU PCB.
HN0016	NMI: Analog Interface Error: analog to digital converter (ADC) Channel Sequencer Fault	Other (BDU)	BDU reset		1. Replace AI PCB. 2. Replace BD CPU PCB.
HN0016	NMI: Analog Interface Error: ADC Timing Fault	Other (BDU)	BDU reset		1. Replace AI PCB. 2. Replace BD CPU PCB.
HN0016	NMI: Analog Interface Error: Hamming Decode Fault	Other (BDU)	BDU reset		1. Replace AI PCB. 2. Replace BD CPU PCB.
HN0080	NMI: Analog Interface Error: ADC Timing Fault	Other (BDU)	BDU reset		Replace AI PCB.
HN0129	NMI: DRAM Parity Error	Other (BDU)	BDU reset		1. Check GUI/BD cable connections. 2. Replace power supply. 3. Replace BD CPU PCB.
HN0130	NMI: Ethernet Parity Error	Other (BDU)	BDU reset		1. Check GUI/BD cable connections. 2. Replace power supply. 3. Replace BD CPU PCB.
KB0001	Bad safety valve switched side	Background check (BDU)	Vent inop	Measured voltage on safety valve switched side indicates valve is not in expected state.	1. Replace safety valve. 2. Replace AI PCB. 3. Replace Inspiratory Electronics PCB. 4. Replace interconnect cable between the mother board and the Inspiratory Electronics PCB.
KB0002	Bad expiratory flow	Background check (BDU)	Vent inop	Exhalation flow sensor (Q3) reading out of range	1. If possible, run EST and use the Flow Sensor Cross Check test to determine if Q3 is failing. Replace Q3 if applicable. 2. Perform flow sensor calibration. 3. Replace AI PCB.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
KB0003	Bad O_2 PSOL current	Background check (BDU)	Vent inop	Oxygen PSOL (PSOL1) current out of range	1. If possible, run EST to determine if PSOL1 is failing. Switch PSOLs to see if the failure transfers to the other side. Replace PSOL1 if applicable. 2. Replace AI PCB. 3. Replace Inspiratory Electronics PCB. 4. Replace interconnect cable between the motherboard and the Inspiratory Electronics PCB.
KB0004	Bad air PSOL current	Background check (BDU)	Vent inop	Air PSOL (PSOL2) current out of range	1. If possible, run EST to determine if PSOL2 is failing. Switch PSOLs to see if the failure transfers to the other side. Replace PSOL2 if applicable. 2. Replace AI PCB. 3. Replace Inspiratory Electronics PCB. 4. Replace interconnect cable between the motherboard and the Inspiratory Electronics PCB.
KB0005	Bad exp motor current	Background check (BDU)	Vent inop	Current to exhalation valve motor out of range	1. Perform exhalation valve (EV) calibration. 2. Replace EV. 3. Replace AI PCB.
KB0007	Bad exp pressure	Background check (BDU)	Vent inop	PE reading out of range	1. Replace exhalation transducer PCB. 2. Replace AI PCB.
KB0008	Bad insp pressure	Background check (BDU)	Vent inop	PI reading out of range	1. Replace Inspiratory Electronics PCB. 2. Replace AI PCB.
KB0009	Air flow out of range HIGH	Background check (BDU)	Vent inop	Q2 reading too high	1. Perform flow sensor calibration. 2. Replace Q2. 3. Replace AI PCB.
KB0012	O_2 flow out of range HIGH	Background check (BDU)	Vent inop	Q1 reading too high	1. Perform flow sensor calibration. 2. Replace Q1. 3. Replace AI PCB.
KB0016	Bad BD 10V supply	Background check (BDU)	Vent inop	BDU +10 V supply out of range	Replace AI PCB.
KB0017	Bad BD 12 V supply	Background check (BDU)	Vent inop	BDU +12 V supply out of range	1. Replace AI PCB. 2. Replace power supply or other power input components.
KB0018	Bad BD 15 V supply	Background check (BDU)	Vent inop	BDU +15 V supply out of range	1. Replace AI PCB. 2. Replace power supply or other power input components.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
KB0019	Bad BD -15 V	Background check (BDU)	Vent inop	BDU -15 V supply out of range	1. Replace AI PCB. 2. Replace power supply or other power input components.
KB0022	Bad BD 5 V supply	Background check (BDU)	Vent inop	BDU +5 V supply out of range	1. Replace AI PCB. 2. Replace power supply or other power input components.
KB0023	O_2 PSOL stuck	Background check (BDU)	Vent inop	Oxygen PSOL (PSOL1) command current out of range	3. If possible, run EST to determine if PSOL1 is failing. Switch PSOLs to see if the failure transfers to the other side. Replace PSOL1 if applicable. 4. Replace AI PCB. 5. Replace Inspiratory Electronics PCB. 6. Replace interconnect cable between the motherboard and the Inspiratory Electronics PCB.
KB0024	Air PSOL stuck	Background check (BDU)	Vent inop	Air PSOL (PSOL2) command current out of range	1. If possible, run EST to determine if PSOL2 is failing. Switch PSOLs to see if the failure transfers to the other side. Replace PSOL2 if applicable. 2. Replace AI PCB. 3. Replace Inspiratory Electronics PCB. 4. Replace interconnect cable between the motherboard and the Inspiratory Electronics PCB.
KB0025	Air PSOL stuck open	Background check (BDU)	Vent inop	Air PSOL (PSOL2) command current reading indicates PSOL stuck open	1. If possible, run EST to determine if PSOL2 is failing. Switch PSOLs to see if the failure transfers to the other side. Replace PSOL2 if applicable. 2. Replace AI PCB. 3. Replace Inspiratory Electronics PCB. 4. Replace interconnect cable between the motherboard and the Inspiratory Electronics PCB.
KB0026	O_2 PSOL stuck open	Background check (BDU)	Vent inop	PSOL1 command current reading indicates PSOL stuck open	1. If possible, run EST to determine if PSOL1 is failing. Switch PSOLs to see if the failure transfers to the other side. Replace PSOL1 if applicable. 2. Replace AI PCB. 3. Replace Inspiratory Electronics PCB. 4. Replace interconnect cable between the motherboard and the Inspiratory Electronics PCB.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
KB0030	Bad safety valve current	Background check (BDU)	Vent inop	Current to safety valve out of range	1. Replace safety valve. 2. Replace AI PCB. 3. Replace Inspiratory Electronics PCB. 4. Replace interconnect cable between the motherboard and the Inspiratory Electronics PCB.
KB0031	Insp pressure stuck	Background check (BDU)	Vent inop	Inspiratory pressure transducer (PI) reading indicates transducer is stuck	1. Replace Inspiratory Electronics PCB. 2. Replace AI PCB.
KB0032	Exp pressure stuck	Background check (BDU)	Vent inop	Expiratory pressure transducer (PE) reading indicates transducer is stuck	1. Replace exhalation transducer PCB. 2. Replace AI PCB.
KB0033	Insp pressure autozero offset failed	Background check (BDU)	Vent inop	Inspiratory pressure transducer (PI) reading following autozero out of range	1. Replace inspiratory pressure transducer autozero solenoid (SOL1). 2. Replace Inspiratory Electronics PCB. 3. Replace AI PCB.
KB0034	Exp pressure autozero offset failed	Background check (BDU)	Vent inop	Expiratory pressure transducer (PE) reading following autozero out of range	1. Replace expiratory pressure transducer autozero solenoid (SOL2). 2. Replace exhalation transducer PCB. 3. Replace AI PCB.
KB0037	Analog-Digital converter failed high	Background check (BDU)	Vent inop	Analog-to-digital converter failure	Replace AI PCB.
KB0038	Analog-Digital converter failed low	Background check (BDU)	Vent inop	Analog-to-digital converter failure	Replace AI PCB.
KB0039	Analog-Digital loopback failed	Background check (BDU)	Vent inop	Analog-to-digital converter failure	Replace AI PCB.
KB0044	BD NOVRAM checksum error	Background check (BDU)	Vent inop	BD NOVRAM failure	Replace BD CPU PCB.
KB0053	BD EEPROM checksum error	Background check (BDU)	Vent inop	BD EEPROM failure	Replace BD CPU PCB.
KB0064	LV Ref out of range	Background check (BDU)	Vent inop	Low-voltage reference out of range	Replace AI PCB.
KB0065	SV current out of range	Background check (BDU)	Vent inop	Safety valve current out of range	1. Replace safety valve. 2. Replace Inspiratory Electronics PCB. 3. Replace AI PCB. 4. Replace interconnect cable between the motherboard and the Inspiratory Electronics PCB.

Table 6-2: *840* Ventilator diagnostic codes (continued)

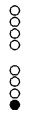
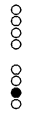
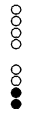
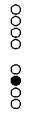
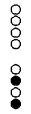
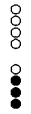
Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
KB0076	Task Monitor	Background check (BDU)	Vent inop		Replace BD CPU PCB.
KB0079	BK vent inop occurred	Background check (BDU)	Vent inop	Ventilator inoperative signal read by BDU is active. This could mean GUI has declared a ventilator inoperative condition.	1. Run the VENT INOP test. a. If the test passes, run EST to reset the Device Alert. Run the unit for 48 hours and then put back into service if the code cannot be duplicated. b. If the test fails, troubleshoot per Table 6-5, VENT INOP Test troubleshooting.
KB0082	Watchdog failure occurred	Background check (BDU)	Vent inop		Replace BD CPU PCB.
KP0001 	Processor Initialization	POST (BDU)	Vent inop		Replace BD CPU PCB.
KP0002 	Integer Unit Test	POST (BDU)	Vent inop		Replace BD CPU PCB.
KP0003 	DRAM Refresh Timer Test	POST (BDU)	Vent inop		Replace BD CPU PCB.
KP0004 	Kernel DRAM Test	POST (BDU)	Vent inop		Replace BD CPU PCB.
KP0005 	Boot EPROM Checksum Test	POST (BDU)	Vent inop		Replace BD CPU PCB.
KP0006 	POST Phase 2 Initialization	POST (BDU)	Vent inop		Replace BD CPU PCB.
KP0007 	Addressing Mode Test	POST (BDU)	Vent inop		Replace BD CPU PCB.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
KP0008 	Kernel NOVRAM Test	POST (BDU)	Vent inop		Replace BD CPU PCB.
KP0009 	Rolling Thunder Test	POST (BDU)	Vent inop	POST has started (but not run to completion) three or more times, for reasons unrelated to power.	1. Replace AI PCB. 2. Replace BD CPU PCB. 3. Replace motherboard.
KP0011 	Time of Day Clock Test	POST (BDU)	Vent inop		Replace BD CPU PCB.
KP0012 	Timer Test	POST (BDU)	Vent inop	Timer failed comparison test with real-time clock (external timing reference) *or* Timer failed to generate interrupt	Replace BD CPU PCB.
KP0013 	Watchdog Timer Test	POST (BDU)	Vent inop	Watchdog timer did not time out as expected	Replace BD CPU PCB.
KP0015 	FLASH Memory Checksum Test	POST (BDU)	Vent inop		Replace BD CPU PCB.
KP0081 	Memory Management Unit Test	POST (BDU)	Vent inop		Replace BD CPU PCB.
KP0082 	Bus Timer Test	POST (BDU)	Vent inop	Activity has ceased on local bus *or* Bus time-out circuit did not generate an interrupt as expected	Replace BD CPU PCB.
KP0083 	NMI Source Register Test	POST (BDU)	Vent inop		Replace BD CPU PCB.
KP0084 	POST DRAM Test	POST (BDU)	Vent inop		Replace BD CPU PCB.

Table 6-2: *840* Ventilator diagnostic codes (continued)

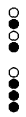
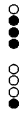
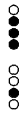
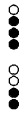
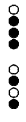
Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
KP0087 	Unexpected Reset Umpire Test	POST (BDU)	Vent inop	POST has been invoked three times in 24 operational hours due to unexpected resets.	1. Check associated errors in the System Diagnostic and System Information log to determine why POST was invoked three times within 24 hours. If the codes indicate that the BD CPU generated the resets, replace the BD CPU (Other codes may be present indicating that the GUI lost communications with the BD). 2. Run a complete EST to check for analog device failures.
KP0089 	Floating Point Unit Test	POST (BDU)	Vent inop		Replace BD CPU PCB.
KP0090 	DRAM Parity Circuit Test	POST (BDU)	Vent inop		Replace BD CPU PCB.
KP0113 	Analog Interface PCB Test	POST (BDU)	Vent inop		1. Replace BD CPU PCB. 2. Replace AI PCB. 3. Replace motherboard.
KP0114 	ADC Test	POST (BDU)	Vent inop	Analog-to-digital converter data not available to CPU as expected	1. Replace AI PCB. 2. Replace motherboard.
KP0115 	DAC Test	POST (BDU)	Vent inop	Digital-to-analog converter data not as expected	1. Replace AI PCB. 2. Replace motherboard.
KP0116 	Analog Devices Test	POST (BDU)	Vent inop	Critical analog data out of range	1. Refer to Section 6.8 to identify which analog device is failing. 2. Run EST to get more information on the analog device failure. 3. Replace the AI PCB. 4. Replace the motherboard. 5. Replace the interconnect cable between the Inspiratory Electronics PCB and the motherboard.
KP0117 	BD Serial Device Test	POST (BDU)	Vent inop		1. Replace AI PCB. 2. Replace BD CPU PCB. 3. Replace the motherboard.

Table 6-2: *840* Ventilator diagnostic codes (continued)

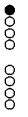
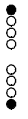
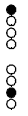
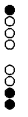
Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
KP0120 	Safe State System Test	POST (BDU)	Vent inop	Places PSOLs and exhalation valve into safe state and verifies that they cannot be commanded.	1. Look up associated codes reported in Diagnostic Log and/or the BD CPU LED array to get more information about other possible system, software, or hardware faults. Troubleshoot those codes. 2. Run a Ground Isolation Test to troubleshoot shorts. 3. Try another inspiratory module and see if the code can be reset by running the VENT INOP, EST and POST tests. a. If the unit passes with a known good inspiratory module, replace the Inspiratory Electronics PCB. b. If the unit fails, replace the inspiratory blind mate interconnect cable. 4. Replace the Inspiratory Electronics PCB. 5. Replace the AI PCB. 6. Replace the BD CPU PCB.
KP0128 	Download operating system (OS) Boot	POST (BDU)	Vent inop		Replace BD CPU PCB.
KP0129 	Application OS Boot	POST (BDU)	Vent inop		Replace BD CPU PCB.
KP0130 	PB-MON Boot	POST (BDU)	Vent inop		Replace BD CPU PCB.
KP0131 	Application Boot	POST (BDU)	Vent inop		Replace BD CPU PCB.
LB0006	Bad exhalation valve coil temp.	Background check (BDU)	Alert	Exhalation valve coil temperature out of range	1. Replace exhalation valve. 2. Replace AI PCB. 3. Replace interconnect harness between the exhalation compartment connector and the motherboard.
LB0010	Air flow out of range LOW	Background check (BDU)	Alert	Air flow sensor (Q2) reading too low	1. Perform flow sensor calibration. 2. Replace Q2. 3. Replace AI PCB.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
LB0011	Bad air flow temperature	Background check (BDU)	Alert	Air flow sensor (Q2) thermistor reading out of range	1. Replace Q2. 2. Replace AI PCB.
LB0013	O_2 flow out of range LOW	Background check (BDU)	Alert	Oxygen flow sensor (Q1) reading too low	1. Ensure that the ventilator has been warmed up for at least 10 minutes in service mode at ambient temperature. 2. Run a flow sensor calibration. 3. Replace Q1.4.Replace the AI PCB.
LB0014	Bad O_2 flow temp.	Background check (BDU)	Alert	Oxygen flow sensor (Q1) thermistor reading out of range	1. Replace Q1. 2. Replace AI PCB.
LB0015	Bad expiratory flow temp	Background check (BDU)	Alert	Expiratory flow sensor (Q3) thermistor reading out of range	1. Replace Q3. 2. Replace AI PCB.
LB0020	Bad GUI 12V supply	Background check (BDU)	Alert	GUI +12 V supply out of range	1. Check cabling from BD CPU PCB to GUI CPU PCB. 2. Replace AI PCB. 3. Replace power supply. 4. Check whether or not the cable from the GUI to the BDU was reconnected to the unit while the ventilator power was on. If yes, run EST to reset the DEVICE ALERT.
LB0021	Bad GUI 5V supply	Background check (BDU)	Alert	GUI +5 V supply out of range.	1. Check cabling from BD CPU PCB to GUI CPU PCB. 2. Replace AI PCB. 3. Replace power supply. 4. Check whether or not the cable from the GUI to the BDU was reconnected to the unit while the ventilator power was on. If yes, run EST to reset the DEVICE ALERT.
LB0027	Bad atmospheric press OOR	Background check (BDU)	Alert	Atmospheric pressure transducer reading out of range	1. Perform atmospheric pressure calibration. 2. Replace Inspiratory Electronics PCB. 3. Replace AI PCB.
LB0028	Bad O_2 sensor OOR	Background check (BDU)	Alert	Oxygen sensor (percentage) reading out of range	1. Calibrate oxygen sensor. 2. Replace oxygen sensor.
LB0029	Bad O_2 sensor OOR reset	Background check (BDU)	Status	A status message indicating that alert was reset	No action required.
LB0035	Bad power fail capacitor voltage	Background check (BDU)	Alert	Power fail capacitor voltage out of range	1. Replace AI PCB. 2. Replace power supply.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
LB0036	Alarm cable error	Background check (BDU)	Alert	Alarm cable voltage out of range	1. Check cabling to main alarm. 2. Replace BD alarm. 3. Replace AI PCB.
LB0039	ADC loopback constant	Background checks (BDU)	Alert		Replace AI PCB.
LB0043	ac switch stuck	Background check (BDU)	Alert	Power switch is in off state but power fail NMI did not occur	1. Replace power switch. 2. Replace AI PCB.
LB0045	BD Time of Day failed	Background check (BDU)	Alert	Real-time clock failure	Replace BD CPU PCB.
LB0048	Bad backup power supply voltage	Background check (BDU)	Alert	BPS voltage out of range	1. Replace BPS battery pack. 2. Replace AI PCB. 3. Replace BPS PCB.
LB0049	Bad backup power supply current	Background check (BDU)	Alert	BPS current out of range	1. Replace BPS battery pack. 2. Replace AI PCB. 3. Replace BPS PCB.
LB0050	Bad backup power supply model	Background check (BDU)	Alert	Model information incorrect	Replace BPS PCB.
LB0051	Bad exp heater	Background check (BDU)	Alert	Exhalation heater thermistor reading out of range	1. Replace exhalation heater. 2. Replace AI PCB. 3. Replace interconnect cable between the exhalation compartment and the motherboard.
LB0056	Compressor elapsed timer error	Background check (BDU)	Alert	Compressor timer failure	Replace compressor PCB.
LB0057	Compressor bad eprom data	Background check (BDU)	Alert	Data in compressor EPROM not as expected	Replace compressor PCB.
LB0058	Loss of GUI communication	Background check (BDU)	Alert		1. This code indicates that the BD logged a loss of communications with the GUI. Check for codes generated by the GUI indicating a GUI fault. 2. Check cabling from BD CPU PCB to the GUI CPU PCB. 3. Replace GUI CPU PCB or BD CPU PCB.
LB0060	Resume GUI communication	Background check (BDU)	Status	A status message indicating that communication with GUI was resumed	No action required.
LB0062	Est required	Background check (BDU)	Alert	EST is required, but user cycled power into normal operation, rather than into service mode	Run EST.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
LB0075	Data key update failed	Background check (BDU)	Alert		1. Plug in data key. 2. Contact Service or your Puritan Bennett representative for a new data key.
LB0076	Task monitor	Background checks (BDU)	Alert		No action required unless XP0087 error is also present.
LB0080	Breath delivery extended	Background checks (BDU)	Alert		Replace BD CPU PCB.
LB0083	Init Resume GUI Communication	Background check (BDU)	Status	A status message indicating that communication with GUI was resumed	No action.
LB0085	Init Loss GUI Communication	Background check (BDU)	Status	A status message indicating that communication with GUI was lost	No action.
LB0087	Compressor S/N updated	Background check (BDU)	Status		No action.
LB0088	10000 hours stored for elapsed time	Background check (BDU)	Alert	Compressor hours corrupted. Contact your Puritan Bennett representative to reset.	Replace the compressor PCB.
LB0089	Cannot determine datakey size	Background check (BDU)	Alert		Replace data key.
LB0092	Battery Event	Background checks (BDU)	Alert	A status message regarding the state of the battery.	1. Ensure that the green LED is lit on the front of the BPS. a. If the green LED is not lit, allow the BPS to charge until the green LED lights. b. If the green LED does not light (within 6-8 hours or less), replace the battery pack. c. Replace the BPS PCB 2. Once the green LED is lit, run EST to test the BPS and use EST diagnostics to determine if further corrective action is needed.

Table 6-2: *840* Ventilator diagnostic codes (continued)

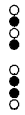
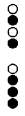
Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
LC1xxx	Varies	Communi-cations error (BDU)	Alert		1. Ensure that the green LED is lit on the front of the BPS. a. If the green LED is not lit, allow the BPS to charge until the green LED lights. b. If the green LED does not light (within 6-8 hours or less), replace the battery pack. c. Replace the BPS PCB 2. Once the green LED is lit, run EST to test the BPS and use EST diagnostics to determine if further corrective action is needed.
LP0008 	Kernel NOVRAM Test	POST (BD)	Alert	Noncritical NOVRAM data failure	Replace the BD CPU PCB.
LP0010	Interrupt Controller Test	POST (BD)	Alert		Replace BD CPU PC.
LP0011	Time of Day Clock Test	POST (BD)	aLERT		Replace BD CPU PCB.
LP0085 	Ethernet Self-Test Start	POST (BD)	Alert		Replace BD CPU PCB.
LP0086 	Ethernet Self-Test End	POST (BDU)	Alert		Replace BD CPU PCB.
LP0087 	Unexpected Reset Umpire Test	POST (BDU)	Alert	POST was invoked due to a watchdog time-out (unexpected reset)	1. Check all logs to see associated errors occurring around the same time and date as this code. 2. Run EST to get more information.
LP0088 	POST NOVRAM Test	POST (BDU)	Alert	Noncritical NOVRAM data failure	1. Check all logs to see associated errors occurring around the same time and date as this code. 2. Run EST to get more information.
LP0112 	Ventilator INOP Test	POST (BDU)	Alert	Ventilator inoperative signal not in expected state	1. Replace the interconnect cable between the Inspiratory Electronics PCB and the motherboard. 2. Run VENT INOP Test. 3. Replace BD CPU PCB.
LP0114	ADC Test	POST (BD)	Alert		Replace AI PCB.

Table 6-2: *840* Ventilator diagnostic codes (continued)

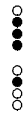
Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
LP0115	DAC Test	POST (BD)	Alert		Replace AI PCB.
LP0116 	Analog Devices Test	POST (BDU)	Alert	Noncritical analog data out of range	1. Refer to Table 6-3: "Address codes for BDU POST analog devices test errors". 2. Replace AI PCB.
LP0121 	Service Switch Stuck Test	POST (BDU)	Alert	Service switch appears to be closed. (Only requests to enter service mode made after this test are honored by system.)	1. Turn off ventilator. Release switch. 2. Check for mechanical obstruction to switch. 3. Replace BD CPU PCB.
LP0122 	ac Voltage Test	POST (BDU)	Alert	ac monitor voltage not within set nominal line voltage ±20%	1. Make sure ventilator is plugged into ac source. 2. Make sure nominal line voltage is set correctly.
Sxxxxx	*Varies*	Other	Status	Status message that indicates an intentionally caused event	No action required.
Uxxxxx	Assertion Failure	Background check (GUI)	Alert		Check System Information and Patient logs for any messages occurring with a high frequency. Otherwise, no corrective action unless accompanied by XP0087 diagnostic code.
U04004	Assertion Failure	Background check (GUI)	Alert	Can occur if there is an intermittent connection to any digital I/O line.	1. Check all cable connections. 2. Perform Ground Isolation Test. 3. Replace GUI CPU PCB.
U05013	Assertion Failure	Background check (GUI)	Alert	Can occur if there is an intermittent connection to any digital I/O line.	1. Check all cable connections. 2. Perform Ground Isolation Test. 3. Replace GUI CPU PCB.
U08002	Assertion Failure	Background check (BDU)	Alert	Occurs when the GUI is overloaded with invalid data from the serial port. Caused by the host device transmitting bad data that is generating over-run, parity, or framing errors. The GUI generates a soft reset or assertion to clear the condition and resynchronize with the BDU.	1. Check for wet expiratory or inspiratory filter. 2. Check all cable connections: GUI, Serial, Internal cables. 3. Review the ventilator logs, including patient logs, observe any occurrences of rapidly repeating messages. This pattern may contribute to a buffer overflow situation that the ventilator will attempt to clear by running POST. 4. Perform Ground Isolation Test. 5. Replace GUI CPU PCB.
U08012	Assertion Failure	Background check (GUI)	Alert	The GUI generates a soft reset or assertion to clear the condition and re synchronize with the BDU.	1. Check all cable connections. 2. Perform Ground Isolation Test. 3. Replace GUI CPU PCB.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
U14019	Assertion Failure	Background check (GUI)	Alert	The GUI generates a soft reset or assertion to clear the condition and resynthesized with the BDU.	1. Check all cable connections. 2. Perform Ground Isolation Test. 3. Replace GUI CPU PCB.
U14021	Assertion Failure	Background check (GUI)	Alert	If the time stamps between the GUI and the BD are out of range, the GUI generates a soft reset or assertion to clear the condition and re synchronize with the BDU.	1. Check all cable connections. 2. Perform Ground Isolation Test. 3. Replace GUI CPU PCB.
UT0002	Assertion Failure	Background check (GUI)	Alert	A reset of the GUI has occurred as a result of a hardware-trap detection.	**NOTE:** Refer to Section 6.10.1 for further information regarding for this error code. 1. Refer to Table 6-3: "Address codes for BDU POST analog devices test errors".
VN0129	NMI: DRAM Parity Error	Other (GUI)	GUI reset		1. Check GUI/BD cable connections. 2. Replace power supply. 3. Replace GUI CPU PCB.
VN0130	NMI: Ethernet Parity Error	Other (GUI)	GUI reset		1. Check GUI/BD cable connections. 2. Replace power supply. 3. Replace GUI CPU PCB.
VN0132	NMI: +5 V dc Overvoltage	Other (GUI)	GUI reset		1. Check GUI/BD cable connections. 2. Replace power supply. 3. Replace GUI CPU PCB.
VN0136	NMI: +12 V dc Overvoltage	Other (GUI)	GUI reset		1. Check GUI/BD cable connections. 2. Replace power supply. 3. Replace GUI CPU PCB.
VN0144	NMI: +12 V dc Undervoltage	Other (GUI)	GUI reset		1. Check GUI/BD cable connections. 2. Replace power supply. 3. Replace GUI CPU PCB.
XB0066	Monitor alarms fail	Background checks (GUI)	Vent inop		Call Technical Support or your Puritan Bennett representative.
XB0067	Monitor apnea alarm fails	Background checks (GUI)	Vent inop		Call Technical Support or your Puritan Bennett representative.
XB0068	Monitor apnea int fails	Background checks (GUI)	Vent inop		Call Technical Support or your Puritan Bennett representative.
XB0069	Monitor hip fails	Background checks (GUI)	Vent inop		Call Technical Support or your Puritan Bennett representative.

Table 6-2: *840* Ventilator diagnostic codes (continued)

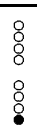
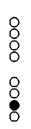
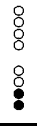
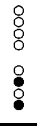
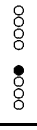
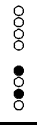
Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
XB0070	Monitor insp time fails	Background checks (GUI)	Vent inop		Call Technical Support or your Puritan Bennett representative.
XB0071	Monitor no data	Background checks (GUI)	Vent inop		Call Technical Support or your Puritan Bennett representative.
XB0072	Monitor data corrupted	Background checks (GUI)	Vent inop		Call Technical Support or your Puritan Bennett representative.
XB0073	Monitor O_2 mixture fails	Background checks (GUI)	Vent inop		Call Technical Support or your Puritan Bennett representative.
XB0074	Monitor breath time fails	Background checks (GUI)	Vent inop		Replace GUI CPU PCB.
XP0001 	Processor Initialization	POST (GUI)	GUI inop		Replace GUI CPU PCB.
XP0002 	Integer Unit Test	POST (GUI)	GUI inop		Replace GUI CPU PCB.
XP0003 	DRAM Refresh Timer Test	POST (GUI)	GUI inop		Replace GUI CPU PCB.
XP0004 	Kernel DRAM Test	POST (GUI)	GUI inop		Replace GUI CPU PCB.
XP0005 	Boot EPROM Checksum Test	POST (GUI)	GUI inop		Replace GUI CPU PCB.
XP0006 	POST Phase 2 Initialization	POST (GUI)	GUI inop		Replace GUI CPU PCB.
XP0007 	Addressing Mode Test	POST (GUI)	GUI inop		Replace GUI CPU PCB.
XP0008 	Kernel NOVRAM Test	POST (GUI)	GUI inop		Replace GUI CPU PCB.
XP0010 	Interrupt Controller Test	POST (GUI)	GUI inop		Replace GUI CPU PCB.

Table 6-2: *840* Ventilator diagnostic codes (continued)

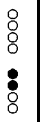
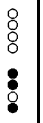
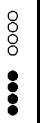
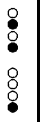
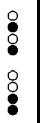
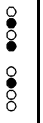
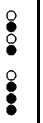
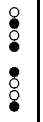
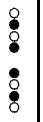
Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
XP0011 	Time of Day Clock Test	POST (GUI)	GUI inop		Replace GUI CPU PCB.
XP0012 	Timer Test	POST (GUI)	GUI inop		Replace GUI CPU PCB.
XP0013 	Watchdog Timer Test	POST (GUI)	GUI reset	Watchdog timer did not time out as expected	1. Make sure ventilator is plugged in to wall power and BPS is fully charged. 2. Replace GUI CPU PCB.
XP0015 	FLASH Memory Checksum Test	POST (GUI)	GUI inop		Replace GUI CPU PCB.
XP0081 	Memory Management Unit Test	POST (GUI)	GUI inop		Replace GUI CPU PCB.
XP0082 	Bus Timer Test	POST (GUI)	GUI inop		Replace GUI CPU PCB.
XP0083 	NMI Source Register Test	POST (GUI)	GUI inop		Replace GUI CPU PCB.
XP0084 	POST DRAM Test	POST (GUI)	GUI inop		Replace GUI CPU PCB.
XP0087 	Unexpected Reset Umpire Test	POST (GUI)	GUI inop	POST has been invoked three times in 24 operational hours due to unexpected resets.	Check associated errors in log. Call Technical Support or your Puritan Bennett representative.
XP0089 	Floating Point Unit Test	POST (GUI)	GUI inop		Replace GUI CPU PCB.
XP0090 	DRAM Parity Circuit Test	POST (GUI)	GUI inop		Replace GUI CPU PCB.
XP0097 	SAAS Self-Test Start	POST (GUI)	GUI inop		Replace GUI CPU PCB.

Table 6-2: *840* Ventilator diagnostic codes (continued)

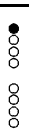
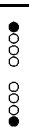
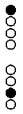
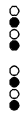
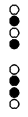
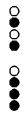
Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
XP0098 	SAAS Self-Test End	POST (GUI)	GUI inop		Replace GUI CPU PCB.
XP0128 	Download OS Boot	POST (GUI)	GUI inop		Replace GUI CPU PCB.
XP0129 	Application OS Boot	POST (GUI)	GUI inop		Replace GUI CPU PCB.
XP0130 	PB-MON Boot	POST (GUI)	GUI inop		Replace GUI CPU PCB.
XP0131 	Application Boot	POST (GUI)	GUI inop		Replace GUI CPU PCB.
ZB0040	Touch screen failed	Background checks (GUI)	Alert		Replace touch frame.
ZB0041	Touch screen blocked	Background checks (GUI)	Alert		1. Check for obstruction on screen or clean screen. 2. Replace touch frame.
ZB0042	Touch screen resumed	Background checks (GUI)	Status	A status message indicating that communication with touch screen was resumed	No action required.
ZB0046	GUI Time of Day failed	Background checks (GUI)	Alert		Replace GUI CPU PCB.
ZB0047	GUI NOVRAM checksum error	Background checks (GUI)	Alert	Noncritical NOVRAM data failure	1. Replace GUI CPU PCB. 2. Call Technical Support or your Puritan Bennett representative.
ZB0052	GUI key stuck	Background checks (GUI)	Alert		1. Replace keyboard. 2. Replace GUI CPU PCB.
ZB0054	GUI EEPROM checksum error	Background checks (GUI)	Alert		Replace GUI CPU PCB.
ZB0055	GUI SAAS communication failed	Background checks (GUI)	Alert		Replace GUI CPU PCB.
ZB0059	Loss of BD communication	Background checks (GUI)	Alert		1. Check cabling from BD CPU PCB to GUI CPU PCB. 2. Replace BD CPU PCB or GUI CPU PCB.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
ZB0061	Resume BD communication	Background checks (GUI)	Status	A status message indicating that communication with BD was resumed	No action required.
ZB0063	GUI SAAS Audio failed	Background checks (GUI)	Alert		1. Replace GUI alarm assembly. 2. Replace GUI CPU PCB.
ZB0076	Task Monitor	Background checks (GUI)	Alert		No action required unless a XP0087 error is also present.
ZB0077	GUI dropped a waveform packet	Background checks (GUI)	Status	A status message indicating a waveform data packet was lost in transmission from the BD.	No action required.
ZB0084	Init Resume BD communication	Background checks (GUI)	Status	A status message indicating that communication with BD was resumed.	No action required.
ZB0086	Init Loss of BD communication	Background checks (GUI)	Alert	A status message indicating that communication with BD was lost.	See associated error codes.
ZB0090	Touch Screen blocked	Background checks (GUI)	Alert		1. Remove visible items from GUI screen. 2. Clean GUI screen. 3. Replace touchscreen PCB.
ZB0091	Touch Screen resumed	Background checks (GUI)	Status	Status message indicates that a touch screen blocked error is cleared.	
ZC0xxx	*Varies*	Communications error (GUI)	Alert		No action required unless a ZB0059 error is also present.
ZC0xxx	Varies	Communications error (BDU)	Alert		1. Ensure that the green LED is lit on the front of the BPS. a. If the green LED is not lit, allow the BPS to charge until the green LED lights. b. If the green LED does not light (within 6-8 hours or less), replace the battery pack. c. Replace the BPS PCB 2. Once the green LED is lit, run EST to test the BPS and use EST diagnostics to determine if further corrective action is needed.
ZC1xxx	*Varies*	Communications error (GUI)	Alert		No action required unless a ZB0059 error is also present.

Table 6-2: *840* Ventilator diagnostic codes (continued)

Code	Message displayed	Test	Response	Information / Possible cause	Corrective action
ZC2000	DCI parity error	Communications error (GUI)	Alert		Check parity of host device.
ZC2001	DCI input buffer overflow error	Communications error (GUI)	Alert		1. Check cabling between ventilator and host. 2. Check baud rate of host device.
ZC2002	DCI command error	Communications error (GUI)	Alert	Undefined command received	1. Check host software for compatibility with ventilator. 2. Check cabling between ventilator and host.
ZC2003	DCI unknown error	Communications error (GUI)	Alert		1. Check host software for compatibility with ventilator. 2. Check cabling between ventilator and host.
ZP0008 	Kernel NOVRAM Test	POST (GUI)	Alert	Noncritical NOVRAM data failure	Call Technical Support or your Puritan Bennett representative.
ZP0085 	Ethernet Self-Test Start	POST (GUI)	Alert	Spec says failure	Replace GUI CPU PCB.
ZP0086 	Ethernet Self-Test End	POST (GUI)	Alert	Spec says failure	Replace GUI CPU PCB.
ZP0087 	Unexpected Reset Umpire Test	POST (GUI)	Alert	POST was invoked due to an unexpected reset.	Check associated errors in log. No action required unless other errors are present.
ZP0088 	POST NOVRAM Test	POST (GUI)	Alert	Noncritical NOVRAM data failure	Replace GUI CPUPCB.

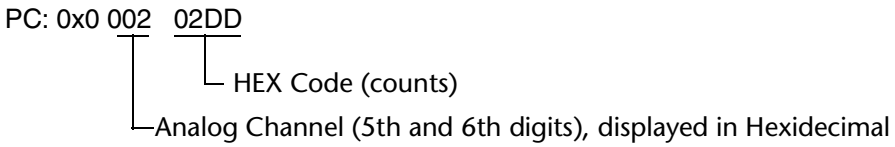
6.8 System Diagnostic Log and BDU POST analog devices test

Analog device errors reported during the BDU POST analog devices test are recorded in the System Diagnostic Log. These errors are reported as diagnostic codes KP0116 and LP0116. Information in the NOTES column of the log identifies the analog channel on which the error occurred.

Using an example of a BDU POST analog device error, as it might be reported in the System Diagnostic Log:

TIME	TEST/EVENT	CODE	TYPE	NOTES
12:55:59 08 Aug 03	ANALOG DEVICE	KP0116	FAILURE	PC: 0x000202DD EV: 0 NMI: 0xC0 Err Code: 0xCC

The error address (NOTES) identifies the analog channel:



The diagnostic codes, KP0116 (BDU) and LP0116 (GUI), are major faults (VENT INOP) that can occur during the Analog Devices Test (Phase 2 POST).

If there are multiple KP0116 and/or LP0116 diagnostic codes, check the PC channels and determine if they are all the same. If the channels are all the same, replace the associated analog device or the AI PCB. If the channels are different, but originate from the same module, check and/or replace the associated module, interconnect cable or AI PCB.

Using the fifth and sixth digits of error address reported in the System Diagnostic Log and Table 6-3, the analog channel on which the error occurred can be identified.

Table 6-3: Address codes for BDU POST analog devices test errors

If the 5th and 6th digits of the error address are:	Parameter Measured	Replace This:
00	Inspiratory Pressure Filtered	Inspiratory Electronics PCB
01	Expiratory Pressure Filtered	Expiratory PCB
02	Q (O_2) Filtered	Q1 (O_2) Flow Sensor
03	Q (O_2) Temperature	Q1 (O_2) Flow Sensor
04	Q (air) Filtered	Q2 (air) Flow Sensor
05	Q (air) Temperature	Q2 (air) Flow Sensor
06	Q (exh) Filtered	Q3 (exh) Flow Sensor
07	Q (exh) Temperature	Q3 (exh) Flow Sensor
08	SUBMUX 0: DACWRAP	AI PCB
09	Safety Valve Switched Side	Safety Valve (SV) Assembly; check Inspiratory Module connections
0A	12 V GUI Sentry	GUI CPU PCB

Table 6-3: Address codes for BDU POST analog devices test errors

If the 5th and 6th digits of the error address are:	Parameter Measured	Replace This:
0B	Alarm Cable Voltage	GUI CPU PCB or alarm cable assembly
0C	O_2 PSOL Current	O_2 PSOL or AI PCB
0D	Air PSOL Current	Air PSOL or AI PCB
0E	Low Voltage Reference	Power Supply
0F	Atmospheric Pressure Transducer	Inspiratory Electronics PCB
10	Exhalation Coil Temperature	Exhalation Valve
11	Exhalation Pressure Transducer	Expiratory PCB
12	O_2 Sensor	O_2 Sensor
13	GUI 5V dc Sentry	GUI CPU PCB
14	12V dc Sentry	Power Supply
15	Safety Valve Current	Safety Valve or Inspiratory Electronics PCB or AI PCB
16	+15V Sentry	Power Supply or AI PCB
17	-15V Sentry	Power Supply or AI PCB
18	Power Fail Cap Voltage	Power Supply
19	Exhalation Manifold Heater Temp	Exhalation Heater
1A	BPS Battery Voltage Signal	BPS PCB
1B	5V dc Venthead	Power Supply
1C	BPS Battery Current	BPS PCB
1D	ac Line Voltage	Power Supply or AI PCB
1E	Exhalation Motor Current	Exhalation Valve Assembly
1F	10V Sentry	Power Supply

6.9 Diagnostic codes for POST faults

Use the following tables to determine the error code associated with the pattern of either the BD or the GUI LED array when a fault occurs during POST.

Table 6-4: BDU and GUI—Phase 1 (kernal) POST diagnostic codes

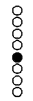
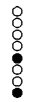
Test	Test Description	BD and GUI LED arrays			Fault Type	Corrective Action
		BDU Diag. code	GUI (10.4-inch) Diag. code	GUI (9.4-inch) Diag. code		
Processor Initialization	Prepares the processor for executing instructions	 KP0001	 XP0001	 XP0001	Major	1. Check the diagnostic codes' corrective actions in Table 6-2. 2. Replace affected CPU PCB.
Integer Unit Test	General CPU confidence test	 KP0002	 XP0002	 XP0002	Major	1. Check the diagnostic codes' corrective actions in Table 6-2. 2. Replace affected CPU PCB.
DRAM Refresh Timer Test	Tests DRAM refresh circuitry	 KP0003	 XP0003	 XP0003	Major	1. Check the diagnostic codes' corrective actions in Table 6-2. 2. Replace affected CPU PCB.
Kernel DRAM Test	Tests read/write function of DRAM	 KP0004	 XP0004	 XP0004	Major	1. Check the diagnostic codes' corrective actions in Table 6-2. 2. Replace affected CPU PCB.
Boot PROM Checksum Test	Verifies kernel PROM integrity	 KP0005	 XP0005	 XP0005	Major	1. Check the diagnostic codes' corrective actions in Table 6-2. 2. Replace affected CPU PCB.
Addressing Mode Test	Verifies CPU functions in preparation for tests using multiple addressing modes	 KP0007	 XP0007	 XP0007	Major	1. Check the diagnostic codes' corrective actions in Table 6-2. 2. Replace affected CPU PCB.
Kernel NOVRAM Test	Validates ranges for NOVRAM variables used in later tests	 KP0008	 XP0008	 XP0008	Major	1. Check the diagnostic codes' corrective actions in Table 6-2. 2. Replace affected CPU PCB.
Rolling Thunder Test (BDU only)	Checks for unexpected resets during POST. Three or more resets not related to ac failures causes the test to fail.	 KP0009	N/A	N/A	Major	1. Check the diagnostic codes' corrective actions in Table 6-2. 2. Replace AI PCB. 3. Replace BD CPU PCB. 4. Replace mother-board.

Table 6-4: BDU and GUI—Phase 1 (kernal) POST diagnostic codes (continued)

Test	Test Description	BD and GUI LED arrays			Fault Type	Corrective Action
		BDU Diag. code	GUI (10.4-inch) Diag. code	GUI (9.4-inch) Diag. code		
Time of Day Clock Test	Verifies functionality of the Time of Day clock	 KP0011 or LP0011	 XP0011 or ZP0011	 XP0011 or ZP0011	Major or Minor	1. Check the diagnostic codes' corrective actions in Table 6-2. 2. Replace affected CPU PCB.
Timer Test	Compares system timer to Time of Day clock to verify functionality	 KP0012	 XP0012	 XP0012	Major	1. Check the diagnostic codes' corrective actions in Table 6-2. 2. Replace affected CPU PCB.
Watchdog Timer Test	Verifies watchdog timer times out as expected	 KP0013	 XP0013	 XP0013	Major	1. Check the diagnostic codes' corrective actions in Table 6-2. 2. Replace affected CPU PCB.
EEPROM Checksum Test	Verifies integrity of flash memory	 KP0015	 XP0015	 XP0015	Major	1. Check the diagnostic codes' corrective actions in Table 6-2. 2. Replace affected CPU PCB.

Table 6-5: BDU only—Phase 2 POST diagnostic codes

BDU Test	BDU Test Description	BDU Diag. Code	BDU Fault Type	Corrective Action
ac Voltage Test	Compares ac monitor voltage to specified range	 LP0122	Minor	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Make sure ventilator is plugged into ac source. 3. Make sure nominal line voltage is set correctly.
ADC Test	Checks analog-to-digital converter data availability	 KP0114	Major	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Replace AI PCB.
Analog Devices Test	Performs a range check on each of the 32 analog channels	 KP0116 or LP0116	Major or Minor	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Refer to Section 6.8 for additional troubleshooting information regarding this fault. 3. Replace affected component. 4. Replace AI PCB. 5. Call Technical Support or your Puritan Bennett representative.
Analog Interface Test	Tests analog interface circuitry	 KP0113	Major	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Replace BD CPU PCB. 3. Replace AI PCB. 4. Replace mother board.
Bus Timer Test*	Monitors activity on the local bus	 KP0082	Major	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Replace BD CPU PCB.
DAC Test	Tests digital-to-analog converter data	 KP0115	Major	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Replace AI PCB.
DRAM Memory Test*	Tests DRAM by writing and verifying data patterns to memory	 KP0084	Major	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Replace BD CPU PCB.
DRAM Parity Error Test*	Checks the ability to detect a parity error upon reading defective parity from memory	 KP0090	Major	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Replace BD CPU PCB.

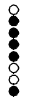
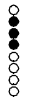
* Tested in Short POST

Table 6-5: BDU only—Phase 2 POST diagnostic codes (continued)

BDU Test	BDU Test Description	BDU Diag. Code	BDU Fault Type	Corrective Action
Ethernet Self-Test End		 LP0086	Minor	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Replace BD CPU PCB.
Ethernet Self-Test Start	Internal routine verifies functionality of Ethernet controller	 KP0085	Major	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Replace BD CPU PCB.
NMI Register Test*	Verifies NMI source register is in reset state (no bits set)	 KP0083	Major	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Replace BD CPU PCB.
Phase 2 Initialization*	Start non-kernel portion of POST	 KP0006	Major	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Replace BD CPU PCB.
Phase 2 NOVRAM Test*	Compares NOVRAM data to valid states and ranges	 LP0088	Minor	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Call Technical Support or your Puritan Bennett representative.
Safe State Test	Places PSOLs and exhalation valve into safe state and verifies that they cannot be commanded	 KP0120	Major	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Replace AI PCB. 3. Replace BD CPU PCB.
Serial Device Test	Writes to serial EEPROM to verify accessibility	 KP0117	Major	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Replace AI PCB. 3. Replace BD CPU PCB.
Service Switch Test End*		 LP0121	Minor	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Turn off ventilator. Release switch. 3. Check for mechanical obstruction to switch. 4. Replace BD CPU PCB.

* Tested in Short POST

Table 6-5: BDU only—Phase 2 POST diagnostic codes (continued)

BDU Test	BDU Test Description	BDU Diag. Code	BDU Fault Type	Corrective Action
Service Switch Test Start*	Checks that the service mode switch is not stuck, and prevents entry into Service Mode from a power fail condition	 LP0121	Minor	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Turn off ventilator. Release switch. 3. Check for mechanical obstruction to switch. 4. Replace BD CPU PCB.
Unexpected Reset Umpire Test*	Checks for unexpected resets of the CPU. Three resets (strikes) in 24 hours will cause a VENT INOP condition.	 KP0087 or LP0087	Major or Minor	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Check associated errors in the System Diagnostic and System Information log to determine why POST was invoked three times within 24 hours. a. If the codes indicate that the BD CPU generated the resets, replace the BD CPU (Other codes may be present indicating that the GUI lost communications with the BD). b. If the codes indicated that the GUI CPU generated the resets, replace the GUI CPU (Other codes may be present indicating that the BD lost communications with the GUI. 3. Run a complete EST to check for analog device failures.
VENT INOP Test	Checks to see if the ventilator is in the VENT INOP state	 KP0112	Major	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Check cabling from BD CPU PCB to GUI CPU PCB. 3. Replace BD CPU PCB. 4. Call Technical Support or your Puritan Bennett representative.

* Tested in Short POST

Table 6-6: GUI only—Phase 2 POST diagnostic codes

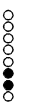
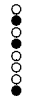
GUI Test	GUI Test Description	GUI (10.4-inch) Diag. code	GUI 9.4-inch) Diag. code	GUI Fault Type	Corrective Action
Bus Timer Test	Monitors activity on the local bus	 XP0082	 XP0082	Major	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Replace GUI CPU PCB.
DRAM Memory Test	Tests DRAM by writing and verifying data patterns to memory	 XP0084	 XP0084	Major	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Replace GUI CPU PCB.
DRAM Parity Error Test	Checks the ability to detect a parity error upon reading defective parity from memory	 XP0090	 XP0090	Major	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Replace GUI CPU PCB.
Ethernet Self-test End		 ZP0086	 ZP0086	Minor	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Replace GUI CPU PCB.
Ethernet Self-Test Start	Internal routine verifies functionality of Ethernet controller	 XP0085	 XP0085	Major	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Replace GUI CPU PCB.
NMI Register Test	Verifies NMI source register is in reset state (no bits set)	 XP0083	 XP0083	Major	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Replace GUI CPU PCB.
Phase 2 Initialization	Start non-kernel portion of POST	 XP0006	 XP0006	Major	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Replace GUI CPU PCB.
Phase 2 NOVRAM Test	Compares NOVRAM data to valid states and ranges	 ZP0088	 ZP0088	Minor	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Replace GUI CPU PCB.

Table 6-6: GUI only—Phase 2 POST diagnostic codes (continued)

GUI Test	GUI Test Description	GUI (10.4-inch) Diag. code	GUI 9.4-inch) Diag. code	GUI Fault Type	Corrective Action
SAAS Self-test End		 XP0098	 XP0098	Major	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Replace GUI audio alarm. 3. Replace GUI CPU PCB.
SAAS Self-test Start	Detects internal errors of alarm circuitry and lack of audio feedback	 XP0097	 XP0097	Major	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Replace GUI audio alarm. 3. Replace GUI CPU PCB.
Unexpected Reset Umpire Test	Checks for unexpected resets of the CPU. Three resets (strikes) in 24 hours will cause a VENT INOP condition.	 XP0087 or ZP0087	 XP0087 or ZP0087	Major or Minor	1. Check the diagnostic code's corrective actions in Table 6-2. 2. Check associated errors in System Diagnostic Log. 3. Call Technical Support or your Puritan Bennett representative.

Table 6-7: BDU or GUI—Phase 3 POST diagnostic codes

Test Step	Test Description	Diag. code BDU PCB LEDs	Diag. code GUI PCB LEDs (10.4-inch)	Diag. code GUI PCB LEDs (9.4-inch)	Fault Type	Corrective Action
Operating System Initialization*	Loads operating system	 KP0129	 XP0129	 XP0129	Major	1. Check the diagnostic codes' corrective actions in Table 6-2. 2. Replace affected CPU PCB.
Floating Point Unit Test*	Tests floating point functionality of the microprocessor	 KP0089	 XP0089	 XP0089	Major	1. Check the diagnostic codes' corrective actions in Table 6-2. 2. Replace affected CPU PCB.
Memory Management Unit Test*	Tests microprocessor's memory management unit	 KP0081	 XP0081	 XP0081	Major	1. Check the diagnostic codes' corrective actions in Table 6-2. 2. Replace affected CPU PCB.
Application Initialization*	Loads application software	 KP0131	 XP0131	 XP0131	Major	1. Check the diagnostic codes' corrective actions in Table 6-2. 2. Replace affected CPU PCB.

* Tested in Short POST

6.9.1 POST interrupt errors and test failures

Table 6-8 below lists the errors that can occur during particular POST test steps. These errors, reported by the diagnostic LED array on the applicable CPU PCB, are of two types: interrupts and test failures. An interrupt error may indicate that an external event (e.g. a power fail interrupt) occurred during the test step. A test failure indicates that the test failed to meet its specifications.

Table 6-8: Interrupt errors and test failures – POST self tests

Error	BD and GUI LED arrays			Error Type	May be caused by
	BDU Diag. code	GUI (10.4-inch) Diag. code	GUI (9.4-inch) Diag. code		
Unknown NMI				Interrupt	CPU PCB
Ethernet Parity Error				Interrupt	CPU PCB
DRAM Parity Error				Interrupt	CPU PCB
Analog Interface Error				Interrupt	AI PCB
Power Fail NMI (BDU only)				Interrupt	Loss of ac power during POST
5 Vdc overvoltage (GUI only)				Interrupt	Power Supply
12 Vdc overvoltage (GUI only)				Interrupt	Power Supply
12 Vdc undervoltage (GUI only)				Interrupt	Power Supply

Table 6-8: Interrupt errors and test failures – POST self tests (continued)

Error	BD and GUI LED arrays			Error Type	May be caused by
	BDU Diag. code	GUI (10.4-inch) Diag. code	GUI (9.4-inch) Diag. code		
SAAS NMI				Interrupt	GUI alarm or alarm cabling
Access fault/Bus error				Interrupt	CPU PCB
Other Unexpected interrupt				Interrupt	CPU PCB
POST Internal Software Failure				Interrupt	CPU PCB
Test Failed				Failure	Specific analog device or CPU PCB