Chapter 8: Troubleshooting

8.1 X5 Fault Codes

When faults occur, you can access the status parameters that are saved along with the fault (Advanced Fault history). To view these parameters, which store the drive's status at the time of the fault, access **Fault History** by pressing **SHIFT** and **ENTER**, and select **Last Fault**. Press the **Shift** key while viewing the last fault, and then use the **INC** or **DEC** (up or down arrow) keys to scroll through the stored drive status parameters. Press the **Shift** key again to return to the programming mode fault parameter.

A great deal of information is contained in the Fault History log for the last fault, and also the previous nine faults, including the following:

Output Frequency	Total Run Time	DI Status	Drive Status 2
Drive Load	DC Bus Voltage	Output Status	
Drive Status	Adv Fault Code	Vin1 Status	
Drive Warning	Cntl Board Temp	Cin Status	
Output Voltage	Drive Power Out	Vin2 Status	
Output Current	Fault Date	Vmet Status	
Load Torque	Fault Time	Imet Status	
Drive Temp	Drive Warning 2	Actual Carrier	

For questions about accessing fault codes, and for advanced troubleshooting problems, please contact us (web site: http://www.vacon.com or by phone (**+1 877-822-6606**, worldwide; or from the United States at **717-267-2522**).

Table 8-1 shows the fault codes that may be displayed during X5 AC drive operation, along with suggestions for recovering from the fault condition.

Table 8-1: X5 Fault Codes *(Page 1 of 6)*

Code	Fault Display	Description	Adv. Fault Code	Explanation	Suggestions for Recovery
1	System	System fault	0,1,2	Internal microprocessor problem	Consult factory for repair or replacement.
			3	Thermistor profile incorrect	Consult factory for repair or replacement.
2	EE Checksum	Checksum error	0	Memory problem when reflashing the drive's memory	• Reset drive to factory settings. • Consult factory.
			1,2,3	Conflict in drive's memory	• Reset drive to factory settings. • Consult factory.
			4	Unable to write an EE parameter after a parameter has been changed through the keypad or SIO	• Reset drive to factory settings. • Consult factory.
			5	The drive is receiving EE write requests faster than they can be processed. This would typically be caused by writing parameters too frequently through Modbus.	Slow down the frequency of Modbus writes.

Note: Shaded faults are auto-resettable, except where noted.

Table 8-1: X5 Fault Codes *(Page 2 of 6)*

Code	Fault Display	Description	Adv. Fault Code	Explanation	Suggestions for Recovery
3	Curr Calibr	Current calibration fault	0	Current calibration fault on phase T1/U	• Check the motor connections to the terminal strip of the drive and at the motor. • Have motor checked. • Consult factory for repair or replacement of drive.
			1	Current calibration fault on phase T3/W	
			2	Current calibration fault on phase T2/V	
4	Power Supp	Power supply fault	0	5V supply is below 4 Vdc for more than 100 ms	• Increase resistance between REF and analog inputs. • Check wiring to REF terminals. • Consult factory.
6	IOC Trip	Instantaneous overcurrent trip	0	Short circuit was detected on power-up	• Remove the short from the power wiring • Check for shorted motor • Consult factory.
			1	Short circuit was detected during operation	
7	MOL	MOL contact fault	0	The MOL digital input was activated, depending on pull-up or pull-down logic configuration	Reset MOL contact or remove condition causing the MOL contact activation.
8	Model ID	ID # out of range	0,1,2	Control board is not reading the drive ID properly	Consult factory for repair or replacement.
10	Res Lockout	Restart lockout	0	The number of fault restarts is greater than the limit defined in the customer parameter.	Check the actual fault in the fault log and use the appropriate remedy.
11	Ground	Ground fault	0	The drive has detected current imbalance between output phases. Imbalance determined to be current flow to ground.	• Check for unbalanced currents. • Check for grounded motor leads or motor. • Consult factory.
12	Vac Imblnce	Input voltage imbalance	0	The drive has detected a single-phase condition or a voltage imbalance outside the drive's rating while running a load that could be damaging to the drive.	Check input voltage and current for imbalance, and correct.
13	OverVoltage	Overvoltage condition	0	• The drive has detected an overvoltage condition during power-up *(not auto-resettable)*.	Verify incoming line power is within specification. Add reactor or transformer to correct.
			1,3	• The drive has detected an overvoltage condition during a running condition.	Verify incoming line power and check for regenerative load. Reduce Regen load or add dynamic braking resistors. Regen Current Limit may help; consult factory.
			2	• The drive has detected an overvoltage condition on power-up on the load side.	Verify incoming line power is within specification. Add reactor or transformer to correct.

Note: Shaded faults are auto-resettable, except where noted.

Table 8-1: X5 Fault Codes *(Page 3 of 6)*

Code	Fault Display	Description	Adv. Fault Code	Explanation	Suggestions for Recovery
15	Dyn Brake	Dynamic brake overload	0	• The DB circuit is active on power-up *(not auto-resettable)*	Check for failed braking transistor. Consult factory.
			1	• The DB circuit is being activated for too long, possibly causing the resistor to overheat or fail.	Reduce braking cycle or increase capacity. Activate current limit; consult factory.
			2	• The DB circuit is overloaded because of too large a regenerative load.	Reduce braking cycle or increase capacity. Activate current limit; consult factory.
			3,4,5	• The DB circuit is faulty on power-up *(not auto-resettable)*.	
18	OverCurrent	Overcurrent condition	0	• The drive sensed an overcurrent condition on power-up *(not auto-resettable)*.	Check for failed output power device or shorted motor.
			1	• The drive sensed an overcurrent condition during operation. The current has exceeded the safe operation point of power devices.	Reduce load on motor. Verify that Motor FLA is programmed correctly. Check for mechanical binding and shock loading.
19	Over Temp	Over- temperature condition	0	• The temperature of the heatsink exceeded a temperature limit.	Check that ambient temperature does not exceed drive's rating. Check for fan operation (assuming drive has fans installed).
			1	• The temperature of the control board exceeded a temperature limit.	Check that ambient temperature does not exceed drive's rating. Check for fan operation (assuming drive has fans installed).
			2	• The drive sensed the heatsink thermistor sensor is faulty or not connected properly.	Check thermistor connections or replace. Consult factory.
			3	• The drive sensed the control board thermistor sensor is faulty or not connected properly.	Check thermistor connections or replace. Consult factory.
20	Motor TOL	Motor timed overload trip	0	The drive detected an overload that exceeds the customer's defined overload setting.	Check load current demand. Verify Motor FLA is programmed to the correct value. Verify TOL characteristic is correct for the application.
21	Low Temp	Low temperature	0	This fault occurs if the temperature of the heatsink falls below -10.0 degrees C.	Verify that ambient temperature is within the drive's specifications; increase the ambient temperature if necessary.
22	Ref Loss	Speed reference loss	0	The drive detected the analog input was configured to fault if the input current went below the level specified by customer parameters.	Check physical connections for reference signal. Check that programming for 4-20 mA signal is correct. Verify that signal to the drive is correct.

Note: Shaded faults are auto-resettable, except where noted.

Table 8-1: X5 Fault Codes *(Page 4 of 6)*

Code	Fault Display	Description	Adv. Fault Code	Explanation	Suggestions for Recovery
23	Brk Wire	Broken wire detection	0	The drive detected that the potentiometer circuit wiring opened and generated a fault.	Check wiring for loss of connection to control terminals. Check that a proper-value potentiometer is installed.
24	Keypad Loss	Keypad loss	0	This fault occurs because of a problem with the keypad or a keypad connection. It occurs if the drive detects that it cannot read any key presses.	Check the connection from keypad to control board. Note that the keypad is not designed for remote mounting without the use of an X5 Remote Keypad option. See ."Chapter 9: X5 Options" on page 131 for more information.
			1	This fault occurs because of a problem with the keypad, a keypad connection, or the wrong keypad is being used. It occurs if the keypad ID for an X5 cannot be read.	
			2	This fault occurs because of a problem with the keypad or a keypad connection. It occurs if the drive detects that it cannot write to the LCD.	
25	Comm Loss	Communication loss	0	This fault occurs when the drive is in a serial link control path and the amount of time since the last Modbus comm. exceeds the time set in parameter **903 (SIO Timer)**.	Check connections to the Modbus port. Adjust value of parameter **903 (SIO Timer)** as needed.
26	Regen Time	Regen timeout	0	This fault occurs if the drive takes more time to decelerate to a stop than is allowed. The timeout is determined by the longest deceleration ramp time (Decel1 or Decel2) plus the Regen Timeout parameter.	Reduce the amount of regenerative energy or iincrease the Regen timeout parameter.
27	Pwr Bridge	Power bridge fault	0,1,2	The drive detected a failure in the output power devices.	Check for failed input power device.
28	Drive TOL	Drive timed overload	0	The drive sensed an overload that exceeded the drive rating.	Check that load conditions do not exceed the drive's rating (120% for 60 seconds from nameplate current rating for normal duty and 150% or rated current for 60 seconds heavy duty).
29	Stuck Key	Stuck key error	0	This fault occurs if a key press is detected upon power-up. This would occur because of a defective keypad or because someone was holding down a key when powering-up the drive.	Check for stuck keypad and repair or replace. Consult factory.
30	Param Range	Parameter out of range	0	One of the customer parameters is out of range.	Check for a parameter value saved out of the standard range. Reset parameters to factory default. Consult factory.

Note: Shaded faults are auto-resettable, except where noted.

Table 8-1: X5 Fault Codes *(Page 5 of 6)*

Code	Fault Display	Description	Adv. Fault Code	Explanation	Suggestions for Recovery
31	Pwr Wiring	Power wiring error	0	This fault flags a problem with the drive wiring.	Check that input power wiring is not connected to load power terminals. Consult factory.
			1	This fault can occur if an IOC fault is detected during the power wiring test.	
32	Low Voltage (Undervoltage)	Low voltage trip	0	This fault occurs if a power dip is detected when the drive is operating, and the drive is not able to ride through the power dip before shutting off outputs.	Verify that input line power is within the drive's specifications. Add a transformer or reduce demands to power feed. Consult factory.
			1	This fault occurs when an undervoltage condition (power-down) is detected, **and** when parameter **501** is set for Vector or Linear Auto mode, with "Coast Stop" assigned as the parameter value. In undervoltage conditions, the drive coasts to a stop, and generates an undervoltage fault.	
			2	This fault occurs when an undervoltage condition (power-down) is detected, **and** when parameter **501** is set for Vector or Linear Auto mode, with "Controlled" assigned as the parameter value. In undervoltage conditions, the drive decelerates the motor. If power is restored, the drive accelerates to the command frequency without faulting; if the drive stops, it generates an undervoltage fault.	
33	1Ph Overload	1Ph overload	0	If the user configures parameter **517 (Single Phase)** for single-phase operation, this fault occurs if the bus voltage ripple is outside the limit of the drive.	Check that input power demand does not exceed the drive's capacity for single-phase operation. Consult factory.
34	RS Meas. Fail	Stator resistance measurement failed	0	If the drive cannot measure the stator resistance properly, this fault occurs.	Try the routine again and if the fault occurs twice, consult the factory.
35	User Flt 1	User-defined fault #1	0	User-defined	Consult factory if assistance is needed.
36	User Flt 2	User-defined fault #2	0	User-defined	Consult factory if assistance is needed.
37	Encoder Flt	Fault in encoder	0	Encoder overspeed fault.	Check parameters for proper configuration.
			1	The encoder has improper setup.	Try setting up the encoder again; consult factory for assistance if needed.
			2 or 3	The encoder is not functioning properly.	Consult factory.

Note: Shaded faults are auto-resettable, except where noted.

Table 8-1: X5 Fault Codes *(Page 6 of 6)*

Code	Fault Display	Description	Adv. Fault Code	Explanation	Suggestions for Recovery
38	OP BRD Flt	Fault on options board	0	Loss of communication between option board and drive.	Check connections. Consult factory.
			1	Could not identify option board	Consult factory.
			2	The option board does not match the last option board ID that was active when the drive was powered down.	Check and reconfigure option board setup.
			3	Option board ID is unsupported.	Consult factory.
			4	Comm option board does not have the proper daughter card installed.	Consult factory.
			5	Internal problem.	Consult factory.
			6	Network communications error.	Check connections and setup.
			7	Option board has been removed.	Reconfigure.
39	Fan Loss	Loss of fan control or operation	0	There is a problem with the heat sink fan.	Consult factory.
			1	There is a problem with the internal fan. This occurs only on Size 4 and 5 models. All other models display a fan error warning. Note that this is lack of fan control, so the fan can be spinning and this fault will still occur. This can happen if the fan is on and should not be, or if the fan feedback signals are obstructed from getting to the control board.	

Note: Shaded faults are auto-resettable, except where noted.

Chapter 9: X5 Options

PDA-trAC® Plus For Pocket PC

The wireless optical interface on the **X5** allows data transfer for X5 AC Drive settings, using the PDA-trAC Plus to upload, download, edit, and save drive parameters easily and conveniently. This software can be downloaded from our web site at www.vacon.com, or contact your sales representative.

WIN-trAC® and WIN-trAC PRO® Drive Supervisor

This Windows®-based software program provides a simple and unique way to configure, monitor, diagnose, control, and manage drive applications. **WIN-trAC**, for single-drive, point-to-point applications, is provided free with the SIOC03 adapter for drives. **WIN-trAC PRO**, configured for multi-drive applications, must be registered for use.

Options for Serial Communications and 115 Vac Interface

Part Numbers: **X5DNET01**, **X5EIP01**, **X5MBTCP01**, **X5OPT01**

The first three options allow the **X5** to communicate on powerful serial communication networks like DeviceNet, Ethernet IP, and Modbus TCP/IP. The fourth option allows you to connect a shaft-mounted optical encoder to the X5 for improved performance. All include five channels of 115 Vac control options.

Remote Keypad for X5 (when used as a panel-mounted drive (Size 0-2))

Part Number: **XRKPM**

This Remote Keypad kit can be used when a Size 0, 1, or 2 **X5** model is mounted inside a host enclosure, and when programming and operation need to be done on the front of the enclosure. The kit comes with a keypad and adapter assembly that replaces the standard keypad on the drive. The original keypad assembly is removed and discarded, or can be kept as a spare for other X5 models not using the XRKPM option. The option includes a standard 12-foot ribbon cable. When installed properly, the remote keypad meets NEMA 4x/IP66 standards and the drive rating will be IP20.

Remote Keypad for X5 (when used as a wall-mounted drive (Size 0-2))

Part Number: **XRKWM**

This Remote Keypad kit can be used when a Size 0, 1, or 2 **X5** model is mounted in a stand-alone configuration, and when programming and operation need to be done in another location. The kit comes with a keypad and adapter assembly that replaces the standard keypad on the drive. The remote keypad can be mounted up to 100 feet from the drive, and requires a 15-conductor shielded cable to be supplied by the user. When installed properly, both the remote keypad and drive meet NEMA 4x/IP66 standards.

Remote Keypad Mounting Kit for X5 (Sizes 3 through 5)

Part Number: **XRKMK**

This Remote Keypad kit can be used with a Size 3, 4, or 5 **X5** model to allow the keypad to be mounted in another location. The kit comes with an adapter assembly to allow the existing keypad to be remotely mounted. The remote keypad can be mounted up to 100 feet from the drive, and requires a 15-conductor shielded cable to be supplied by the user. When installed properly, both the remote keypad and drive will meet the unit's core enclosure standards, either NEMA 4x/IP66, or NEMA 12/IP55.

Appendix A: Parameter 201 Options

The following table shows how parameter **201** (Input Mode) options function in local or remote mode.

Parameter 201 Option	Local		Remote	
	Speed Control	Start/Stop Control	Speed Control	Start/Stop Control
Local Only	Keypad	Keypad	None	None
Remote Only	None	None	Speed potentiometer, terminal strip signals	Terminal strip switch network
L/R Rem Ctl	Keypad	Keypad	Keypad	Terminal strip switch network
L/R Rem Ref	Keypad	Keypad	Speed potentiometer, terminal strip signals	Keypad
L/R Rem Bth	Keypad	Keypad	Speed potentiometer, terminal strip signals	Terminal strip switch network
EMOP_EMOP2	None	None	Terminal strip momentary pushbuttons	Terminal strip switch network
LOC / EMOP_EMOP2	Keypad	Keypad	Terminal strip momentary pushbuttons	Terminal strip switch network

Appendix B: Binary-Hexadecimal Conversion

The X5 AC drive utilizes hexadecimal numbers to display and store the binary values of some parameters. These parameters are read and written as four-digit hexadecimal values.

The following table shows the binary values that correspond to the sixteen hexadecimal values. The binary values are divided into four columns so you may more readily see which bits of the status or control words are affected by the binary values.

Binary Value				Hexadecimal Value
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	A
1	0	1	1	B
1	1	0	0	C
1	1	0	1	D
1	1	1	0	E
1	1	1	1	F
15	14	13	12	
11	10	9	8	
7	6	5	4	
3	2	1	0	
Corresponding Bit Positions of Parameter Words				

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EU Declaration of Conformity

WE: Vacon, Inc.
3181 Black Gap Road
Chambersburg, PA 17202 USA

hereby declare that the products:

Product Name: Vacon X Series AC Drives;

Model Designation: Vacon X4CxxxxxC(or D) and X5CxxxxxC(or D) and X5CxxxxxC09

have been designed and manufactured in accordance with standards:

Low Voltage Directive:	EN50178 Electronic equipment for use in power installations
Electromagnetic compatibility:	The models listed above do not include internal EMC filters and external equipment must be used to achieve EN61800-3 compliance. Units in the 380-460V range (as denoted with a 1 suffix, e.g. XxC4xxxxC1) include internal EMC filters, and fulfill the requirements of the 2nd environment (EN61800-3 category C3; EN55011 class A2). XxC40750C through XxC42000D meet the 2nd environment requirements without added filters.

The products referenced above are for the use of control of the speed of AC motors.

Via internal mechanisms and Quality Control, it is verified that these products conform to the requirements of the Directive and applicable standards.

Chambersburg, PA, USA — February 27, 2009

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