BAC Refrigeration Controls

Quick Start-up Guide

NOTE: For the complete BAC Refrigeration Controls user manual visit
www.baltimoreaircoil.com/refrigcontrolsusermanual.

Table of Contents

Section 1: Safety

Use of Warnings and Notes

There are two types of safety instructions throughout this manual:

- Notes draw attention to a particular condition or fact, or give information on a subject.

- Warnings caution you about conditions which can result in serious injury or death and/or damage to the equipment. They also tell you how to avoid the danger. The warning symbols are used as follows:

Electricity warning warns of hazards from electricity which can cause physical injury and/or damage to the equipment.

General warning warns about conditions, other than those caused by electricity, which can result in physical injury and/or damage to the equipment.

WARNING! The BAC adjustable speed AC drive should ONLY be installed by a qualified electrician.

WARNING! Even when the motor is stopped, dangerous voltage is present at the power circuit terminals U1, V1, W1 (L1, L2, L3) and U2, V2, W2 (T1, T2 T3) and, depending on the frame size, UDC+ and UDC-, or BRK+ and BRK-.

WARNING! Dangerous voltage is present when input power is connected. After disconnecting the supply, wait at least 5 minutes (to let the intermediate circuit capacitors discharge) before removing the cover.

WARNING! Even when power is switched off from the input terminals of the BAC Drive, there may be dangerous voltage (from external sources) on the terminals of the relay outputs.

WARNING! When the control terminals of two or more drives are connected in parallel, the auxiliary voltage for these control connections must be taken from a single source which can either be one of the drives or an external supply.

WARNING! Disconnect the internal EMC filter when installing the drive on an IT system (an ungrounded power system or a high-resistance-grounded [over 30 ohm] power system).

WARNING! Do not attempt to install or remove EM1, EM3, F1 or F2 screws while power is applied to the drive's input terminals.

WARNING! Do not control the motor with the disconnecting device (disconnecting means); instead, use the control panel keys or commands via the I/O board of the drive. The maximum allowed number of charging cycles of the DC capacitors (i.e. power-ups by applying power) is five in ten minutes.

WARNING! Never attempt to repair a malfunctioning BAC Drive; contact your BAC representative for repair or replacement.

WARNING! The BAC Drive will start up automatically after an input voltage interruption if the external run command is on.

**WARNING!** The heat sink may reach a high temperature.

Note: For more technical information, contact the factory or your local BAC representative.

Section 2: Product Overview

Thank you for choosing BAC Refrigeration Controls for your BAC Evaporative Condenser. If you have any questions about this product please contact us at 410.799.6222.

2.1 Product Description

The BAC Total Control Package (TCP) provides an integrated control solution with BAC proprietary Sequencing Software to ensure efficient control of the evaporative cooling equipment. The TCP contains a VFD for fan motor control, up to two spray pump starters, up to two basin heater connections, along with an optional mechanical VCOS and EWLC connections. This configuration comes standard in a Type 3R enclosure. Control in both Hand or Auto is achievable through operator friendly controls located on the front of the door. The new TCP will help minimize installation costs and startup time.
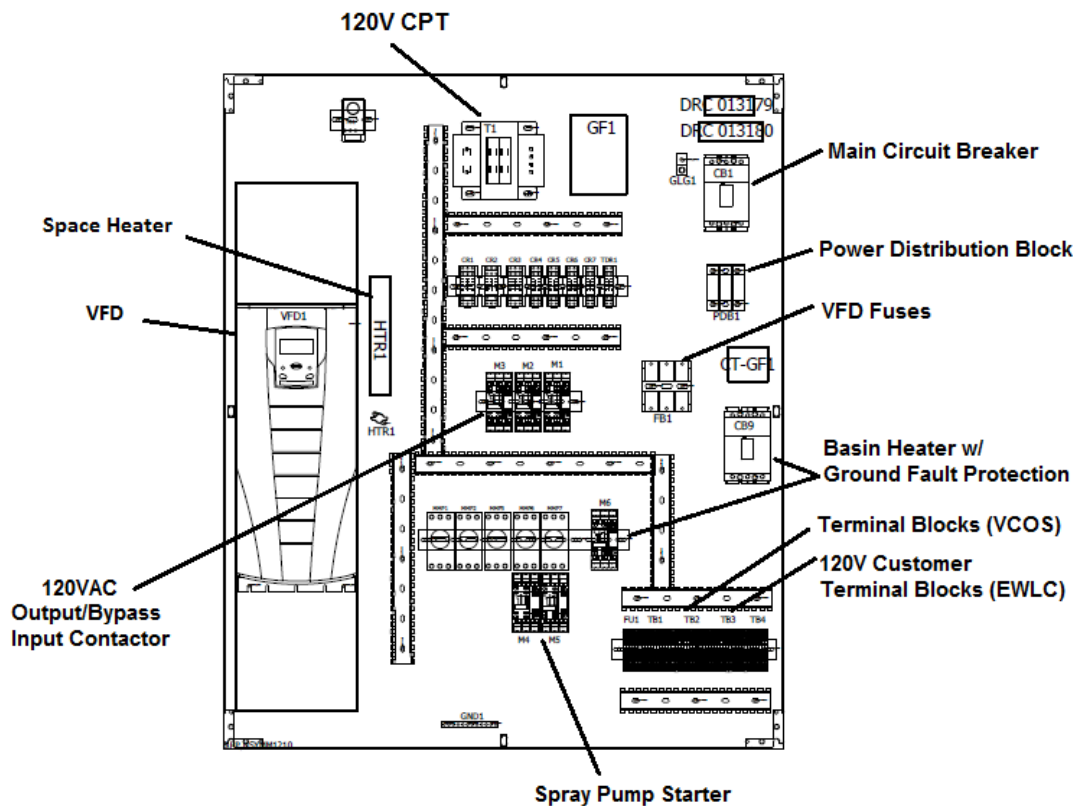
2.2 General Control Mode Overview

The following section describes the different control modes built into the VFD logic. Control modes VFD Only, SP -> VFD, and VFD -> SP relate to the TCP offering only, while Remote Control should only be used on VFD Only applications.

2.2.1 Total Controls Package

SP -> VFD
Application: Total Control Package includes a VFD and a spray pump. Optional unit accessories include: Mechanical VCOS, EWLC, and/or basin heater. Auto mode will cycle on the spray pump. If the actual leaving temperature/pressure continues to rise, the VFD will cycle on to provide increased cooling. The VFD and the spray pump will remain on until the actual leaving temperature/pressure falls below the leaving setpoint. The VFD cycles off when the temperature/pressure falls below the lower deadband. The spray pump cycles off when the temperature/pressure falls below the lower limit and the Off-Delay Timer (OFDT) has expired. When the temperature/pressure begins to increase, the cycle will restart. A remote run command is required to enable the VFD.

VFD -> SP
Application: Total Control Package includes a VFD and a spray pump. Optional unit accessories include: Mechanical VCOS, EWLC, and/or basin heater. Auto mode will cycle on the VFD. If the actual leaving temperature/pressure continues to rise, the spray pump will cycle on to provide increased cooling. The spray pump and the VFD will remain on until the actual leaving temperature/pressure falls below the leaving setpoint. The spray pump cycles off when the temperature/pressure falls below the lower deadband and the Off-Delay Timer (OFDT) has expired. The VFD cycles off when the temperature/pressure falls below the lower limit. When the temperature begins to increase, the cycle will restart. A remote run command is required to enable the VFD.

2.2.2 VFD Only Package

VFD Only
Application: A temperature/pressure sensor provides a reference signal (4-20mA default) to the VFD. Auto Mode will modulate the fan speed to maintain the setpoint. A remote run command is required to enable the VFD.

Remote Control
Application: For VFD only applications. A temperature/pressure sensor (provided by others) or a Building Automation System would provide signals such as a speed reference to the VFD. A remote run command is required to enable the VFD.

Section 3: Unit Start-up Information

3.1 Input Signal:

The TCP and VFD only control panels are designed to operate with a 4-20mA signal originated from a pressure sensor. This signal will be used to control and maintain the setpoint.

3.1 System Voltage:

The system voltage must match the control panel's voltage; the voltage must have been specified at the time the unit was configured. The current options are 200//230/460/575VAC, 3 phase, 60Hz.

3.2 Motor Data:

The motor data can be found in the motor nameplate, the nameplate is attached to the motor(s) as seen in Figure 1.

The motor data needed is:
Motor HP (total hp if multiple motors)
Motor Voltage
Motor FLA (total FLA if multiple motors)
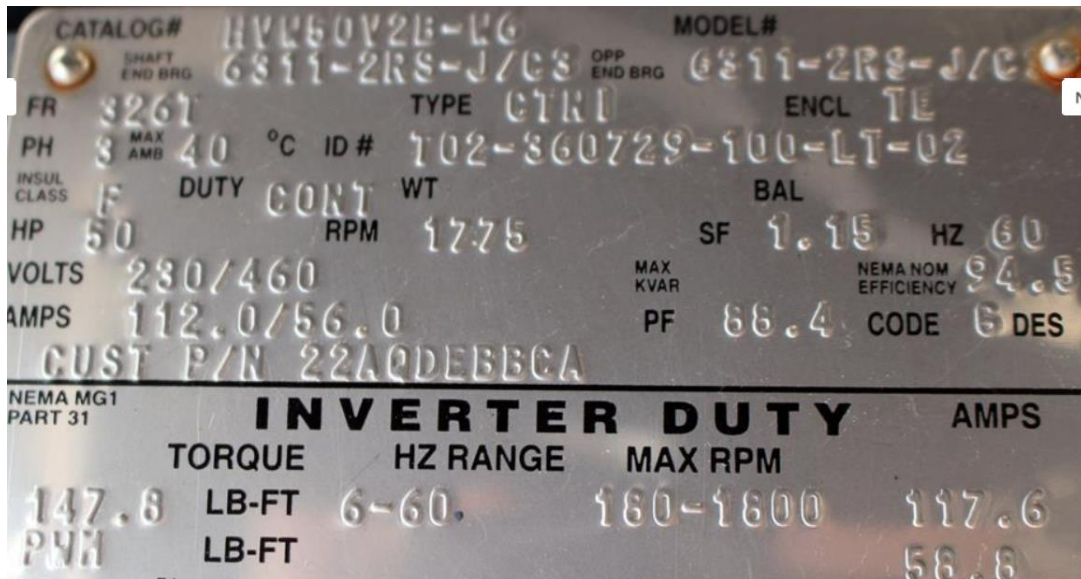Motor Frequency
Motor Max RPM

Figure 1: Motor Data

Note: Some motors have multiple voltages (as shown in Figure 1). Identify the proper voltage of the system and follow the wiring diagram provided with the motor to ensure proper operation.

3.3 Glossary

Set Point (SP): the target value the operator enters into the controller to maintain the evaporative condenser temperature/pressure.

Dead Band (DB): range in which no action occurs. The dead band range is (dead band/2) above and below the set point.

Leaving Fluid Temperature (LFT): measured in leaving refrigerant piping using a RTD temperature transducer providing a 4-20mA output.

Leaving Fluid Pressure (LFP): measured in the leaving refrigerant piping using a pressure transducer providing a 4-20mA output.

Upper Dead Band (UDB): the value for bringing on additional stages for increased capacity. Upper dead band is calculated by set point + (dead band/2).

Lower Dead Band (LDB): the value for turning off stages for decreased capacity. Lower dead band is calculated by set point – (dead band/2).

Upper Limit (UL): the value above set point that will cause the controller to turn on the next stage of capacity. The Upper Limit is calculated by set point + limit.

Lower Limit (LL): The value below set point that will cause the controller to turn off the current stage of capacity. The Lower Limit is calculated by set point – limit.

Off-Delay Timer (OFDT): The minimum amount of time the spray pump will operate before turning off.

Minimum Pump Timer: is the minimum period of time that the spray pump motor operates before cycling off, the timer begins when spray pump cycles on. The minimum value allowed is 10 minutes.

Stage Override Multiplier: is the value used to calculate the value at which the next stage of cooling occurs. The default value is 2. This value is calculated by multiplying the deadband value by the stage override multiplier and adding the setpoint value. This value becomes the Upper Limit; the lower limit will be calculated similarly except that the setpoint value gets subtracted.

Constant Speed: is the value that will pre-set the fan speed when the unit is placed in "hand mode".

Minimum Frequency is the frequency at which the fan will run when the pressure in the system is below the septpoint but is above the lower deadband.

EWLC: Electric Water Level Control

VCOS: Vibration Cutout Switch

Section 4: Panel Item Description

VFD Only:

<u>Lights:</u>
Yellow light: Hand Enabled: Illuminates when the unit is on hand mode
Red Light: Drive Motor: Illuminates when the motor is running
Red Light: VFD bypass on: Illuminates when the motor is on bypass mode
Green Light VFD: Drive Ready: Illuminates when the VFD is enabled and ready to run

<u>VFD Drive Switches:</u>
Hand/OFF/AUTO: Selects the drive's mode of operation
Drive ON/OFF: On/Off switch for the VFD drive
Drive BYPASS/OFF/Drive: Selects the motor mode when the drive is on "Hand" mode

VFD Only Enclosure

Total Control Package:

Lights:
Yellow light 1: Hand Enabled: Illuminates when the unit is on hand mode
Red Light 1: Drive Motor: Illuminates when the motor is running
Red Light 2: VFD bypass on: Illuminates when the motor is on bypass mode
Green Light VFD: Drive Ready: Illuminates when the VFD is enabled and ready to run
Red Light 3: Basin Heater on
Red Light 4: Spray Pump on
Yellow Light/Reset button: Vibration Cutout switch alarm and remote reset
Yellow Light 2: EWLC High water level alarm
Yellow Light 3: EWLC Low water level alarm
Red Light 4: EWLC Make up valve open

TCP Switches:
Fan and Pump modes: Hand-OFF-AUTO: Selects the drive and pump's mode of operation
Fan Hand Mode: DRIVE/AUTO/BYPASS: Selects the motor mode when the drive is on "Hand" mode
Drive Power: ON/OFF: On/Off switch for the VFD drive
Basin Heater(s): OFF/Auto
Spray Pump Mode (when in Hand): OFF/ON
Spray Pump Mode (when in Auto): Dry/Wet
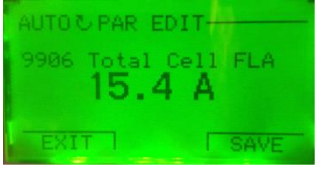
Section 5: Start-up Wizard

4.1 General
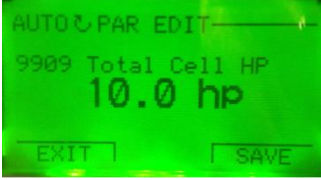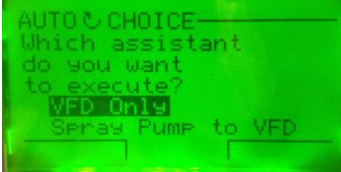
Start-up can be performed in two ways:
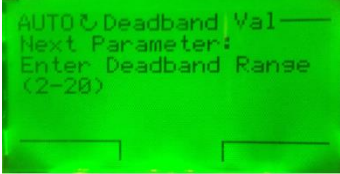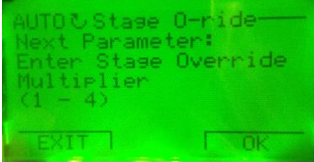
- Using the Start-Up Wizard.
- Changing the parameters individually. Please refer to the full BAC Refrigeration Controls User Manual at www.baltimoreaircoil.com/refrigerationcontrolsusermanual for more information.

Start-up by Using the Start-Up Wizard

Upon initial power-up, the Start-Up Wizard guides the commissioner through the basic VFD setup. The Start-Up Wizard will appear automatically the first time the BAC Drive is powered up. To proceed through the Wizard, follow these steps:

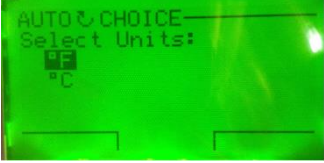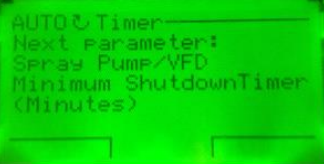|		
1.	**Voltage Screen** The Voltage listed on the motor nameplate. Acceptable entries are: 208V, 230V, 460V and 575V. Press Save to continue.	AUTO ↻ PAR EDIT 9905 MOTOR NOM VOLT **460 V** EXIT SAVE
2.	**FLA Screen** Enter the total **sum** of fan motor FLA per cell, using the current value listed on the motor nameplate(s).	AUTO ↻ PAR EDIT 9906 Total Cell FLA **15.4 A** EXIT SAVE
3.	**Motor Frequency Screen** Enter the motor frequency listed on the motor nameplate. Press Save to continue.	AUTO ↻ PAR EDIT 9907 MOTOR NOM FREQ **60.0 Hz** EXIT SAVE
4.	**Fan Motor Speed Screen** Enter the RPM listed on the motor nameplate, then press Save to continue.	AUTO ↻ PAR EDIT 9908 MOTOR NOM SPEED **1740 rpm** EXIT SAVE

5.	**HP Screen** Enter the total **sum** of fan motor HP per cell, using the HP value listed on the motor nameplate(s).The selectable range is 1 to 75 HP. Press Save to continue.	AUTO ↻ PAR EDIT 9909 Total Cell HP **10.0 hp** EXIT · SAVE
6.	**Control Mode Screen** The following control modes are offered: SP -> VFD, VFD -> SP, and VFD only. **For a TCP application:** Select either SP -> VFD or VFD -> SP. **For a VFD only:** Select the VFD only control mode. **NOTE**: If VFD only mode is selected, a follow-up "Remote Control" question will appear. If Remote Control is **not** selected, the Wizard will continue through the Start-Up. If Remote Control **is** selected, the Wizard will discontinue and the BAC Drive will default to the HVAC Default configuration.	AUTO ↻ CHOICE Which assistant do you want to execute? VFD Only Spray Pump to VFD AUTO ↻ CHOICE Do you have remote control? Yes/No Yes No EXIT · OK
7.	**Constant Speed Screen** This screen sets the fan motor speed for **Hand Mode**. Enter the desired value and select Save to continue.	AUTO ↻ PAR EDIT 1202 CONST SPEED 1 **30.0 Hz** EXIT · SAVE
8.	**Minimum Motor Frequency Screen** Enter the desired minimum fan frequency or accept the default value of 20 Hz.	AUTO ↻ PAR EDIT 2007 MINIMUM FREQ **20.0 Hz** EXIT · SAVE
9.	**Engineering Units Screen** Select unit of measure for the temperature/pressure sensor. Available options are: °F and °C for temperature, PSI and Bar for Pressure.	AUTO ↻ CHOICE Select Units: °F °C
10.	**OFDT Screen** Enter a value for the Off-Delay Timer. The Off-Delay may be set to a value between 10 – 60 minutes. The default OFDT value is 10 minutes. **Note:** OFDT pertains to VFD->SP and SP->VFD control modes only. OFDT screen will not appear if VFDonly control mode is	AUTO ↻ Timer Next parameter: Spray Pump/VFD Minimum ShutdownTimer (Minutes)

	selected.	AUTO ↻ PAR EDIT 0135 Default **10** EXIT SAVE
11.	**Deadband Screen** Enter the desired deadband. This value will be divided by two then added/subtracted to the setpoint value in order to create the Upper and Lower Deadbands. The deadband ranges and default values are shown below with respect to each unit of measurement. **°F:** Range = 2 - 20, Default = 5 **°C:** Range = 2 – 11 , Default = 5 **PSIG:** Range = 2-20, Default = 5 **BAR:** Range = 2 – 6, Default = 5	AUTO ↻ Deadband Val Next Parameter: Enter Deadband Range (2-20) AUTO ↻ PAR EDIT 0135 Default **5** EXIT SAVE
12.	**SORM Screen** Select a value for the Stage Override Multiplier. SORM is used to calculate the Upper and Lower Limits using the following formulas: Upper Limit = Setpoint + (SORM x the full deadband value) Lower Limit = Setpoint – (SORM x the full deadband value)	AUTO ↻ Stage O-ride Next Parameter: Enter Stage Override Multiplier (1 – 4) EXIT OK AUTO ↻ PAR EDIT 0136 Default **1** EXIT SAVE
13.	**Setpoint Screen** Enter the target value at which to maintain the leaving fluid temperature. The setpoint ranges and default setpoints are shown below with respect to each unit of measurement. **°F:** Range = 45-125, Default = 75°F **°C:** Range = 7 – 52, Default = 24°C **PSIG:** Range=20–300, Default=75 PSIG **BAR:** Range = 2 – 20, Default = 12 BAR	AUTO ↻ PAR EDIT 4011 INTERNAL SETPNT **75.0 °F** EXIT SAVE

14.	**<u>Wizard Complete Screen</u>** The Start-Up Wizard exits to the main menu, and the drive parameters become locked. (Note: Parameters are able to be unlocked and adjusted manually outside the Start-Up Wizard).	

After the Start-Up Wizard is complete, the drive parameters will lock. These parameters can be unlocked and adjusted manually if necessary. If Remote Control Mode is selected, the parameters will remain unlocked after exiting the Wizard interface.

Section 6: Verifying Proper Operation

1. **Fan Rotation:** Direction must be checked first in bypass mode, when it's confirmed to be correct the fan direction must be verified in Auto Mode.
2. **Pump Operation:** The pump must follow the sequence of operations provided with the unit. Refer to the unit manual for more details.

Optional Equipment:

3. **Heater interlocks:** If the unit is equipped with basin heaters, these must only get energized when the water temperature is below 34°F and the pump and fans are off.
4. **VCOS:** When the vibration levels on the unit exceed the VCOS setpoint, the fan(s) should stop and the VCOS light should illuminate.
5. **EWLC**: When the water level on the basin is below the minimum, the "low level" light should illuminate, similarly, when the water level is too high, the "high water" light should illuminate. The make-up valve should open anytime the water drops below the make up on level; the "make up on" light should illuminate when the valve opens.

Section 7: Troubleshooting Guide

Troubleshooting		
	Issue	**Solution**
General	Fan(s) rotate in wrong direction in Bypass Mode	Switch 2 Leads of the VFD output power lines.
	Fan(s) rotate in wrong direction in Auto Mode (verify 1st in Bypass Mode)	After verifying that the fans rotate properly in Bypass Mode, check the direction of the fan on the drive's pad (group 10, parameter 1003) ensure that is set to "forward".
	Basin Heater Does not turn on	1. Verify that fan(s) nor pumps are running. 2. Verify that basin thermostat is properly set. 3. Verify that the Heater starter closes when the coil is energized.
	Pump does not turn on	1. Verify that the switches are in "auto" and that the unit is on "wet" mode. 2. Verify that the pump overload is not tripped. 3. Verify that the wizard was properly completed and that the setpoints are correctly entered
	EWLC does not work properly	1. Verify wiring was completed as per BAC's diagrams. 2. Check 3A fuse, if the fuse is blown ensure that no device associated with the EWLC is using more than 3A.
VFD Specific	Missing run/start enable alarm	Provide a jumper or a connection for terminals TB1 (11-12).
	Motor over temp alarm	Motor could be over amping, verify KW/HP drawn and if motor name plate is exceeded check fan(s) pitch.
	Drive Overtemp alarm	Verify enclosure's temperature, verify that fans on the drive and control panel are operational.
	Temp/Pressure ranges on pad do not match actual readings	Verify that the Pressure sensor installed has the following specs: 0-500Psig/4-20mA.

There are 2 types of warnings produced by the VFD drive, Faults and Alarms:

1. Alarms: When a low severity error occurs an alarm is generated, the diagnostic display is advisory only. For these situations, the drive is simply reporting that it had detected something "unusual."

2. Faults: When a high severity error occurs a Fault is generated, the display will show the fault code and the drive will shut down.

The following table lists the alarms by code number and describes each alarm:

Fault Name In Panel	Fault Code	Description and Recommended Corrective Action
OVERCURRENT	1	Output current is excessive. Check for and correct: • Adjust the TDR1 Off-Delay Relay dipswitch. TDR1 timer is factory set to the lowest value. Maximum recommended value is1.5 seconds. • Excessive motor load. • Insufficient acceleration time (parameters 2202 ACCELER TIME 1 and 2205 ACCELER TIME 2). Contact BAC for further information. • Faulty motor, motor cables or connections.
DC OVERVOLT	2	Intermediate circuit DC voltage is excessive. Check for and correct: • Static or transient overvoltages in the input power supply. • Insufficient deceleration time (parameters 2203 DECELER TIME 1 and 2206 DECELER TIME 2). • Verify that overvoltage controller is ON (using parameter 2005).
DEV OVERTEMP	3	Drive heatsink is overheated. Temperature is at or above limit. R1…R4 & R7/R8: 115 °C (239 °F) R5/R6: 125 °C (257 °F) Check for and correct: • Fan failure. • Obstructions in the air flow. • Dirt or dust coating on the heat sink. • Excessive ambient temperature. • Excessive motor load.
SHORT CIRC	4	Fault current. Check for and correct: • A short-circuit in the motor cable(s) or motor. • Supply disturbances.
DC UNDERVOLT	6	Intermediate circuit DC voltage is not sufficient. Check for and correct: • Missing phase in the input power supply. • Blown fuse. Undervoltage on mains.
MOT TEMP	9	Motor is too hot, based on either the drive's estimate or on temperature feedback. • Check for overloaded motor. • Adjust the parameters used for the estimate (3005…3009). Contact BAC for further information
PANEL LOSS	10	Panel communication is lost and either: • Drive is in local control mode (the control panel displays HAND or OFF), or • Drive is in remote control mode (AUTO) and is parameterized to accept start/stop, direction or reference from the control panel. To correct check: • Communication lines and connections • Parameter 3002 PANEL COMM ERROR. • Parameters in Group 10: START/STOP/DIR and Group 11:

		REFERENCE SELECT (if drive operation is AUTO).
ID RUN FAIL	11	The motor ID run was not completed successfully. Check for and correct: • Motor connections • Motor parameters 9905…9909
MOTOR STALL	12	Motor or process stall. Motor is operating in the stall region. Check for and correct: • Excessive load. • Insufficient motor power. • Parameters 3010…3012.
EARTH FAULT	16	Possible ground fault detected in the motor or motor cables. The drive monitors for ground faults while the drive is running and while the drive is not running. Detection is more sensitive when the drive is not running and can produce false positives. Possible corrections: • Check for/correct faults in the input wiring. • Verify that motor cable does not exceed maximum specified length. • A delta grounded input power supply and motor cables with high capacitance may result in erroneous error reports during non-running tests. To disable response to fault monitoring when the drive is not running, use parameter 3023 WIRING FAULT. To disable response to all ground fault monitoring, use parameter 3017 EARTH FAULT.
UNDERLOAD	17	Motor load is lower than expected. Check for and correct: • Disconnected load. • Group 37: USER LOAD CURVE.
THERM FAIL	18	• Internal fault. The thermistor measuring the internal temperature of the drive is open or shorted. Contact your local BAC sales representative.
OPEX LINK	19	Internal fault. A communication-related problem has been detected on the fiber optic link between the OITF and OINT boards. Contact your local BAC Representative.
OPEX PWR	20	Internal fault. Low voltage condition detected on OINT power supply. Contact your local BAC sales representative.
CURR MEAS	21	• Internal fault. Current measurement is out of range. Contact your local BAC sales representative.

SUPPLY PHASE	22	Ripple voltage in the DC link is too high. Check for and correct: • Missing mains phase. • Blown fuse.
ENCODER ERR	23	Not used (Available only with encoder and parameter Group 50).
ENCODER ERR	23	The drive is not detecting a valid encoder signal. Check for and correct: • Encoder presence and proper connection (reverse wired, loose connection, or short circuit). • Voltage logic levels are outside of the specified range. • A working and properly connected Pulse Encoder Interface Module, OTAC-01. • Wrong value entered in parameter 5001 PULSE NR. A wrong value will only be detected if the error is such that the calculated slip is greater than 4 times the rated slip of the motor. Encoder is not being used, but parameter 5002 ENCODER ENABLE = 1 (ENABLED).
OVERSPEED	24	Motor speed is greater than 120% of the larger (in magnitude) of 2001 MINIMUM SPEED or 2002 MAXIMUM SPEED. Check for and correct: • Parameter settings for 2001 and 2002. • Adequacy of motor braking torque. • Applicability of torque control. Brake chopper and resistor.
DRIVE ID	26	• Internal fault. Configuration Block Drive ID is not valid. Contact your local BAC sales representative.
CONFIG FILE	27	Internal configuration file has an error. Contact your local BAC sales representative.
SERIAL 1 ERR	28	Fieldbus communication has timed out. Check for and correct: • Fault setup (3018 COMM FAULT FUNC and 3019 COMM FAULT TIME). • Communication settings (Group 51 or 53 as appropriate). • Poor connections and/or noise on line.
EFB CONFIG FILE	29	• Error in reading the configuration file for the embedded fieldbus.
FORCE TRIP	30	Fault trip forced by the fieldbus. See the fieldbus User's Manual.

EFB 1	31	Fault code reserved for the embedded fieldbus (EFB) protocol application. These codes are not used as of the publication of this manual.
EFB 2	32	Fault trip forced by the fieldbus. See the fieldbus User's Manual.
EFB 3	33	Fault code reserved for the embedded fieldbus (EFB) protocol application. These codes are not used as of the publication of this manual. Fault in the motor circuit. One of the motor phases is lost. Check for and correct: • Motor fault. • Motor cable fault. • Thermal relay fault (if used). Internal fault. Possible power wiring error detected. When the drive is not running it monitors for an improper connection between the drive input power and the drive output. Check for and correct: • Proper input wiring – line voltageis NOT connected to drive output. • The fault can be erroneously declared if the input power is a delta grounded system and motor cable capacitance is large. This fault can be disabled using parameter 3023 WIRING FAULT.
MOTOR PHASE	34	Fault trip forced by the fieldbus. See the fieldbus User's Manual.
OUTPUT WIRING	35	Fault code reserved for the embedded fieldbus (EFB) protocol application. These codes are not used as of the publication of this manual. Fault in the motor circuit. One of the motor phases is lost. Check for and correct: • Motor fault. • Motor cable fault. • Thermal relay fault (if used). Internal fault. Possible power wiring error detected. When the drive is not running it monitors for an improper connection between the drive input power and the drive output. Check for and correct: • Proper input wiring – line voltageis NOT connected to drive output. The fault can be erroneously declared if the input power is a delta grounded system and motor cable capacitance is large. This fault can be disabled using parameter 3023 WIRING FAULT. The drive cannot use the software. • Internal Fault. • The loaded software is not compatible with the drive. Call support representative. Drive control board is overheated. Check for and correct: • Excessive ambient temperatures • Fan failure. Obstructions in the air flow.
INCOMP SWTYPE	36	Fault code reserved for the embedded fieldbus (EFB) protocol application. These codes are not used as of the publication of this manual.
CB OVERTEMP	37	Fault in the motor circuit. One of the motor phases is lost. Check for and

USER LOAD CURVE	38	correct:
		• Motor fault.
		• Motor cable fault.
		• Thermal relay fault (if used).
		Internal fault.
		Possible power wiring error detected. When the drive is not running it monitors for an improper connection between the drive input power and the drive output. Check for and correct:
		• Proper input wiring – line voltageis NOT connected to drive output.
		The fault can be erroneously declared if the input power is a delta grounded system and motor cable capacitance is large. This fault can be disabled using parameter 3023 WIRING FAULT.
		The drive cannot use the software.
		• Internal Fault.
		• The loaded software is not compatible with the drive.
		Call support representative.
		Drive control board is overheated. Check for and correct:
		• Excessive ambient temperatures
		• Fan failure.
		Obstructions in the air flow.
		Condition defined by parameter 3701 USER LOAD C MODE has been valid longer than the time defined by 3703 USER LOAD C TIME.
SERF CORRUPT	101	• Error internal to the drive. Contact your local BAC sales representative and report the error number.
RESERVED	102	• Condition defined by parameter 3701 USER LOAD C MODE has been valid longer than the time defined by 3703 USER LOAD C TIME.
SERF MACRO	103	Error internal to the drive. Contact your local BAC sales representative and report the error number. • Error in the system. Contact your local BAC sales representative and report the error number.
RESERVED	104	• Condition defined by parameter 3701 USER LOAD C MODE has been valid longer than the time defined by 3703 USER LOAD C TIME.
RESERVED	105	Error internal to the drive. Contact your local BAC sales representative and report the error number. Error in the system. Contact your local BAC sales representative and

		report the error number.
		Error in the system. Contact your local BAC sales representative and report the error number.
		Parameter values are inconsistent. Check for any of the following:
		• 2001 MINIMUM SPEED > 2002 MAXIMUM SPEED.
		• 2007 MINIMUM FREQ > 2008 MAXIMUM FREQ.
		• 2001 MINIMUM SPEED / 9908 MOTOR NOM SPEED is outside proper range (> 50)
		• 2002 MAXIMUM SPEED / 9908 MOTOR NOM SPEED is outside proper range (> 50)
		• 2007 MINIMUM FREQ / 9907 MOTOR NOM FREQ is outside proper range (> 50)
		2008 MAXIMUM FREQ / 9907 MOTOR NOM FREQ is outside proper range (> 50)
		Parameter values are inconsistent. Check for the following:
		2007 MINIMUM FREQ is negative, when 8123 PFA ENABLE is active.
DSP T1 OVERLOAD	201	Error internal to the drive. Contact your local BAC sales representative and report the error number.
DSP T2 OVERLOAD	202	Error in the system. Contact your local BAC sales representative and report the error number.
DSP T3 OVERLOAD	203	Error in the system. Contact your local BAC sales representative and report the error number.
DSP STACK ERROR	204	Parameter values are inconsistent. Check for any of the following:
RESERVED (obsolete)	205	• 2001 MINIMUM SPEED > 2002 MAXIMUM SPEED.
		• 2007 MINIMUM FREQ > 2008 MAXIMUM FREQ.
		• 2001 MINIMUM SPEED / 9908 MOTOR NOM SPEED is outside proper range (> 50)
		• 2002 MAXIMUM SPEED / 9908 MOTOR NOM SPEED is outside proper range (> 50)
		• 2007 MINIMUM FREQ / 9907 MOTOR NOM FREQ is outside proper range (> 50)
		2008 MAXIMUM FREQ / 9907 MOTOR NOM FREQ is outside proper range (> 50)
		Parameter values are inconsistent. Check for the following:
		2007 MINIMUM FREQ is negative, when 8123 PFA ENABLE is active.
		Error in the system. Contact your local BAC sales representative and report the error number.
		Parameter values are inconsistent. Check for any of the following:
		• 2001 MINIMUM SPEED > 2002 MAXIMUM SPEED.
		• 2007 MINIMUM FREQ > 2008 MAXIMUM FREQ.
		• 2001 MINIMUM SPEED / 9908 MOTOR NOM SPEED is outside proper range (> 50)
		• 2002 MAXIMUM SPEED / 9908 MOTOR NOM SPEED is outside proper range (> 50)
		• 2007 MINIMUM FREQ / 9907 MOTOR NOM FREQ is outside proper range (> 50)
		2008 MAXIMUM FREQ / 9907 MOTOR NOM FREQ is outside proper range (> 50)
		Parameter values are inconsistent. Check for the following:
		2007 MINIMUM FREQ is negative, when 8123 PFA ENABLE is active.
		Parameter values are inconsistent. Check for any of the following:
		• 1301 AI 1 MIN > 1302 AI 1 MAX.
		1304 AI 2 MIN > 1305 AI 2 MAX.

OMIO ID ERROR	206	Error in the system. Contact your local BAC sales representative and report the error number.
EFB LOAD ERR	207	Parameter values are inconsistent. Check for any of the following: • 2001 MINIMUM SPEED > 2002 MAXIMUM SPEED. • 2007 MINIMUM FREQ > 2008 MAXIMUM FREQ.
PAR HZRPM LIMITS	1000	• 2001 MINIMUM SPEED / 9908 MOTOR NOM SPEED is outside proper range (> 50) • 2002 MAXIMUM SPEED / 9908 MOTOR NOM SPEED is outside proper range (> 50)
PAR PFAREFNG	1001	• 2007 MINIMUM FREQ / 9907 MOTOR NOM FREQ is outside proper range (> 50)
RESERVED (Obsolete)	1002	2008 MAXIMUM FREQ / 9907 MOTOR NOM FREQ is outside proper range (> 50) Parameter values are inconsistent. Check for the following:
PAR AI SCALE	1003	2007 MINIMUM FREQ is negative, when 8123 PFA ENABLE is active. Parameter values are inconsistent. Check for any of the following:
PAR AO SCALE	1004	• 1301 AI 1 MIN > 1302 AI 1 MAX. 1304 AI 2 MIN > 1305 AI 2 MAX. Parameter values are inconsistent. Check for any of the following: • 1504 AO 1 MIN > 1505 AO 1 MAX. 1510 AO 2 MIN > 1511 AO 2 MAX.
PAR PCU 2	1005	Parameter values for power control are inconsistent: Improper motor nominal kVA or motor nominal power. Check for the following: • $1.1 \le$ (9906 MOTOR NOM CURR * 9905 MOTOR NOM VOLT * 1.73 / P_N) ≤ 3.0 • Where: P_N = 1000 * 9909 MOTOR NOM POWER (if units are kW) or P_N = 746 * 9909 MOTOR NOM POWER (if units are HP, e.g. in US)
EXT ROMISSING	1006	Parameter values are inconsistent. Check for the following: • Extension relay module not connected and • 1410…1412 RELAY OUTPUTS 4…6 have non-zero values.
PAR FBUSMISSING	1007	Parameter values are inconsistent. Check for and correct: A parameter is set for fieldbus control (e.g. 1001 EXT1 COMMANDS = 10 (COMM)), but 9802 COMM PROT SEL = 0.
PAR PFAWOSCALAR	1008	• Parameter values are inconsistent – 9904 MOTOR CTRL MODE must be = 3 (SCALAR: SPEED), when 8123 PFA ENABLE is activated.
PAR PCU1	1009	Parameter values for power control are inconsistent: Improper motor nominal frequency or speed. Check for both of the following: • $1 \le$ (60 * 9907 MOTOR NOM FREQ / 9908 MOTOR NOM SPEED ≤ 16 • $0.8 \le$ 9908 MOTOR NOM SPEED / (120 * 9907 MOTOR NOM FREQ / Motor Poles) ≤ 0.992

PAR PFA OVERRIDE	1010	• Both the override mode and PFA are activated at the same time. These modes are mutually incompatible, because PFA interlocks cannot be observed in the override mode.
PAR OVERRIDE PARS	1011	• Overeride is enabled, but parameters are incompatible. Verify that 1701 is not zero, and (depending on 9904 value) 1702 or 1703 is not zero. Verify that 4010 is either AI1, AI2 or INTERNAL.
PAR PFA IO 1	1012	• IO configuration is not complete – not enough relays are parameterized to PFA. Or, a conflict exists between Group 14, parameter 8117, NR OF AUX MOT, and parameter 8118, AUTOCHNG INTERV.
PAR PFA IO 2	1013	IO configuration is not complete – the actual number of PFA motors (parameter 8127, MOTORS) does not match the PFA motors in Group 14 and parameter 8118 AUTOCHNG INTERV.
PAR PFA IO 3	1014	• IO configuration is not complete – the drive is unable to allocate a digital input (interlock) for each PFA motor (parameters 8120 INTERLOCKS and 8127 MOTORS).

The following table lists the alarms by code number and describes each.

Alarm Code	Display	Description
2001	OVERCURRENT	Current limiting controller is active. Check for and correct: • Excessive motor load. • Insufficient acceleration time (parameters 2202 ACCELER TIME 1 and 2205 ACCELER TIME 2). • Faulty motor, motor cables or connections.
2002	OVERVOLTAGE	Over voltage controller is active. Check for and correct: • Static or transient overvoltages in the input power supply. • Insufficient deceleration time (parameters 2203 DECELER TIME 1 and 2206 DECELER TIME 2).
2003	UNDERVOLTAGE	Under voltage controller is active. Check for and correct: • Undervoltage on mains.
2004	DIR LOCK	The change in direction being attempted is not allowed. Either: • Do not attempt to change the direction of motor rotation, or • Change parameter 1003 DIRECTION to allow direction change (if reverse operation is safe).

2005	I/O COMM	Fieldbus communication has timed out. Check for and correct: • Fault setup (3018 COMM FAULT FUNC and 3019 COMM FAULT TIME). • Communication settings (Group 51 or 53 as appropriate). • Poor connections and/or noise on line.
2006	AI1 LOSS	Analog input 1 is lost, or value is less than the minimum setting. Check: • Input source and connections • Parameter that sets the minimum (3021) • Parameter that sets the Alarm/Fault operation (3001)
2007	AI2 LOSS	Analog input 2 is lost, or value is less than the minimum setting. Check: • Input source and connections • Parameter that sets the minimum (3022) • Parameter that sets the Alarm/Fault operation (3001)
2008	PANEL LOSS	Panel communication is lost and either: • Drive is in local control mode (the control panel displays HAND or OFF), or • Drive is in remote control mode (AUTO) and is parameterized to accept start/stop, direction or reference from the control panel. To correct check: • Communication lines and connections • Parameter 3002 PANEL LOSS. • Parameters in Groups 10 START/STOP/DIR and 11: REFERENCE SELECT (if drive operation is AUTO).
2009	DEVICE OVERTEMP	Drive heatsink is hot. This alarm warns that a DEVICE OVERTEMP fault may be near. R1…R4 & R7/R8: 100 °C (212 °F) R5/R6: 110 °C (230 °F) Check for and correct: • Fan failure. • Obstructions in the air flow. • Dirt or dust coating on the heat sink. • Excessive ambient temperature. • Excessive motor load.
2010	MOT OVERTEMP	Motor is hot, based on either the drive's estimate or on temperature feedback. This alarm warns that a Motor Underload fault trip may be near. Check: • Check for overloaded motor. • Adjust the parameters used for the estimate (3005…3009). • Check the temperature sensors and Group 35 parameters.
2011	UNDERLOAD	Motor load is lower than expected. This alarm warns that a Motor Underload fault trip may be near. Check: • Motor and drive ratings match (motor is NOT undersized for the drive) • Settings Group 37: USER LOAD CURVE

2012	MOTOR STALL	Motor is operating in the stall region. This alarm warns that a Motor Stall fault trip may be near.
2013 (note 1)	AUTORESET	This alarm warns that the drive is about to perform an automatic fault reset, which may start the motor. • To control automatic reset, use parameter Group 31: AUTOMATIC RESET.
2014 (note 1)	AUTOCHANGE	This alarm warns that the PFA autochange function is active. • To control PFA, use parameter Group 81: PFA CONTROL
2015	PFA INTERLOCK	This alarm warns that the PFA interlocks are active, which means that the drive cannot start the following: • Any motor (when Autochange is used), • The speed regulated motor (when Autochange is not used).
2016	Reserved	
2017	OFF BUTTON	Note 1.
2018 (note 1)	PID SLEEP	This alarm warns that the PID sleep function is active, which means that the motor could accelerate when the PID sleep function ends. • To control PID sleep, use parameters 4022…4026 or 4122…4126.
2019	ID RUN	Performing ID run.
2020	OVERRIDE	This alarm warns that the Override function is active, which may start the motor.
2021	START ENABLE 1 MISSING	This alarm warns that the Start Enable 1 signal is missing. • To control Start Enable 1 function, use parameter 1608. To correct, check: • Digital input configuration. • Communication settings.
2023	EMERGENCY STOP	• Emergency stop activated.
2024	ENCODER ERROR	The drive is not detecting a valid encoder signal. Check for and correct: • Encoder presence and proper connection (reverse wired, loose connection, or short circuit). • Voltage logic levels are outside of the specified range. • A working and properly connected Pulse Encoder Interface Module, OTAC-01. • Wrong value entered in parameter 5001 PULSE NR. A wrong value will only be detected if the error is such that the calculated slip is greater than 4 times the rated slip of the motor. Encoder is not being used, but parameter 5002 ENCODER ENABLE = 1 (ENABLED).

2025	FIRST START	• Signals that a the drive is performing a First Start evaluation of motor characteristics. This is normal the first time the motor is run after motor parameters are entered or changed. See parameter 9910 (MOTOR ID RUN) for a description of motor models.
2026	RESERVED	Not used.
2027	USER LOAD CURVE	This alarm warns that the condition defined by parameter 3701 USER LOAD C MODE has been valid longer that half of the time difined by 3703 USER LOAD C TIME.
2028	START DELAY	Shown during the Start delay. See parameter 2113 START DELAY.

Note 1. Even when the relay output is configured to indicate alarm conditions (e.g. parameter 1401 RELAY OUTPUT 1 = 5 (ALARM) or 16 (FLT/ALARM)), this alarm is not indicated by a relay output.