

# Gardner Denver

300XXX1255

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## Drive Fault Investigation Manual



## WARNING – PROHIBITION – MANDATORY LABEL INFORMATION

Gardner Denver Rotary Screw compressors are the result of advanced engineering and skilled manufacturing. To be assured of receiving maximum service from this machine, the owner must exercise care in its operation and maintenance. This book is written to give the operator and maintenance department essential information for day-to-day operation, maintenance and adjustment. Careful adherence to these instructions will result in economical operation and minimum downtime.

**Boxed text formats are used, within this manual, to alert users of the following conditions:**

**Safety Labels are used, within this manual and affixed to the appropriate areas of the compressor package, to alert users of the following conditions:**



Indicates a hazard with a high level of risk, which if not avoided, WILL result in death or serious injury.



Equipment Starts Automatically



Health Hazard – Explosive Release of Pressure



Cutting of Finger or Hand Hazard – Rotating Impeller Blade



High Voltage – Hazard of Shock, Burn or Death Present Until Electrical Power is Removed



Cutting of Finger or Hand Hazard – Rotating Fan Blade



Entanglement of Fingers or Hand – Rotating Shaft

**WARNING**

Indicates a hazard with a medium level of risk, which if not avoided, COULD result in death or serious injury.



Asphyxiation Hazard – Poisonous Fumes or Toxic Gas in Compressed Air

**CAUTION**

Indicates a hazard with a low level of risk, which if not avoided, MAY result in a minor or moderate injury.



Burn Hazard – Hot Surface

**PROHIBITION - MANDATORY ACTION REQUIREMENTS**



Do Not Operate Compressor with Guard Removed



Lockout Electrical Equipment in De-Energized State



Do Not Lift Equipment with Hook – No Lift Point



Loud Noise Hazard – Wear Hearing Protection



Handle Package at Forklift Points Only



Read the Operator's Manual Before Proceeding with Task

## SAFETY PRECAUTIONS

The following text presents common safety issues of which the user should be aware. Though the list below includes unit and supporting equipment dangers present, the user must also be vigilant to other hazards introduced in an industrial environment, and ensure they have received the necessary safety training.



Failure to observe these notices could result in injury to or death of personnel.

- **Keep fingers and clothing away** from rotating fan, drive coupling, etc.
- **Disconnect the compressor unit** from its power source, lockout and tagout before working on the unit – this machine is automatically controlled and may start at any time.
- **Do not loosen or remove** the oil filler plug, drain plugs, covers, the thermostatic mixing valve or break any connections, etc., in the compressor air or oil system until the unit is shut down and the air pressure has been relieved.
- **Electrical shock** can and may be fatal.
- **Perform all wiring in accordance with the National Electrical Code (NFPA-70)** and any applicable local electrical codes. Wiring and electrical service must be performed only by qualified electricians.
- **Open main disconnect switch**, lockout and tagout before working on the control, wait 10 minutes and check for voltage.



Failure to observe these notices could result in damage to equipment.

- **Stop the unit** if any repairs or adjustments on or around the compressor are required.
- **Do not use the air discharge from this unit for breathing** – not suitable for human consumption.
- **An Excess Flow Valve** should be on all compressed air supply hoses exceeding 1/2 inch inside diameter (OSHA Regulation, Section 1926.302).
- **Do not exceed** the rated maximum pressure values shown on the nameplate.
- **Do not operate unit if safety devices are not operating properly**. Check periodically. Never bypass safety devices.

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# Section 1 General Information

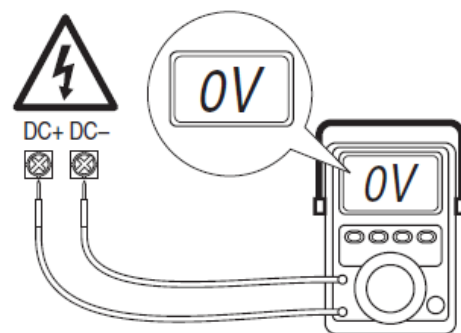
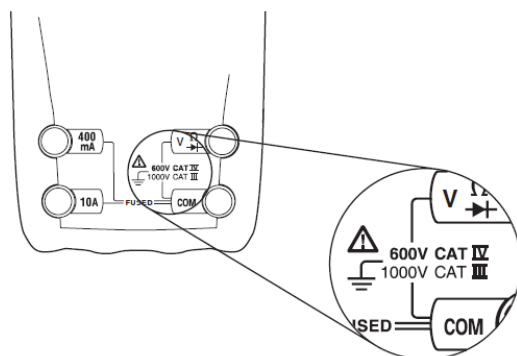
This manual is intended to assist in troubleshooting and repair of drive faults on VS, VST, and LRS units. The flow charts are intended to provide a technician with the most common scenarios for the fault. Every scenario and culprit cannot be detailed due to the different installations and operating characteristics of the different units. After going through the items listed the technician can then call into the field service help desk if needed. Having the model/serial number of the compressor, catalog/SN number of the drive recorded prior to calling is a good practice to follow.

## Safety

Safety is everybody's business and is based on your use of good common sense. All situations or circumstances cannot always be predicted and covered by established rules. Therefore, use your past experience, watch out for safety hazards and be cautious. Some general safety precautions are given below:

Failure to observe these notices could result in injury to or death of personnel.

- Keep fingers and clothing away from rotating fan, drive coupling, etc.
- Disconnect the compressor unit from its power source, lockout and tagout before working on the unit – this machine is automatically controlled and may start at any time.
- Do not loosen or remove the oil filler plug, drain plugs, covers, the thermostatic mixing valve or break any connections, etc., in the compressor air or oil system until the unit is shut down and the air pressure has been relieved.
- Electrical shock can and may be fatal.
- Perform all wiring in accordance with the National Electrical Code (NFPA-70) and any applicable local electrical codes. Wiring and electrical service must be performed only by qualified electricians.
- Open main disconnect switch, lockout and tagout before working on the control, wait 10 minutes and check for voltage.
- Verify the voltmeter used for testing is rated for up to 1000 volts.



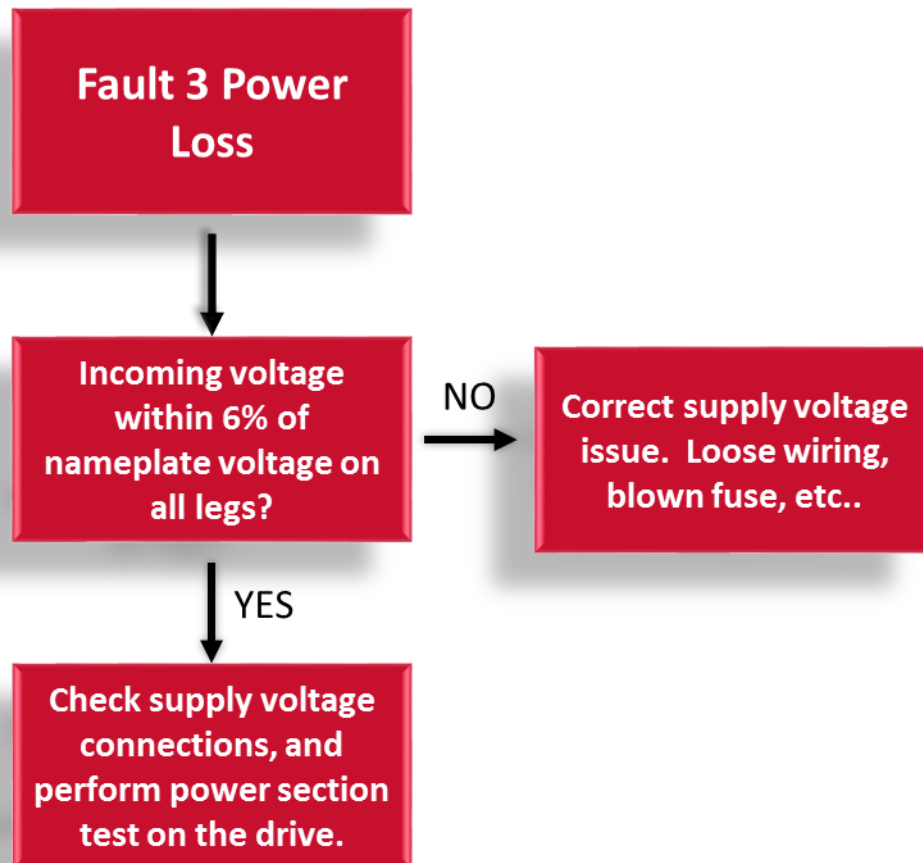
# Section 2 Drive Fault Troubleshooting Flow Charts

The fault numbers listed are referencing Allen Bradley drive fault numbers. Similar faults on a drive made by other manufacturers such as Yaskawa and Weg can will follow much of the same troubleshooting steps.

## Fault 3 Power Loss

Fault Description – The DC bus voltage fell below the undervoltage level within 200 ms of start command. The DC bus ripple is excessive, or an input phase loss has been detected.

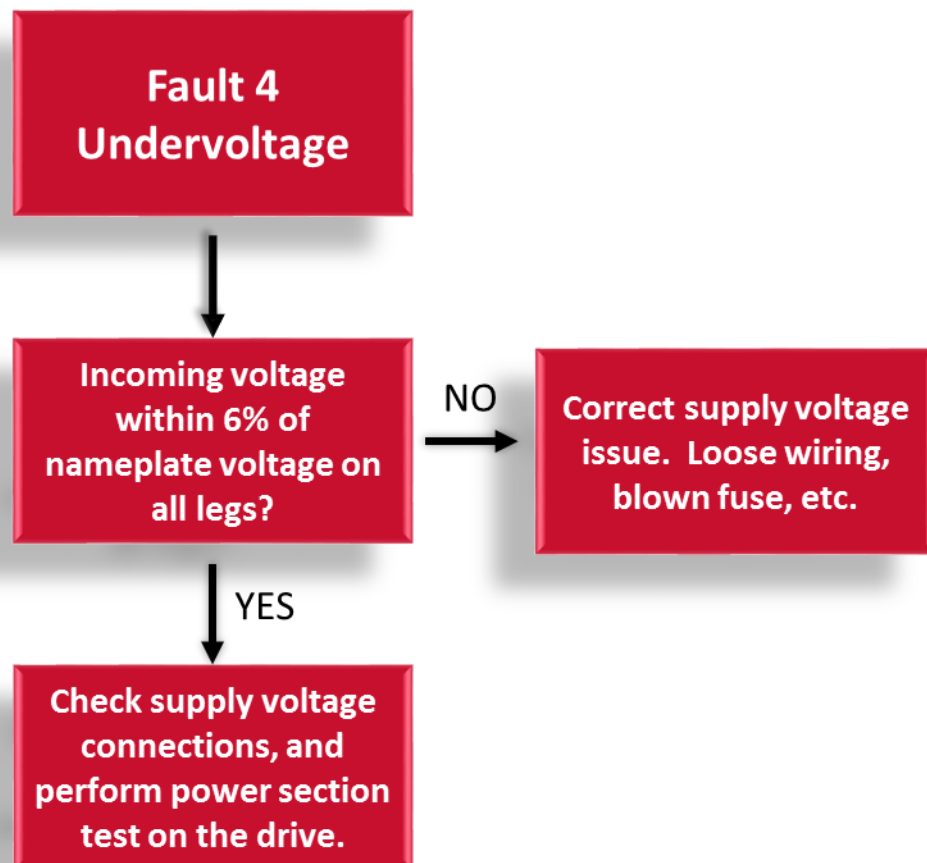
Fault Summary – The drive is sensing a disruption or loss of supply power to it.



## Fault 4 Undervoltage

Fault Description – The DC bus voltage fell below the minimum value.

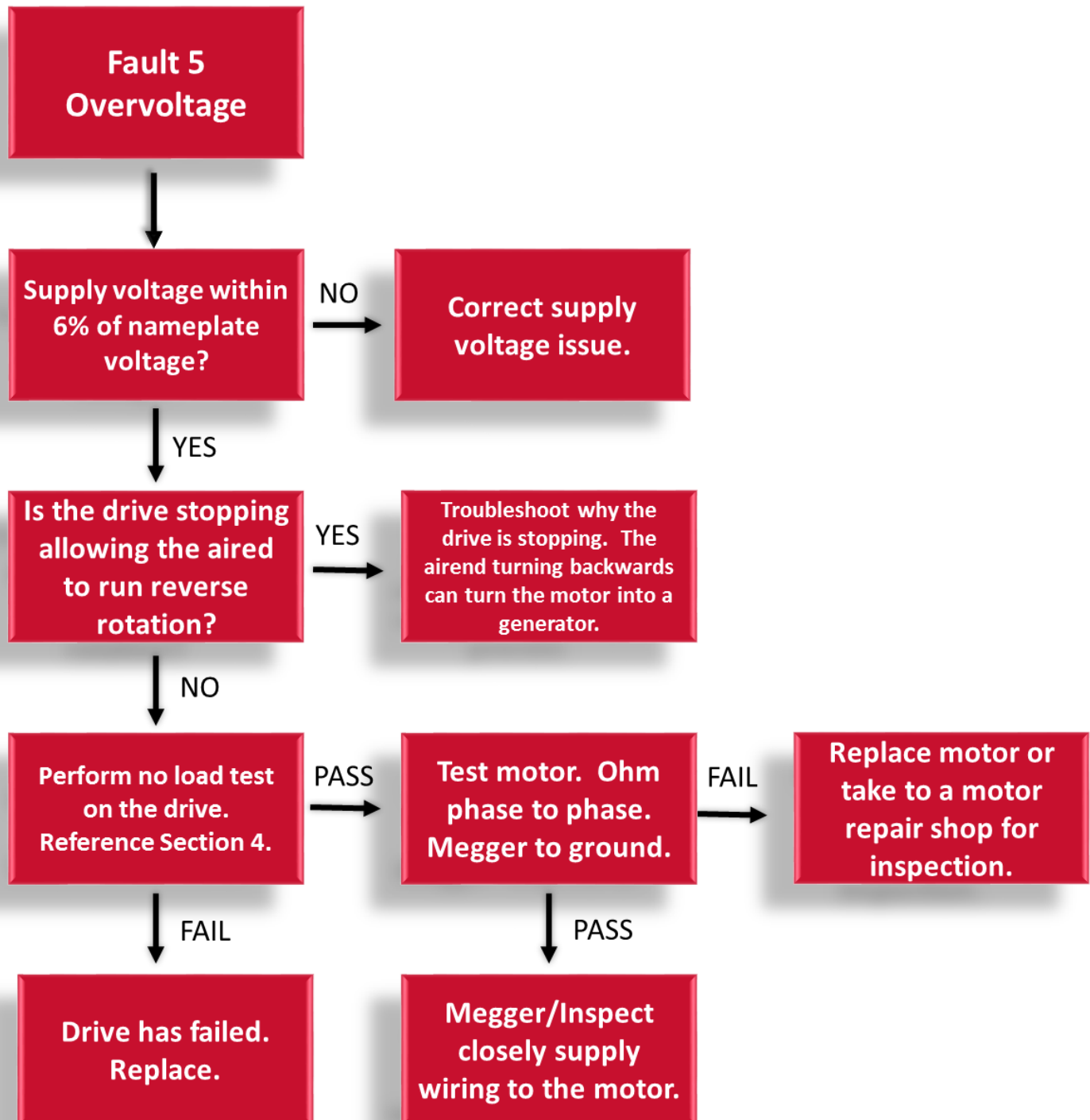
Fault Summary – The fault is an indication the DC bus is below a minimum value for the drive rating. The DC bus voltage is related to the supply voltage to the drive. To calculate what the approximate DC bus voltage should be multiply the supply power by 1.35. Example for a 480 volt system the DC bus should be approximately 648 volts DC. Checking the supply power to the unit would be the most important item to check for this fault.



## Fault 5 Overvoltage

Fault Description – The DC bus voltage exceeded the maximum value.

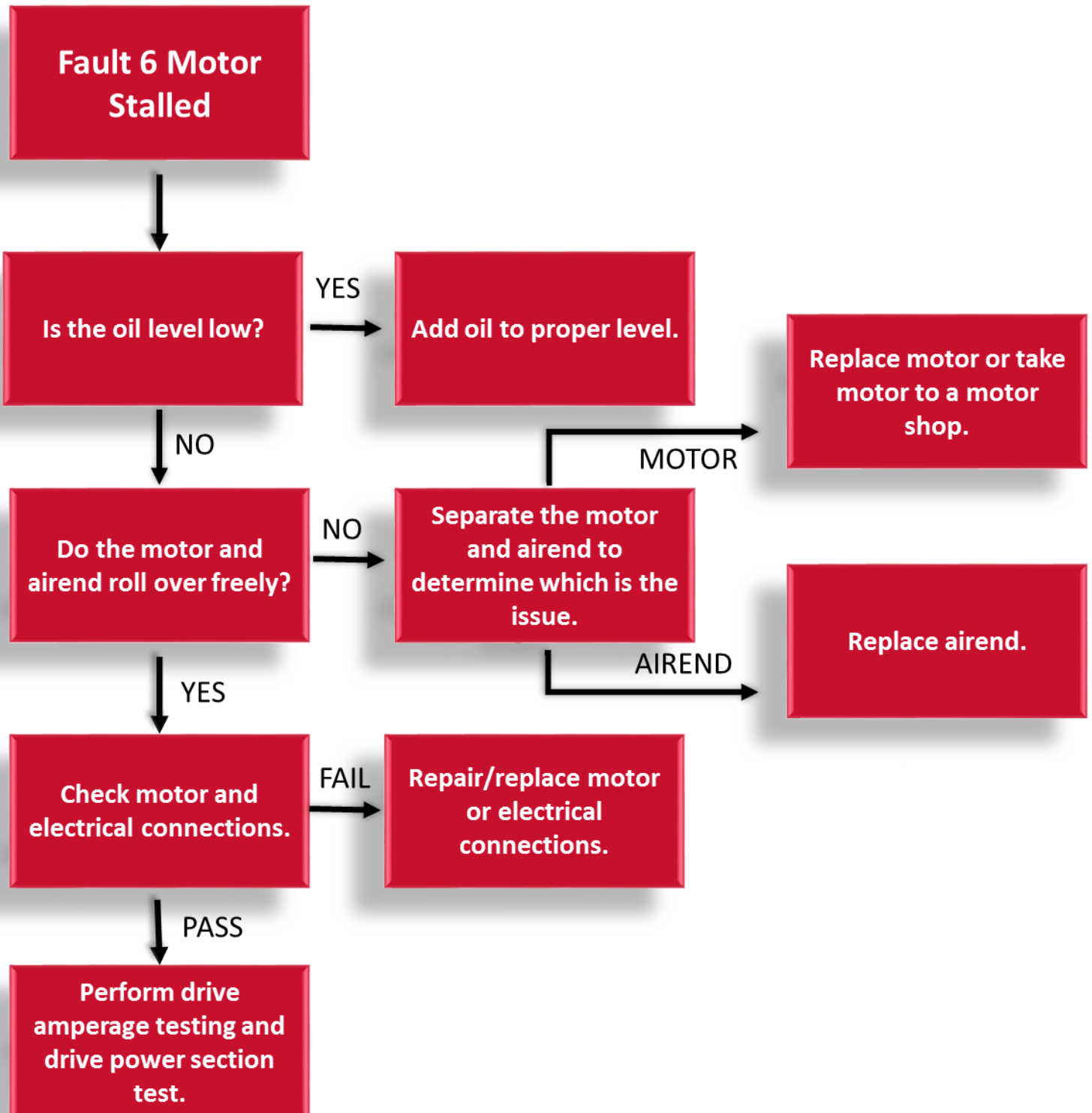
Fault Summary – The fault is an indication the DC bus is above the maximum value for the drive rating. The DC bus voltage is related to the supply voltage to the drive. To calculate what the approximate DC bus voltage should be multiply the supply power by 1.35. Example for a 480 volt system the DC bus should be approximately 648 volts DC. Checking the supply power and the motor would be the most important items to check if this fault occurs.



## Fault 6 Motor Stalled

Fault Description – The drive is unable to accelerate the motor.

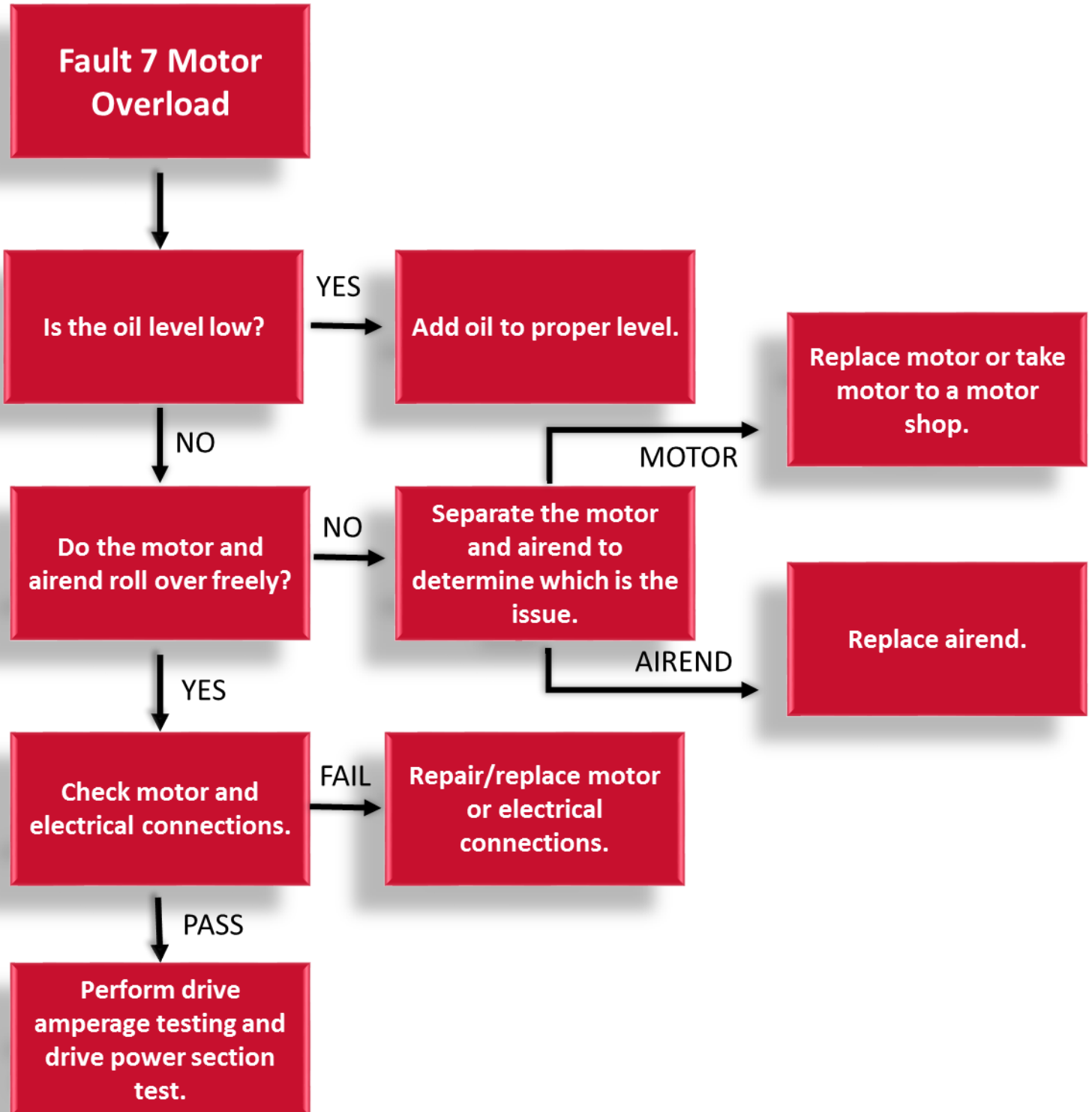
Fault Summary – This fault is an indication the drive is unable to accelerate the motor to command speed due to a current limit setting within the drive.



# Fault 7 Motor Overload

Fault Description – The internal overload in the drive has tripped.

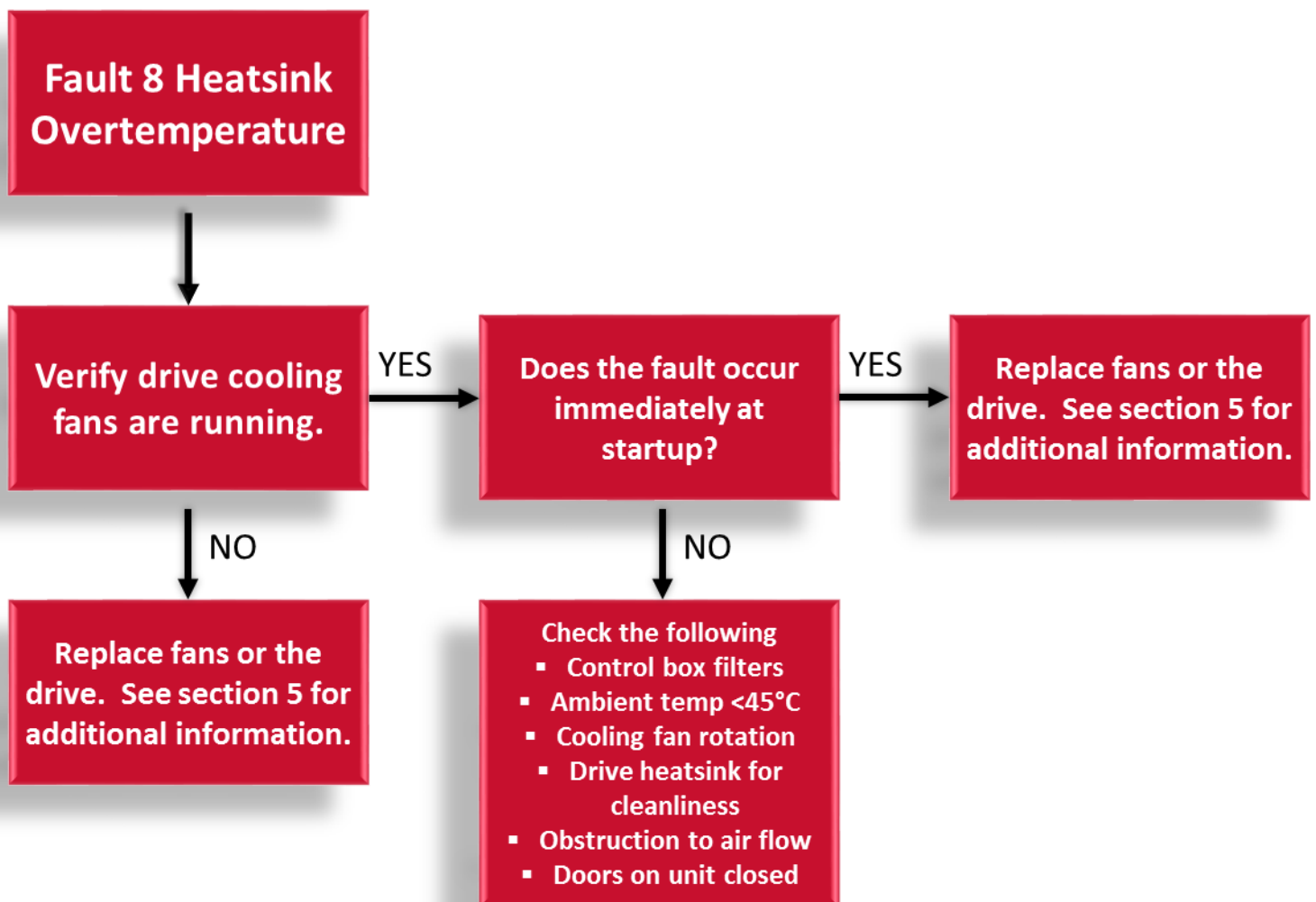
Fault Summary – This fault would be comparable to the overloads tripping on an overload block on a motor starter. Check for causes for the high amperage.



## Fault 8 Heatsink Overtemperature

Fault Description – The heatsink temperature on the drive has exceeded the maximum value.

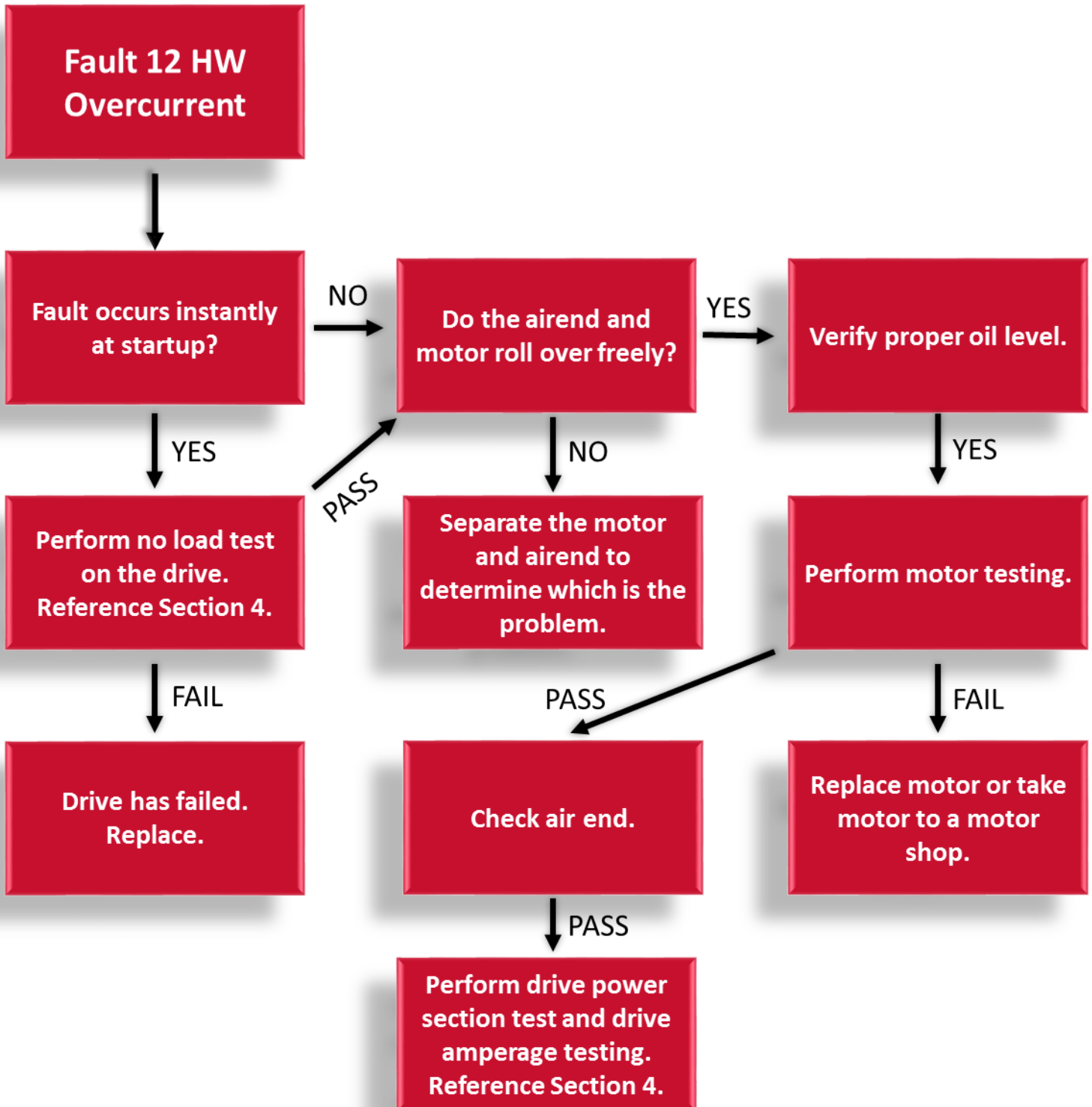
Fault Summary – This fault is an indication the internal drive temperature is too high. Monitoring the drive temperature in the AirSmart Drive Information menu will help troubleshoot the fault. When the main motor is running verify all the fans on the drive are running. Reference section 5 of this manual for additional information on the drive fans.



# Fault 12 HW Overcurrent

Fault Description – The drive output current has exceeded the hardware current limit.

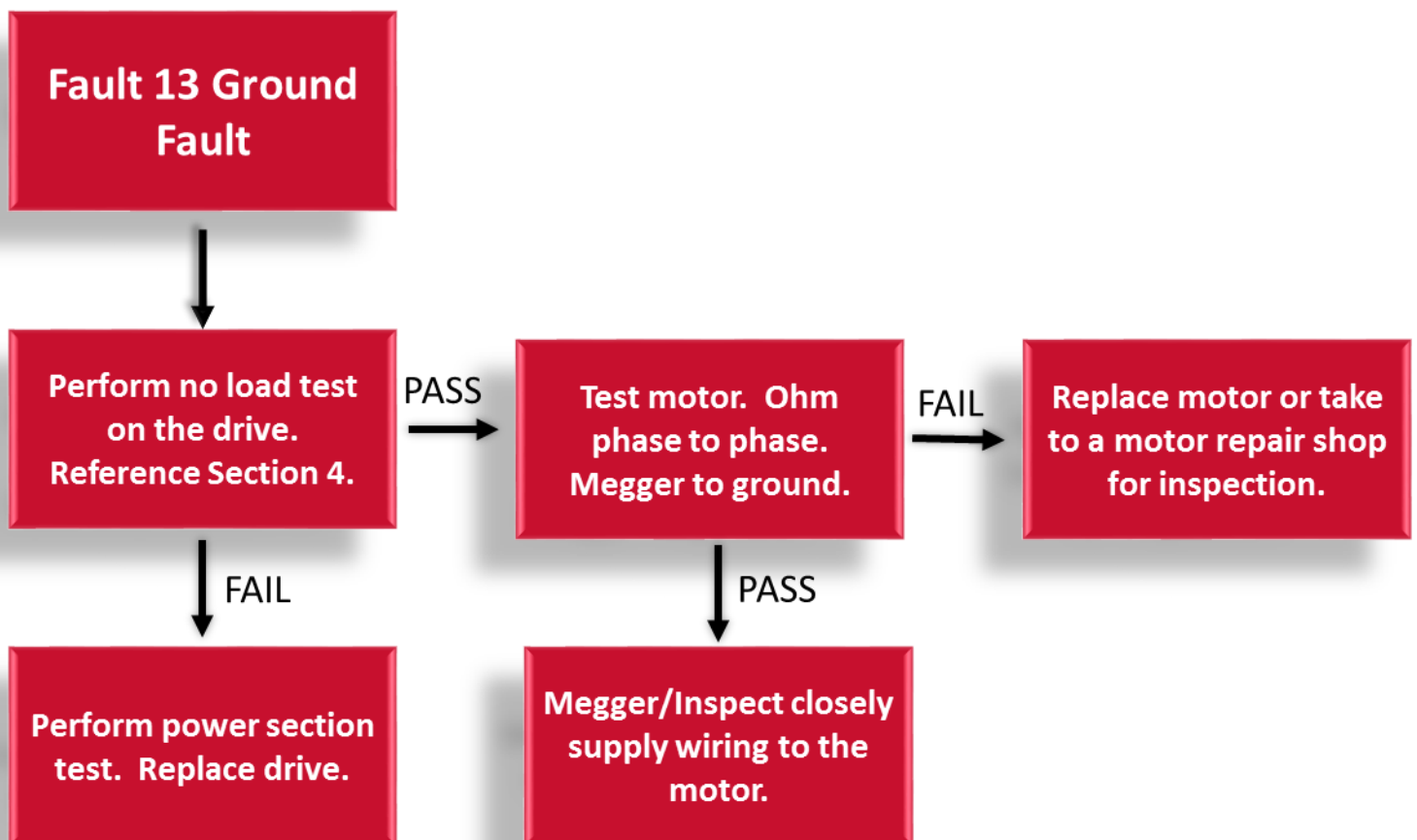
Fault Summary – This fault is an excessive overcurrent fault. The drive experienced an amperage draw on the output of twice the drives amperage. Check for causes for the high amperage.



## Fault 13 Ground Fault

Fault Description – A current path to ground has been detected at one or more of the drive output terminals.

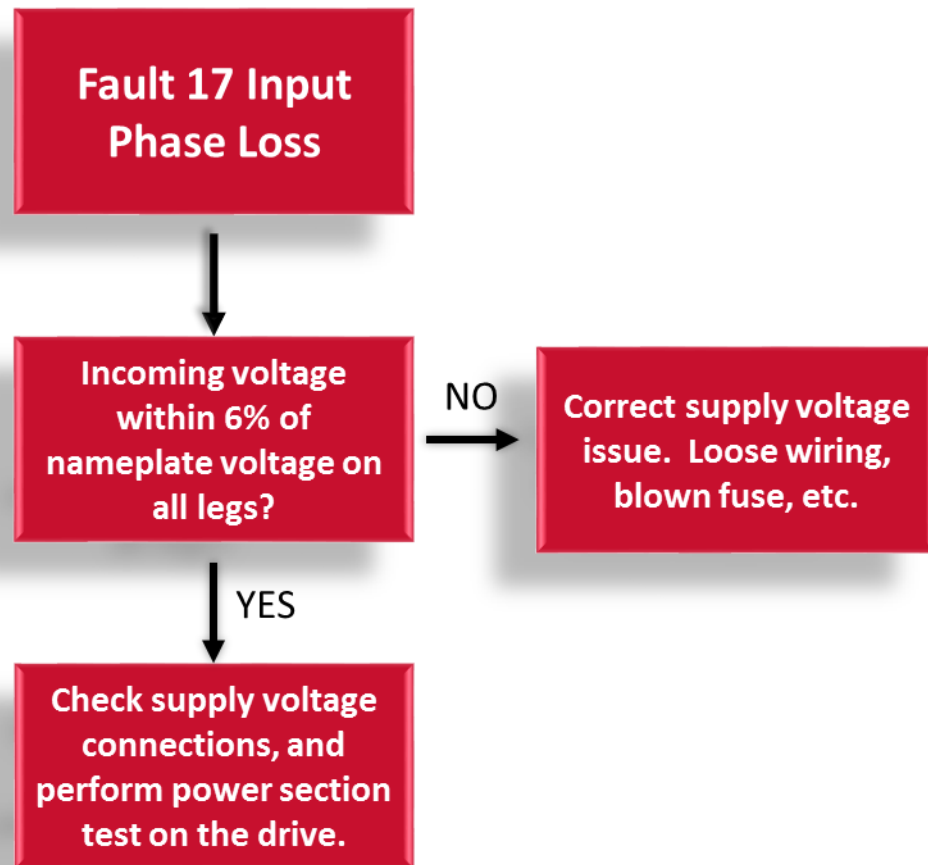
Fault Summary – This fault is an indication the drive is sensing current to ground resulting in a ground fault shutdown. This can be caused by a short within the drive, wires to the motor, connections in the motor junction box, or a bad motor.



## Fault 17 Input Phase Loss

Fault Description – The drive has sensed a loss of one leg of the supply power.

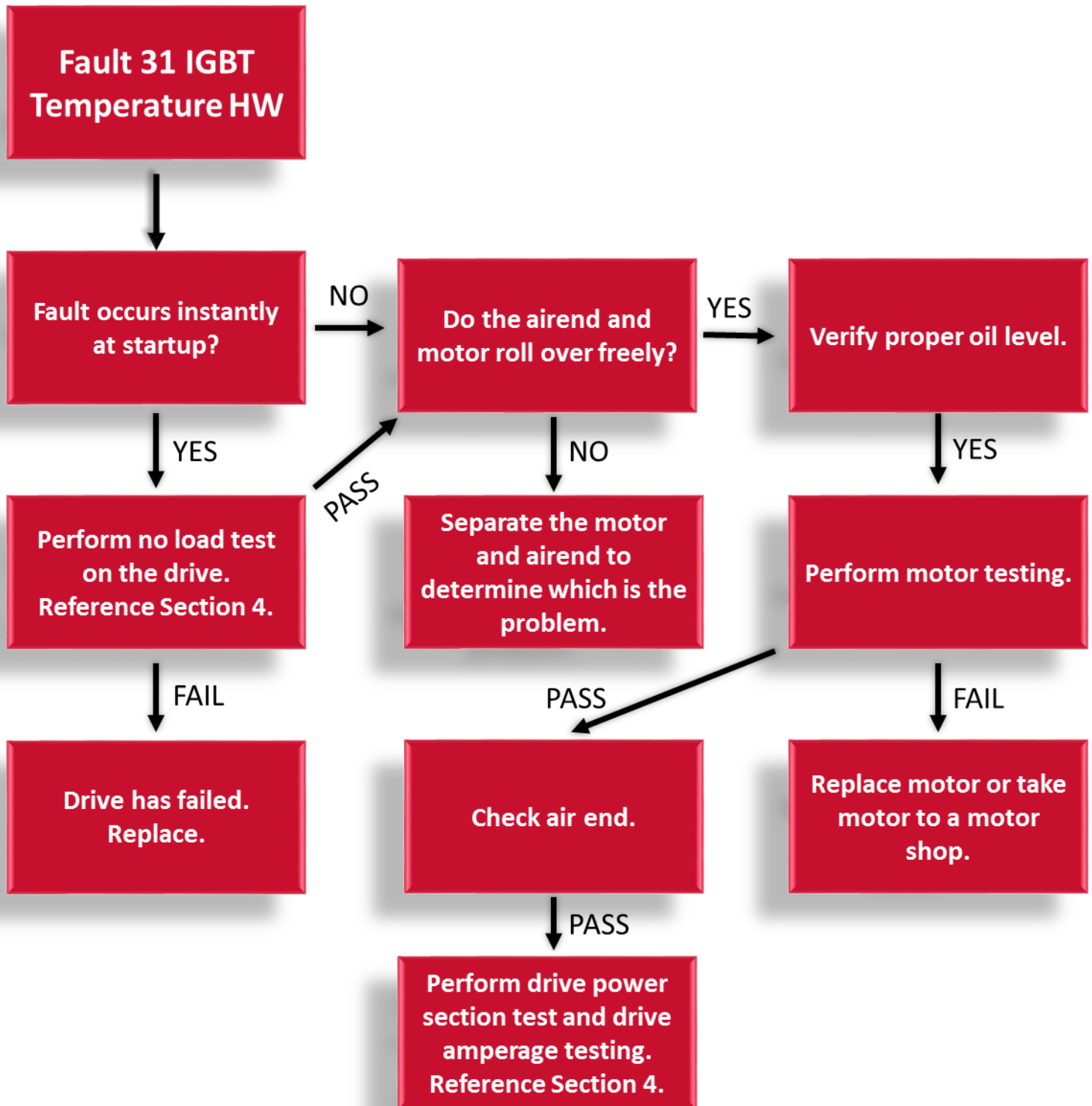
Fault Summary – One leg on the supply power to the drive is dropping or not present.



# Fault 31 IGBT Temperature HW

Fault Description – The drive has exceeded the instantaneous current limit.

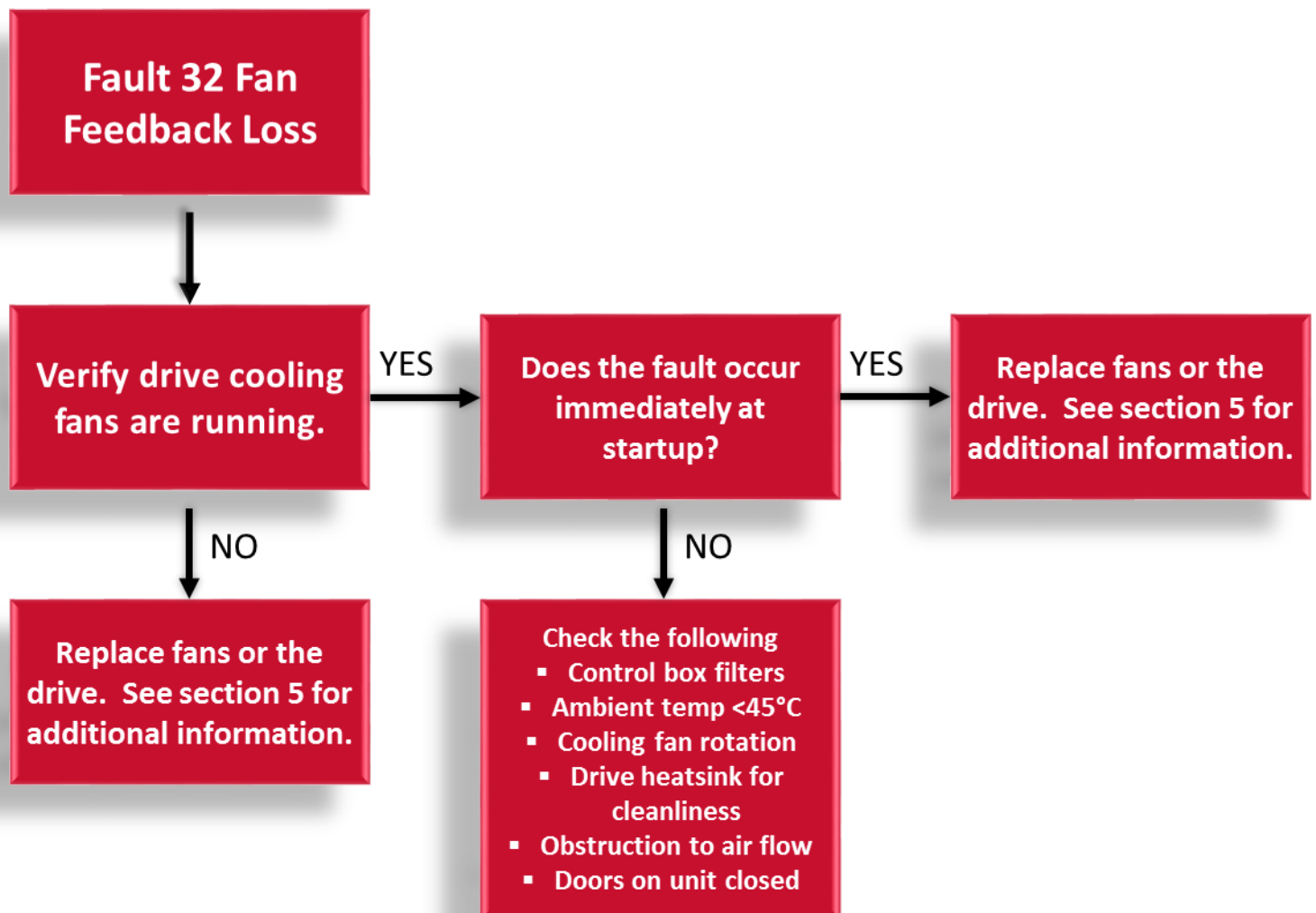
Fault Summary – This fault is specific to the Powerflex 700H drive. It is an indication of an excessive load on the drive. Check for causes for the high amperage.



## Fault 32 Fan Feedback Loss

Fault Description – The drive is sensing a loss of feedback from the cooling fans internal to the drive.

Fault Summary – This fault is associated with the cooling fans internal to the drive. Verify the cooling fans are clear of debris and spinning freely. Replacing the fans is an option on certain drives. Monitoring the V1 temperature in the AirSmart Drive Information menu will provide an indication of the internal drive temperature. Reference section 5 of this manual for additional information on the drive fans.

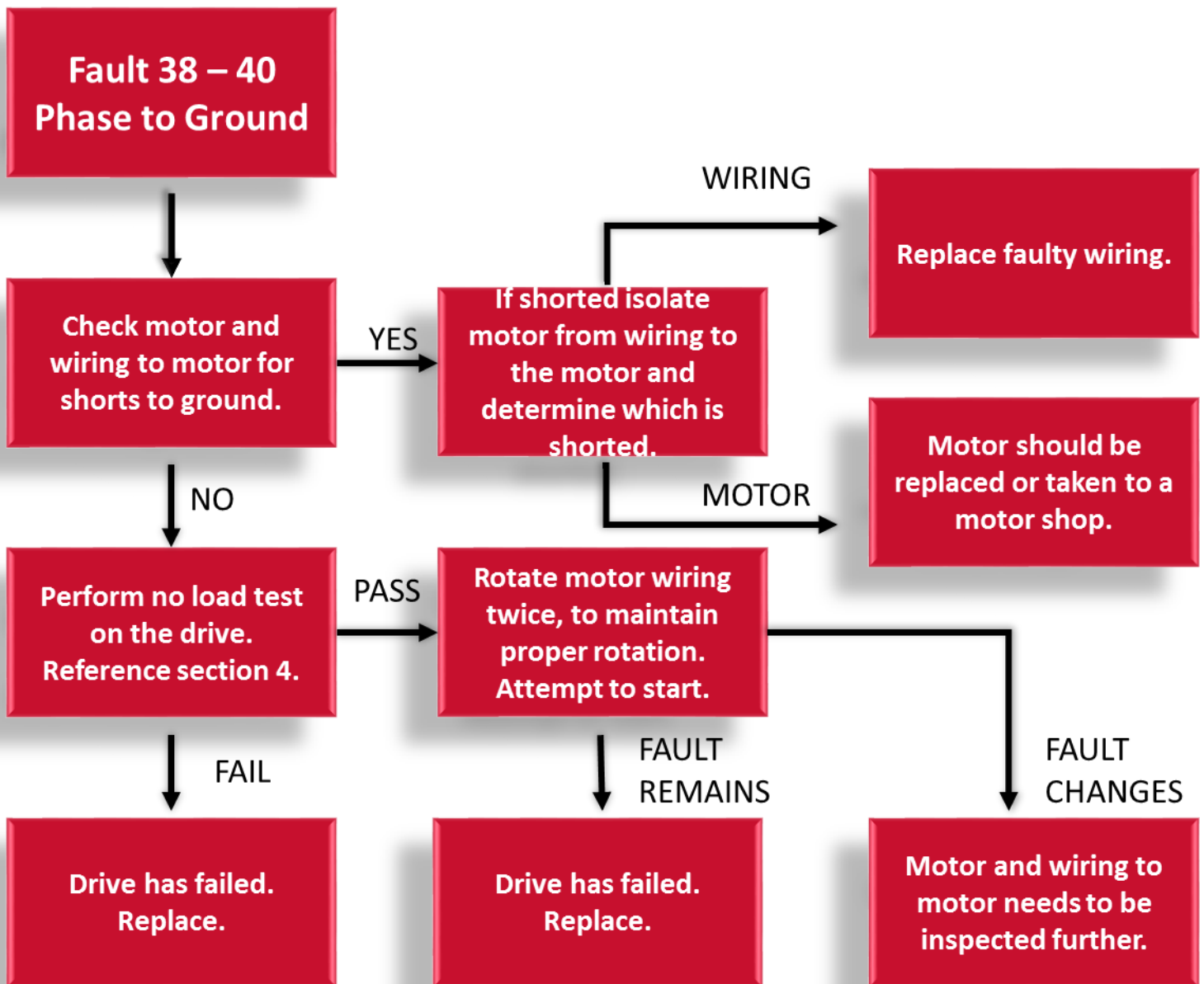


# Fault 38-40 Phase to Ground

Fault Description – The drive is sensing a short between the motor phase indicated and ground.

Fault 38 – Phase U to ground  
Fault 39 – Phase V to ground  
Fault 40 – Phase W to ground

Fault Summary – This fault is an indication there is a short to ground within the drive, the leads going to the motor, or the motor.

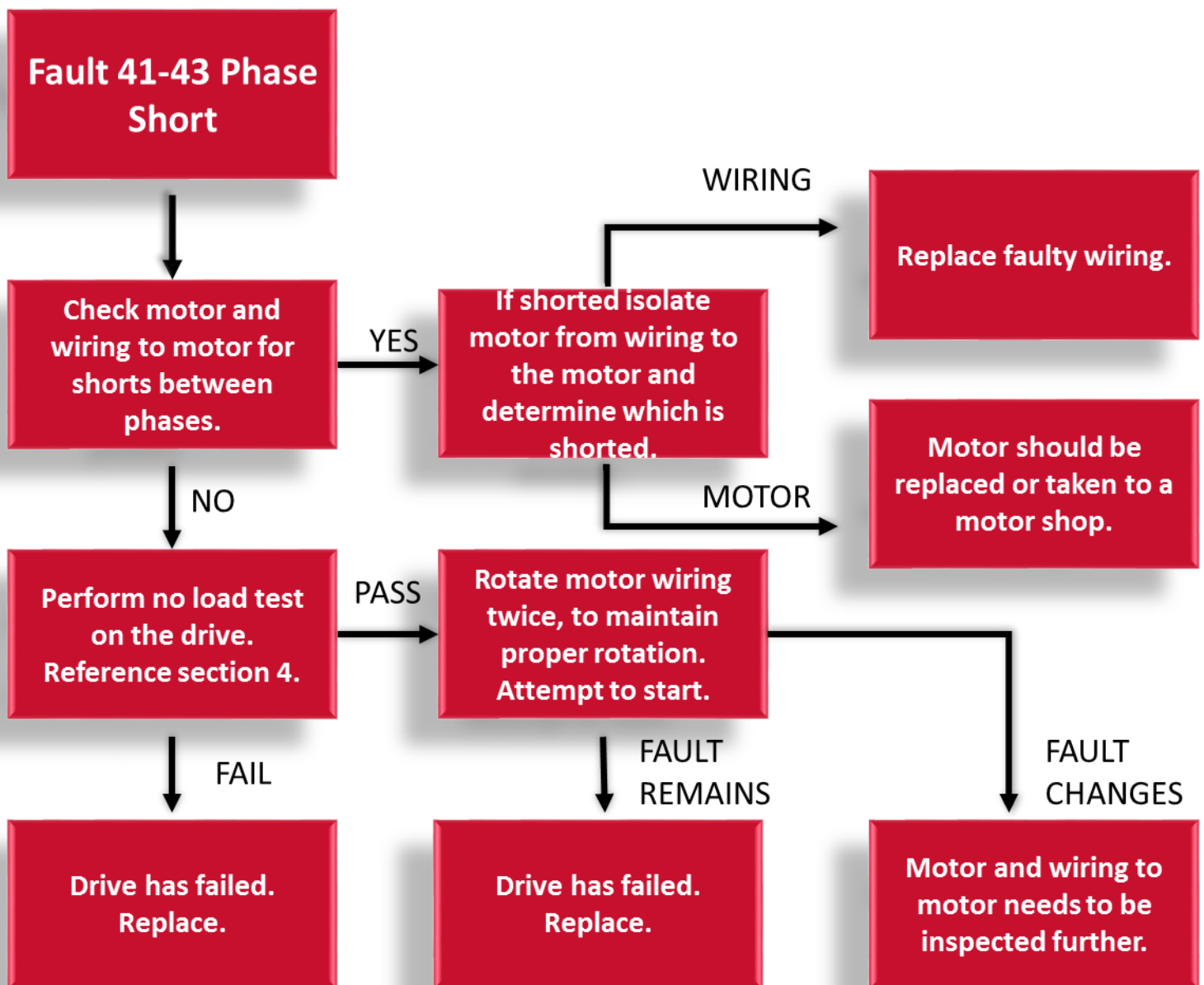


# Fault 41-43 Phase Short

Fault Description – The drive is sensing a short between two output terminals to the motor. Each fault number will indicate the two specific terminals.

- Fault 41 – Phase UV Short
- Fault 42 – Phase UW Short
- Fault 43 – Phase VW Short

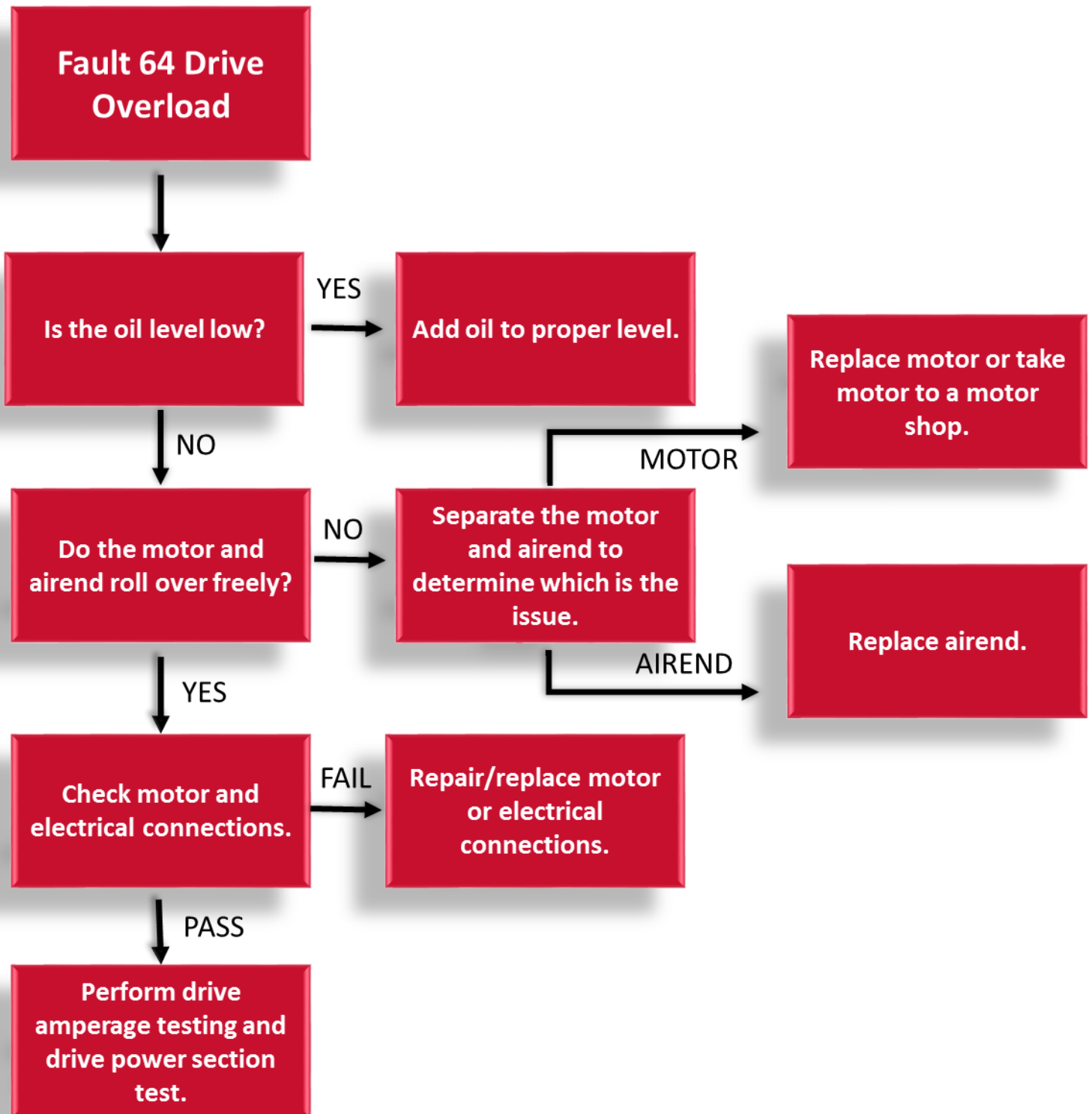
Fault Summary – This fault is an indication there is a phase to phase short within the drive, the leads going to the motor, or the motor.



# Fault 64 Drive Overload

Fault Description – Drive rating of 110% for 1 minute or 150% for 3 seconds has been exceeded.

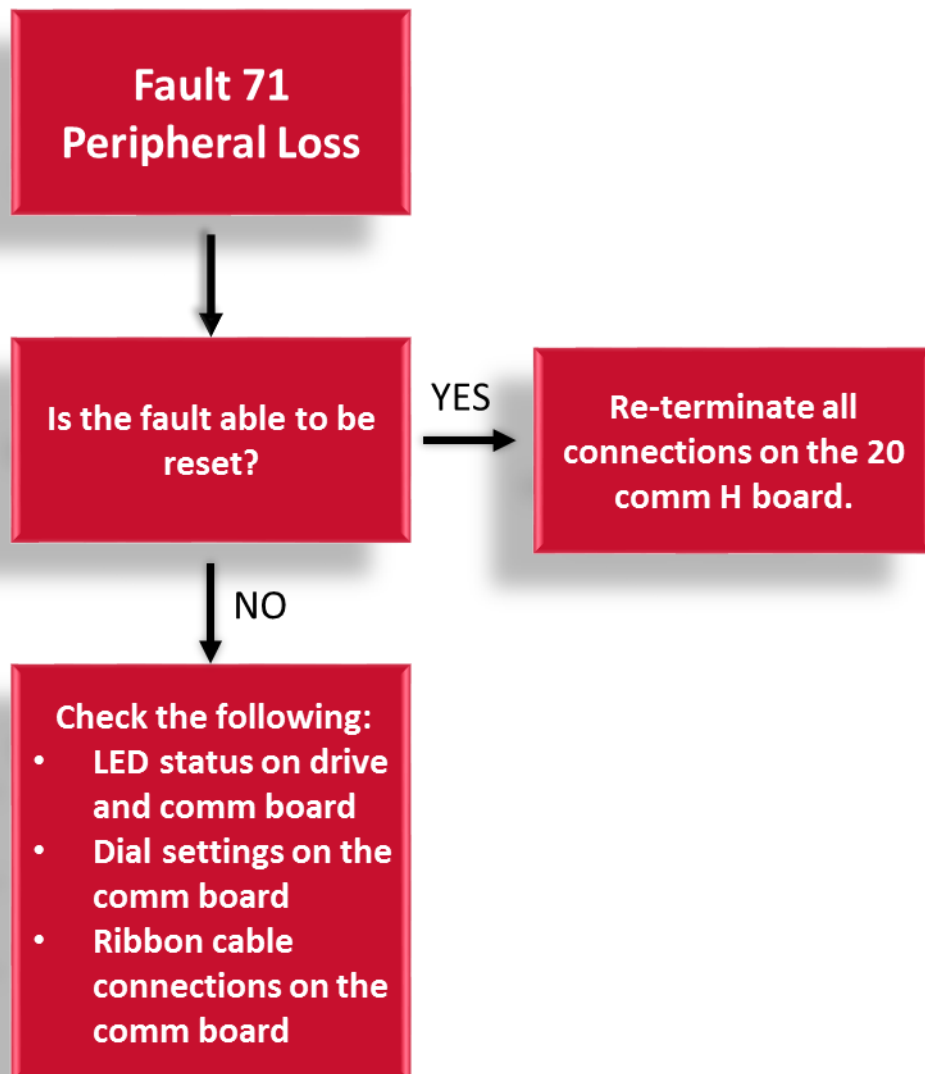
Fault Summary – This fault would be comparable to the overloads tripping on a fixed speed unit. There is a high amperage problem. Check for causes for the high amperage.



## Fault 71 Peripheral Loss

Fault Description – The communications card has a fault.

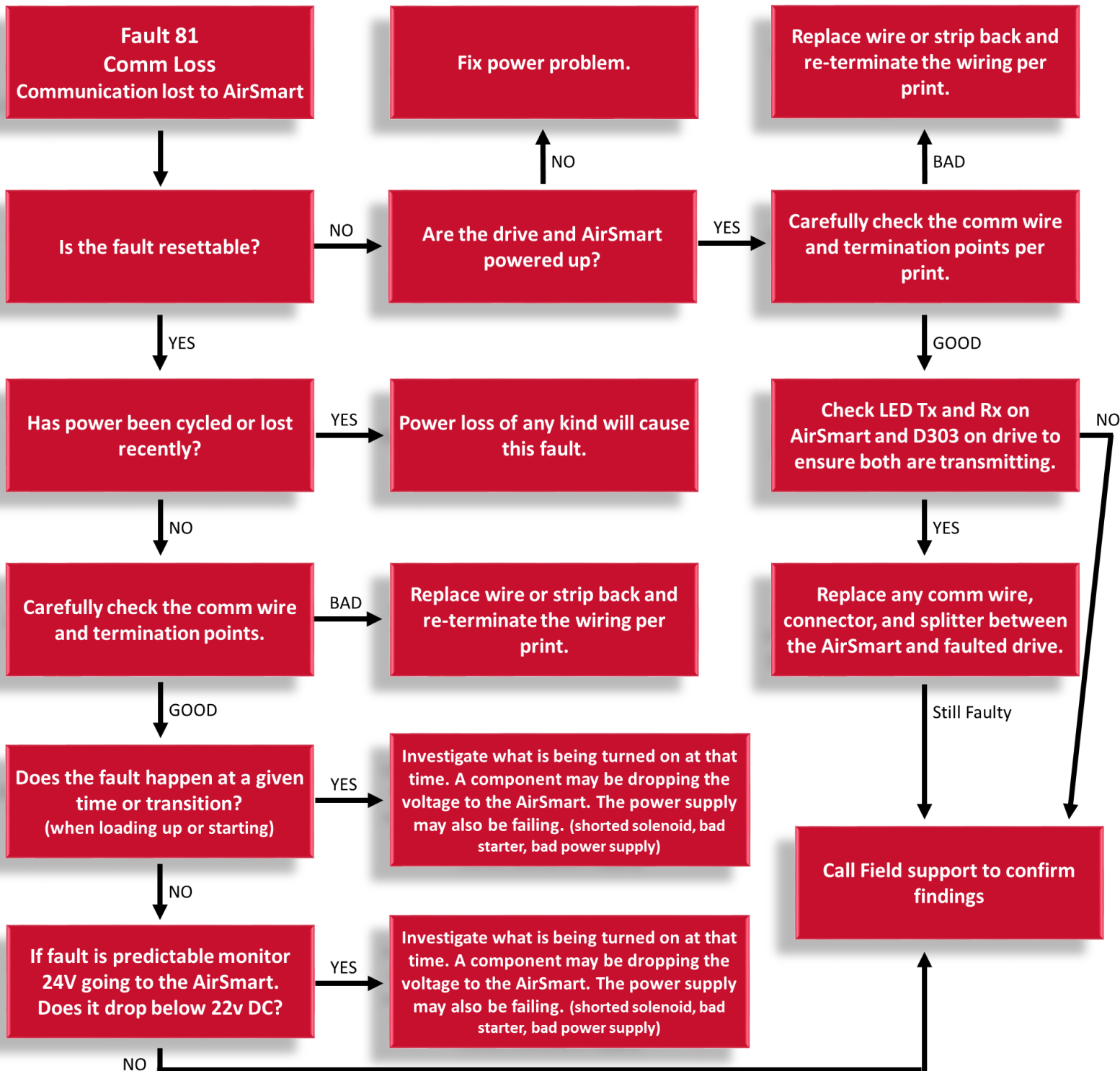
Fault Summary – This fault is an indication that the communications board has lost communication with the drive. This fault will only occur on the Powerflex 7 series drives which use a 20-comm-H RS 485 board to communicate with the drive. Checking the connections from the board to the drive will be critical if this fault is occurring. Further information on the board is included in section 3.



# Fault 81 Communications Loss

**Fault Description** – There has been a loss of communication between the drive and the AirSmart controller.

**Fault Summary** – This fault is an indication that the Drive has lost communication with the AirSmart. This can be caused by the AirSmart losing power briefly, poor communication connections, or a failed device.



# Fault 100 Parameter Checksum

Fault Description – The checksum read from the board does not match the checksum calculated.

Fault Summary – A meter in the drive needs to be reset if this fault occurs. A counter in the drive has reached it maximum value. When this occurs the F100 will appear when the drive is powered up. Below is the procedure to prevent this fault from appearing when the power is applied to the drive. It is important to remember not to follow the instructions in the drive manual for this fault.

Step	Key(s)	Example Displays
1. When power is applied, the last user-selected Basic Display Group parameter number is displayed with flashing characters. The display then defaults to that parameter's current value. (Example shows the value of b001 [Output Freq] with the drive stopped.) If you have other display than this, press <b>ESC</b> until You have same display on.	<b>ESC</b>	Output Freq S 00.00 Hz
2. Press <b>Enter</b> once to select group menu. The group menu letter will flash.	<b>↵</b>	Advanced Program S <b>A</b> 001
3. Press the <b>Up</b> or <b>Down</b> Arrow to scroll to group <b>A</b> (Advanced Program).	<b>↓</b> or <b>↑</b>	Advanced Program S <b>A</b> 001
4. Press <b>Enter</b> to enter the group menu. The parameter number will flash. Scroll <b>Up</b> or <b>Down</b> to select parameter A195 (Reset Meters).	<b>↵</b>	Reset Meters S <b>A</b> 195
5. Press <b>Enter</b> and you will come to Reset Meters function.	<b>↵</b>	Reset Meters S <b>A</b> 195
6. Press <b>Enter</b> , "0" will start to flash	<b>↵</b>	Reset Meters S <b>A</b> 195
7. Scroll Up until you have value 002 (Reset Time). "Program" light will be red.	<b>↑</b>	Reset Meters S <b>A</b> 195
8. Press Enter and the program light be shut down and "000" will be displayed. The counter have been reset.	<b>↵</b>	Reset Meters Ready/Idle 000
9. Press <b>ESC</b> until you are in the basic menu.	<b>↵</b>	Reset Meters Ready/Idle 000
10. Turn power ON and again OFF three times to clear history of last three faults. Wait at least 10 seconds between switching ON and OFF	<b>↵</b>	Reset Meters Ready/Idle 000
	<b>↑</b> x2	Reset Meters Reset Time 002
	<b>↵</b>	Reset Meters Ready/Idle 000
	<b>ESC</b>	Output Freq S 00.00 Hz

## Powerflex 400 Integral Keypad

In some circumstances parameters in the drive will need to be checked. Below is information on the integral keypad to assist with navigating the menus within the drive.

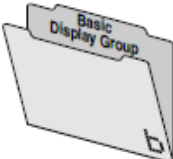

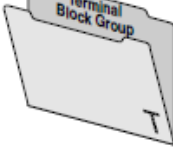





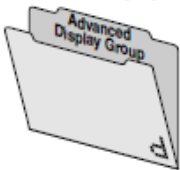
### Operator Keys

Key	Name	Description
	Escape	Back one step in programming menu. Cancel a change to a parameter value and exit Program Mode.
	Select	Advance one step in programming menu. Select a digit when viewing parameter value.
	Up Arrow Down Arrow	Scroll through groups and parameters. Increase/decrease the value of a flashing digit.
	Enter	Advance one step in programming menu. Save a change to a parameter value.
	Digital Speed Increment and Decrement Arrows	Used to control speed of drive. Default is active. Control is activated by parameter <a href="#">P038</a> [Speed Reference] or <a href="#">P042</a> [Auto Mode].
	Run/Start & Hand <sup>(1)</sup>	Used to start the drive. Default is Hand mode as controlled by parameter <a href="#">P042</a> [Auto Mode]. Control is activated by parameter <a href="#">P036</a> [Start Source] or <a href="#">P042</a> [Auto Mode].
	Auto <sup>(1)</sup>	Used to select Auto control mode. Controlled by parameter <a href="#">P042</a> [Auto Mode].
	Stop/Off	Used to stop the drive or clear a fault. This key is always active. Controlled by parameter <a href="#">P037</a> [Stop Mode].

# Powerflex 400 Drive Parameter Organization

The drive parameter organization is grouped in different folders within the drive. Below is the breakdown of the different groups and drive settings.

Group	Parameters					
 <b>Basic Display</b>	Output Freq	b001	Drive Status	b006	Elapsed MWh	b011
	Commanded Freq	b002	Fault 1 Code	b007	Elapsed Run Time	b012
	Output Current	b003	Process Display	b008	Torque Current	b013
	Output Voltage	b004	Output Power	b010	Drive Temp	b014
	DC Bus Voltage	b005			Elapsed kWh	b015
 <b>Basic Program</b>	Motor NP Volts	P031	Maximum Freq	P035	Accel Time 1	P039
	Motor NP Hertz	P032	Start Source	P036	Decel Time 1	P040
	Motor OL Current	P033	Stop Mode	P037	Reset To Defaults	P041
	Minimum Freq	P034	Speed Reference	P038	Auto Mode	P042
					Motor OL Ret	P043
 <b>Terminal Block</b>	Digital In1 Sel	T051	Opto Out Sel	T065	Wake Level	T080
	Digital In2 Sel	T052	Opto Out Level	T066	Wake Time	T081
	Digital In3 Sel	T053	Opto Out Logic	T068	Analog Out1 Sel	T082
	Digital In4 Sel	T054	Analog In 1 Sel	T069	Analog Out1 High	T083
	Relay Out1 Sel	T055	Analog In 1 Lo	T070	Analog Out1 Setpt	T084
	Relay Out1 Level	T056	Analog In 1 Hi	T071	Analog Out2 Sel	T085
	Relay 1 On Time	T058	Analog In 1 Loss	T072	Analog Out2 High	T086
	Relay 1 Off Time	T059	Analog In 2 Sel	T073	Analog Out2 Setpt	T087
	Relay Out2 Sel	T060	Analog In 2 Lo	T074	Anlg Loss Delay	T088
	Relay Out2 Level	T061	Analog In 2 Hi	T075	Analog In Filter	T089
	Relay 2 On Time	T063	Analog In 2 Loss	T076	Sleep Sel	T090
	Relay 2 Off Time	T064	Sleep-Wake Sel	T077	Wake Sel	T091
			Sleep Level	T078		
			Sleep Time	T079		
	 <b>Communications</b>	Language	C101	Comm Format	C102	Start Source 2
			Comm Data Rate	C103	Speed Ref 2	C109
			Comm Node Addr	C104		
			Comm Loss Action	C105		
			Comm Loss Time	C106		
			Comm Write Mode	C107		
 <b>Advanced Program</b>	Purge Frequency	A141	Reverse Disable	A166	Skip Frequency 1	A188
	Internal Freq	A142	Flying Start En	A167	Skip Freq Band 1	A189
	Preset Freq 0	A143	PWM Frequency	A168	Skip Frequency 2	A190
	Preset Freq 1	A144	PWM Mode	A169	Skip Freq Band 2	A191
	Preset Freq 2	A145	Boost Select	A170	Skip Frequency 3	A192
	Preset Freq 3	A146	Start Boost	A171	Skip Freq Band 3	A193
	Accel Time 2	A147	Break Voltage	A172	Compensation	A194
	Decel Time 2	A148	Break Frequency	A173	Reset Meters	A195
	S Curve %	A149	Maximum Voltage	A174	Testpoint Sel	A196
	PID Trim Hi	A150	Slip Hertz @ FLA	A175	Fault Clear	A197
	PID Trim Lo	A151	DC Brake Time	A176	Program Lock	A198
	PID Ref Sel	A152	DC Brake Level	A177	Motor NP Poles	A199
	PID Feedback Sel	A153	DC Brk Time@Strt	A178	Motor NP FLA	A200
	PID Prop Gain	A154	Current Limit 1	A179	PID Invert Error	A201
	PID Integ Time	A155	Current Limit 2	A180	MOP Reset Sel	A202
	PID Diff Rate	A156	Motor OL Select	A181	Wake Deviation	A203
	PID Setpoint	A157	Drive OL Mode	A182	ACT1 Input	A204
	PID Deadband	A158	SW Current Trip	A183	ACT2 Input	A205
	PID Preload	A159	Load Loss Level	A184	ACT1 Minimum	A206
	Process Factor	A160	Load Loss Time	A185	ACT1 Maximum	A207
	Auto Rstrt Tries	A163	Stall Fault Time	A186	ACT2 Minimum	A208
	Auto Rstrt Delay	A164	Bus Reg Mode	A187	ACT2 Maximum	A209
	Start At PowerUp	A165			Wake PID Preload	A210

Group	Parameters					
 Aux Relay Card	Relay Out3 Sel	R221	Aux Motor Mode	R239	Aux Start Delay	R250
	Relay Out3 Level	R222	Aux Motor Qty	R240	Aux Stop Delay	R251
	Relay Out4 Sel	R224	Aux 1 Start Freq	R241	Aux Prog Delay	R252
	Relay Out4 Level	R225	Aux 1 Stop Freq	R242	Aux AutoSwap Tme	R253
	Relay Out5 Sel	R227	Aux 1 Ref Add	R243	Aux AutoSwap Lvl	R254
	Relay Out5 Level	R228	Aux 2 Start Freq	R244		
	Relay Out6 Sel	R230	Aux 2 Stop Freq	R245		
	Relay Out6 Level	R231	Aux 2 Ref Add	R246		
	Relay Out7 Sel	R233	Aux 3 Start Freq	R247		
	Relay Out7 Level	R234	Aux 3 Stop Freq	R248		
	Relay Out8 Sel	R236	Aux 3 Ref Add	R249		
	Relay Out8 Level	R237				
	 Advanced Display	Control Source	d301	Output Powr Fctr	d318	Fault 9 Code
Contrl In Status		d302	Testpoint Data	d319	Fault 10 Code	d336
Comm Status		d303	Control SW Ver	d320	Fault 4 Time-hr	d337
PID Setpnt Displ		d304	Drive Type	d321	Fault 4 Time-min	d338
Analog In 1		d305	Output Speed	d322	Fault 5 Time-hr	d339
Analog In 2		d306	Output RPM	d323	Fault 5 Time-min	d340
Fault 1 Code		d307	Fault Frequency	d324	Fault 6 Time-hr	d341
Fault 2 Code		d308	Fault Current	d325	Fault 6 Time-min	d342
Fault 3 Code		d309	Fault Bus Volts	d326	Fault 7 Time-hr	d343
Fault 1 Time-hr		d310	Status @ Fault	d327	Fault 7 Time-min	d344
Fault 1 Time-min		d311	PID Fdbk Display	d328	Fault 8 Time-hr	d345
Fault 2 Time-hr		d312	DC Bus Ripple V	d329	Fault 8 Time-min	d346
Fault 2 Time-min		d313	Fault 4 Code	d330	Fault 9 Time-hr	d347
Fault 3 Time-hr		d314	Fault 5 Code	d331	Fault 9 Time-min	d348
Fault 3 Time-min		d315	Fault 6 Code	d332	Fault10 Time-hr	d349
Elapsed Time-hr		d316	Fault 7 Code	d333	Fault10 Time-min	d350
Elapsed Time-min		d317	Fault 8 Code	d334		

## Powerflex 400 LCD Display

The breakdown of the LCD display to better understand the information the drive is displaying.



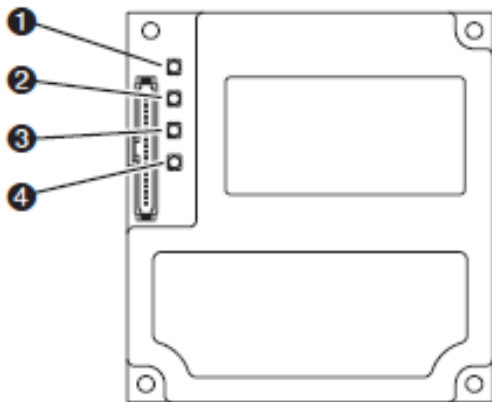
No.	Description
1	Parameter Name
2	<p>Run/Stop Status: <math>S^{\rightarrow}</math> &amp; <math>S^{\leftarrow}</math> = Stopped / <math>R^{\rightarrow}</math> &amp; <math>R^{\leftarrow}</math> = Running</p> <p><math>R^{\rightarrow}</math> or <math>R^{\leftarrow}</math> flashes to indicate that the drive is stopping, but is still decelerating.</p> <p><math>R^{\rightarrow}</math> or <math>R^{\leftarrow}</math> flashes when DC Injection is commanded.</p> <p>Direction Indication: The Direction Arrow <math>\rightarrow</math> &amp; <math>\leftarrow</math> indicates the commanded direction of rotation. If the Arrow is flashing, the drive has been commanded to change direction, but is still decelerating.</p> <p>Sleep Mode Indication: <math>R^{\rightarrow}</math> or <math>R^{\leftarrow}</math> flashes to indicate that the drive is in sleep mode.</p>
3	<p>Parameter Group and Number:</p> <p><b>b</b> = Basic Display      <b>P</b> = Basic Program      <b>T</b> = Terminal Block</p> <p><b>C</b> = Communications      <b>A</b> = Advanced Program      <b>R</b> = Aux Relay Card</p> <p><b>d</b> = Advanced Display</p>



4	Fault Indication and Fault Number
5	Fault Name

## 20-Comm-H RS485 Adapter Board

The RS485 adapter board is installed on Powerflex 7 series drives. The controller communicates with this board which communicates with the drive. Checking the communication wiring connections and the ribbon cable connections may need to be done if communication problems exist.



Name	Color	State	Description
<b>Adapter Status Indicators</b>			
PORT <b>1</b>	Green	Flashing	Normal Operation. The adapter is establishing an I/O connection to the drive. It will turn solid green or red.
		Steady	Normal Operation. The adapter is properly connected and communicating with the drive
MOD <b>2</b>	Green	Flashing	Normal Operation. The adapter is operating but is not transferring I/O data.
		Steady	Normal Operation. The adapter is operating and transferring I/O data.
NET A <b>3</b>	Green	Flashing	Normal Operation. The adapter is properly connected but does not have an I/O connection.
		Steady	Normal Operation. The adapter is properly connected and communicating on the network.
NET B <b>4</b>	Green	Off	Normal Operation. The adapter is properly connected but is idle.
		Flashing	Normal Operation. The adapter is properly connected and transmitting data packets on the network.

There are three switches on the communication board. Pay close attention to the arrow that indicates the switch setting. At first glance it is easy to assume the screw driver slot is the indicator.

The protocol select switch will always be set to RTU for our applications.

VS units the node address switches will both be set to one.

VST units the node address switches for the first stage are both set to 1, the second stage both set to 2.

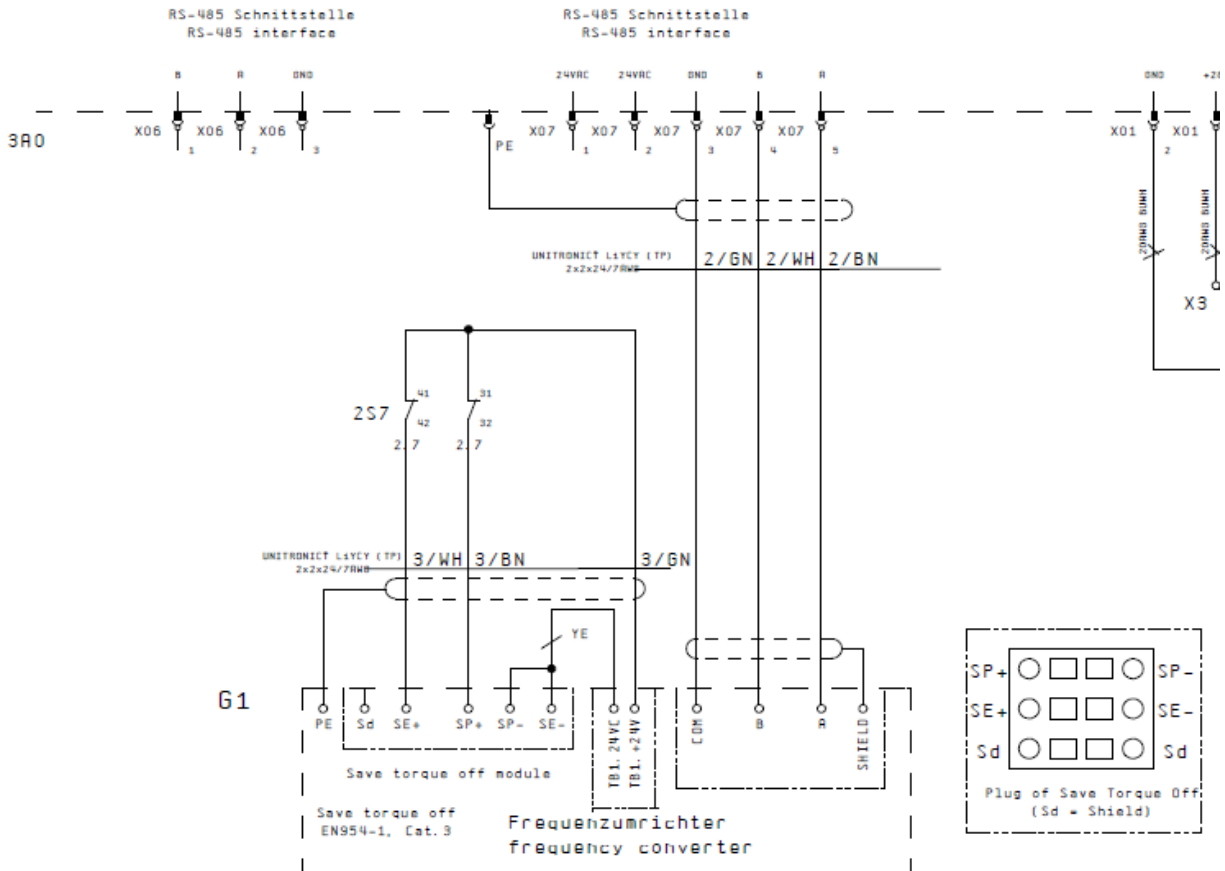
LRS units the node address switch on left is set to 0. The node address switch on the right is set to 1.

# PowerFlex 753 and 755 Safe Torque Off (STO) Card

The STO Card is used to initiate an emergency shutdown of the drive. This card is wired via the machines (2S7) emergency stop switch utilizing 2 contacts.

These circuits and 2S7 NC contacts should always be checked in the case of Stop Asserted message from the VFD.

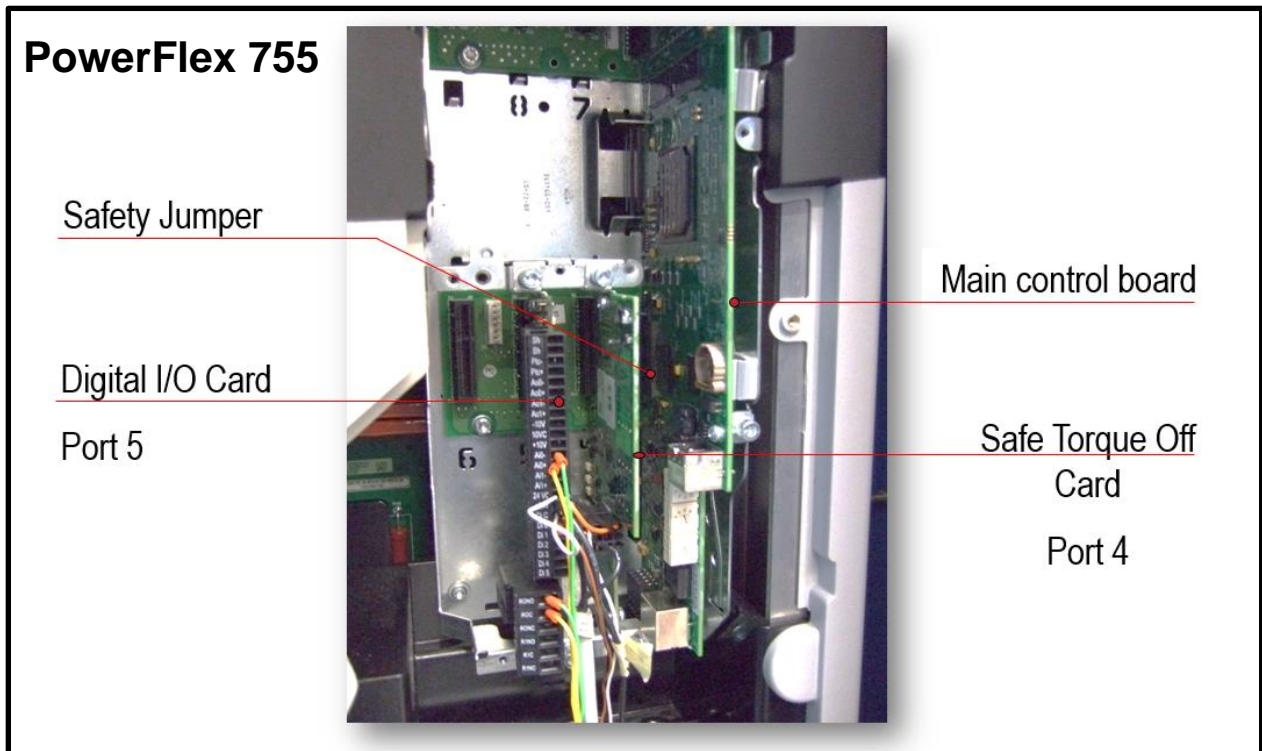
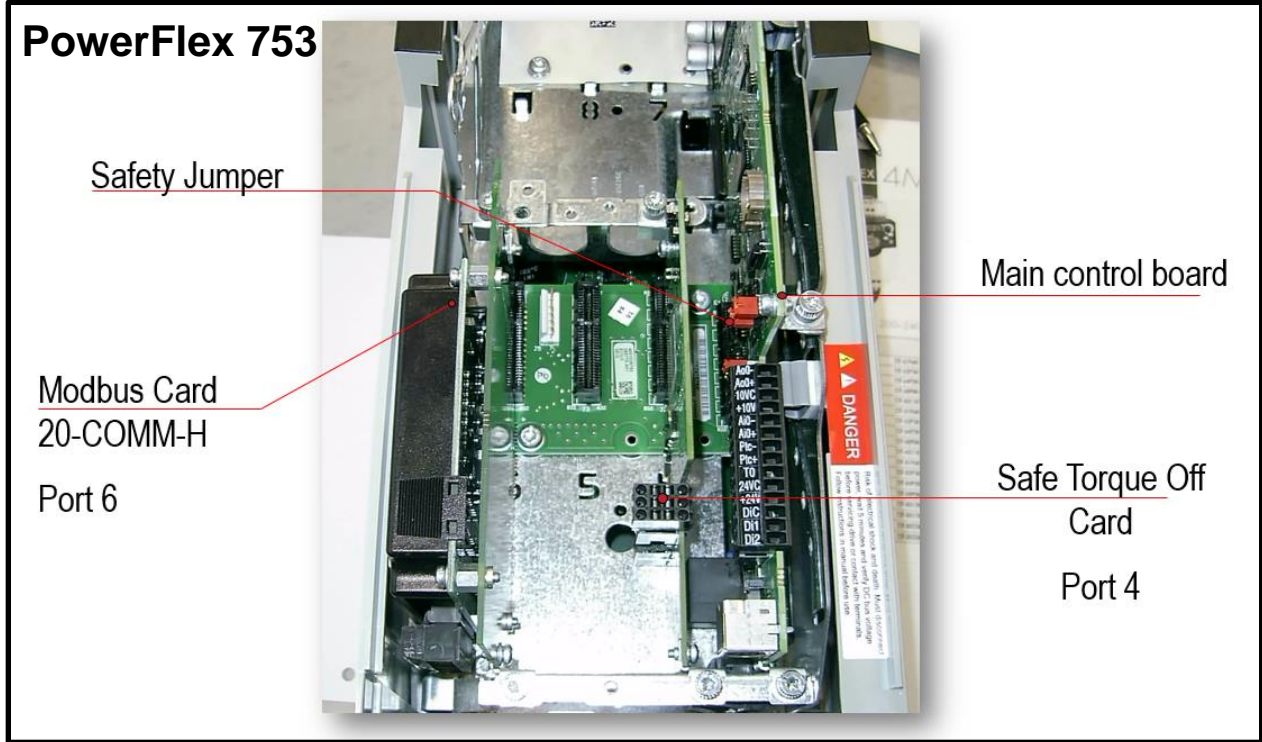
## Circuit Example – PF753



# PowerFlex 753 and 755 Card Ports

If cards are removed from ports, they must be reinstalled in the same port. Failure to do this can cause port conflicts. Never attempt to run a drive with a card missing.

New drives should always be checked to ensure the Safety Jumper has been removed after the installation of a Safe Torque Off card during drive assembly.

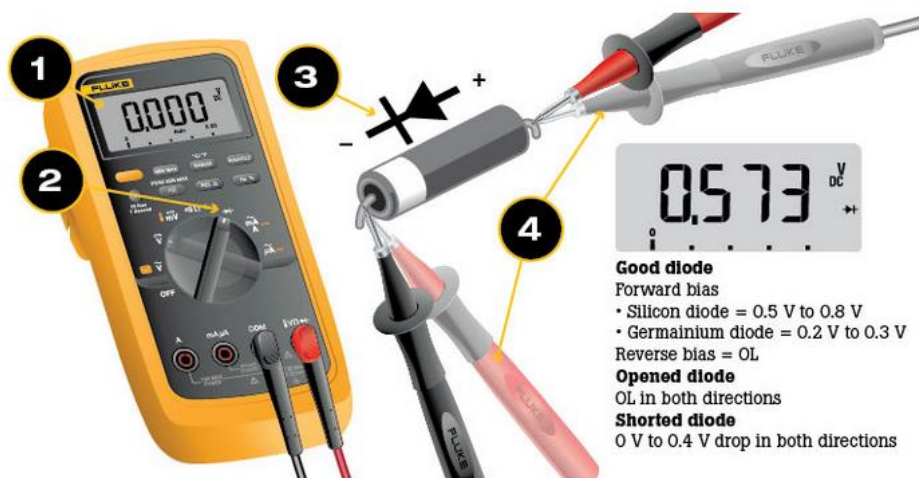


# Section 4 Drive Testing

## Drive Power Section Test

Checking the power structure of the drive is needed when troubleshooting a drive that is suspected to have failed. A multimeter with a diode test function will be needed to perform the tests. The test is broken up into two sections. The converter section test and the inverter section test.

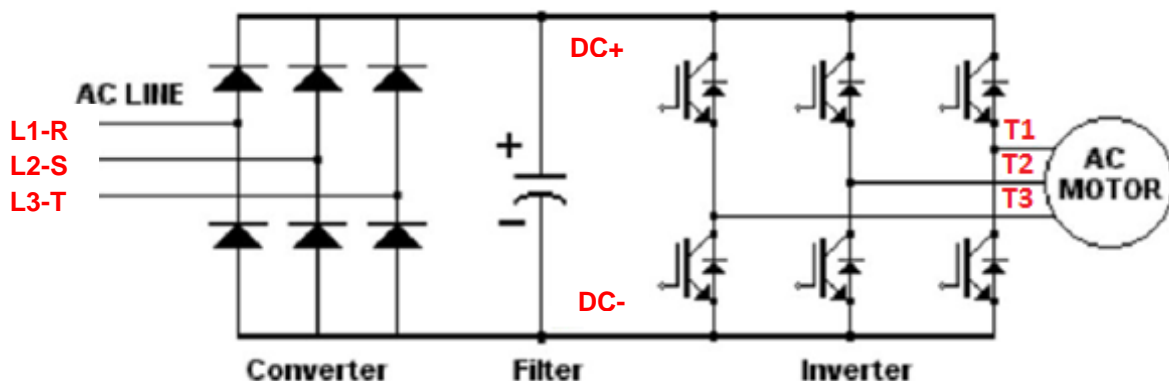
A diode will only allow the flow of current in one direction. Similar to a check valve on an air system. The symbol for a diode is  $\rightarrow|$ . This diode  $\rightarrow|$  will only allow current flow from the left to right. Notice the direction of the arrow indicating this. A multimeter's diode test mode produces a small voltage between test leads. The multimeter then displays the voltage drop when the test leads are connected across a diode when forward-biased.



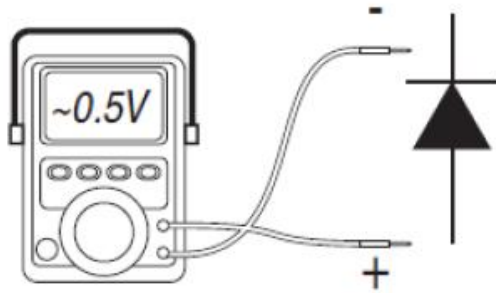
Test procedure for a diode:

1. Make certain a) all power to the circuit is OFF and b) no voltage exists at the diode. Voltage may be present in the circuit due to charged capacitors. If so, the capacitors need to be discharged. Set the multimeter to measure ac or dc voltage as required.
2. Turn the dial (rotary switch) to Diode Test mode.
3. Connect the test leads to the diode. Record the measurement displayed.
4. Reverse the test leads. Record the measurement displayed.

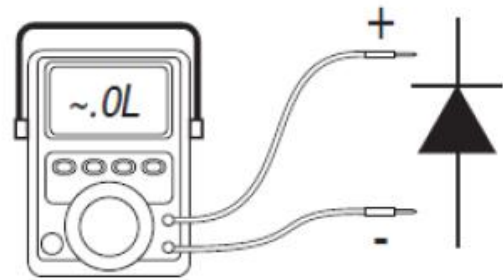
To apply this test to a variable speed drive first we need to know the schematic of the drive. We can then utilize this to check the drive diodes. Shown below is the drive schematic. The DC bus + and - will be used to test the one end of the diodes. The input lines L1, L2, and L3 for the converter test. The T1, T2, and T3 for the inverter test.



Schematic showing the basic power structure of the drive and terminals.



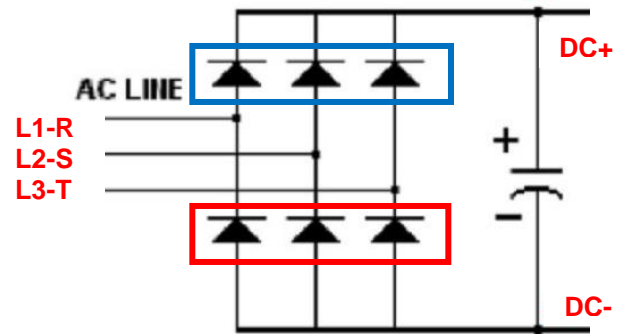
Forward biased test on PN-junction



Reverse biased test on PN-junction

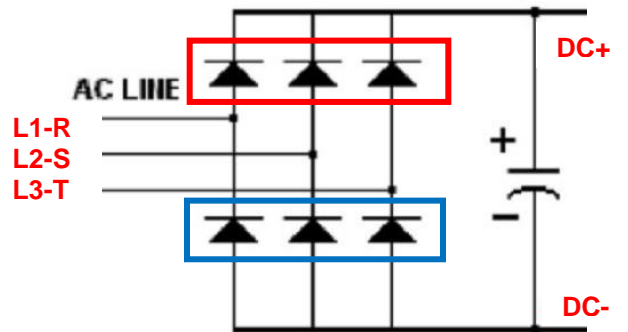
**Forward Biased Diode Tests on Rectifying Module(s)**

Meter Leads		Nominal meter reading
+	-	
L1	DC+	Value should gradually rise to about 0.5V
L2	DC+	
L3	DC+	
DC-	L1	
DC-	L2	
DC-	L3	



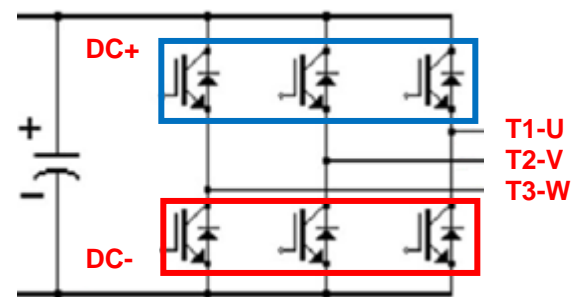
**Reverse Biased Diode Tests on Rectifying Module(s)**

Meter Leads		Nominal meter reading
+	-	
L1	DC-	Meter should display ".0L" (zero load)
L2	DC-	
L3	DC-	
DC+	L1	
DC+	L2	
DC+	L3	



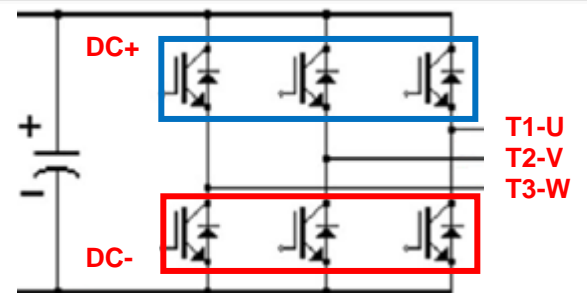
**Forward Biased Diode Tests on Output Power Modules**

Meter Leads		Nominal meter reading
+	-	
DC-	T1	Value should gradually rise to about 0.5V
DC-	T2	
DC-	T3	
T1	DC+	
T2	DC+	
T3	DC+	



**Reverse Biased Diode Tests on Output Power Modules**

Meter Leads		Nominal meter reading
+	-	
T1	DC-	Meter should display ".0L" (zero load)
T2	DC-	
T3	DC-	
DC+	T1	
DC+	T2	
DC+	T3	



## Drive No Load Test

The drive no load test is a test to determine if the drive has failed. When certain faults occur immediately at startup the culprit could be either the load connected to the drive or a faulty drive. Eliminating the load connected to the drive is a fast way to determine if the drive has failed. If the fault does not occur with the leads disconnected this would most likely eliminate the drive as the culprit for the fault.

### Example

A drive is experiencing a F12 HW overcurrent immediately at startup. The first thing that would need to be done is locking out the supply power to the unit. While waiting on the DC bus to discharge verify the motor and air end roll over freely by hand. After the DC bus has discharged label and remove the T1, T2, and T3 leads going to the motor at the drive. Isolate the leads so they will not come into contact with anything. Placing wire nuts or electrical tape on the leads for example. Apply power to the unit. Then attempt to start. If the drive immediately faults on F12 HW overcurrent again the drive has failed.

At this point the motor should still be checked with a meter and megger to verify it is in good condition.

If the fault does not occur with the leads disconnected the motor, leads to the motor, and connections in the motor connection box need to be checked.

## Drive Amperage Testing

A test that can be done to check the condition of the drive is checking amperage while running. The three input leads feeding the drive should be balanced. The three output leads should be balanced. Checking these readings at different load percentages can also be useful.

If there is an imbalance with either the input or the output further testing needs to be done.

If the imbalance is on the supply side swap two phases. If the unbalanced leg moves the supply power would need to be checked. If the unbalanced leg stays with the drive further checks to the drive would need to be done.

If the imbalance is on the load or motor side of the drive rotate the leads twice to maintain proper rotation. Then check to see if the unbalanced leg moved or stayed with the motor. If the unbalanced leg moved the motor, motor wiring, and motor connections would need to be checked. If the unbalanced leg stays with the drive the drive would be suspect.

When swapping around leads use the JOG function on the controller to verify proper rotation.

## Motor Rotation Information

A common misconception is that the drive will always rotate the motor in the correct rotation. This is not correct

Swapping two outgoing motor leads on the drive will reverse the rotation of the motor.

Swapping two of the incoming leads on the drive will not affect the rotation of the motor.

If there is ever a chance the rotation has been changed the motor should be jogged to verify the correct rotation.

# Communication Fault Investigation

The steps taken to troubleshoot communication faults will vary dependent upon the different scenarios and symptoms. Below are a few detailed examples on the most common scenarios. The first step in all communication faults investigation is verify proper wiring and connections. When checking the connections take care not to cross the communication wiring with any control or supply voltage wiring. Doing so can damage any or all of the communication ports in the communication line.

## Example 1

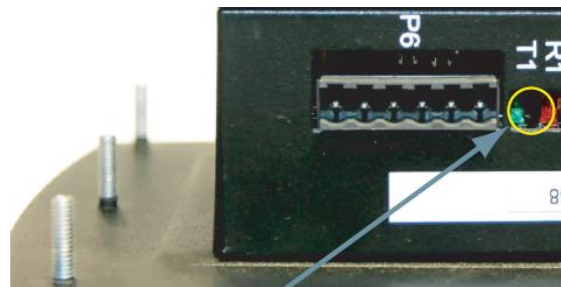
The AirSmart controller has a 144 Drive 1 Comm Error. The fault will not reset.

First check the drive to see if the display and LEDs are lit. If these are not lit check the supply power to the drive on terminals L1-L3. Proper voltage measured here with no display would indicate the drive has failed.

If the drive is operational next isolate the precision mixing valve (PMV) from the communication loop (if applicable). Unwire or unplug the mixing valve communication wiring at the splitter. Reference the original wiring diagram and current wiring when rewiring. When the PMV is unwired attempt to reset the 144 Drive 1 Comm Error. If the fault changed to a 170 Actuator Comm Error the PMV is the culprit. Check the PMV and associated wiring. The reason the fault changed was due to the PMV dragging down the communications completely. When this occurs the 144 fault is higher on the fault hierarchy. Thus a 144 is displayed.

Check the communication status of the drive and AirSmart next. Below details how to check the communication status on each device. Both should be transmitting and receiving. If the AirSmart is transmitting but the drive isn't receiving the drive would be suspect.

The AirSmart controller has LEDs to indicate whether it is transmitting and receiving information. The LEDs are next to the P6 connector. The T1 led is green and indicates the AirSmart is transmitting information when it is flashing. The R1 led is red and indicates the AirSmart is receiving information when it is flashing from either or both the drive and precision mixing valve (if applicable). With normal communication established the transmitting/receiving led's will flash very quickly.

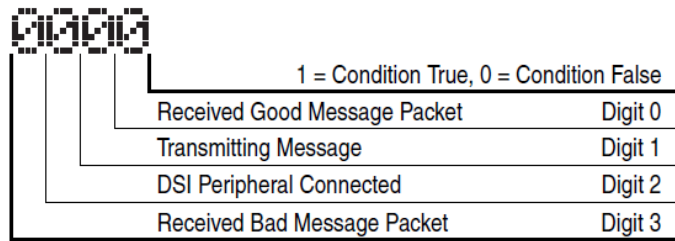


T1 - R1 (DRIVE + PMV) transmit and receiving acknowledgment

On the Powerflex 400 drive entering parameter d303 will provide the communication status information. The digit of the far right indicates the drive is receiving information. The third digit to the right indicates the drive is transmitting information. With normal communication established the transmitting/receiving digits will flash very quickly.

## d303 [Comm Status]

Status of the communications ports.



The final step would be to check that each device is programmed correctly. Check the correct model is selected under the Configuration Adjust menu in the AirSmart. Next verify no changes were made to the drive. If the drive is not programmed correctly it will not communicate with the AirSmart. To verify these settings a call will need to be placed to the Gardner Denver field service department.

### Example 2

The unit runs but will intermittently shutdown on a communications fault. For this example it could be either a 144 Drive 1 Comm Error or a 170 Actuator Comm Error. For either shutdown the same problem is occurring. An electrical noise is causing an interruption or distortion in the communication line. Electrical noise can be unpredictable. The solution for one installation may not eliminate the noise on a different installation.

Below is list of different items to help eliminate the electrical noise causing the communication fault.

- The importance of properly terminating connections for this example is very critical. Remove the wire, trim, and strip all wires in the communication line. Check all grounding connections in the cabinet.
- Verify the communication cabling isn't ran in parallel or wrapped around any supply voltage lines in the cabinet.
- Replace the communication wiring. The cable installed between the AirSmart and the drive is part number 97J93 (ordered by the foot).
- Reference the wiring diagram for the unit and locate the DIG GND terminal on the drive terminal strip. This is the digital ground connection on the drive. Install a wire from this terminal to a ground in the cabinet.
- Eliminate the RJ45 splitter connection at the drive. Unplug the splitter connection at the drive. Remove the two RJ45 connectors plugged into the splitter. Plug one RJ45 connector into the drive. Remove the wiring on the other RJ45 connector. Install the wires into the RJ45 plug in the drive. When facing the RJ45 connector screw connections the – terminal is on the left, + terminal on the right.

### Example 3

The AirSmart controller has a 170 actuator communication error that won't reset.

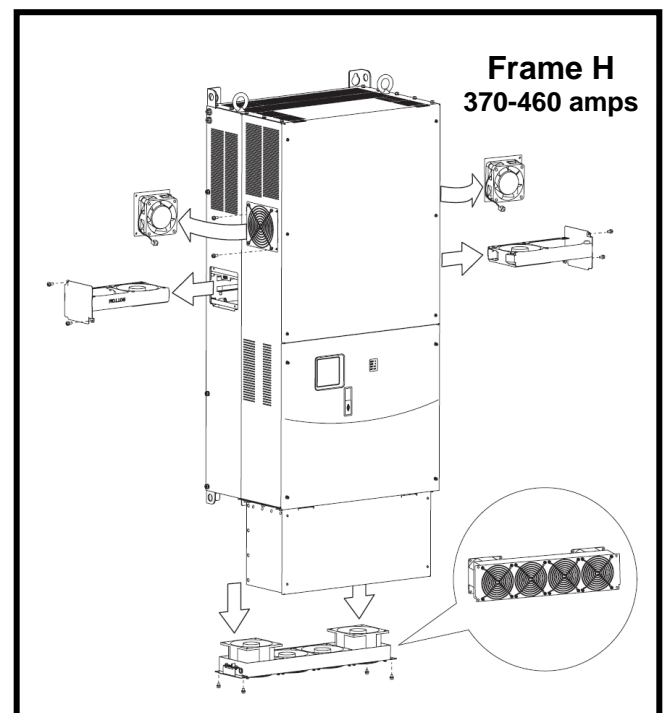
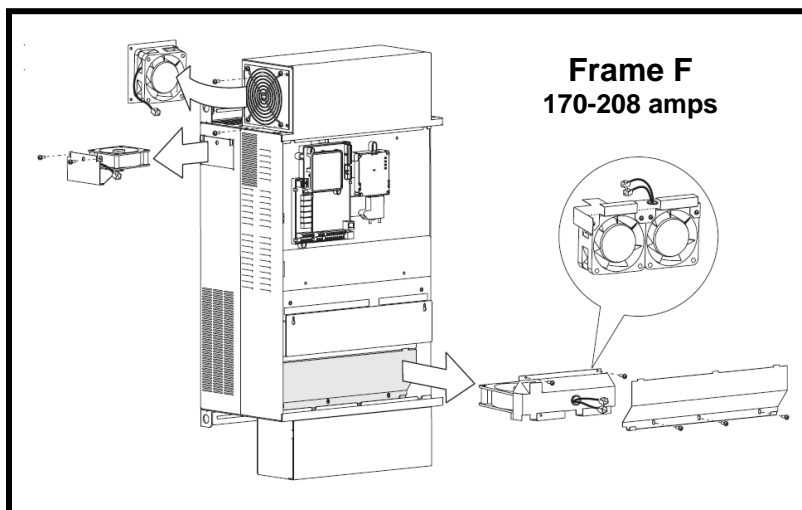
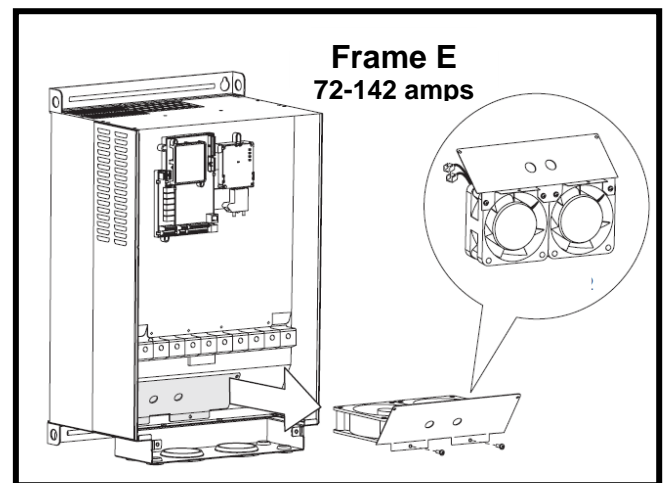
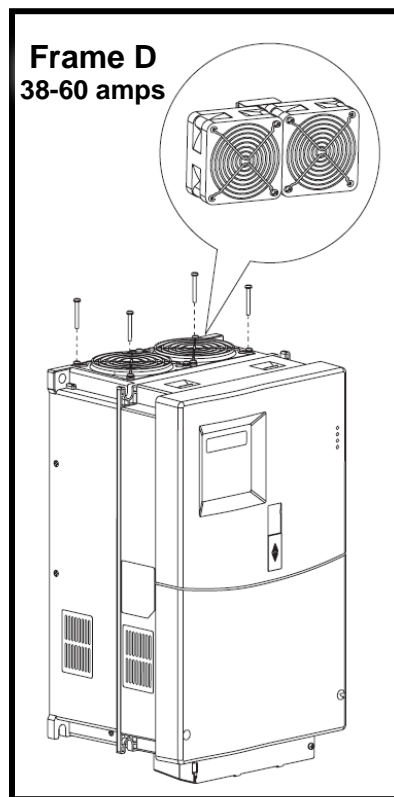
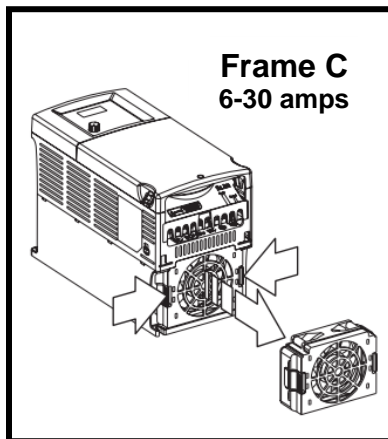
- Verify the PMV has 24 VDC supply power on the control board.
- Verify the RS485 and 24 VDC wiring polarity is correct.
- Replace the cable to the PMV. Grey/Red molded cable part number 97J89 (ordered by the foot).
- Visually look at the PMV electronic board. Checking for any burn marks or failed solder joints.

# Section 5 Drive Fan Information

## Powerflex 400 Series Fan Locations

When troubleshooting certain faults it will be needed to verify the drive cooling fans are running. The fan location and number of fans on the different size drives will vary. Pictured below the different frame sizes along with their fan locations on 480 volt drives.

To determine the frame size of your drive reference catalog number on the drive nameplate. An example of a catalog would be 22C-D142A103. The number after the D designates the amperage rating of the drive.

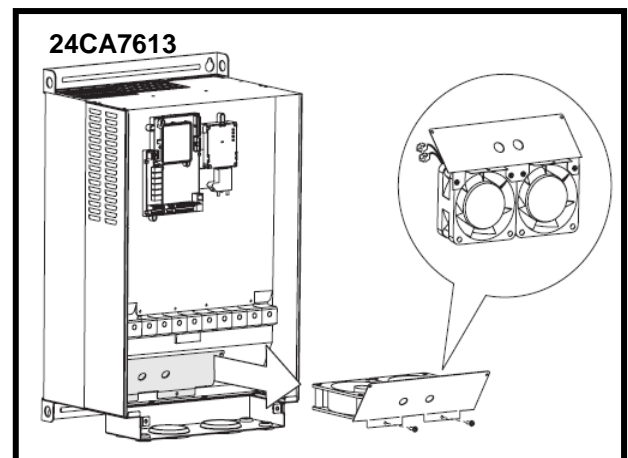
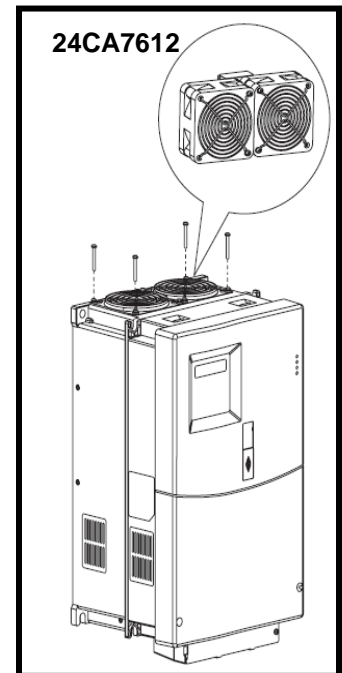
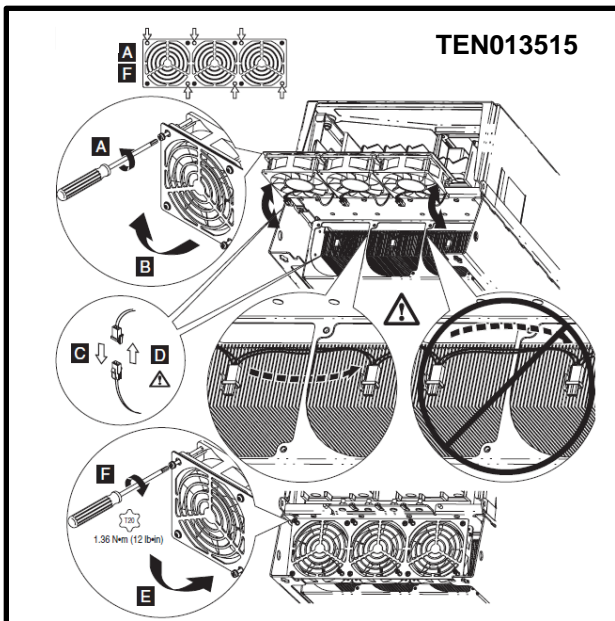
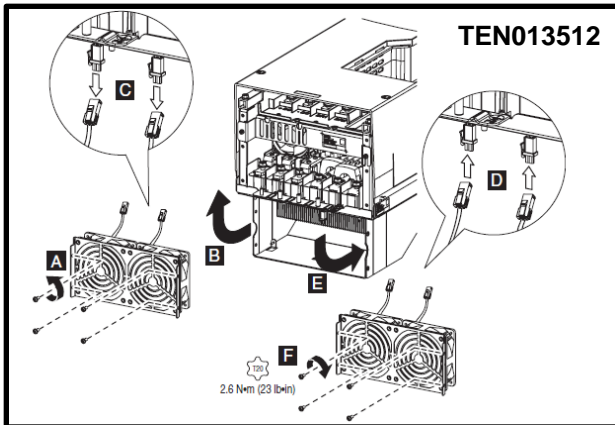


# Drive Fan Replacement

Certain drives have cooling fan replacement kits available if the cooling fans on the drive need to be replaced. The part numbers listed below are for Allen Bradley drives.

The units that have this option are listed below along with the part number for the fan kit. Instructions for the replacement are included within the kit. Fan kits are not available for 575 volt configuration units. For the VS40 230 volt configuration there is no fan kit available.

VST Series	Fan Kit	VS Series	Fan Kit	LRS Series	Fan Kit	Apex VS Series	Fan Kit
<b>Model</b>	<b>Part Number</b>	<b>Model</b>	<b>Part Number</b>	<b>Model</b>	<b>Part Number</b>	<b>Model</b>	<b>Part Number</b>
VST55	24CA7612	VS20	24CA7612	L15RS	24CA7612	Apex VS15	24CA7612
VST75	24CA7613	VS25	24CA7612	L18RS	24CA7612	Apex VS18	24CA7612
VST90	24CA7613	VS30	24CA7613	L22RS	24CA7612	Apex VS18+	24CA7612
VST110	24CA7613	VS40	24CA7613	L23RS	24CA7613	Apex VS22	24CA7612
VST150	24CA7613	VS45	24CA7613	L26RS	24CA7613		
		VS50	24CA7613	L29RS	24CA7613		
		VS70	24CA7613	L30RS	24CA7613		
		VS80	24CA7613	L37RS	24CA7613		
				L45RS	24CA7613		
				L55RS	24CA7613		
				L90RS	TEN013512		
				L110RS	TEN013512		
				L132RS	TEN013515		



# Section 6 Drive Part Number Listing

This section provides the part numbers for the drives used on the various product lines. When ordering a replacement drive always include the serial number on the sales order to verify the correct drive part number is ordered.

## VS and VST Series Drives

A re-manufactured drive is needed when a drive is replaced under warranty if it failed 90 days after startup of the unit. When placing an order for a re-manufactured drive place a prefix of RMF prior to the drive part number. For example a VS70 460 volt remanufactured drive would be a RMF9050031B in comparison to the new drive part number 9050031B.

VS Series			
Model	460 Volt	575 Volt	200/230 Volt
VS11	90500024B		
VS20	90500026D	VP1038204A	VP1038573A
VS25	89864539B		
VS30	89864409B	VP1026953A	VP1026951A
VS40	89864389B	VP1026958A	VP1026955A
VS45	89864389D		
VS50	90500030B	90500157A	
VS70	90500031B	90500155A	
VS80	90500031D	90500155B	
VS110	90500033B	VP1029689A	
VS135	90500033D	VP1029689B	
VS170A	90500037A	VP1029692A	
VS170B	VP1140160A	VP1140159A	
VS200	90500038B		
VS250	90500039B		

VST Series			
Model	First Stage	Second Stage	Air Cooled
VST55	90500055A	90500055B	90500022A
VST75	89864409C	89864409D	90500022A
VST90	89864389E	89864389F	90500022A
VST110	90500030C	90500030D	90500149A
VST150	90500031E	90500031F	90500149A
VST180	90500032C	90500032D	90500149A
VST225	90500033E	90500033F	90500153A
VST260	90500035B	90500035C	90500153A

## Apex VS Series Drives

### Apex VS Series

<b>Model</b>	<b>460 Volt</b>	<b>575 Volt</b>	<b>208 Volt</b>	<b>230 Volt</b>
Apex VS7	VP1079945	VP1079947	VP1079941	VP1079941
Apex VS11	VP1079954	VP1079957	VP1079942	VP1079942
Apex VS15	90500026H	VP1029685D	VP1041255B	VP1041255C
Apex VS18	90500026G	VP1029685C	VP1123675B	VP1123675C
Apex VS18+	90500055F	VP1041306B		VP1038573B
Apex VS22	90500055F	VP1041306B		VP1038573B

# Section 7 Yaskawa Drives

Yaskawa drives are installed on frame 1 and frame 2 of the LRS series B configurations. Example a LRS7-11A would have an Allen Bradley drive while a LRS7-11B would have a Yaskawa drive.

## Yaskawa Drive Fault Listing

Fault Code	Fault Name	Fault Code	Fault Name
0002H	DC Bus Undervoltage (Uv1)	0036H	Output Current Imbalance (LF2)
0003H	Control Power Supply Voltage Fault (Uv2)	0037H	Pullout Detection (Sto)
0004H	Undervoltage 3 (Uv3)	0038H	PG Hardware Fault (PGoH)
0005H <->	Output Short-Circuit or IGBT Fault (SC)	0039H	MECHATROLINK Watchdog Timer Error (E5)
0006H	Ground Fault (GF)	003BH	Too Many Speed Search Restarts (SEr)
0007H	Overcurrent (oC)	0041H	PID Feedback Loss (FbH)
0008H	Drive Overheat Warning (ov)	0042H	External Fault 1, Input Terminal S1 (EF1)
0009H	Heatsink Overheat (oH)	0043H	External Fault 2, Input Terminal S2 (EF2)
000AH	Overheat 1 (oH1)	0044H	Mechanical Weakening Detection 1 (oL5)
000BH	Motor Overload (oL1)	0045H	Mechanical Weakening Detection 2 (UL5)
000CH	Drive Overload (oL2)	0046H	Current Offset Fault (CoF)
000DH	Overtorque Detection 1 (oL3)	0047H	PLC Detection Error 1 (PE1)
000EH	Overtorque Detection 2 (oL4)	0048H	PLC Detection Error 2 (PE2)
000FH	Dynamic Braking Transistor (rr)	0049H	DriveWorksEZ Fault (dWFL)
0010H	Braking Resistor Overheat (rH)	004AH <->	EEPROM Memory DriveWorksEZ Data Error (dWF1)
0011H	External Fault at Input Terminal S3 (EF3)	004DH	Output Voltage Detection Fault (voF)
0012H	External Fault at Input Terminal S4 (EF4)	004EH	Braking Resistor Transistor Fault (rF)
0013H	External Fault at Input Terminal S5 (EF5)	004FH	Braking Transistor Overload Fault (boL)
0014H	External Fault at Input Terminal S6 (EF6)	0050H	Motor Overheat (NTC Input) (oH5)
0015H	External Fault at Input Terminal S7 (EF7)	0051H	LSo Fault (LSo)
0016H	External Fault at Input Terminal S8 (EF8)	0052H	Node Setup Fault (nSE)
0017H	Internal Fan Fault (FAn)	0053H	Thermistor Disconnect (THo)
0018H	Overspeed (oS)	005BH <->	Initial Polarity Estimation Timeout (dv7)
0019H	Speed Deviation (dEv)	005FH	Power Unit Output Phase Loss 3 (LF3)
001AH	PG Disconnect (PGo)	0060H	Current Unbalance (UnbC)
001BH	Input Phase Loss (PF)	0061H	Power Supply Module Undervoltage (Uv4)
001CH	Output Phase Loss (LF)	0083H	A/D Conversion Error (CPF02)
001DH	Motor Overheat (PTC input) (oH3)	0084H	PWM Data Fault (CPF03)
001EH	Digital Operator Connection (oPr)	0087H	EEPROM Memory Data Error (CPF06)
001FH	EEPROM Write Error (Err)	0088H	Terminal Board Connection Error (CPF07)
0020H	Motor Overheat (PTC input) (oH4)	0089H	EEPROM Serial Communication Fault (CPF08)
0021H	MEMOBUS/Modbus Communication Error (CE)	008CH	RAM Fault (CPF11)
0022H	Option Communication Error (bUS)	008DH	Flash Memory Circuit Exception (CPF12)
0025H	Control Fault (CF)	008EH	Watchdog Circuit Exception (CPF13)
0026H	Zero-Servo Fault (SvE)	008FH	Control Circuit Fault (CPF14)
0027H	Option External Fault (EF0)	0091H	Clock Fault (CPF16)
0028H	PID Feedback Loss (FbL)	0092H	Timing Fault (CPF17)
0029H	Undertorque Detection 1 (UL3)	0093H	Control Circuit Fault (CPF18)
002AH	Undertorque Detection 2 (UL4)	0094H	Control Circuit Fault (CPF19)
002BH	High Slip Braking Overload (oL7)	0095H	Hardware Fault at Power Up (CPF20)
0030H	Hardware Fault (including oFx)	0096H	Hardware Fault at Communication Start Up (CPF21)
0032H	Z Pulse Fault (dv1)	0097H	A/D Conversion Fault (CPF22)
0033H	Z Pulse Noise Fault Detection (dv2)	0098H	PWM Feedback Fault (CPF23)
0034H	Inversion Detection (dv3)	0099H	Drive Unit Signal Fault (CPF24)
0035H	Inversion Prevention Detection (dv4)	009AH	Terminal Board is Not Properly Connected. (CPF25)

Fault Code	Fault Name
009BH	ASIC BB Circuit Error (CPF26)
009CH	ASIC PWM Setting Register Error (CPF27)
009DH	ASIC PWM Pattern Error (CPF28)
009EH	ASIC On-delay Error (CPF29)
009FH	ASIC BBON Error (CPF30)
00A0H	ASIC Code Error (CPF31)
00A1H	ASIC Start-up Error (CPF32)
00A2H	Watch-dog Error (CPF33)
00A3H	ASIC Power/Clock Error (CPF34)
00A4H	External A/D Converter Error (CPF35)
00A9H	Control Circuit Error (CPF40)
00AAH	Control Circuit Error (CPF41)
00ABH	Control Circuit Error (CPF42)
00ACH	Control Circuit Error (CPF43)
00ADH	Control Circuit Error (CPF44)
00AEH	Control Circuit Error (CPF45)
0101H	Option Compatibility Error (oFA00)
0102H	Option Not Properly Connected (oFA01)
0103H	Same Type of Option Card Already Connected (oFA02)
0106H	A/D Conversion Error (oFA05)
0107H	Option Response Error (oFA06)
0111H	Option RAM Fault (oFA10)
0112H	Option Operation Mode Fault (SLMOD) (oFA11)
0113H	Drive Receive CRC Error (oFA12)
0114H	Drive Receive Frame Error (oFA13)
0115H	Drive Receive Abort Error (oFA14)
0116H	Option Receive CRC Error (oFA15)
0117H	Option Receive Frame Error (oFA16)
0118H	Option Receive Abort Error (oFA17)
0131H	Comm. ID Error (oFA30)
0132H	Model Code Error (oFA31)
0133H	Sumcheck Error (oFA32)
0134H	Comm. Option Timeout Waiting for Response (oFA33)
0135H	MEMOBUS Timeout (oFA34)
0136H	Drive Timeout Waiting for Response (oFA35)
0137H	CI Check Error (oFA36)
0138H	Drive Timeout Waiting for Response (oFA37)
0139H	Control Command Selection Error (oFA38)
013AH	Drive Timeout Waiting for Response (oFA39)
013BH	Control Response Selection 1 Error (oFA40)
013CH	Drive Timeout Waiting for Response (oFA41)
013DH	Control Response Selection 2 Error (oFA42)
013EH	Control Response Selection Error (oFA43)
0201H	Option Compatibility Error (oFB00)
0202H	Option Connection Error (oFb01)

<1> Available in drive software versions PRG: 1015 and later.

<2> Available in drive software versions PRG: 1018 and later.

Fault Code	Fault Name
0203H	Same Type of Option Card Already Connected (oFb02)
0206H	A/D Conversion Error (oFb05)
0207H	Option Response Error (oFb06)
0211H	Option RAM Fault (oFb10)
0212H	Option Operation Mode Fault (SLMOD) (oFb11)
0213H	Drive Receive CRC Error (oFb12)
0214H	Drive Receive Frame Error (oFb13)
0215H	Drive Receive Abort Error (oFb14)
0216H	Option Receive CRC Error (oFb15)
0217H	Option Receive Frame Error (oFb16)
0218H	Option Receive Abort Error (oFb17)
0231H	Comm. ID Error (oFb30)
0232H	Model Code Error (oFb31)
0233H	Sumcheck Error (oFb32)
0234H	Comm. option Timeout Waiting for Response (oFb33)
0235H	MEMOBUS Timeout (oFb34)
0236H	Drive Timeout Waiting for Response (oFb35)
0237H	CI Check Error (oFb36)
0238H	Drive Timeout Waiting for Response (oFb37)
0239H	Control Command Selection Error (oFb38)
023AH	Drive Timeout Waiting for Response (oFb39)
023BH	Control Response Selection 1 Error (oFb40)
023CH	Drive Timeout Waiting for Response (oFb41)
023DH	Control Response Selection 2 Error (oFb42)
023EH	Control Response Selection Error (oFb43)
0301H	Option Compatibility Error (oFC00)
0303H	Option Not Properly Connected (oFC01)
0304H	Same Type of Option Card Already Connected (oFC02)
0306H	A/D Conversion Error (oFC05)
0307H	Option Response Error (oFC06)
0311H	Option RAM Fault (oFC10)
0312H	Option Operation Mode Fault (SLMOD) (oFC11)
0313H	Drive Receive CRC Error (oFC12)
0314H	Drive Receive Frame Error (oFC13)
0315H	Drive Receive Abort Error (oFC14)
0316H	Option Receive CRC Error (oFC15)
0317H	Option Receive Frame Error (oFC16)
0318H	Option Receive Abort Error (oFC17)
0351H	Encoder Option AD Conversion Error (oFC50)
0352H	Encoder Option Analog Circuit Error (oFC51)
0353H	Encoder Communication Timeout (oFC52)
0354H	Encoder Communication Data Error (oFC53)
0355H	Encoder Error (oFC54)
0356H	Resolver Error (oFC55)

# Section 8 Weg Drives

Weg drives are installed on the frame 6 LRS series (LRS160-290A).

## Weg Drive Fault Listing

Fault/Alarm	Description	Possible Causes
F006 Imbalance or Input Phase Loss	Mains voltage imbalance too high or phase missing at the input power supply. <b>Note:</b> - If the motor is unloaded or operating with reduced load, this fault may not occur. - Fault delay is set at parameter P0357. P0357 = 0 disables the fault.	<input checked="" type="checkbox"/> Phase missing at the inverter input power supply. <input checked="" type="checkbox"/> Input voltage imbalance > 5%. <input checked="" type="checkbox"/> Pre-charge circuit fault.
F021 DC Bus Undervoltage	DC bus undervoltage condition occurred.	<input checked="" type="checkbox"/> The input voltage is too low and the DC bus voltage dropped below the minimum permitted value (monitor the value at Parameter P0004): Ud < 385 V - for supply voltage 380 V (P0296 = 1). Ud < 405 V - for supply voltage 400-415 V (P0296 = 2). Ud < 446 V - for supply voltage 440-460 V (P0296 = 3). Ud < 487 V - for supply voltage 480 V (P0296 = 4). <input checked="" type="checkbox"/> Phase loss at the input power supply. <input checked="" type="checkbox"/> Pre-charge circuit failure. <input checked="" type="checkbox"/> Parameter P0296 was set to a value above the power supply rated voltage.
F022 DC Bus Overvoltage	DC bus overvoltage condition occurred.	<input checked="" type="checkbox"/> The input voltage is too high and the DC bus voltage surpassed the maximum permitted value: Ud > 800 V - for 380-480 V models (P0296 = 1, 2, 3 or 4). <input checked="" type="checkbox"/> Inertia of the driven-load is too high or deceleration time is too short. <input checked="" type="checkbox"/> Parameters P0151 or P0153 or P0185 set to high.
F030 Power Module U Fault	Power Module U IGBTs desaturation.	<input checked="" type="checkbox"/> Short-circuit between motor phases U and V or U and W.
F034 Power Module V Fault	Power Module V IGBTs desaturation.	<input checked="" type="checkbox"/> Short-circuit between motor phases V and U or V and W.
F038 Power Module W Fault	Power Module W IGBT desaturation.	<input checked="" type="checkbox"/> Short-circuit between motor phases W and U or W and V.
F042 DB IGBT Fault	Desaturation of Dynamic Braking IGBT occurred.	<input checked="" type="checkbox"/> Short-circuit between the connection cables of the dynamic braking resistor.
A046 High Load on Motor	Load is too high for the used motor. <b>Note:</b> It may be disabled by setting P0348 = 0 or 2.	<input checked="" type="checkbox"/> Settings of P0156, P0157, and P0158 are too low for the used motor. <input checked="" type="checkbox"/> Motor shaft load is excessive.
A047 IGBT Overload Alarm	An IGBT overload alarm occurred. <b>Note:</b> It may be disabled by setting P0350 = 0 or 2.	<input checked="" type="checkbox"/> Inverter output current is too high.
F048 IGBT Overload Fault	An IGBT overload fault occurred.	<input checked="" type="checkbox"/> Inverter output current is too high.

Fault/Alarm	Description	Possible Causes
A050 U Phase IGBT High Temperature	The IGBT NTC temperature sensors detected a high temperature alarm. <b>Note:</b> It may be disabled by setting P0353 = 2 or 3.	<input checked="" type="checkbox"/> High inverter surrounding air temperature (> 50 °C (122 °F)). and high output current. <input checked="" type="checkbox"/> Blocked or defective fan. <input checked="" type="checkbox"/> Very dirty heatsink.
F051 U Phase IGBT Overtemperature	The IGBT NTC temperature sensors detected an overtemperature fault.	
A053 V Phase IGBT High Temperature	The IGBT NTC temperature sensors detected a high temperature alarm. <b>Note:</b> It may be disabled by setting P0353 = 2 or 3.	
F054 V Phase IGBT Overtemperature	The IGBT NTC temperature sensors detected an overtemperature fault.	
A056 W Phase IGBT High Temperature	The IGBT NTC temperature sensors detected a high temperature alarm. <b>Note:</b> It may be disabled by setting P0353 = 2 or 3.	
F057 W Phase IGBT Overtemperature	The IGBT NTC temperature sensors detected an overtemperature fault.	
F062 <sup>(2)</sup> Thermal Imbalance	Fault of power module temperature imbalance.	<input checked="" type="checkbox"/> The temperature difference between IGBTs modules of the same phase (U, V, W) was above 15 °C (59 °F). <input checked="" type="checkbox"/> The temperature difference between IGBTs modules of the same phase (U, V, W) was above 20 °C (68 °F). <input checked="" type="checkbox"/> The temperature difference between rectifier modules of different phases (R and S, R and T, S and T) was above 15 °C (59 °F).
F067 Encoder / Motor Wiring is Inverted	Fault related to the phase relation of the encoder signals if P0202 = 4 and P0408 = 2, 3 or 4. <b>Note:</b> - It is not possible to reset this fault during the selftuning. - It is not possible to reset this fault. - In this case, turn off the power supply, solve the problem, and then turn it on again.	<input checked="" type="checkbox"/> Output motor cables U, V, W are inverted. <input checked="" type="checkbox"/> Encoder channels A and B are inverted. <input checked="" type="checkbox"/> Encoder was not properly mounted.
F071 Output Overcurrent	Output overcurrent fault.	<input checked="" type="checkbox"/> Excessive load inertia or acceleration time too short. <input checked="" type="checkbox"/> Settings of P0135 or P0169, P0170, P0171, and P0172 are too high.
F072 Motor Overload	Fault of motor current imbalance. <b>Note:</b> It may be disabled by setting P0348 = 0 or 3.	<input checked="" type="checkbox"/> Settings of P0156, P0157, and P0158 are too low for the used motor. <input checked="" type="checkbox"/> Excessive load at the motor shaft.
F074 Ground Fault	Ground overcurrent fault. <b>Note:</b> It may be disabled by setting P0343 = 0.	<input checked="" type="checkbox"/> Short-circuit to the ground at one or more of the output phases. <input checked="" type="checkbox"/> Motor cable capacitance is too large, resulting in current peaks at the output. <sup>(3)</sup>
F076 Motor Current Imbalance	Fault of motor current imbalance. <b>Note:</b> It may be disabled by setting P0342 = 0.	<input checked="" type="checkbox"/> Loose connection or interrupted wiring between motor and inverter. <input checked="" type="checkbox"/> Vector control lost orientation. <input checked="" type="checkbox"/> Vector control with inverted encoder wiring or inverted motor connection.
F077 DB Resistor Overload	The dynamic braking resistor overload protection tripped.	<input checked="" type="checkbox"/> Excessive load inertia or deceleration time too short. <input checked="" type="checkbox"/> Excessive load at the motor shaft. <input checked="" type="checkbox"/> Parameter P0154 and P0155 incorrect setting.
F078 Motor Overtemperature	Fault related to the PTC temperature sensor installed in the motor. <b>Note:</b> - It may be disabled by setting P0351 = 0 or 3. - It is necessary to set an analog input / output to the PTC function.	<input checked="" type="checkbox"/> Excessive load at the motor shaft. <input checked="" type="checkbox"/> Too heavy duty cycle (too many starts/stops per minute). <input checked="" type="checkbox"/> Too high motor surrounding air temperature. <input checked="" type="checkbox"/> Loose connection or short-circuit (resistance < 60 Ω) in the wiring connected to the motor thermistor. <input checked="" type="checkbox"/> Motor thermistor is not installed. <input checked="" type="checkbox"/> Blocked motor shaft.
F079 Encoder Signal Fault	Lack of encoder signals.	<input checked="" type="checkbox"/> Broken wires between the motor encoder and the option and the encoder interface board. <input checked="" type="checkbox"/> Defective encoder.
F080 CPU Watchdog	Microcontroller watchdog fault.	<input checked="" type="checkbox"/> Electrical noise.
F082 Copy Function Fault	Fault while copying parameters.	<input checked="" type="checkbox"/> An attempt to copy the keypad parameters to an inverter with an incompatible firmware version.

Fault/Alarm	Description	Possible Causes
F084 Auto-diagnosis Fault	Auto-diagnosis fault.	<input checked="" type="checkbox"/> Internal inverter circuitry defect.
A088 Communication Lost	A failure in the communication between the HMI and the control board.	<input checked="" type="checkbox"/> Loose keypad cable connection. <input checked="" type="checkbox"/> Electrical noise in the installation.
A090 External Alarm	External alarm via digital input. <b>Note:</b> It is necessary to set a digital input for 'no external alarm'.	<input checked="" type="checkbox"/> Open wiring at digital inputs (DI1 to DI8) programmed for 'no external alarm'.
F091 External Fault	External fault via digital input. <b>Note:</b> It is necessary to set a digital input to 'no external fault'.	<input checked="" type="checkbox"/> Open wiring at digital inputs (DI1 to DI8) programmed for 'no external fault'.
F099 Invalid Current Offset	Current measurement circuit is measuring a wrong value for null current.	<input checked="" type="checkbox"/> Defect in the inverter internal circuitry.
A110 High Motor Temperature	Alarm related to the PTC temperature sensor installed in the motor. <b>Note:</b> - It may be disabled by setting P0351 = 0 or 2. - It is necessary to set an analog input/output to the PTC function.	<input checked="" type="checkbox"/> Excessive load at the motor shaft. <input checked="" type="checkbox"/> Too heavy duty cycle (too many starts / stops per minute). <input checked="" type="checkbox"/> Too high motor surrounding air temperature. <input checked="" type="checkbox"/> Motor thermistor is not installed. <input checked="" type="checkbox"/> Blocked motor shaft.
A128 Timeout for Serial Communication	Indicates that the inverter stopped receiving valid telegrams within a certain time interval. <b>Note:</b> It may be disabled by setting P0314 = 0.0 s.	<input checked="" type="checkbox"/> Check the wiring and grounding installation. <input checked="" type="checkbox"/> Make sure the inverter has sent a new telegram within the time interval set at P0314.
A129 Anybus is Offline	Alarm that indicates interruption of the Anybus-CC communication.	<input checked="" type="checkbox"/> The PLC has entered the idle state. <input checked="" type="checkbox"/> Programming error. Master and slave set with a different number of I/O words. <input checked="" type="checkbox"/> Communication with master has been lost (broken cable, unplugged connector, etc.).
A130 Anybus Access Error	Alarm that indicates an access error to the Anybus-CC communication module.	<input checked="" type="checkbox"/> Defective, unrecognized, or incorrectly installed Anybus-CC module. <input checked="" type="checkbox"/> Conflict with a WEG option board.
A133 CAN Not Powered	Alarm indicating that the power supply was not connected to the CAN controller.	<input checked="" type="checkbox"/> Broken or loose cable. <input checked="" type="checkbox"/> Power supply is off.
A134 Bus Off	Inverter CAN interface has entered the bus-off state.	<input checked="" type="checkbox"/> Incorrect baud-rate. <input checked="" type="checkbox"/> Two nodes configured with the same address in the network. <input checked="" type="checkbox"/> Wrong cable connection (inverted signals).
A135 CANopen Communication Error	Alarm that indicates a communication error.	<input checked="" type="checkbox"/> Communication problems. <input checked="" type="checkbox"/> Wrong master configuration/settings. <input checked="" type="checkbox"/> Incorrect configuration of the communication objects.
A136 Idle Master	Network master has entered the idle state.	<input checked="" type="checkbox"/> PLC in IDLE mode. <input checked="" type="checkbox"/> Bit of the PLC command register set to zero (0).
A137 DNet Connection Timeout	DeviceNet I/O connection timeout alarm.	<input checked="" type="checkbox"/> One or more allocated I/O connections have entered the timeout state.
A138 <sup>(1)</sup> Profibus DP Interface in Clear Mode	It indicates that the inverter received a command from the Profibus DP network master to enter the clear mode.	<input checked="" type="checkbox"/> Verify the network master status, making sure it is in execution mode (Run). <input checked="" type="checkbox"/> Refer to the Profibus DP communication manual for more information.
A139 <sup>(1)</sup> Offline Profibus DP Interface	It indicates an interruption in the communication between the Profibus DP network master and the inverter.	<input checked="" type="checkbox"/> Verify whether the network master is correctly configured and operating normally. <input checked="" type="checkbox"/> Verify the network installation in a general manner - cable routing, grounding. <input checked="" type="checkbox"/> Refer to the Profibus DP communication manual for more information.
A140 <sup>(1)</sup> Profibus DP Module Access Error	It indicates an error in the access to the Profibus DP communication module data.	<input checked="" type="checkbox"/> Verify whether the Profibus DP module is correctly fit into the slot 3. <input checked="" type="checkbox"/> Refer to the Profibus DP communication manual for more information.
F150 Motor Overspeed	Overspeed fault. It is activated when the real speed exceeds the value of P0134 x (100 % + P0132) for more than 20 ms.	<input checked="" type="checkbox"/> Wrong settings of P0161 and/or P0162. <input checked="" type="checkbox"/> Problem with the hoist-type load.
F151 FLASH Memory Module Fault	FLASH memory module (MMF-03) fault.	<input checked="" type="checkbox"/> Defective FLASH memory module. <input checked="" type="checkbox"/> FLASH memory module is not connected properly.

Fault/Alarm	Description	Possible Causes
A152 Internal Air High Temperature	Alarm indicating that the internal air temperature is too high. <b>Note:</b> It may be disabled by setting P0353 = 1 or 3.	<input checked="" type="checkbox"/> Defective internal fan (if existent) and high output current. <input checked="" type="checkbox"/> High temperature inside the cabinet (>45 °C (113 °F)).
F153 Internal Air Overtemperature	Internal air overtemperature fault.	
A156 <sup>(R)</sup> Undertemperature	Only 1 sensor indicates temperature below -30 °C (-22 °F).	<input checked="" type="checkbox"/> Surrounding air temperature $\leq$ -30 °C (-22 °F).
F156 Undertemperature	Undertemperature fault (below -30 °C (-22 °F) <sup>(R)</sup> ) in the IGBTs or rectifier measured by the temperature sensors.	<input checked="" type="checkbox"/> Surrounding air temperature $\leq$ -30 °C (-22 °F) <sup>(R)</sup> .
F160 Safety Stop Relays	Safety Stop relay fault.	<input checked="" type="checkbox"/> One of the relays is defective or it does not have +24 Vdc applied to its coil.
F161 Timeout PLC11 CFW-11	<input checked="" type="checkbox"/> Refer to the PLC11-01 module programming manual.	
A162 Incompatible PLC Firmware		
A163 AI1 Broken Wire	It indicates that the AI1 current signal (4-20 mA or 20-4 mA) is out of the 4 to 20 mA range.	<input checked="" type="checkbox"/> Broken AI1 cable. <input checked="" type="checkbox"/> Bad contact at the signal connection to the terminal strip.
A164 AI2 Broken Wire	It indicates that the AI2 current signal (4-20 mA or 20-4 mA) is out of the 4 to 20 mA range.	<input checked="" type="checkbox"/> Broken AI2 cable. <input checked="" type="checkbox"/> Bad contact at the signal connection to the terminal strip.
A165 AI3 Broken Wire	It indicates that the AI3 current signal (4-20 mA or 20-4 mA) is out of the 4 to 20 mA range.	<input checked="" type="checkbox"/> Broken AI3 cable. <input checked="" type="checkbox"/> Bad contact at the signal connection to the terminal strip.
A166 AI4 Broken Wire	It indicates that the AI4 current signal (4-20 mA or 20-4 mA) is out of the 4 to 20 mA range.	<input checked="" type="checkbox"/> Broken AI4 cable. <input checked="" type="checkbox"/> Bad contact at the signal connection to the terminal strip.
F174 <sup>(R)</sup> Left Fan Speed Fault	Heatsink left fan speed fault.	<input checked="" type="checkbox"/> Dirt on the blades and in the bearings of the fan. <input checked="" type="checkbox"/> Defective fan. <input checked="" type="checkbox"/> Defective fan power supply connection.
F175 <sup>(R)</sup> Center Fan Speed Fault	Heatsink center fan speed fault.	<input checked="" type="checkbox"/> Dirt on the blades and in the bearings of the fan. <input checked="" type="checkbox"/> Defective fan. <input checked="" type="checkbox"/> Defective fan power supply connection.
F176 Right Fan Speed Fault	Heatsink right fan speed fault.	<input checked="" type="checkbox"/> Dirt on the blades and in the bearings of the fan. <input checked="" type="checkbox"/> Defective fan. <input checked="" type="checkbox"/> Defective fan power supply connection.
A177 Fan Replacement	Heatsink fan replacement alarm (P0045 > 50000 hours). <b>Note:</b> This function may be disabled by setting P0354 = 0.	<input checked="" type="checkbox"/> The maximum number of operating hours for the heatsink fan has been reached.
F179 Heatsink Fan Speed Fault	Heatsink fan speed feedback fault. <b>Note:</b> This function may be disabled by setting P0354 = 0.	<input checked="" type="checkbox"/> Dirt on the blades and in the bearings of the fan. <input checked="" type="checkbox"/> Defective fan. <input checked="" type="checkbox"/> Defective fan power supply connection.
A181 Invalid Clock Value	Invalid clock value alarm.	<input checked="" type="checkbox"/> It is necessary to set date and time at parameters from P0194 to P0199. <input checked="" type="checkbox"/> Keypad battery is discharged, defective, or not installed.
F182 Pulse Feedback Fault	Indicates a fault at the feedback from the output pulses.	<input checked="" type="checkbox"/> No motor connected or the motor connected to the inverter output is too small. <input checked="" type="checkbox"/> Possible defect on the internal circuits of the inverter. Possible solutions: <input checked="" type="checkbox"/> Reset inverter and try again. <input checked="" type="checkbox"/> Set P0356 = 0 and try again.
F183 IGBT Overload + Temperature	Overtemperature related to the IGBTs overload protection.	<input checked="" type="checkbox"/> High surrounding air temperature. <input checked="" type="checkbox"/> Operation with overload at frequencies below 10 Hz.
F185 Pre-charge Contactor Fault	It indicates fault at the pre-charge contactor.	<input checked="" type="checkbox"/> Pre-charge circuit defect.
F186 <sup>(R)</sup> Sensor 1 Temperature Fault	It indicates a temperature fault at the sensor 1.	<input checked="" type="checkbox"/> Motor high temperature.
F187 <sup>(R)</sup> Sensor 2 Temperature Fault	It indicates a temperature fault at the sensor 2.	<input checked="" type="checkbox"/> Motor high temperature.
F188 <sup>(R)</sup> Sensor 3 Temperature Fault	It indicates a temperature fault at the sensor 3.	<input checked="" type="checkbox"/> Motor high temperature.

Fault/Alarm	Description	Possible Causes
F189 <sup>(1)</sup> Sensor 4 Temperature Fault	It indicates a temperature fault at the sensor 4.	<input checked="" type="checkbox"/> Motor high temperature.
F190 <sup>(1)</sup> Sensor 5 Temperature Fault	It indicates a temperature fault at the sensor 5.	<input checked="" type="checkbox"/> Motor high temperature.
A191 <sup>(1)</sup> Sensor 1 Temperature Alarm	It indicates a temperature alarm at the sensor 1.	<input checked="" type="checkbox"/> Motor high temperature. <input checked="" type="checkbox"/> A problem in the wiring connecting the sensor to the IOE-01 (02 or 03).
A192 <sup>(1)</sup> Sensor 2 Temperature Alarm	It indicates a temperature alarm at the sensor 2.	<input checked="" type="checkbox"/> Motor high temperature. <input checked="" type="checkbox"/> A problem in the wiring connecting the sensor to the IOE-01 (02 or 03).
A193 <sup>(1)</sup> Sensor 3 Temperature Alarm	It indicates a temperature alarm at the sensor 3.	<input checked="" type="checkbox"/> Motor high temperature. <input checked="" type="checkbox"/> A problem in the wiring connecting the sensor to the IOE-01 (02 or 03).
A194 <sup>(1)</sup> Sensor 4 Temperature Alarm	It indicates a temperature alarm at the sensor 4.	<input checked="" type="checkbox"/> Motor high temperature. <input checked="" type="checkbox"/> A problem in the wiring connecting the sensor to the IOE-01 (02 or 03).
A195 <sup>(1)</sup> Sensor 5 Temperature Alarm	It indicates a temperature alarm at the sensor 5.	<input checked="" type="checkbox"/> Motor high temperature. <input checked="" type="checkbox"/> A problem in the wiring connecting the sensor to the IOE-01 (02 or 03).
A196 <sup>(1)</sup> Sensor 1 Cable Alarm	Temperature sensor 1 cable alarm.	<input checked="" type="checkbox"/> Shorted temperature sensor.
A197 <sup>(1)</sup> Sensor 2 Cable Alarm	Temperature sensor 2 cable alarm.	<input checked="" type="checkbox"/> Shorted temperature sensor.
A198 <sup>(1)</sup> Sensor 3 Cable Alarm	Temperature sensor 3 cable alarm.	<input checked="" type="checkbox"/> Shorted temperature sensor.
A199 <sup>(1)</sup> Sensor 4 Cable Alarm	Temperature sensor 4 cable alarm.	<input checked="" type="checkbox"/> Shorted temperature sensor.
A200 <sup>(1)</sup> Sensor 5 Cable Alarm	Temperature sensor 5 cable alarm.	<input checked="" type="checkbox"/> Shorted temperature sensor.
F228 Timeout Comunicação Serial	<input checked="" type="checkbox"/> Refer to the RS232/RS485 Serial communication manual.	
F229 Anybus Offline	<input checked="" type="checkbox"/> Refer to the Anybus-CC communication manual.	
F230 Anybus Access Error		
F233 CAN Bus Power Failure	<input checked="" type="checkbox"/> Refer to the CANopen communication manual and/or the DeviceNet communication manual.	
F234 Bus Off		
F235 CANopen Communication Error	<input checked="" type="checkbox"/> Refer to the CANopen communication manual.	
F236 Master Idle	<input checked="" type="checkbox"/> Refer to the DeviceNet communication manual.	
F237 DeviceNet Connection Timeout		
F238 <sup>(1)</sup> Profibus DP Interface in Clear Mode	It indicates that the inverter received a command from the Profibus DP network: master to enter the clear mode.	<input checked="" type="checkbox"/> Verify the network: master status, making sure it is in execution mode (Run). <input checked="" type="checkbox"/> The fault indication will occur if P0313 = 5. <input checked="" type="checkbox"/> Refer to the Profibus DP communication manual for more information.
F239 <sup>(1)</sup> Offline Profibus DP Interface	It indicates an interruption in the communication between the Profibus DP network: master and the inverter.	<input checked="" type="checkbox"/> Verify whether the network: master is correctly configured and operating normally. <input checked="" type="checkbox"/> Verify the network: installation in a general manner - cable routing, grounding. <input checked="" type="checkbox"/> The fault indication will occur if P0313 = 5. <input checked="" type="checkbox"/> Refer to the Profibus DP communication manual for more information.
F240 <sup>(1)</sup> Profibus DP Module Access Error	It indicates an error in the access to the Profibus DP communication module data.	<input checked="" type="checkbox"/> Verify whether the Profibus DP module is correctly fit into the slot 3. <input checked="" type="checkbox"/> The fault indication will occur if P0313 = 5. <input checked="" type="checkbox"/> Refer to the Profibus DP communication manual for more information.

Fault/Alarm	Description	Possible Causes
F416 <sup>(7)</sup> IGBT Current Imb. Fault	Fault of current imbalance on the IGBTs.	<input checked="" type="checkbox"/> IGBTs of the same phase presented a current imbalance above 15 %.
A417 <sup>(7)</sup> Thermal Imbalance	The temperature difference between IGBT modules of the same phase (U, V, W) was above 10 °C (50 °F).	<input checked="" type="checkbox"/> The temperature difference between IGBT modules of different phases (U and V, U and W, V and W) was above 10 °C (50 °F). The temperature difference between rectifier modules of different phases (R and S, R and T, S and T) was above 10 °C (50 °F).
F418 <sup>(7)</sup> Air Control Overtemperature	Fault of overtemperature of the internal air on the control board.	<input checked="" type="checkbox"/> Temperature of the internal air of the control board is above 85 °C (185 °F).
A419 <sup>(7)</sup> Control Air Temperature High Alarm	Alarm of overtemperature of the internal air on the control board.	<input checked="" type="checkbox"/> When the temperature of the internal air of the control board is above 70 °C (158 °F).
A700 <sup>(4)</sup> Disconnected HMI	Alarm or fault related to the HMI disconnection.	<input checked="" type="checkbox"/> RTC function block has been activated in the SoftPLC applicative and the HMI is disconnected from the inverter.
F701 <sup>(4)</sup> Disconnected HMI		
A702 <sup>(4)</sup> Disabled Inverter	Alarm indicating that the General Enable command is not active.	<input checked="" type="checkbox"/> The SoftPLC Run/Stop command is equal to Run or a movement block has been enable while the inverter is general disabled.
A704 <sup>(4)</sup> Two Enabled Movements	Two movements have been enabled.	<input checked="" type="checkbox"/> It occurs when two or more movement blocks are enabled simultaneously.
A706 <sup>(4)</sup> Speed Reference not Programmed for SoftPLC	Speed reference not programmed for SoftPLC.	<input checked="" type="checkbox"/> It occurs when a movement block has been enabled and the speed reference has not been configured for SoftPLC (check P0221 and P0222).

Models where they can occur and additional notes:

(1) With a Profibus DP module connected into the slot 3 (XC43).

(2) All the frame sizes G and H models.

(3) With an IOE-01 (02 or 03) module connected into the slot 1 (XC41).

(4) All the models with a SoftPLC applicative.

(5) Very long motor cables (longer than 100 meters) present a high parasite capacitance against the ground. The circulation of parasite currents through those capacitances may cause the ground fault circuit activation and thus disabling the inverter with F074, immediately after the inverter enabling.

(6) CFW110370T4, CFW110477T4, and all the frame sizes G and H models.

(7) Only frame size H.

(8) Below -20 °C (-4 °F) for frame size H.

(9) Only for models of frame sizes F and G.

# Section 9 Eaton Drives

The Eaton drive is installed on the VS170B. A VS170A would have an Allen Bradley 700H drive.

## Eaton Drive Fault Listing

Fault Code	Fault	Possible Cause	Solution
1	Overcurrent	The SVX9000/SPX9000 has detected a high current ( $>4 \times I_n$ ) in its output due to: <ul style="list-style-type: none"> <li>• sudden heavy load increase</li> <li>• short in the motor</li> <li>• short in the cables to the motor</li> <li>• unsuitable motor</li> </ul>	Check loading Check motor Check cables
2	Overvoltage	The DC link voltage has exceeded its high limit due to: <ul style="list-style-type: none"> <li>• too short a deceleration time</li> <li>• high voltage levels or surges in the utility supply</li> </ul>	Make the deceleration time longer Use a chopper and brake resistor (standard on some models, available as an option on others) Correct utility supply voltage (level is too high) Add input impedance to limit surges
3**	Ground (earth) fault	Current sensing indicates that the sum of motor phase currents is not zero <ul style="list-style-type: none"> <li>• insulation failure in motor or motor cables</li> </ul>	Check the motor and motor cables
5	Charging switch	The charging switch was open when the START command was been given due to: <ul style="list-style-type: none"> <li>• faulty operation</li> <li>• component failure</li> </ul>	Reset the fault and restart. Should the fault reoccur, contact your Eaton distributor
6	Emergency stop	An Emergency stop signal was received from one of the digital inputs	Determine the reason for the Emergency stop and remedy it
7	Saturation trip	Defective component Motor or motor cable short	Cannot be reset from the keypad Switch off power If this fault appears simultaneously with Fault 1, check the motor and motor cables <b>IF THE PROBLEM IS NOT IN THE MOTOR OR ITS CABLES, DO NOT RECONNECT POWER!</b> Contact your Eaton distributor
8	System fault	Component failure Faulty operation Exceptional fault data record, see the Active Fault Menu and Fault Time Data Record for more information	Reset the fault and restart Should the fault reoccur, contact your Eaton distributor
9**	Undervoltage	DC link voltage is less than the minimum safe operating voltage limit <ul style="list-style-type: none"> <li>• most probable cause: supply voltage too low</li> <li>• SVX9000/SPX9000 internal fault</li> </ul>	If there was a supply voltage loss or dip, reset the fault and restart the SVX9000/SPX9000. Check the supply voltage. If it was within specification at the time of the fault, an internal failure has occurred Contact your Eaton distributor
10**	Input line supervision	Input line phase is low or missing	Check the utility supply voltage, cables, and connections
11**	Output phase supervision	Current sensing indicates that there is no current in one motor phase	Check the motor cables, connections, and motor
12	Brake chopper supervision	No brake resistor installed Brake resistor is open Brake chopper failure	Check the brake resistor If the resistor is ok, the chopper is faulty. Contact your Eaton distributor
13	SVX9000/SPX9000 undertemperature	Heatsink temperature is under 14°F (-10°C)	Provide supplemental heating or relocate the SVX9000/SPX9000 to a warmer location
14	SVX9000/SPX9000 overtemperature	Heatsink temperature is over 194°F (90°C)	An overtemperature warning is issued when the heatsink temperature exceeds 185°F (85°C), a fault occurs at 194°F (90°C). Check for the correct amount and unrestricted flow of cooling air Check the heatsink for dust or dirt buildup Check the highest ambient temperature level Make sure that the switching frequency is not set too high in relation to ambient temperature and motor load

15**	Motor stalled	Motor or load mechanical failure Load is too high Stall parameter settings incorrect	Check motor, mechanical system, and load level Confirm the stall parameter settings
16**	Motor overtemperature	Motor is overloaded Motor overheating has been detected by the SVX9000/SPX9000 motor temperature model	Decrease the motor load If no motor overload exists, check the temperature model parameters
17**	Motor underload	Mechanical or load problems Underload parameter settings incorrect	Check the motor. Check for a loose belt, broken coupling or load problems. Confirm the underload parameter settings
22	EEPROM checksum fault	Parameter save fault due to: • faulty operation • component failure	Upon reset of this fault, the SVX9000/SPX9000 will automatically reload the parameter default settings. Check all parameter settings after reset. If the fault reoccurs, contact your Eaton distributor
24*	Counter fault	Values displayed on the counters are incorrect	—
25	Microprocessor watchdog fault	Faulty operation Component failure	Reset the fault and restart Should the fault reoccur, contact your Eaton distributor
26	Startup prevented	Startup of the drive has been prevented	Check Start Enable/Interlock settings
29**	Thermistor fault	The thermistor input of an option board has detected a high motor temperature	Check the motor cooling and the motor loading Check the thermistor connection (If the thermistor input of an option board is not being used, it must be short-circuited)
31	IGBT temperature (hardware)	IGBT inverter bridge overtemperature protection has detected a high short-term overload current	Check loading Check motor size
32	Fan cooling	The SVX9000/SPX9000 cooling fan did not start when commanded	Contact your Eaton distributor
34	CAN bus communication	Sent message not acknowledged	Ensure that there is another device on the bus with the appropriate configuration
36	Control unit	The control unit cannot control the power unit and vice-versa	Change the control unit
37*	Device change (same type)	Option board changed Different power rating of drive	Reset No Fault Time Data Record is made
38*	Device added (same type)	Option board added Drive of different power rating added	Reset No Fault Time Data Record is made
39*	Device removed	Option board removed Drive removed	Reset No Fault Time Data Record is made
40	Device unknown	Unknown option board or drive	Contact your Eaton distributor
41	IGBT temperature	IGBT inverter bridge overtemperature protection has detected a high short-term overload current	Check loading Check motor size
42**	Brake resistor overtemperature	Brake resistor overtemperature protection has detected excessive braking	Set the deceleration time longer Use an external brake resistor
43	Encoder fault	Exceptional fault data record, see the Active Fault Menu and Fault Time Data Record for more information. Additional codes: 1 = Encoder 1 channel A is missing 2 = Encoder 1 channel B is missing 3 = Both encoder 1 channels are missing 4 = Encoder reversed	Check encoder channel connections Check the encoder board
44*	Device change (different type)	Option board changed Different power rating of drive	Reset No Fault Time Data Record is made Application parameter values restored to default
45*	Device added (different type)	Option board added Drive of different power rating added	Reset No Fault Time Data Record is made Application parameter values restored to default
50**	Analog input $I_{in} < 4$ mA (for the signal range 4 to 20 mA)	Current at the analog input is $< 4$ mA Control cable is broken or loose Signal source has failed	Check the current loop, signal source, and wiring
51	External fault	Digital input set as an external fault input has been triggered	Check source of trigger
52	Keypad communication fault	The connection between the control keypad and the SVX9000/SPX9000 has been lost	Check the keypad connection and keypad cable
53	Communication bus fault	The data connection between the communication bus master and the communication bus board has failed	Check installation If installation is correct contact your Eaton distributor
54	Slot fault	Defective option board or slot	Check that the board is properly installed and seated in slot. If the installation is correct, contact your Eaton distributor
56	PT100 board temperature fault	Temperature limit values set for the PT100 board parameters have been exceeded	Determine the cause of the high temperature

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For additional information, contact your local representative or visit:  
[www.contactgd.com/compressors](http://www.contactgd.com/compressors)

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