

1336FORCE Troubleshooting Guide

This document provides information to guide you in troubleshooting the 1336 FORCE. The 1336T (FORCE) Drive employs extensive diagnostics to aid in correcting many malfunctions that may occur in the system. This guide is designed to help you interpret the diagnostic response of the Drive when a malfunction occurs. Possible corrective measures will be explained to help you get the Drive repaired or functional as quickly as possible for most types of malfunctions.



ATTENTION: Only qualified personnel familiar with the 1336 FORCE drive system and the associated machinery should perform troubleshooting or maintenance functions on the Drive. Failure to comply may result in personal injury and/or equipment damage.

During Start-up the following information should have been recorded for reference during troubleshooting. If it was not, record the following at this time:

Software Version numbers should be recorded for each board. These are necessary to assist on-site personnel or when calling for assistance.

Drive and motor nameplate data should have been recorded at start-up and maintained for ready reference during troubleshooting. Many systems do not allow for easy access to the motor after start-up. If the motor nameplate data was not recorded previously, do so at this time.

Required Equipment

For initial troubleshooting, a programming device is required to read fault codes. In addition to a programming device, the following should be available before initiating any troubleshooting procedures:

Digital Multimeter (DMM) capable of 1000V DC/750VAC, with one megohm minimum input impedance.

Clamp on Ammeter (AC/DC) with current ratings to 2X rated current output of 1336 FORCE AC Drive.

Dual trace oscilloscope with differential capability, digital storage, two X10 and one X100 calibrated probes (optional but recommended).

Hand tachometer used to monitor motor velocities.

Programming Device Instruction Manual and Adapter Board Reference Manuals.

Fault Descriptions

Fault Display - Faults are indicated by showing a decimal number of up to 5 characters relating to the fault (Figure 1.1) or by flashing LED sequences on the Motor Control Board. The fault will be displayed until a Drive reset is initiated. Refer to Tables 1.A & 1.B for a listing and description of the various faults. When applicable, a possible solution will also be provided.

Figure 1.1 Typical Fault Description Display



Fault Code Definition - The fault code is a 5 character decimal number that is defined as follows:

SAXXX S = Source Designator
 A = Area Designator
 XXX = Internal Fault Code (0 thru 999)

The Source Designator (S) is the 1st digit of the number:

- 0 = Main Board Velocity Processor (VP)
- 1 = Main Board Current Processor (CP)
- 2 = Reserved
- 3 = Adapter Processor (PLC Comm etc.)
- 4 = Domino Processor (DP)
- 5 = Reserved

Area Designator (A) is the 2nd digit of a number:

- 0 = General
- 1 = Motor
- 2 = Inverter
- 3 = Mtr Control
- 4 = Adapter
- 5 = External Device
- 6 = Communications
- 7 = Reserved
- 8 = Reserved
- 9 = Converter/Brake

Internal Fault Code (XXX)

The internal fault codes (last three digits of number) are identified in Table 1.A thru 1.C.

Table 1.A
1336 FORCE Motor Control Fault Descriptions

Fault #	LED	Description	Parameter #	Bit #
13000	CP, Red 1 blink	CP EPROM Fault	80	00
13001	CP, Red 2 blink	CP Internal RAM Fault	80	01
13002	CP, Red 3 blink	CP External RAM Fault	80	02
13003	CP, Red 4 blink	CP Stack RAM Fault	80	03
13004	CP, Red 5 blink	VP MBI Failure (Dual Port)	80	04
03008	VP, Red 1 blink	VP EPROM Fault	80	08
03009	VP, Red 2 blink	VP Internal RAM Fault	80	09
03010	VP, Red 3 blink	VP External RAM Fault	80	10
03011	VP, Red 4 blink	VP Stack RAM Fault	80	11
03012	VP, Red 5 blink	CP MBI Failure (DualPort)	80	12
03013	VP, Red 6 blink	AP MBI Failure (MECO DualPort)	80	13
03014	VP, Red steady	Power Driver Board EEPROM Fault	80	14
12016	CP, Solid Red	Bus Overvoltage	81	00
12017	CP, Solid Red	Transistor Desat	81	01
12018	CP, Solid Red	Ground Fault	81	02
12019	CP, Solid Red	IOC	81	03
14020	CP, Solid Red	SW Malfunction (AP Hndshk)	81	04
16021	CP, Solid Red	Master/Slave Cable Loss	81	05
16022	CP, Solid Red	Master/Slave Enable Timeout	81	06
04024	VP, Solid Red	AP Handshake Error	81	08
03025	VP, Flashing Red	Absolute Overspeed	81	09
03026	VP, Flashing Red	Analog Supply Tolerance	81	10
12027	CP, VP, Flash Red	Diagnostics Failure	81	11
12028	VP, Solid Red	Inverter Overtemperature Trip	81	12
13029	VP, Solid Red	Software Malfunction - VP	81	13
12032	CP, Flashing Red	Ridethrough Timeout	82	00
12033	CP, Flashing Red	Precharge Timeout	82	01
12034	CP, Flashing Red	Bus Drop	82	02
12035	CP, Flashing Red	Bus Undervoltage	82	03
12036	CP, Flashing Red	Bus Drop Cycles >5	82	04
05048	VP, Flashing Red	Velocity Feedback Loss	83	00
02049	VP, Flashing Red	Inverter Overtemp Pending	83	01
01050	VP, Flashing Red	Motor Overtemp	83	02
01051	VP, Flashing Red	Motor Overload Pending	83	03
01052	VP, Flashing Red	Motor Overload Tripped	83	04
01053	VP, Flashing Red	Motor Stalled	83	05
05054	VP, Flashing Red	External Fault Input	83	06
03057	VP, Flashing Red	Parameter Limit	83	09
03058	VP, Flashing Red	Math Limit	83	10
09059	VP, Flashing Red	Dynamic Brake Overtemperature	83	11
02060	VP, Solid Red	AC Contactor Failure	83	12
02061	VP, Flashing Red	Inverter Overload pending (IT)	83	13
06062	VP, Flashing Red	Drive to Drive Error	83	14

The first digit in the 5 character fault number for PLC Comm Board faults indicates the source as follows:

- 0 = Velocity Processor (VP)
- 1 = Current Processor (CP)
- 2 = Adapter Processor (PLC Comm etc.)
- 3 = Domino Processor (DP)

The Area Designator (2nd digit) and internal fault codes (last three digits) remain the same as described under the Fault Code Definition.

Table 1.B 1336 FORCE PLC Comm Adapter Fault Descriptions

Fault #	Description	Fault Text
24000	Faults Cleared/No Fault exists	Clear Faults
24009	Soft Fault - Adapter BRAM checksum fault	Adpt BRAM Cksm
24012	Soft Fault - Main Board Bram checksum fault	Main BRAM Cksm
34001	DP-PSD RAM code	SW Malfunction
34002	DP-RAM	SW Malfunction
34003	DP-Checksum (code)	SW Malfunction
34004	Domino interface	SW Malfunction
34005	DP/AP dual port RAM	SW Malfunction
24013	Nard Fault - Integrity Check on Board Failed	SW Malfunction
24014	Hard Fault - Integrity Check on Board Failed	SW Malfunction
24015	Hard Fault - Integrity Check on Board Failed	SW Malfunction
24016	Hard Fault - Integrity Check on Board Failed	SW Malfunction
24017	Hard Fault - Integrity Check on Board Failed	SW Malfunction
24018	Hard Fault - Integrity Check on Board Failed	SW Malfunction
25023	No Adapter Language Module Present	No AP LM exists
25024	No Main Board Language Module present	No MC LM exists
24025	PLC Comm Bd SW/LM version mismatch	AP SW/LM Rev Err
24026	Soft Fault - Dip switch settings on Adapter incorrect	Adptr Config Err
34001	Hard Fault - Integrity Check on Board Failed	HW Malfunction
34002	Hard Fault - Integrity Check on Board Failed	HW Malfunction
34003	Hard Fault - Integrity Check on Board Failed	HW Malfunction
34004	Hard Fault - Integrity Check on Board Failed	HW Malfunction
34005	Hard Fault - Integrity Check on Board Failed	HW Malfunction
34006	ChA Protocol Fault	ChA Protocol
34007	ChB Protocol Fault	ChB Protocol
34008	ChA Baud Rate	ChA Baud Rate
34009	ChB Baud Rate	ChB Baud Rate
34010	ChA Rack Size	ChA Rack Size
34011	ChB Rack Size	ChB Rack Size
34012	ChA Module Group	ChA Module Group
34013	ChB Module Group	ChB Module Group
34014	RIO redundant-diff rack size	Redund Rack Size
34015	RIO redundant-diff protocols	Redund Diff Prot
34016	Hard Fault - Integrity Check on Board Software Failed	HW Malfunction

Table 1.B
1336 FORCE PLC Comm Adapter Fault Descriptions cont.

Fault #	Description	Fault Text
36019	ChA Duplicate DH+ Node Addr 's	ChA Dup Nodeaddr
36020	ChB Duplicate DH+ Node Addr 's	ChB Dup NodeAddr
24027	FB INTERNAL ERROR	FB Internal Err
24028	FB INVALID LINK ERROR	Invalid FB Link
24029	FB I/O LIMIT ERROR	FB I/O Lim Err
24030	FB MEM ALLOCATION ERROR	FB Mem Alloc Err
24031	FB Event Value ERROR	FB Event Value Err
24032	FB BLOCK NUMBER LIMIT ERROR	At FB Block Lim
24034	FB BRAM CHECKSUM ERROR	FB BRAM CHECKSUM ER-
24035	FB INTERNAL ERROR	ROR
24036	FB EXECUTION TIME LIMIT	FB Internal Err
24037	FB BRAM is Not Initialized	FB Exe Time Lim Init FB BRAM Flt
26038	Device connected to Scanbus Port 1 disconnected	
26039	SB Port 2 timeout	SB PT 1 Timeout
26040	SB Port 3 timeout	SB PT 2 Timeout
26041	SB Port 4 timeout	SB PT 3 Timeout
26042	SB Port 5 timeout	SB PT 4 Timeout
26043	SB Major Fault	SB PT 5 Timeout
36021	ChA Comm loss	SB Comm Fault
36022	ChB Comm loss	ChA Comm Loss
36023	ChA Reset program test	ChB Comm Loss
36024	ChB Reset program test	ChA Prg/Res/T est
36025	Ch A Rack Fault	ChB Prg/Res/T est
36026	Ch B Rack Fault	Ch A Rack Fault Ch B Rack Fault
24044	FB Near Memory limit WARN 0	
24045	FB Illegal event downloaded WARN 1	FB Near Mem Lim
24036	FB WARN 2	FB DNLD Bad Evnt
24037	FB WARN 3	
24038	FB WARN 4	
24040	FB WARN 5	
24039	FB EVENT LIST CHECKSUM WARN 6	
24041	FB WARN 7	
24042	FB WARN 8	
24046	FB Bad Packet Number	
24048	FB Illegal Event Download WARN	FB BAD PKT NUM
24049	FB Block Number Warning	FB DNLD Bad Event
24050	FB Event List checksum warning	FB DNLD BLK # Warn
24052	FB Near execution limit warn	FB Dnld Cksm Wrn FB NEAR EXEC LIM

Fault/Warning Handling

The lights on the motor control board indicate the status of the Current and Velocity processors. Both the Current and Velocity processors have both Green and Red LED's associated with their status. Table 1.D displays the meaning of the CP and VP status lights.

Table 1.C
CP and VP Status

VP LED	CP LED	Status	Meaning
D2	D4	Solid Green	Drive Hard Fault
D2	D4	Flashing Green	Drive Soft Fault
D3	D5	Flashing Red	Drive Warning
D3	D5	Solid Red	No Fault

Hard Fault - A Drive hard fault is a fault that trips the Drive causing it to coast to a stop. This type of fault requires the user to perform a Drive Reset to remove the fault.

Soft Fault - A Drive soft fault will also cause the drive to trip and coast to a stop. This type of fault can be removed by doing a Clear Faults command after the condition that caused the Drive to trip has been removed.

Drive Warning - A Drive Warning is simply an undesirable condition that exists within the Drive. It will not cause the Drive to trip. A Clear Faults command after the warning condition has been alleviated, will remove the warning. Everytime the Drive has any of the faults or warnings deccribed above, a fault/warning message is logged in either the fault or warning queue. This is designed to aid in troubleshooting.

Motor Control Board Faults & Warnings - There are two types of fault and warning queues for the Motor Control Board, configurable and nonconfigurable.

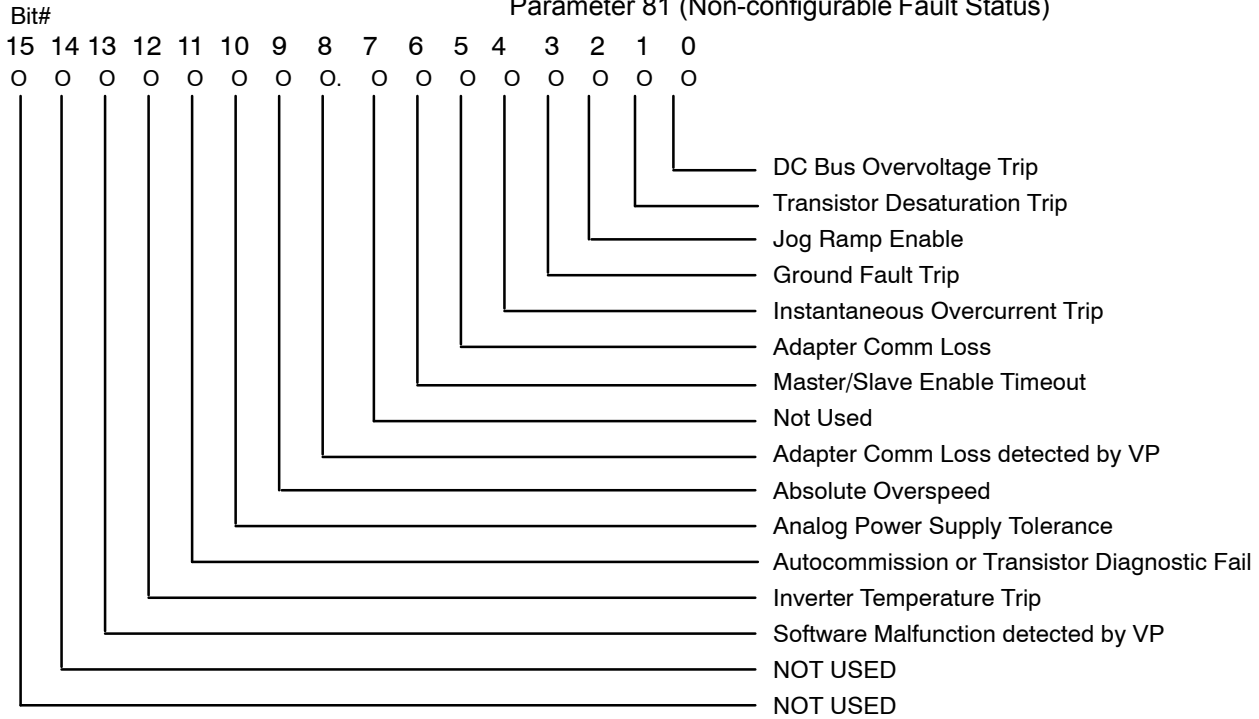
Configurable Faults & Warnings - The configurable fault queue contains faults that can be set up to either trip the drive or provide only a visual warning while the drive continues to operate.

Nonconfigurable Faults & Warnings - The nonconfigurable fault queue contains faults that the user can't shut off. These faults are the result of a condition that could damage the Drive if allowed to persist. The non - configurable fault queue faults can be viewed in parameter 81 (Fig. 1.2). In addition to configurable & non-configurable faults, there are the powerup faults.

Powerup Faults - The powerup faults appear in parameter 80 (Fig. 1.3). These faults primarily consist of problems that could occur with powerup of both the current and velocity processors.

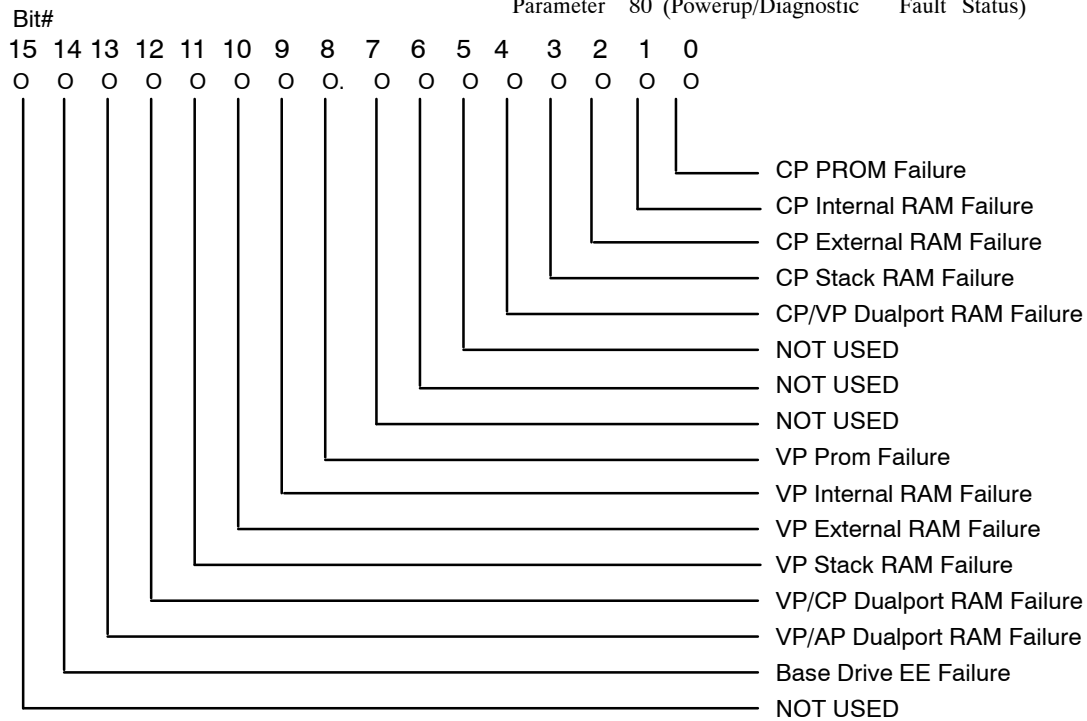
Adapter Board Faults - Adapter board faults are setup and displayed in separate parameters from the Motor Control Board. For a list of adapter board faults, refer to your adapter board manual.

Figure 1.2
Parameter 81 (Non-configurable Fault Status)



This word parameter indicates fault conditions in the Drive that CANNOT be configured as warnings. When a bit is set to 1, the corresponding condition in the Drive is true, otherwise the condition is false. Bit 0-3 are detected by hardware and 4-15 are detected by software.

Figure 1.3
Parameter 80 (Powerup/Diagnostic Fault Status)



This word parameter indicates a fault condition which has been detected during power up or reset of the the drive. Where the bit is set to "1", the corresponding condition in the Drive is true, otherwise the condition is false.

Current Processor Faults & Warnings - Both the fault and warning queues are configurable for either the Current or the Velocity processor. You can configure which Current processor faults you want to trip the Drive by setting Parameter 86 (Figure 1.4). When the Drive trips on one of the faults set in parameter 86, the CP light on the Motor Control board will turn red. When the drive trips, it will coast the motor to a stop. Parameter 87 (Figure 1.5) has the same bit weights as parameter 86, but instead of tripping, the Drive will display a warning fault, which in turn causes the CP light to flash green, indicating a warning. The Drive will continue to run when there is a CP warning. Parameter 82 (Figure 1.6) displays which CP fault caused the Drive to trip, while parameter 84 displays any CP warnings that have occurred.

Most of the setup for the current processor Fault/Warning configuration deals with DC Bus conditions. These Bus conditions deal with the Bus precharge and any type of ride through conditions.

The Precharge and Ride Through functions are configured through parameter 223 (Precharge/Ridethrough Selection). This parameter is bit encoded as follows:

PRECHARGE/RIDETHRU		SELECTION	PARAMETER 223
Bit 12	Set	Enables	Precharge as a Common Bus Inverter
Bit 13	Set	Disables	Bus precharge timeout and undervoltage faults while the drive is DISABLED (in HOME state)
Bit 14	Set	Disables	Disables
Bit 15	Set	Disables	Disables
PRECHARGE/RIDETHRU		FAUL T/W ARNING	SETPOINTS:
Undervoltage Setpoint		Parameter 224	Scaled in volts
Bus Precharge Timeout		Parameter 225	Scaled for seconds x 10
Bus Ridethru Timeout		Parameter 226	Scaled for seconds x 1000

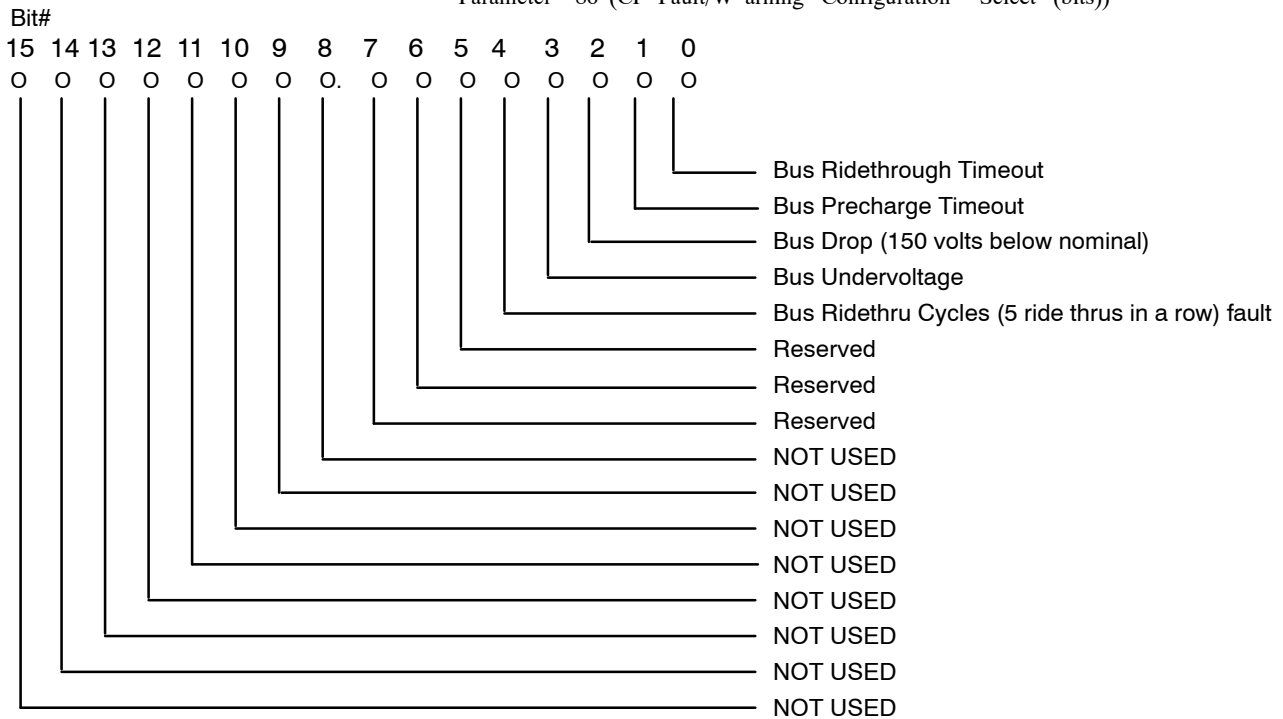
PRECHARGE and RIDETHRU FAULTS:

The precharge and Ride Through faults are configured through parameters 86 & 87 CP Fault/Warning Configuration Select) as shown in Figures 1.4 and 1.5. To assist in determining the precharge and ride through operating modes software test point #27 (dRam_bus_status) gives the present operating conditions. The test point is bit encoded as follows:

dRam	Bus	Status	SOFTW	ARE	TESTPOINT	#27
Bit 0	Set	Indicates				Precharge has been completed
Bit 1	Set	Indicates				Drive is in ride through
Bit 2	Set	Indicates				Precharge initiated by ride through
Bit 3	Set	Indicates				Not Used
Bit 4	Set	Indicates				AC Line Status (valid only while in precharge)
Bit 5	Set	Indicates				Bus rising or falling (valid only while in precharge)
Bit 6	Set	Indicates				Low Bus Cap voltage: small drives only (valid only while in precharge)
Bit 7	Set	Indicates				Precharge cannot be completed because bus is too low compared to the initial bus voltage at power up.

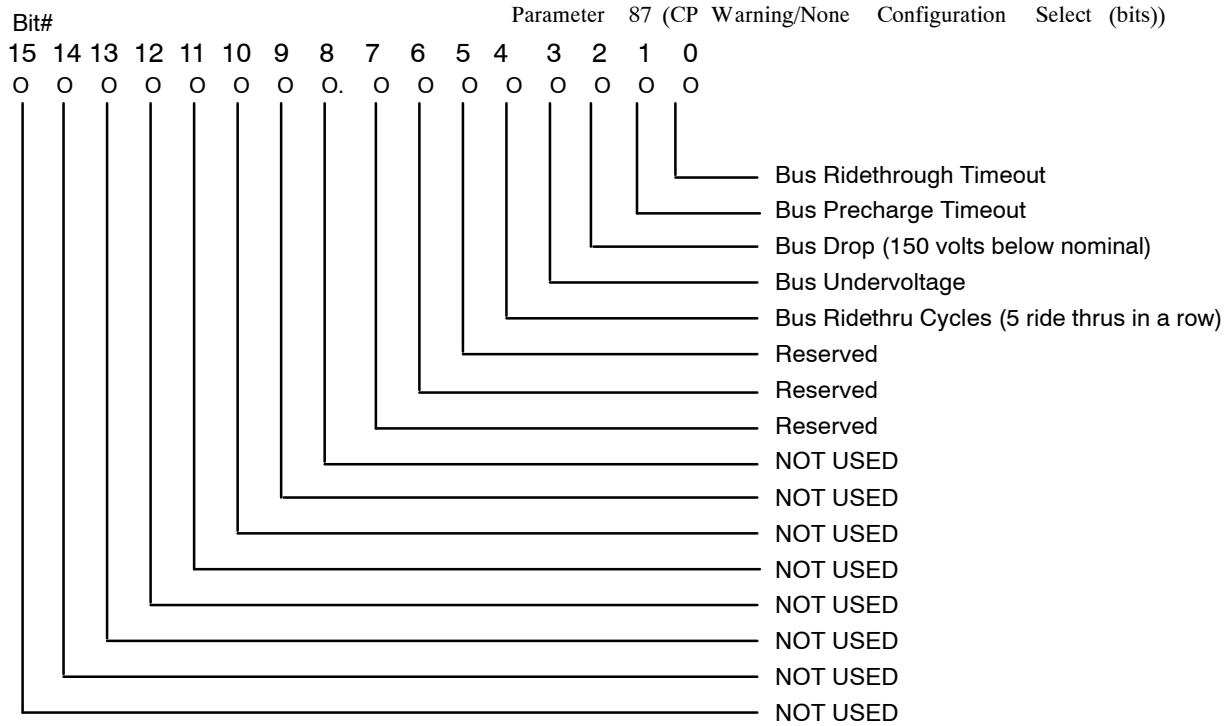
The software test point can be monitored by first entering the dRam_bus_status number (#27) into the Test point selection parameter (e.g. #273). Then the data can be viewed in the corresponding Test point data parameter (e.g. #274).

Figure 1.4
Parameter 86 (CP Fault/W arning Configuration Select (bits))



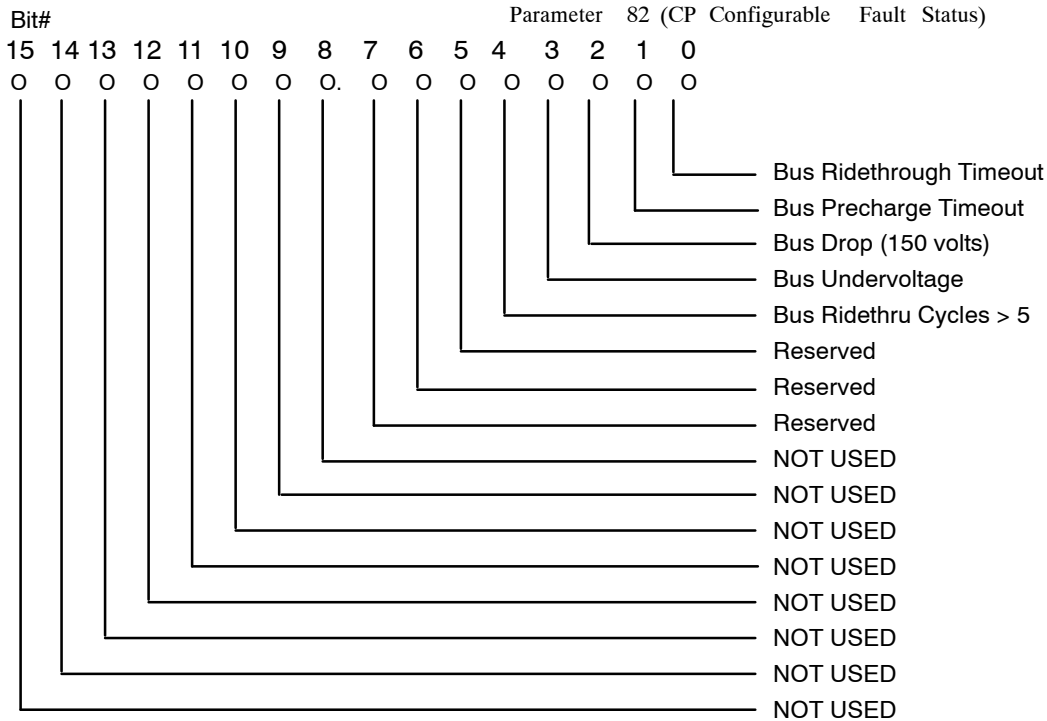
This word parameter determines conditions detected by the Current Processor (CP) that will be reported as either a drive fault or drive warning condition. Each configuration bit matches the bit definitions of Parameters 82, 84 and 87. When a bit is set to "1", the corresponding condition in the Drive will be reported as a FAULT, otherwise the condition is reported as a WARNING.

Figure 4.5



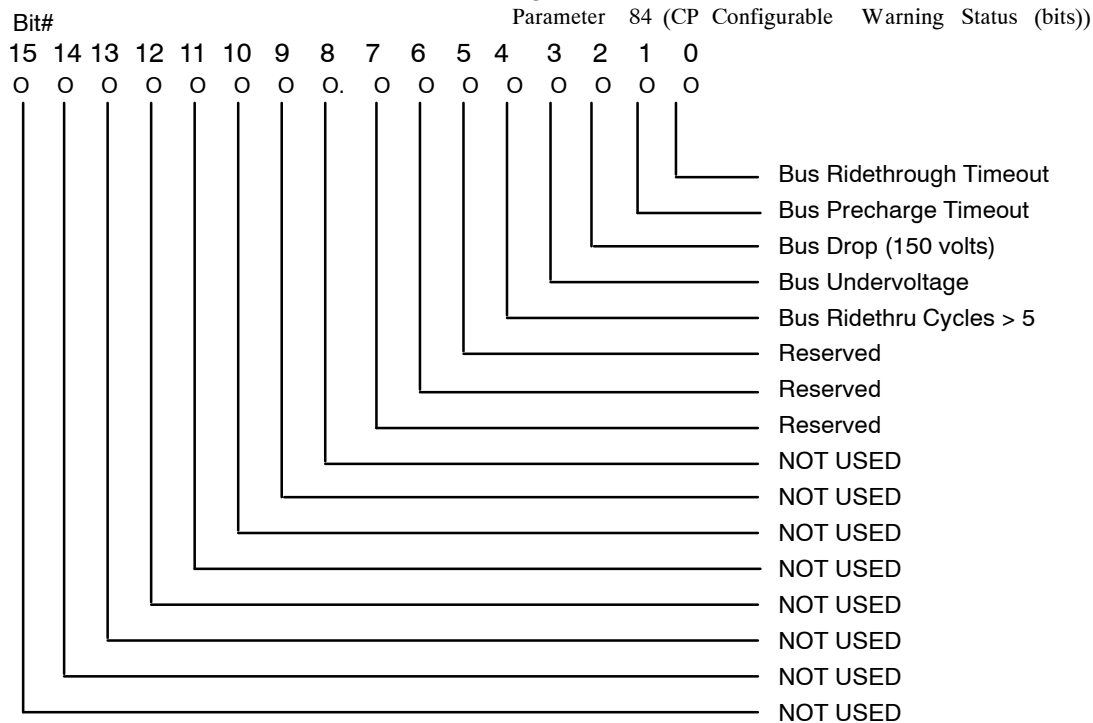
This word parameter determines conditions detected by the Current Processor (CP) that will be reported as either a drive fault or drive warning or not reported at all (ignored). Each configuration bit matches the bit definitions of Parameters 82, 84 and 86. When a bit is set to "1", the corresponding condition in the Drive will be reported as configured by parameter 86. If the bit is set to "0", the condition is not reported.

Figure 1.6



This word parameter indicates conditions detected by the Current Processor (CP) that have been configured to report as a Drive fault condition. Each configuration bit matches the bit definitions of parameters 84, 86 and 87. When a bit is set to "1", the corresponding condition in the Drive is true, otherwise the condition is false.

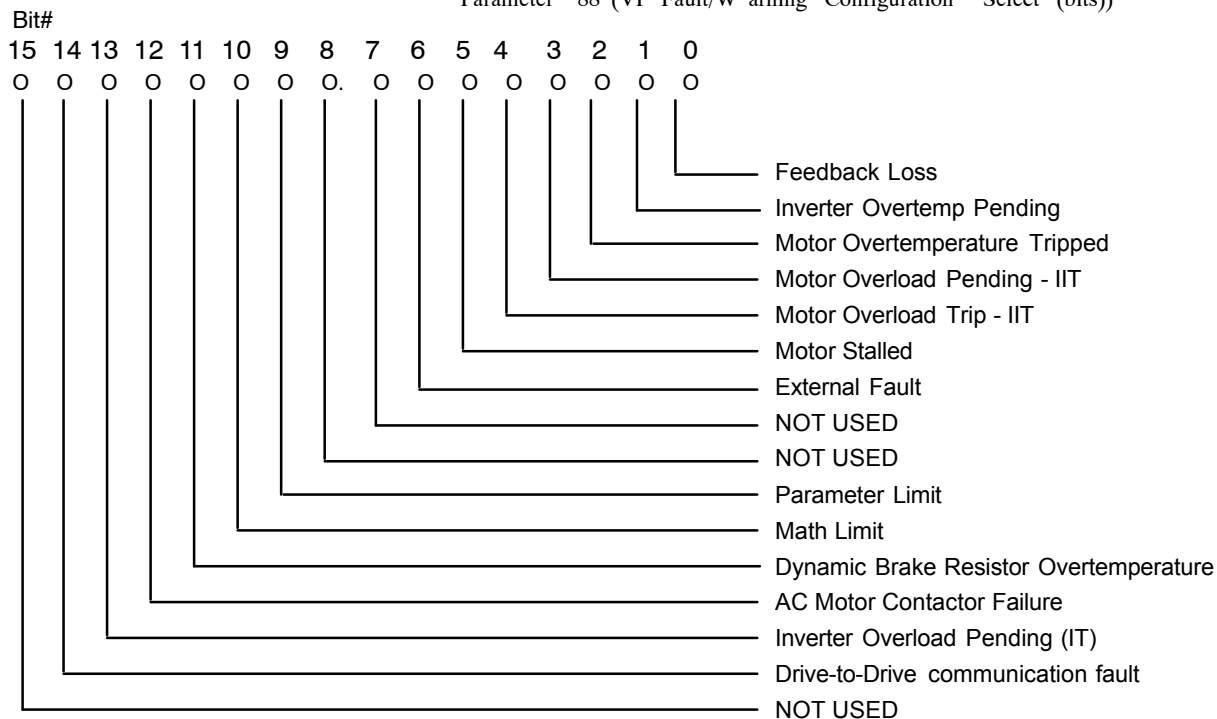
Figure 1.7



This word parameter indicates conditions detected by the Current Processor (CP) that have been configured to report as a Drive warning condition. Each configuration bit matches the bit definitions of parameters 82, 86 and 87. When a bit is set to "1", the corresponding condition in the Drive is true, otherwise the condition is false.

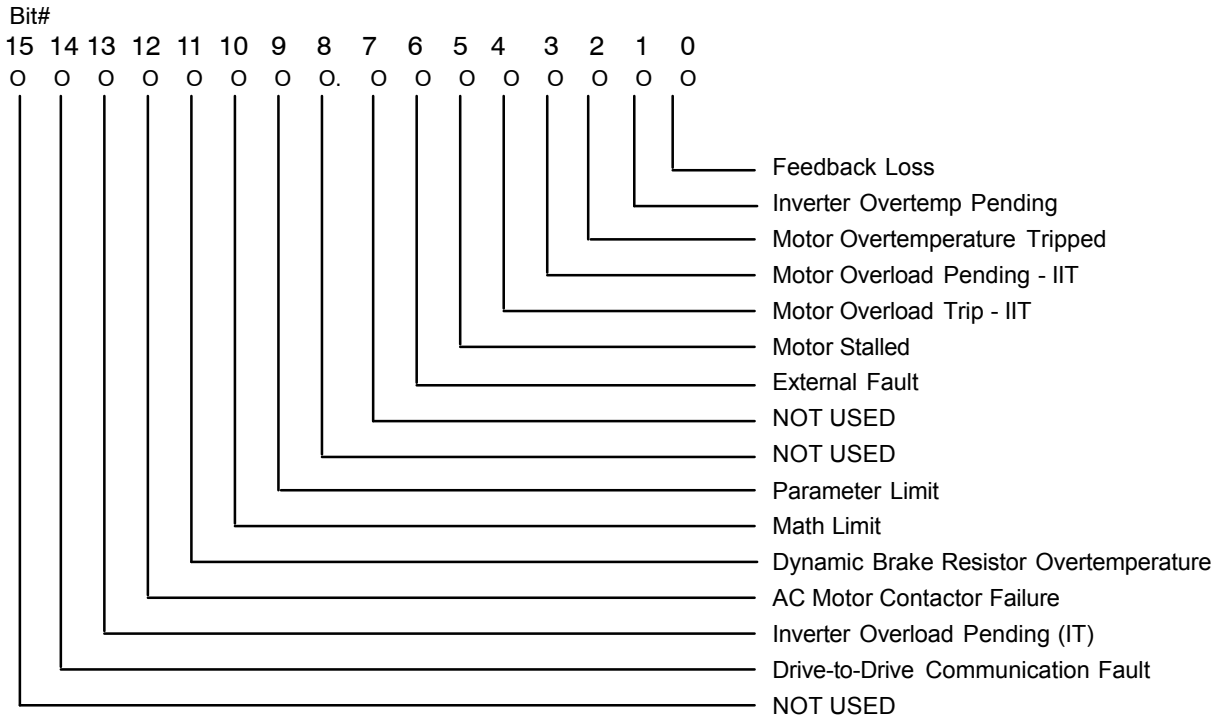
Velocity Processor Faults & Warnings - You can configure which velocity processor faults you want to trip the drive by setting Parameter 88 (Figure 1.8). When there is a velocity processor fault, the VP light on the motor control board will blink red (soft fault) for configurable VP faults. When this happens, the drive will shut off and coast the motor to a stop. VP faults can be viewed in parameter 83 (Figure 1.9). Configurable VP warnings can be setup in Parameter 89 (Figure 1.10) and viewed in parameter 85. When a configurable VP warning exists, the VP light will be flashing green, but the drive will continue to run. Velocity processor warning faults can be viewed in parameter 85 (Figure 1.11).

Figure 1.8
Parameter 88 (VP Fault/W arning Configuration Select (bits))



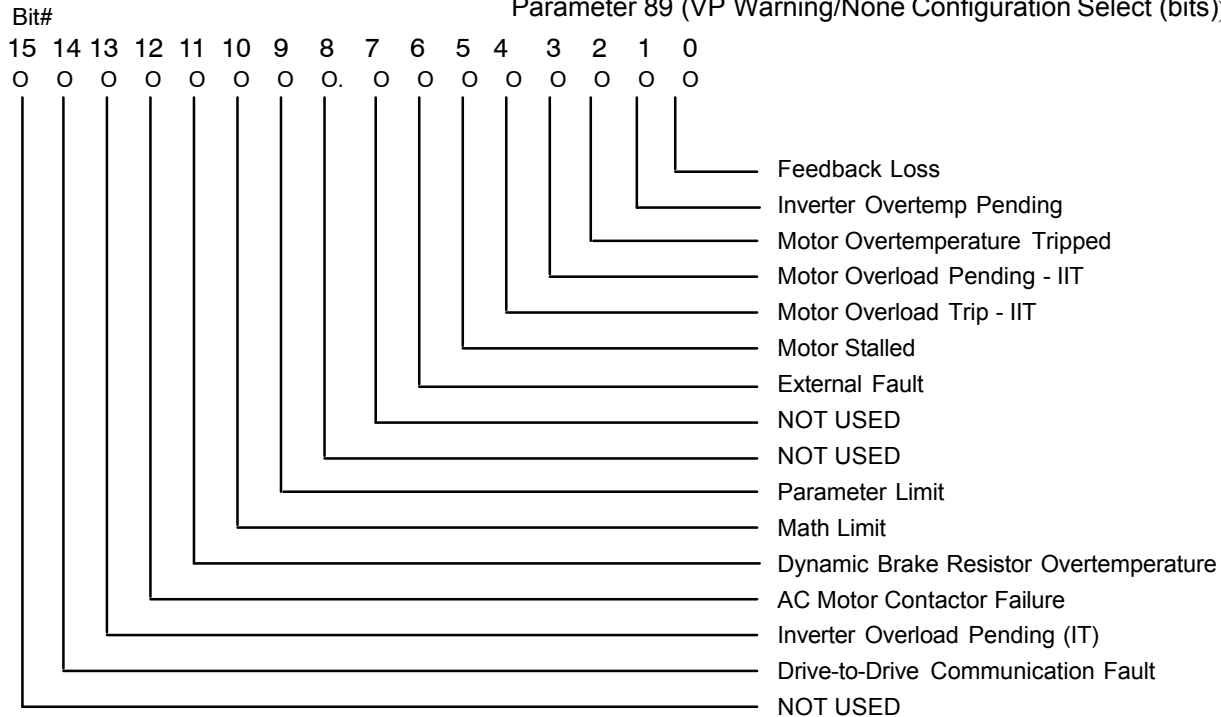
This word parameter indicates conditions detected by the Velocity Processor (VP) that have been configured to report as a Drive warning condition. Each configuration bit matches the bit definitions of Parameters 83, 85 and 89. When a bit is set to "1", the corresponding condition in the Drive will be reported as a FAULT, otherwise the condition is reported as a WARNING.

Figure 1.9 Parameter 83 (CP Configurable Fault Status)



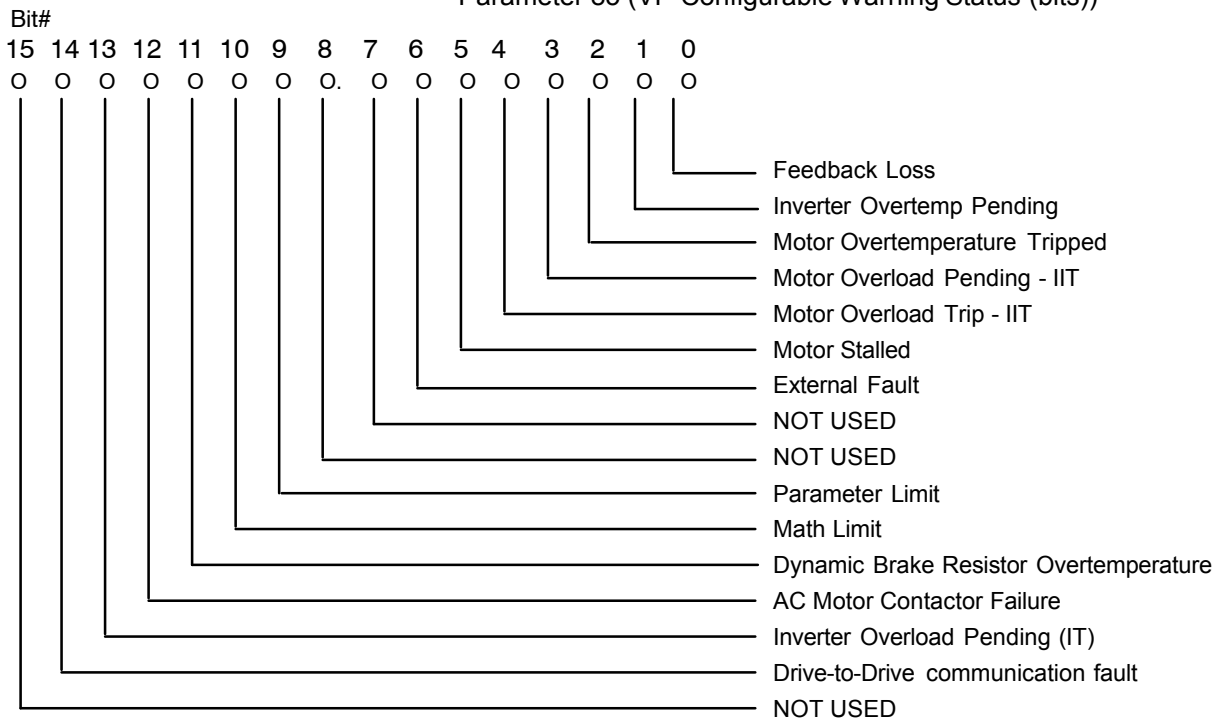
This word parameter indicates conditions detected by the Velocity Processor (VP) that have been configured to report as a Drive fault condition. Each configuration bit matches the bit definitions of Parameters 85, 88 and 89. When a bit is set to "1", the corresponding condition in the Drive is true, otherwise the condition is false.

Figure 1.10
Parameter 89 (VP Warning/None Configuration Select (bits))



This word parameter indicates conditions detected by the Velocity Processor (VP) that will be reported as either a drive fault or warning or not reported at all (ignored). Each configuration bit matches the bit definitions of Parameters 83, 85 and 88. When a bit is set to "1", the corresponding condition in the Drive will be reported as configured by parameter 88. When the bit is set to "0", the condition in is not reported.

Figure 1.11
Parameter 85 (VP Configurable Warning Status (bits))



This word parameter indicates conditions detected by the Velocity Processor (VP) that have been configured to report as a Drive warning condition. Each configuration bit matches the bit definitions of Parameters 83, 88 and 89. When a bit is set to "1", the corresponding condition in the Drive is true, otherwise the condition is false.