SENSIA
Rockwell Automation + SLB

INSTRUCT LIFT CONTROL SYSTEMS

E30 VSD Configuration via ESP Controller

Configuration Manual

MODEL: INSTRUCT ESP Intelligent Controller
INSTRUCT E30 Intelligent VSD

Manual No: LCS-ENG-M0005

Publisher Notes

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REVISION HISTORY

REVISION	DESCRIPTION OF CHANGE	SENSIA ISSUER	DATE
01	Initial release.	Lift Control Systems	30 Nov 2021
02	Added 2.1.7 and 3.2. Updated 2.1 and 5.1 for additional parameters for configuration. Updated Figure 4-1 and Figure 5-2 for the VSD brand update.	Lift Control Systems	31 Mar 2022
03	Added 2.1.8, 2.3 and 5.3. Updated VSD menus and configuration in 3.1 and 5.1.	Lift Control Systems	01 Feb 2023
04	Updated 2.3 to remove restart and bypass. Added 2.4 for Electrical Stability control parameters. Updated 4.2 to add Modbus TCP card configuration with script.	Lift Control Systems	12 Jul 2023
05	Added RPM units selection and made electrical stability enabled mandatory for PM VHz control mode.	Lift Control Systems	11 Sept 2024

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GENERAL

WARNING!

To avoid the risk of electric shock and fire, the following safety instructions must be observed, and the guidelines followed.

The specifications must not be exceeded, and the device must only be applied as described in the following.

Prior to the installation and commissioning of the unit, the installation guide must be examined carefully.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

GENERAL

AVERTISSEMENT!

Pour éviter tout risque de choc électrique et d'incendie, les consignes de sécurité de ce manuel doivent être observées, et les instructions suivies.

Les spécifications ne doivent pas être dépassées, et l'unité ne doit être appliquée que comme décrit dans le texte suivant.

Ce manuel doit être examiné avec soin, avant l'installation et la mise en service de l'unité.

Si l'équipement est utilisé d'une manière non spécifiée par le fabricant, la protection assurée par l'équipement peut être altérée.

INSTALLATION

WARNING!

Installation may only be carried out by electrically skilled and instructed personnel in accordance with national legislation, including the relevant standards.

All technical data on the instrument is to be observed.

Changes to the design and modifications to the equipment are not permitted.

The equipment shall only be operated as intended and only in undamaged and perfect condition.

Sufficient segregation must exist between different cables and wires carrying different types of signal or power and all other circuits.

All wires must be terminated, complete with crimping lugs. Unused cores should be terminated to the earth bus bar.

INSTALLATION

AVERTISSEMENT!

L'installation ne peut être effectuée que par un électricien qualifié, conformément à la législation nationale, y compris les normes pertinentes.

Toutes les données techniques sur l'instrument doivent être observées.

Modifications de l'équipement ne sont pas autorisés.

L'équipement ne doit être utilisé comme prévu par le fabriquant et uniquement si il est en parfait état.

Une séparation suffisante doit exister entre les différents câbles et les fils transportant différents types de signaux ou de puissance et tous les autres circuits.

Tous les fils doivent être terminés, avec pattes de sertissage. Les noyaux non-utilisés doivent être terminés au jeu de barres de la terre.

Section 1: **Description**

This configuration manual describes how to use the INSTRUCT ESP Intelligent Controller to configure a E30 drive for various artificial lift applications. It is written for users who understand the physical setup of the well, along with the characteristics and relationships among flow, pressure, temperature, and signal noise in the well.

This manual shall be read in conjunction with the following drive and controller manuals:

- INSTRUCT ESP Intelligent Controller Manual (LCS-ENG-M0009)
- INSTRUCT E30 Low Voltage VSD Manual (LCS-ENG-M0006)

1.1 DOCUMENT SCOPE

This document assumes that the controller is already installed in the E30 drive and is ready to be started.

This document describes:

- theory of operation
- VSD settings screens
- VSD communication configuration
- basic VSD configuration
- application-specific configuration
- VSD commissioning

1.2   DRIVE PICTURES

Refer to Figure 1-1 and Figure 1-2 for pictures of a E30 drive, 500kVA 18pulse SWD.

Figure 1-1: INSTRUCT E30, 500 kVA 18-pulse SWD

Figure 1-2: INSTRUCT E30, 500 kVA 18-pulse SWD—Power Module Section

Section 2: **Theory of Operation**

Variable speed motor control uses a variable speed drive (VSD) to control speed/frequency of the motor. The controller changes modes to operate as a VSD controller. All the motor protection requirements are set using the controller and using the feedback from the VSD. The controller performs the motor protection. The available voltage and frequency can be changed by the VSD. In the event a VSD trip occurs, the drive turns off the output going to the motor. In the event the controller detects a trip condition, the VSD is instructed to turn off the output. Figure 2-1: VSD shows a simplified block diagram of a controller VSD system.
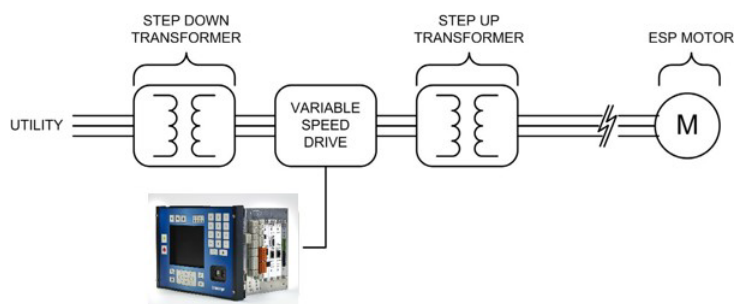
Figure 2-1: VSD Interface

The controller uses an Ethernet cable to interface to the VSD. A Modbus TCP card is required to be inserted into one of the four slots in the controller to enable communication.

⚠️ **WARNING**	**Potential Severity: Serious** **Potential Loss: Assets** **Hazard Category: Electrical** The Modbus TCP card and other expansion cards are not hot-swappable. Power to the controller must be turned off prior to insertion of the card into an expansion card slot.

2.1   VARIABLE SPEED DRIVE CONTROLS

The variable speed drive is a self-contained drive system controlled by the controller. The controller accepts operation/configuration parameters via the keypad, SCADA, or StarView. The controller sends these parameters to the VSD.

The INSTRUCT ESP Controller begins to support the E30 drive from firmware version v2.122r005 onwards. Table 2-1 summarizes the parameters as viewed on the controller display.

TABLE 2-1: VSD CONTROL PARAMETERS

PARAMETER	DESCRIPTION
Target Speed	This setting allows adjustment of the desired VSD/motor running frequency in hertz (Hz). When the VSD is running, changing this setting ramps the VSD to the new frequency as soon as the **ACCEPT** key is pressed. The ramp rate depends on the acceleration/deceleration settings. This screen is also accessible from the live values screen in the motor table.
Maximum Speed	The maximum speed is used to set the upper operating frequency limit. The VSD will not operate above this limit. This parameter cannot be changed while the VSD is running.
Minimum Speed	The minimum speed is used to set the lower operating frequency limit. The VSD will not operate below this limit except when performing a ramp from a start or to a stop. This parameter cannot be changed while the VSD is running.

PARAMETER	DESCRIPTION
Startup Frequency	This setting controls the frequency at which the inverter begins to operate during a start. The VSD starts at this frequency and ramps to the **Target Speed**. This parameter can be set between 0 and 10 Hz and is typically set to around 7 Hz for ESP applications. For PMM, it is typically set to around 3 Hz. **WARNING** — **Potential Severity: Serious** **Potential Loss: Assets** **Hazard Category: Electrical, Machinery Equipment Hand Tools** For DHT applications where a three-phase choke is used with the DHT interface card, setting this frequency to 0Hz may result in damage to the DHT interface card.
Ramp Frequency	The **Ramp Frequency** is used to calculate the acceleration/deceleration times during operation. This parameter sets the frequency at which the **Acceleration Ramp Time** and **Deceleration Ramp Time** parameters occur. The **Ramp Frequency** is fixed at 90.00 Hz and cannot be changed.
Accel Ramp Time	This parameter sets the time to accelerate from 0 Hz to the **Ramp Frequency**. Target speed changes are affected by this value. *Acceleration time to x Hz (seconds) = Accel Ramp Time * (x – Start-Up freq.)/Ramp freq.*
Decel Ramp Time	This parameter sets the time to decelerate from the **Ramp Frequency** to 0 Hz. Target speed changes are affected by this value. *Deceleration time to x Hz (seconds) = Decel Ramp Time * (x / Ramp freq.)*
Accel/Decel Pattern	The **Acceleration / Deceleration Pattern** sets the acceleration and deceleration patterns used to ramp up/down the frequency according to the acceleration and deceleration times on the voltage/frequency curve. **Linear** is the only option.
Stop Method	This parameter controls how the VSD stops the motor in a shutdown that is manually triggered or automatically triggered. The two options are: • **Coast**: Power is removed from the motor allowing it to coast to a stop. • **Decel**: The VSD powers the motor to a controlled stop according to deceleration time that is set.
Catch A Spinning Motor	This setting allows the VSD to start safely into a spinning motor (either forward or reverse direction). The VSD will detect the rotation speed and adjust the VSD output voltage and frequency to match before applying power. **CAUTION** — **Potential Severity: Light** **Potential Loss: Assets, Process** **Hazard Category: Electrical** As of the release of this manual, this feature is not recommended to be used. If required, please contact InTouch for further clarifications.
Catch A Spinning Motor Mode	This parameter sets the mode of CASM: • **Enhanced**: This advanced mode performs the reconnect function quickly • **Sweep:** This frequency sweep mode is used with output sine filter. • **Sweep2:** This frequency sweep mode is used with output sine filter as well, and when the motor frequencies above 120Hz.
Rotation Direction	This parameter allows the VSD to run in the opposite direction. This can be toggled between 0 and 1 to change the rotation from the previous operating condition. This is used during commissioning in the event the pump operates backwards, to avoid having to make wiring changes. The change to the rotation

PARAMETER	DESCRIPTION
	direction takes effect on the next start. The **Rotation Direction** is also controlled by **Reverse While Running**.
Reverse While Running	This is a one-shot parameter used to reverse the direction of motor operation while the VSD is running. The VSD will decelerate and start in the other direction automatically. The **Rotation Direction** parameter will automatically be changed to indicate the new direction.
Power Ride Through	Enable or Disable the Power Ride Through feature of the VSD. When enabled, it allows a VSD to continue running through power sags without trips.
Output Relay (RO1) Off Delay (s)	Add off delay in seconds to the Relay RO1 of the drive IO card. This relay is to control the enclosure cooling fans. Depending on construction of the drive, a physical off delay relay may be provided and connected to R01. This parameter can be set to 0 when a physical off delay relay is installed. Otherwise, the delay can be implemented in the software with this parameter.
Heat Exchanger (DI2) Action	Select the action for a heat exchanger alarm. This is a normally closed contact and connected to the DI2 of the drive I/O card. The action can be *1. Bypass*, *2. Log*, *3. Stop*, or *4. Stop and Log*.
Safety Switch (DI3) Action	Select the action for a safety switch alarm. This is a normally closed circuit and has contacts from step-up transformer door switch and auxiliary breaker of a 12-pulse drive connected in series. This circuit is connected to the DI3 of the drive I/O card. The action can be *1. Bypass*, *2. Log*, *3. Stop*, or *4. Stop and Log*.
Door Interlock (DI5) Action	Select the action for a Door Interlock Bypassed alarm. This is a normally opened contact and connected to the DI5 of the drive I/O card. The action can be *1. Bypass*, or *2. Log*.
Underload Tracking	This parameter enables the VSD to adjust the underload trip point over time based on nominal operating parameters. Users can enable and disable it by selecting the **Enable Underload Tracking** check box. The **Tracking Target** can be set anywhere from 1% to 100%.
Base Voltage	This parameter sets the maximum value of the output voltage of the drive. This value is the VSD output voltage at the base frequency. The output voltage cannot be higher than the input voltage. The actual output voltage will be influenced by the input voltage of the VSD. This parameter **cannot** be changed while the system is running.
Base Frequency	This parameter sets the frequency at which the VSD is providing the maximum output voltage. This parameter **cannot** be changed while the system is running.
Carrier Frequency	This parameter sets the pulse width modulation (PWM) switching frequency. It can only be set to either 2 kHz or 4 kHz. This parameter **cannot** be changed while the system is running.
Start-up Voltage Boost	This parameter controls the amount of voltage added to the starting voltage to provide increased torque for acceleration. You may change the voltage boost anywhere from 0–30%.
Speed Force	This feature is used to force the VSD to operate at a specific frequency during an event captured on the controller digital inputs. For details see Section 2.1.1 Speed Force.
Rocking Starts	This feature rotates the motor in short bursts in the event of a stuck motor or heavy load. For details, see Section 2.1.2 Rocking Start.
VSD Jump Frequency VSD Jump Width	This screen allows you to set up a maximum of three (3) frequency bands that act as dead zones for the **Target Speed**. For details see Section 2.1.3 Jump Frequency.

PARAMETER	DESCRIPTION
Feedback	Feedback Parameters. For details see Section 2.1.4 Feedback.
Extended Ramp	This feature permits customizing the ramp rate beyond the capability of the VSD. For details, see Section 2.1.5 Extended Ramp Rate.
Gas Lock Protection	This feature automatically detects and deals with gas lock condition. For details see Section 2.1.6 Gas Lock Protection.
Reset VSD to Factory Defaults	Reset the VSD to the VSD factory defaults *(not available at the time of this release)*.
Drive Info	This screen contains information on the VSD. These are viewable parameters only. This screen is typically used for troubleshooting purposes.
Catch A Spinning Motor Mode	This parameter sets the mode of CASM: • **Enhanced:** This advanced mode performs the reconnect function quickly • **Sweep:** This frequency sweep mode is used with output sine filter. • **Sweep2**: This frequency sweep mode is used with output sine filter as well, and when the motor frequencies above 120Hz.
Rotation Direction	This parameter allows the VSD to run in the opposite direction. This can be toggled between 0 and 1 to change the rotation from the previous operating condition. This is used during commissioning in the event the pump operates backwards, to avoid having to make wiring changes. The change to the rotation direction takes effect on the next start. The **Rotation Direction** is also controlled by **Reverse While Running**.
Reverse While Running	This is a one-shot parameter used to reverse the direction of motor operation while the VSD is running. The VSD will decelerate and start in the other direction automatically. The **Rotation Direction** parameter will automatically be changed to indicate the new direction.
Power Ride Through	Enable or Disable the Power Ride Through feature of the VSD. When enabled, it allows a VSD to continue running through power sags without trips.
RPM or Frequency Selection	Select either RPM or Frequency mode. Default is Frequency. Available from FW v2.125r006 or higher.

2.1.1 SPEED FORCE

Speed Force is used to force the VSD to change to a specific frequency during an alarm event. The controller digital inputs are used as the alarm source.

When the selected digital input goes into an alarm condition, the VSD **Target Speed** will change to the **Speed Force Frequency**. If the input alarm clears, the **Target Speed** will return to its normal setting. During the change in motor speed the **Accel/Decel Ramp Times** are used.

NOTE	The speed force function will not work if the associated digital input alarm is set to **Bypass**.

TABLE 2-2: SPEED FORCE PARAMETERS

PARAMETER	DESCRIPTION
Speed Force Source	This parameter sets which digital input is used for the **Speed Force**. Digital inputs 1 to 6 are available.
Speed Force Freq	This parameter sets the VSD output frequency/motor speed to use when **Speed Force** is activated.

2.1.2 ROCKING START

The **Rocking Start** is used to agitate a stuck pump or used during a pump start-up in sanded well conditions. Once configured, the **Rocking Start** feature operates only once and must be re-configured if repeat rocking starts are required. The parameters are summarized in Table 2-3: Rocking Start Parameters.

TABLE 2-3: ROCKING START PARAMETERS

PARAMETER	DESCRIPTION
Rocking Cycles	The **Rocking Cycles** represents how many rotation pulses are to occur. This does not represent a change in direction.
Rocking Target Freq	The **Rocking Target Frequency** represents the frequency the VSD drive will generate for the motor during the rocking feature.
Rocking Method	The **Rocking Method** represents different rocking patterns. • 1: STOP – JOG REVERSE – STOP – JOG FORWARD • 2: JOG REVERSE – JOG FORWARD • 3: JOG REVERSE – JOG REVERSE – JOG FORWARD – JOG FORWARD

The **Rocking Method** is performed by the number of **Rocking Cycles** at the frequency set by **Rocking Target Frequency**. Refer to Figure 2-2.
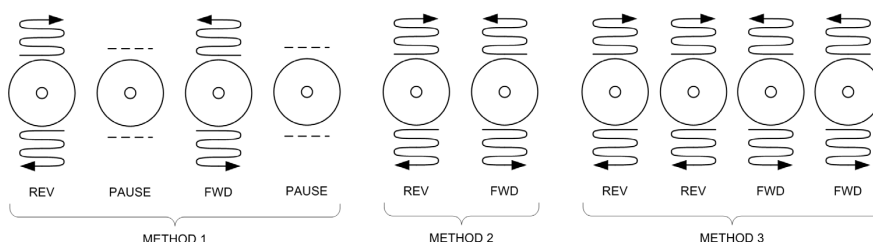
Figure 2-2: Rocking Methods

Refer to InTouch Content ID 3928493 for important information on using the **Rocking Start** feature.

⚠️ WARNING	**Potential Severity: Serious** **Potential Loss: Assets** **Hazard Category: Machinery equipment hand tools** Rocking Start should only be used as a last resort for starting.

2.1.3 JUMP FREQUENCY

The **Jump Frequency** applies to the frequency zones, or motor speed, where the VSD drive is not to operate. The **Jump Frequency** is used to prevent the VSD from changing to a motor speed that would resonate the ESP pump.

The controller can configure up to three (3) frequency bands that act as dead zones for the target frequency. The VSD will not operate in these dead bands except during acceleration ramp-up on start and decelerate ramp-down on stop.

eg **Example**

Setting the VSD Jump Frequency to 10 Hz with a width of 2 Hz will result in a dead band from 8-12 Hz.

TABLE 2-4: JUMP FREQUENCY PARAMETERS

PARAMETER	DESCRIPTION
VSD Jump Frequency	The center frequency location where the jump is to occur
VSD Jump Width	The spread from the center frequency the dead band occupies.

2.1.4 FEEDBACK

The controller provides a **Feedback** feature to control motor speed to attain a target value. Using **Feedback**, the controller constantly monitors the feedback data and incrementally changes the VSD output frequency. The rate of change and the amount of change are configurable. During operation, the VSD output frequency will fluctuate up and down.

Table 2-5 describes the configuration parameters.

TABLE 2-5: FEEDBACK PARAMETERS

PARAMETER	DESCRIPTION
VSD Speed Source	• Analog input 1 to 4 as a target • The controller will control the VSD speed/frequency based on the value on this input. • Analog input 1 to 4 as feedback • The controller will control the VSD speed/frequency to try and match the value of the analog input. • Pump intake pressure for when a Phoenix Interface Card is used. • This parameter acts like **Analog input 1 to 4 as feedback**. If the intake pressure increases, the controller can be configured to slow down the VSD. • Pump discharge pressure for when a Phoenix Interface Card is used. • This parameter acts like **Analog input 1 to 4 as feedback**. If the discharge pressure increases, the controller can be configured to slow down the VSD. • VSD motor amps • This parameter acts like **Analog input 1 to 4 as feedback**. If the motor amps increase, the controller can be configured to slow down the VSD. • Target speed • Feedback is disabled and the controller will control the VSD to match this frequency.
If Feedback Increases	This parameter defines the action the controller should perform with an analog input change. The sensor operation may be proportional or inversely proportional with changes to motor speed. So basically, if analog feedback increases, the controller can be configured to increase or reduce motor speed.
Feedback Set point	The analog input target value. The VSD will change motor speed to attempt to match the target value. This value is an engineering unit which is defined by the analog input configuration. For details see Section 4.6.2: Analog Input of INSTRUCT ESP Intelligent Controller Manual (InTouch ID 6128576).
Feedback Step Size	This parameter defines by what amount the motor speed should change during each change step. If configured too large for the application, the feedback will constantly hunt and exceed the feedback value. If configured too small, the controller will not be able to maintain control, the feedback data will exceed **Feedback Values,** and the system will alarm.

PARAMETER	DESCRIPTION
Feedback Step Interval	This parameter defines how often the change step takes place. This time takes into account how long a change in motor speed will take to affect the sensor on the analog input. Configuration considerations are like **Feedback Step Size**. **NOTE:** A change in motor speed may take 10 minutes for a pressure change on the surface to be detected.
Feedback Value High & Low Alarm	These parameters set the maximum and minimum range of the feedback window. The controller will perform feedback operations within this range. If the controller is unable to maintain control within range, the system will alarm. These parameters have no units associated with them as the data type will vary.
Feedback Deadband	The deadband is a range of values around the target value for which the controller will make no speed adjustments to the VSD. Outside of the deadband range, the controller will make an adjustment to reach the target value. **NOTE:** Starting with firmware version 1.401r1, the controller can adjust the deadband of the VSD feedback mode between the range of 0.1% and 10.0%, with a factory default setting of 1.0%. Previous versions of firmware were limited to a non-adjustable 1.0% deadband.

The implementation of the feedback parameters is very flexible and can best be explained with examples.

eg **Example**

The controller analog 1 is connected to a surface pressure sensor. The controller is expected to operate the VSD to maintain a specific surface pressure.

The controller feedback parameters will be configured as follows:

Parameter	Configuration
VSD Speed Source	Analog input 1 as feedback
Analog input 1	Configure the analog input 1 to ensure the input data are converted to engineering units that reflect the pressure readings of the sensor.
If Feedback Increases	If feedback increases (pressure rises), then the controller should control the VSD to reduce motor speed.
Feedback Step Size	Configure the controller to increment motor speed changes by a specific value.
Feedback Step Interval	Configure the controller to perform the **Feedback Step Size** in a specific interval.
Feedback Value High & Low Alarm	Configure the maximum and minimum pressure values in which the system will operate.
Feedback Deadband	Set the desired deadband value.
Feedback set point	Set the desired operating pressure.

2.1.5 EXTENDED RAMP RATE

The **Extended Ramp Rate** (ERR) is an enhancement to the standard ramp rate available on the VSD. This feature provides the ability to customize a ramp rate far longer than what the VSD can normally provide. The ERR operates in the region between **Min Speed** and **Target Speed**. The VSD will use the standard ramp process from the **Start Up Frequency** to the **Min Speed** then switch to ERR to the **Target Speed**. Table 2-6 summarizes these parameters.

TABLE 2-6: EXTENDED RAMP RATE PARAMETERS

PARAMETER	DESCRIPTION
Extended Ramp Rate	Function to enable or disable this feature
Extended Ramp Step Size	The amount the speed/frequency will change during each step. This entry is limited to 0.01Hz–1Hz.
Extended Ramp Step Interval	The time duration between each step change. This entry is limited to 1s–1000s.

The **Extended Ramp Rate** target is the **Target Speed**. To calculate the duration of a ramp, use the following.

Equation 2-1: VSD Ramp Time

$$\frac{Target\ Speed\ -\ Min\ Speed}{Step\ Size} \times Step\ Interval = Ramp\ Time$$

To calculate the **Extended Ramp Step Size** and **Extended Ramp Step Interval** based on a target ramp time use the following:

Equation 2-2: VSD Ramp Time Using Step Interval and Step Size

$$Step\ Interval = \frac{Ramp\ Time \times Step\ Size}{Target\ Speed\ -\ Min\ Speed}$$

$$Step\ Size = \frac{Target\ Speed\ -\ Min\ Speed}{Ramp\ Time} \times Step\ Interval$$

2.1.6 GAS LOCK PROTECTION

The controller has a **Gas Lock Protection** (GLP) feature, which can automatically detect and deal with gas lock conditions. When GLP is enabled, the controller automatically uses motor current as a method of detecting gas lock events. When this event is detected, the controller will slow the pump down and then subsequently return to the previous operating speed. The GLP parameters are summarized in Table 2-7: .

TABLE 2-7: GAS LOCK PROTECTION PARAMETERS

PARAMETER	DESCRIPTION
GLP Parameters – Settings	
Enable Gas Lock Protection	Check to enable the GLP feature. It can be used in all operating modes and all VSD types. Please note that when GLP is enabled, the motor underload alarm will be bypassed regardless of its action setting.
GLP Frequency (Hz)	This is the frequency at which the VSD will operate during a GLP cycle. It should be slower than the normal operating frequency of the system, as the slower speed is what clears the gas from the ESP. **NOTE:** The GLP frequency setting is not bound by the minimum frequency setting, i.e., it can always be set as low as 20 Hz regardless of minimum frequency configured for the VSD. A typical setting is 20–40 Hz but may be different depending on the well's condition.
GLP Cycle Time (Sec)	This specifies the length of time of a GLP cycle. The amount of time spent running at the actual GLP frequency will be equal to this time setting minus the amount of time it takes to decelerate from the previous operating frequency, i.e., the deceleration ramp is included in the GLP cycle time setting.
GLP Max Cycles	This is the maximum number of consecutive GLP cycles allowed by the controller before tripping the system. Note that *consecutive* means that the system is still determined to be in a gas lock condition, even after a GLP cycle has been applied. If it is determined that a gas lock condition is not present, the counter for the purposes of this trip is returned to zero. Typical setting is 3.
GLP Automatic Restarts	This is the maximum number of times the controller will automatically attempt to restart the VSD, before entering the lockout state. It is similar to the automatic restart setting for all other controller trips, with the same restrictions and configuration requirements, i.e., must be in AUTO mode, etc. The typical setting is 3.

PARAMETER	DESCRIPTION
GLP Automatic Restart Delay (Minutes)	The amount of time after a trip that the controller will wait before attempting to automatically restart the VSD. Its effect is like all other alarms which have this parameter. This setting is highly wellsite dependent, but the default setting is 30 minutes like most other alarms.
GLP Parameters – Motor Amps	
Set Point (Amp)	This is the motor amps reading, below which a gas lock condition is suspected.
Activation Time (Sec)	This is the amount of time that the motor amps reading can stay continuously below the setpoint before the controller will declare a gas lock event.
GLP Parameters – Motor Temperature	
Bypass	Use the Checkmark to bypass the GLP motor temp detection method or uncheck to use it. NOTE: It is generally recommended to bypass the motor temperature method of detecting gas lock. ONLY use this setting in circumstances where the motor amps detection method is selected, and it is determined not to be sufficient for the case.
Setpoint (F or C)	This is the expected motor temperature value above which gas lock is suspected.
Activation Time (Sec)	The amount of time that the motor temperature reading can stay continuously above the setpoint before the controller declares a gas lock event
GLP Parameters – Manual Override	
Start Gas Lock Cycle	Forces the system to begin a GLP cycle. The controller will immediately decelerate the drive down to the GLP frequency.
Stop Gas Lock Cycle	Forces the system to end the current GLP cycle. The controller will immediately accelerate the drive as appropriate for the currently configured operating mode.
GLP Parameters – Status	
Cycle Engaged	When checked, it indicates that the controller is currently in a GLP cycle. This is a read-only status indicator, letting the operator know if the operation is in the middle of a Gas Lock Cycle condition. If required, the operator can use the manual override button to immediately start or end a Gas Lock Cycle.
Time Left (Sec)	Number of seconds remaining in the current GLP cycle
Cycles	The count of the number of consecutive GLP cycles, for the purposes of tripping the system. See the setting for GLP Max Cycles above.

For additional information, refer to the Gas Lock Protection guidelines (InTouch ID 6923767) for details.

NOTE	The motor undercurrent alarm is automatically bypassed whenever GLP is enabled, even if the action for the motor undercurrent alarm is configured to a non-bypass setting. That is, when GLP is enabled, it supersedes the normal motor undercurrent alarm.

2.1.7   POWER RIDE THROUGH

A Power Ride Through feature is added in INSTRUCT ESP controller FW 2.123r001. It enables a VSD to continue running through power sags without trips.

In Power Ride Through mode, the VSD will attempt to recover energy from the inertia of the system in order to withstand short-lived power events and brown outs. The effectiveness of the Power Ride Through feature is highly dependent on the loading of the drive at the time of the power dip and how long the power dip remains.

The feature can be found under **Menu > VSD > Configure**.

Figure 2-3: Power Ride Through

2.1.8   CATCH A SPINNING MOTOR

The Catch a Spinning Motor function is utilizing the flying start feature of the drive.

While the default gain values of this feature would be appropriate for most of the application, these gains can be adjusted if necessary to improve the CASM performance. The CASM parameters can be found under **Menu > VSD > Expert**.

PARAMETER	DESCRIPTION
FS Ki	Flying Start Integral Gain. In *Enhanced* mode, this integral term is used in the current regulator which controls the reconnect function. While in *Sweep* mode, this integral term used in the voltage recovery to the normal V/Hz level.
FS Speed Reg Ki	Flying Start Speed Regulator Integral Gain. In *Enhanced* mode, this integral term is used in the speed regulator which controls the reconnect function. While in *Sweep* mode, it sets the time to sweep frequency in one direction. Units of 10us.
FS Speed Reg Kp	Flying Start Speed Regulator Proportional Gain. In *Enhanced* mode, this is the proportional term used in the speed regulator which controls the reconnect function. While in *Sweep* mode, it programs the level for the speed detection signal. The monitored signal needs to drop below this level to indicate motor speed.

PARAMETER	DESCRIPTION
FS Msrmnt CurLvl	Flying Start Measurement Current Level. In *Enhanced* mode, this is the level of the current used during the measurement stage of the reconnect function. In *Sweep* mode, this is the adjustment for the V/Hz end point. Used to change the slope of the V/Hz curve during the frequency sweep.

2.2 VSD OPERATING PARAMETERS

The VSD operating parameters are summarized in Table 2-8.

TABLE 2-8: VSD OPERATING PARAMETERS

PARAMETER	DESCRIPTION
Drive Frequency	This is the VSD run frequency, i.e., the frequency output by the VSD. This should typically be the same as the Target Speed while the VSD is running, although the value will change as the VSD ramps up or down.
VSD Load	This is the live value of the VSD output current and the percentage loading of the full-rated VSD output current. There are no controller alarms associated with this parameter. Alarming is performed using the VSD Motor Amps.
VSD Motor Amps	The controller displays the calculated value of the current delivered by the VSD to the motor. This value is calculated from the VSD Drive Amps read from the drive and the VSD Transformer Ratio. Two alarms are associated with this parameter: VSD Underload (VSD UL) Typically set to 85% of nominal operating current. Setting this value is subjective as there are dependencies on pumping fluid. However, VSD Underload should not be less than 60% of motor nameplate current. VSD Overload (VSD OL) Typically set to 110% of nominal operating current. Using a VSD, there is no issue with motor inrush currents.
	These two alarms use the standard controller alarm configurations detailed in Section 4.2.4 of INSTRUCT ESP Intelligent Controller Manual (InTouch ID 6128576). The VSD Overload alarm uses an inverse time curve. For proper operation, these parameters require the output transformer ratio to be set. The VSD can only monitor the output power which is not necessarily the motor power if a transformer is used. The controller can provide the motor protection taking into account the transformer ratio.
VSD Voltage	The controller displays VSD voltage which represents the incoming RMS voltage to the drive and the output RMS voltage. The output voltage will vary during motor operation.
VSD Power	The controller displays output power to the motor. The output power will vary during motor operation.
VSD Alarm Control	VSD Alarm Control provides access to settings that control how the controller acts on warnings/alarms from the VSD and on the communication link between the controller and VSD. For more information consult the INSTRUCT E30 Low Voltage VSD Manual (LCS-ENG-M0006).
Cos Phi	The controller displays output power factor of the drive.

2.3   PMM STEP-OUT DETECTION PARAMETERS

When operating a PMM, it is necessary to setup the step out detection to protect the motor from continuous running after it has stepped out (lost synchronization). The step out detection menu is located at *VSD>PMM Configuration* page, the parameters are summarized in Table 2-9.

TABLE 2-9: PMM STEP-OUT DETECTION PARAMETERS

PARAMETER	DESCRIPTION
Action	Select the action for a step out detection alarm. The action can be 1. Bypass, 2. Log, 3. Stop, or 4. Stop and Log.
Min Arming Speed (%)	Defines the speed when the step out detection would kick in, in percent of motor nominal speed.
Arming Speed (Hz)	A read-only parameter, showing the arming speed in Hz.
Power Factor Low Setpoint	Defines the minimum power factor below which motor is deemed to be stepped out.
Power Factor Low Tracking (%)	The power factor is constantly tracked, the motor is deemed to be stepped out if the power factor reading dropped below this setpoint(%) of the previous reading.
Trip Time (s)	Sets the time to trigger step out detection alarm when the step out conditions are met.
Restarts *	The maximum number of restarts allowed for shutdowns by this alarm before a lockout condition is generated to prevent automatic restarts.
Restart Delay (minutes) *	The countdown time that must elapse before an automatic restart can occur. All alarms must also be clear before the restart occurs. The restart countdown can be manually bypassed by pressing the **Start** key from the **Control Screen** during the countdown.
Start Bypass (seconds) *	A temporary bypass time delay added to the Trip Time for starting only. A setting of 0.0 seconds disables this function. Any other number bypasses the alarm to allow a start and keeps it bypassed for the time set. A temporarily bypassed alarm will be displayed on the **Status Screen** when active but will not cause a shutdown. When Start Bypass is enabled, starting can occur when an active alarm is present.
Maintenance Bypass (minutes) *	Maintenance Bypass allows for the temporary bypass of an alarm. To activate a Maintenance Bypass, enter the Maintenance Bypass timer value. While the motor is running, the **Maint. Bypass** button will be enabled on the **Start** screen pop-up indicating that this feature is available but not active. This button must be pressed to activate. The controller will display the message "MaintBypass" in the marquee area during Maintenance Bypass. Once the timer has expired, the bypassed alarm will become active. The Maintenance Bypass function must be reset and activated each time it is to be used as the controller clears the timer value and deactivates this function after each use.

* These parameters are not utilised and will be removed from Instruct firmware version later than 2.124r008

2.4   ELECTRICAL STABILITY CONTROL PARAMETERS

The configuration for electrical stability control is located at *VSD>PMM Configuration* page. The parameters under Electrical Stability are only available when Motor Control Mode is *PM VHz.* Otherwise, these parameters would be greyed off and have the default values.

In most of our VSD applications with sinewave filter, the recommendation was to keep electrical stability control disabled and its time constant and gains default. These settings would perform a stable operation for most of the time.

However, electrical stability control would be required in **ALL** PMM applications for stable operation and to keep PM motor in synchronization. In this case, enable the stability control and tune its parameters as follows:

1. Set *Elect Stab Enable* to *Enabled*
2. Set *Stability Voltage Gain* to 0
3. Set *Current Limit Kd* to 0
4. Keep *Stability Filter Gain* and *Stability Angle Gain* at default values.
5. Perform a start and run to the speed reference. If the system continues to lose control or show an instability, continue to increase the Stability Filter in steps of about 2000.
6. If the system still shows instability after the Stability Filter increased to 15000, please contact LCS Sustaining for further advise.

Instruct FW v2.125r014 will have electrical stability enabled when PM VHz is first enabled. In the event PM VHz was already selected, for the default parameters to be applied, the control mode has to be changed to anything other than PM VHz and then PM VHz, applied again. The Default will have Voltage gain and Kd to zero.

TABLE 2-10: ELECTRICAL STABILITY CONTROL PARAMETERS

PARAMETER	DESCRIPTION
Elect Stab Enable	To enable or disable Electrical Stability control.
Stability Filter(s)	The filter time constant for the angle and voltage stability control.
Stability Voltage Gain	The gain of the voltage stability control function.
Stability Angle Gain	The gain of the electrical angle stability control function
Current Limit Kd(s)	Despite this is shown under Electrical Stability, this is not a gain related to electrical stability control. Instead, it is a derivative gain for the current limit function.

Section 3: **VSD Settings Screens**

3.1   VSD MENUS

The following menus are available when *INSTRUCT E30* is selected for **Device Function**:

1. Operator
2. Summary
3. Alarms
4. Speed
5. Time
6. Configure
7. Expert
8. Gas Lock

Refer to the corresponding figures.
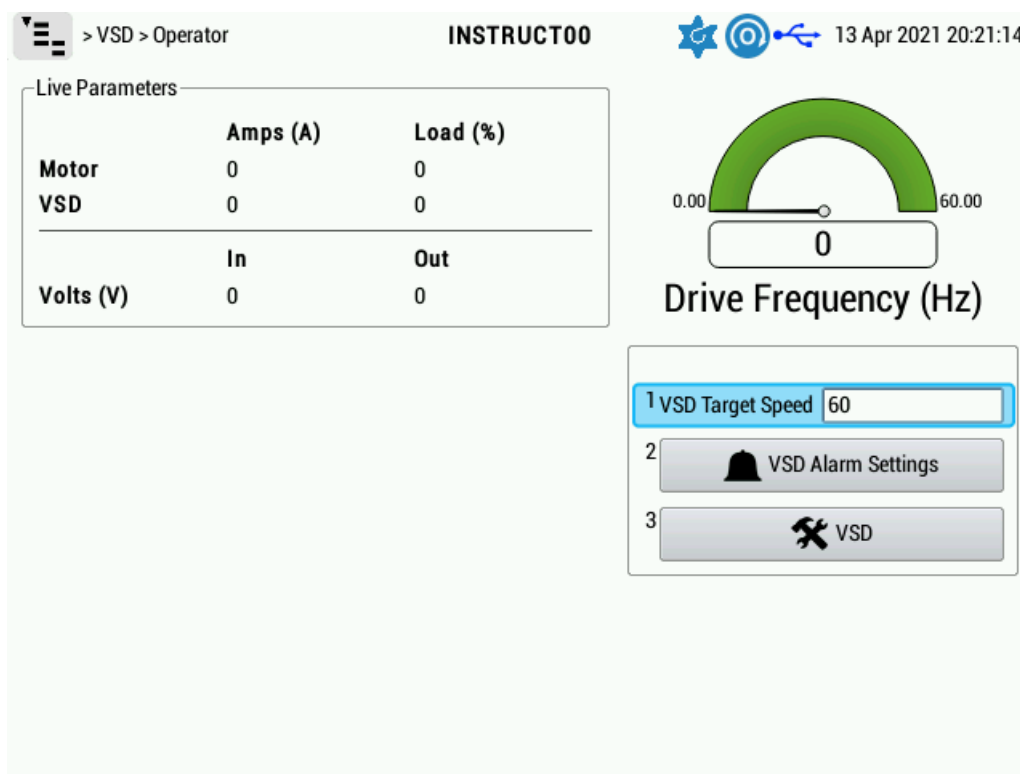
Figure 3-1: Operator Screen
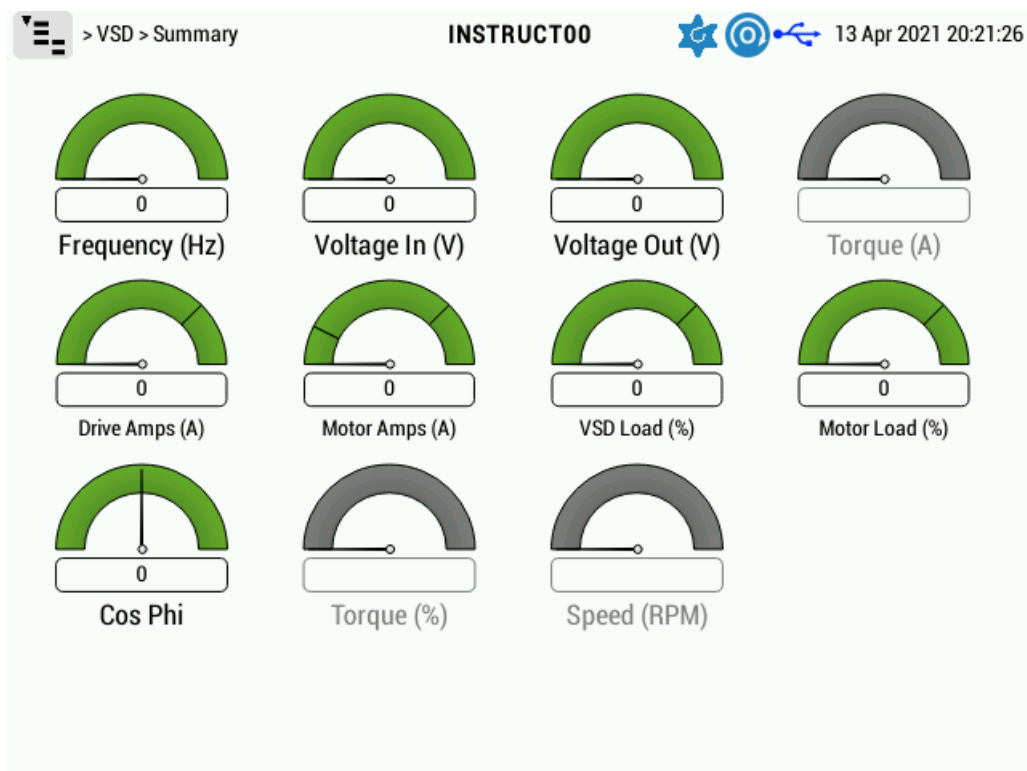
Figure 3-2: Summary Screen

Figure 3-3: Alarms Screen

Figure 3-4: Speed Screen

Figure 3-5: Time Screen

Figure 3-6: Configure Screen

Figure 3-7: Expert Screen

Figure 3-8: Gas Lock Screen

Figure 3-9: PMM Configure Screen

3.2   POWER ANALYZER MENU – 5KV SENSOR

In a standard E30 VSD, a Power Analyzer (PA) kit will be provided as standard. The kit consists of an INSTRUCT Power Analyzer 5kV Voltage Sensor, an INSTRUCT Power Analyzer Card, and an 8m INSTRUCT Power Analyzer cable. The kit measures the three phase-to-ground voltages, calculates the three phase-to-phase voltages, and displays the readings on the controller. It also provides readings for spin voltage, spin frequency, and ground imbalance on the controller.

To view the readings, navigate to **Power Analyzer > Slot A or B > 5kV Sensor**. Refer to Figure 3-10.

NOTE	The Power Analyzer menu is only available when the Power Analyzer Card is installed in either slot A or B of the controller.
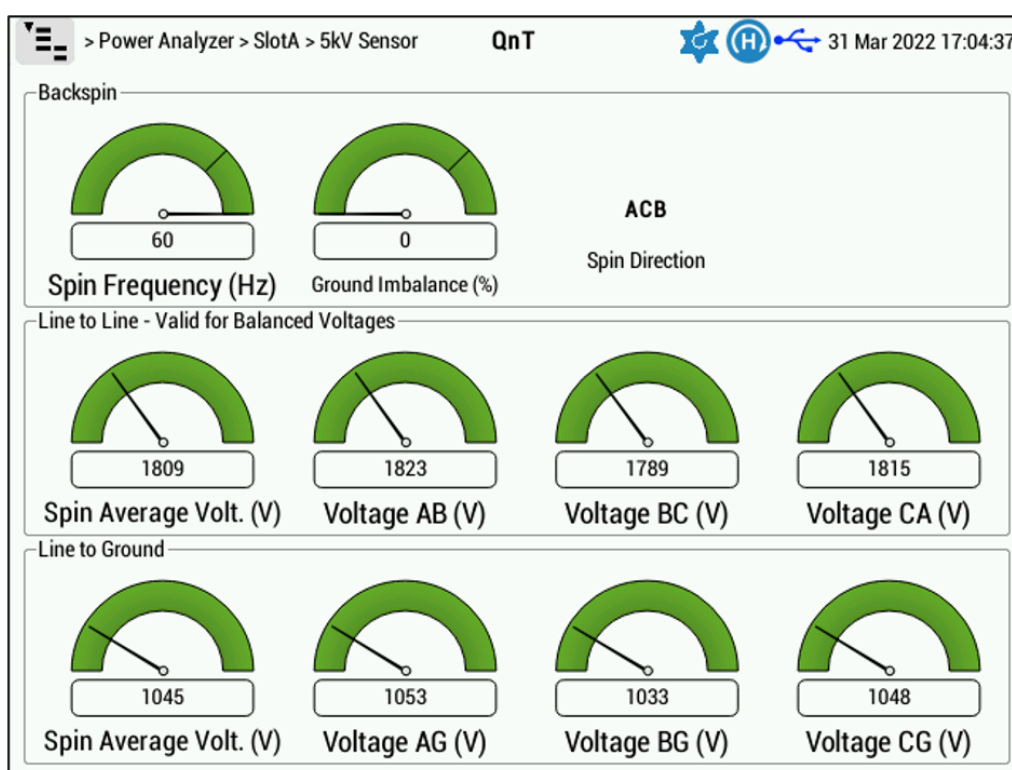
Figure 3-10: Display of Measurements from Power Analyzer

Section 4: **Initial Communication Setup Settings**

This section provides instructions to configure the communication between the controller and the E30 VSD during the initial start-up.

4.1   CONTROLLER CONFIGURATION

The controller connects to the E30 VSD via Modbus TCP protocol. To enable this communication, a Modbus TCP card shall be inserted into one of the four slots in the controllers. The configuration of the Modbus TCP card is detailed in 4.2 Controller Modbus TCP Card Configuration**.**

The following figure depicts the configuration of Slot2 where the Modbus TCP card is installed, but the card can be installed into any of the four expansion slots and configured for the VSD, as required. As seen at the top of the screen you navigate via the sequence **Menu > Controller > Slot2**.
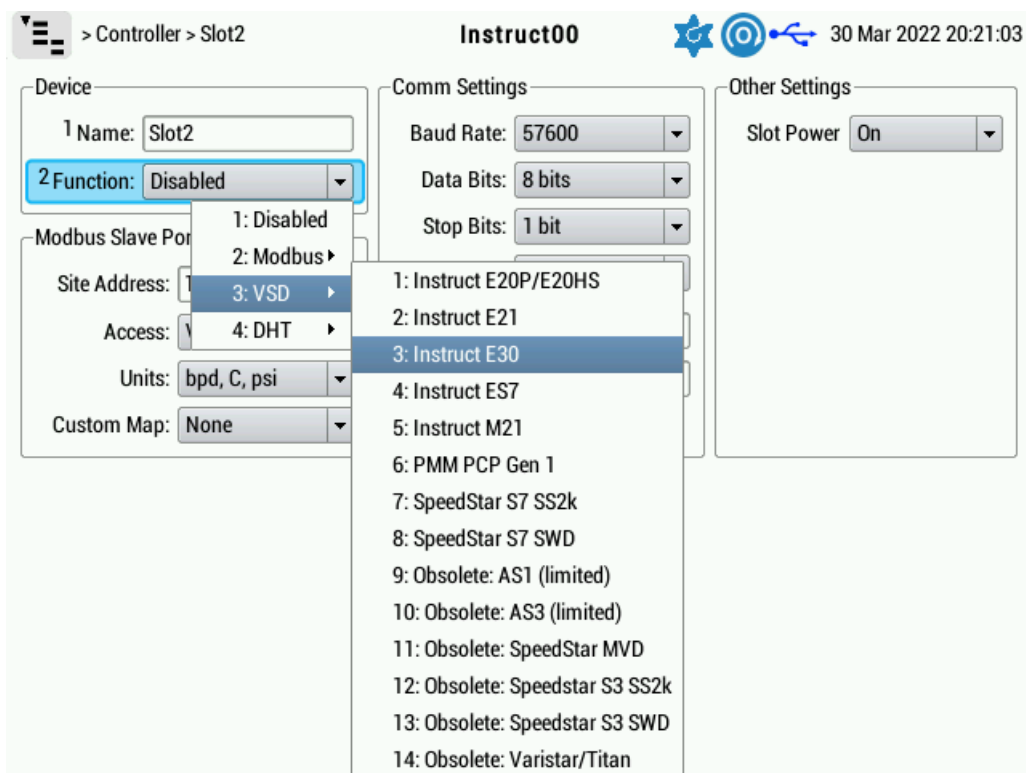
Figure 4-1: Port Configuration

4.2   CONTROLLER MODBUS TCP CARD CONFIGURATION

The Modbus TCP card shall be configured before the communication between the controller and the drive can be established. In the following sections, procedures are provided to configure the card either manually(Section 4.2.1) or automatically via a script (Section 4.2.2).

For reference, the Modbus TCP card installation manual is available at InTouch 6470145.

4.2.1 MANUAL CONFIGURATION OF MODBUS TCP CARD

1. Connect the PC to the RS232 engineering port of the Modbus TCP card via a serial communication cable.

2. Connect *Tera Term* or similar program to Modbus TCP card engineering port at 9600, 8-N-1.
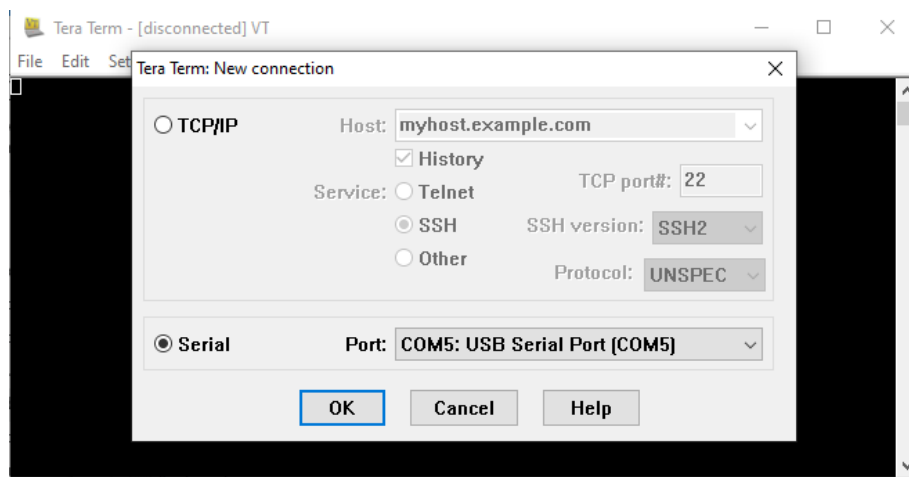
Figure 4-2: Tera Term Setup for New Connection

3. Press the **X** key at your computer. You should see the RX LED light red on the TCP card faceplate.

4. Use a pin to press the reset button on the Modbus TCP card, and then release the pin. You should be pressing **X** this whole time.

5. After a few seconds, you should get the prompt `Modbus/TCP to RTU Bridge`. You may release the **X** key and press **Enter** to go into Setup Mode.

6. If the `Modbus/TCP to RTU Bridge` prompt does not display, try pressing the reset pin again while continuously pressing **X**.

```
Modbus/TCP to RTU Bridge
MAC address 0080A36BB666
Software version V4.0.0.3 (210714) XPTE
Press Enter for Setup Mode

Model: Device Server Plus+! (Firmware Code:YM)

Modbus/TCP to RTU Bridge Setup
1) Network/IP Settings:
      IP Address ................. 192.168.0.1
      Default Gateway ............ --- not set ---
      Netmask .................... --- not set ---
2) Serial & Mode Settings:
      Protocol ................... Modbus/RTU,Slave(s) attached
      Serial Interface ........... 57600,8,N,1,RS232
      Modbus Port No ............. 40
3) Modem/Configurable Pin Settings:
      CP1 ...... Not Used
      CP2 ...... Not Used
      CP3 ...... Not Used
4) Advanced Modbus Protocol settings:
      Slave Addr/Unit Id Source .. Modbus/TCP header
      Modbus Serial Broadcasts ... Disabled (Id=0 auto-mapped to 1)
      MB/TCP Exception Codes ..... Yes (return 00AH and 00BH)
      Char, Message Timeout ...... 00050msec, 05000msec
7) Security Settings:
      SNMP ....................... Disabled
      Telnet Setup ............... Enabled
      TFTP Download .............. Enabled
      Port 77FEh ................. Enabled
      Web Server ................. Enabled
      Enhanced Password .......... Enabled
      Port 77F0h ................. Enabled
      Telnet Authentication ...... Disabled
8) Expert Settings:
      TCP Re-transmission timeout  500 ms

D)efault settings, S)ave, Q)uit without save
Select Command or parameter set (1..7) to change:
```

Figure 4-3: Screen Display after Modbus TCP Card is Connected

7. Set the following:

    a. **Option 1:** Network settings:

        - IP address = **192.168.1.11**

        - Default Gateway = **not set**

        - Set Netmask: **Yes, Netmask = 255.255.255.0**

        - Change telnet config password: **N**

```
Select Command or parameter set (1..7) to change:

IP Address (192) .(168) .(001) .(011)
Set Gateway IP Address (N) ? N

Set Netmask (N for default) (Y) ? Y
(255) .(255) .(255) .(000)
Change telnet config password (N) ? N
```

Figure 4-4: Configuring Option 1 - Network Settings

NOTE	This is the IP address of the Modbus TCP card itself. It can be anything we want it to be, but it needs to be unique, and the subnet should be the same as the 20-COMM-M adapter.

b. **Option 2**:

- Attached Device: **2=Master**

- Serial Protocol: **1=Modbus/RTU**

- Interface Type: **1=RS232**

- Enter serial parameter: **57600, 8,N,1**

- Enter Port No: **502** (Note: this is not available for older versions of the card, eg. V3.3.0.3 and V3.3.0.6)

```
D)efault settings, S)ave, Q)uit without save
Select Command or parameter set (1..7) to change:

Attached Device (1=Slave 2=Master) (2) ? 2
Serial Protocol (1=Modbus/RTU 2=Modbus/ASCII) (1) ? 1
Interface Type (1=RS232 2=RS422/RS485+4-wire 3=RS485+2-wire) (1) ? 1
Enter serial parameters (57600,8,N,1)
Modbus Port No  (502) ?
```

Figure 4-5: Configuring Option 2

c. **Option 4**

- Use MB/TCP 00BH/00AH: **2** for Yes

- Disable Modbus/TCP pipeline: **1** = NO

- Character Timeout: **00050**

- Message Timeout: **05000**

- Serial TX delay after RX: Press **Enter**

- Swap 4x/0H to get 3x/1x: Press **Enter**

```
D)efault settings, S)ave, Q)uit without save
Select Command or parameter set (1..7) to change:

Use MB/TCP 00BH/00AH Exception Responses (1=No 2=Yes) (2) ? 2
Disable Modbus/TCP pipeline (1=No 2=Yes) (1) ?
Character Timeout (0 for auto, or 10-6950 msec) (50)
Message Timeout (200-65000 msec) (5000)
Serial TX delay after RX (0-1275 msec) (0)
Swap 4x/0H to get 3x/1x (N) ?
```

Figure 4-6: Configuring Option 4

d. **Option 5**:

- Close Idle TCP sockets after: **10**

- Redundant entry retries after: **0**

```
Close Idle TCP sockets after (3-60 sec, 0=leave open) (10)
Redundant entry retries after (15-60 sec, 0=disable feature) (0)
```

Figure 4-7: Configuring Option 5

8. Press **A** for Add:

a. Modbus Addr from = 1

b. Modbus Addr To = 255

NOTE	This is the range of Modbus device IDs we want the Modbus TCP card to send out to the network, and for ease we will set it to handle the entire range from 1 to 255. At the moment, the controller firmware only uses IDs 6, 16, 17, and 255.

c. Slave IP address = **192.168.1.12**

```
A)dd, D)elete, E)xit - select function
        Modbus addr from (2) ? 1
        Modbus addr  to  (2) ? 255
        Slave IP address (192) 192.(168) 168.(001) 001.(000) 012

    1):      001-255: 192.168.1.12

A)dd, D)elete, E)xit - select function
```

Figure 4-8: Configuring Target Slave Modbus Address and IP Address

NOTE	This is the target slave IP address. In our case, the target is the 20-COMM-M card (which is installed in the E30).

9. Press **E** for **Exit**.

10. Press **S** for **Save**.

11. The setup of the Modbus TCP card is completed. You may want to check the settings of the card with the verified settings as below (software version V4.0.0.3 is shown).

```
MAC address 0080A3E6E5E9
Software version V4.0.0.3 (210714) XPTE
Press Enter for Setup Mode

Model: Device Server Plus+! (Firmware Code:YM)

Modbus/TCP to RTU Bridge Setup
1) Network/IP Settings:
     IP Address ................. 192.168.1.11
     Default Gateway ........... --- not set ---
     Netmask ................... 255.255.255.0
2) Serial & Mode Settings:
     Protocol .................. Modbus/RTU,Master attached
     Serial Interface .......... 57600,8,N,1,RS232
     Modbus Port No ............ 502
3) Modem/Configurable Pin Settings:
     CP1 ...... Not Used
     CP2 ...... Not Used
     CP3 ...... Not Used
4) Advanced Modbus Protocol settings:
     MB/TCP Exception Codes ..... Yes (return 00AH and 00BH)
     Char, Message Timeout ...... 00050msec, 05000msec
5) Unit ID -> IP Address Table:
     Close Idle Sockets ......... 10sec
     Redundant Entry Retry ...... Feature Disabled
     001-255: 192.168.1.12
7) Security Settings:
     SNMP ...................... Disabled
     Telnet Setup .............. Enabled
     TFTP Download ............. Enabled
     Port 77FEh ................ Enabled
     Web Server ................ Enabled
     Enhanced Password ......... Enabled
     Port 77F0h ................ Enabled
     Telnet Authentication ..... Disabled
8) Expert Settings:
     TCP Re-transmission timeout  500 ms

D)efault settings, S)ave, Q)uit without save
Select Command or parameter set (1..7) to change: █
```

Figure 4-9: Final settings of Modbus TCP card
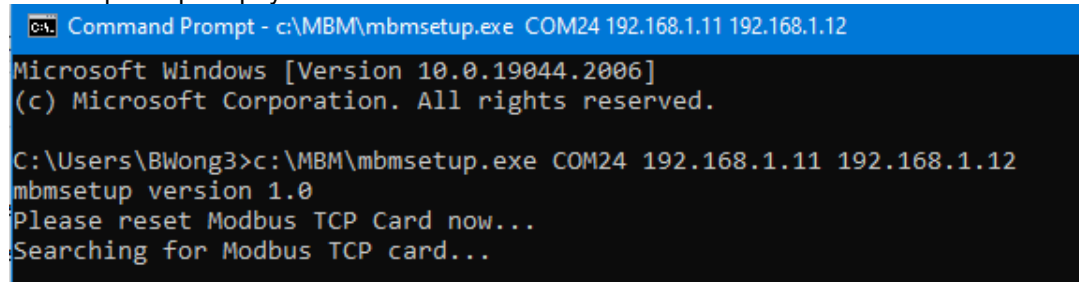
4.2.2 CONFIGURATION OF TCP CARD WITH MBMSETUP SCRIPT

1. Download the MBMSetup script and extract it to your preferred directory.

2. Connect the PC to the RS232 engineering port of the Modbus TCP card via a serial communication cable.

3. Launch the Command Prompt in the PC.

4. Type *[directory]*\mbmsetup.exe *[COM#]* 192.168.1.11 192.168.1.12

    In this example, the .exe is saved in **C:\MBM** directory, and the serial port is connected to **COM24**.

    Type *c:\MBM\mbmsetup.exe COM24 192.168.1.11 192.168.1.12*
    The script will prompt you to reset the Modbus TCP card.
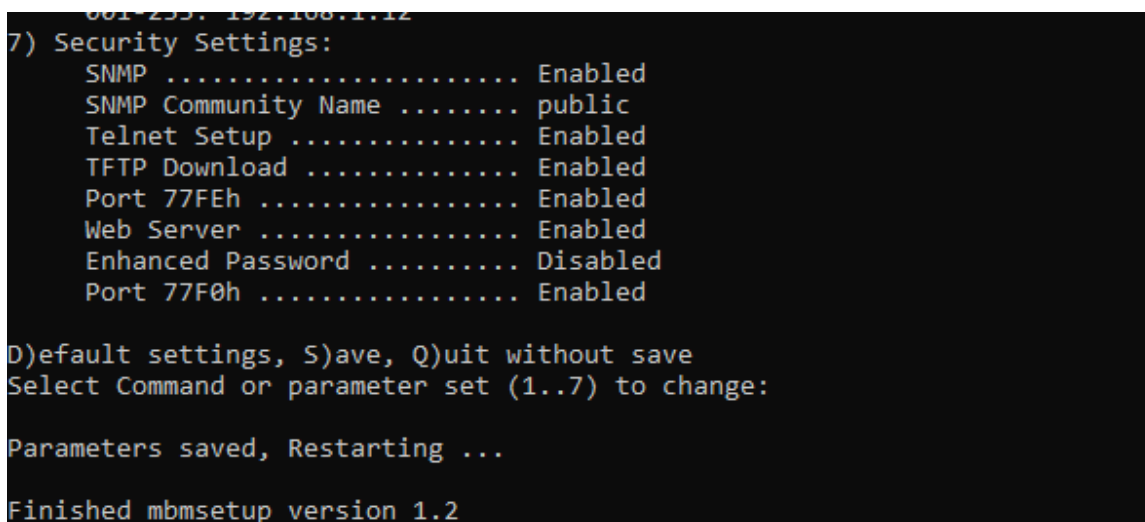
5. Use a pin to press the reset button on the Modbus TCP card.

6. The script will configure the Modbus TCP card automatically. Once the setup is complete, it will prompt "Finished mbmsetup version 1.2".

NOTE	MBMSetup script only recognizes certain software revisions of Modbus TCP card. Once the script has finished running, all the final settings will be displayed. You may want to check them with the verified settings as shown in **Appendix B: Modbus TCP card settings snapshot.**
	In case the MBMSetup did not configure the card successfully, please head back to Section 4.2.1 to configure the card manually.

4.3   SETTING UP E30 DRIVE

Make sure the received E30 drive comes with the **20-COMM-M** card as the drive communicates with the controller through this card. This card should be inserted into the **port 6** of the option card slots in the drive.

1. Connect the Ethernet port of the **20-COMM-M** card to the Ethernet port of the Controller Modbus TCP Card using a **crossover** Ethernet cable.

NOTE	If a crossover cable is not available, you will need a switch or hub. Neither the Modbus TCP card nor the 20-COMM-M has Auto MDI/MDIX negotiation.

Set the IP address of the drive. The simplest way to set the IP address of the drive is to use the rotary switches. The drive by default is set to **192.168.1.xxx**, where **xxx** is set by the rotary switches. In our case, the switches are set to 0, 1, and 3. Thus the IP address will be **192.168.1.13**. Alternatively, the user can also use the HMI to set the IP address.
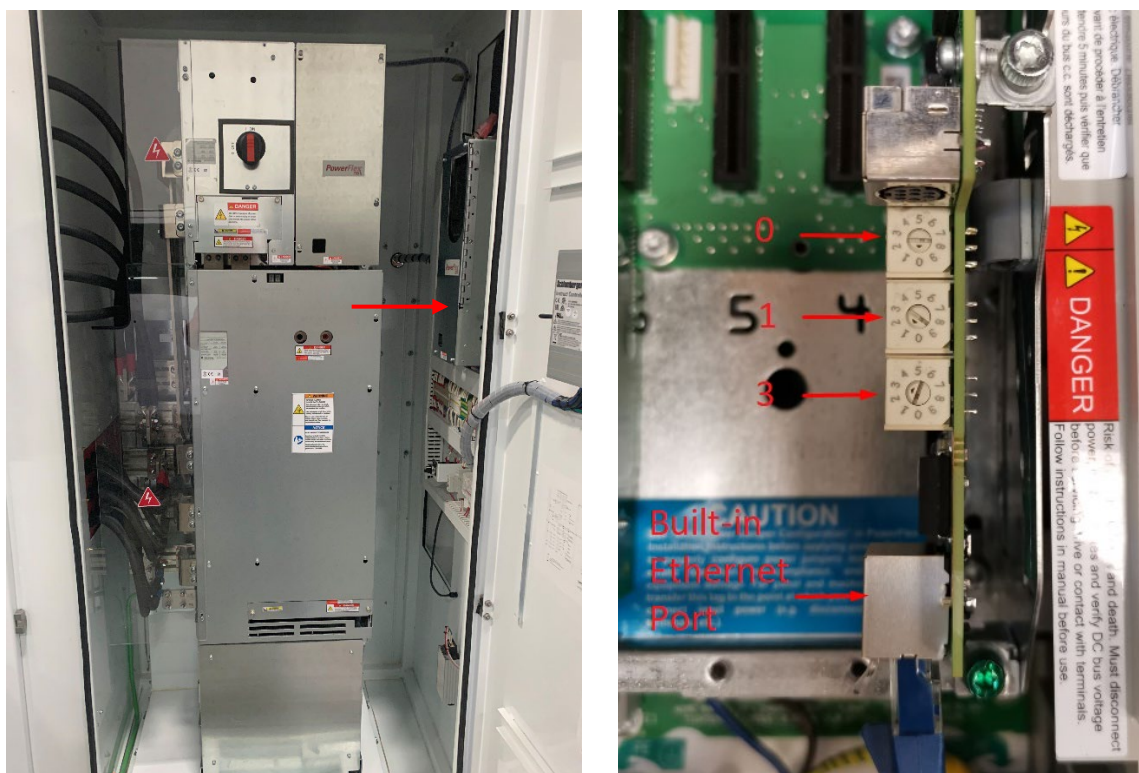
Figure 4-10: Setting Drive IP Address by the Rotary Switches

NOTE	This is for the built-in Ethernet port on the E30 drive, which is not the same as the **20-COMM-M** which is attached to the controller. This port is set up so that we can use Connected Components Workbench (CCW). The cover may have to be removed to access the port and rotary switches.

2. Once the rotary switches are set, cycle the power on the PF755 for it to take effect.

NOTE	Not all values are valid for the IP address octet. There are a few special ones like 000 and 888 that set up other operating modes in the PF755.

4.4   DRIVE CONFIGURATION VIA CONNECTED COMPONENTS WORKBENCH (CCW)

Ideally the drive will already come preconfigured from the factory to communicate with the controller.

In case the drive is not preconfigured, the Rockwell Automation software application Connected Components Workbench (CCW) will be required to configure the drive settings for communication with the controller.

CCW can be downloaded free of charge here:
https://compatibility.rockwellautomation.com/Pages/MultiProductFindDownloads.aspx?crumb=112&mode=3&refSoft=1&versions=57681

A free user account must be created before CCW can be downloaded.

4.4.1   CONFIGURING THE DRIVE

1.   Using a standard straight-through Ethernet cable, connect the drive's built-in Ethernet port to the RJ45 port/adaptor of your computer. The Ethernet port is located at the back of the drive in the control IO junction box.
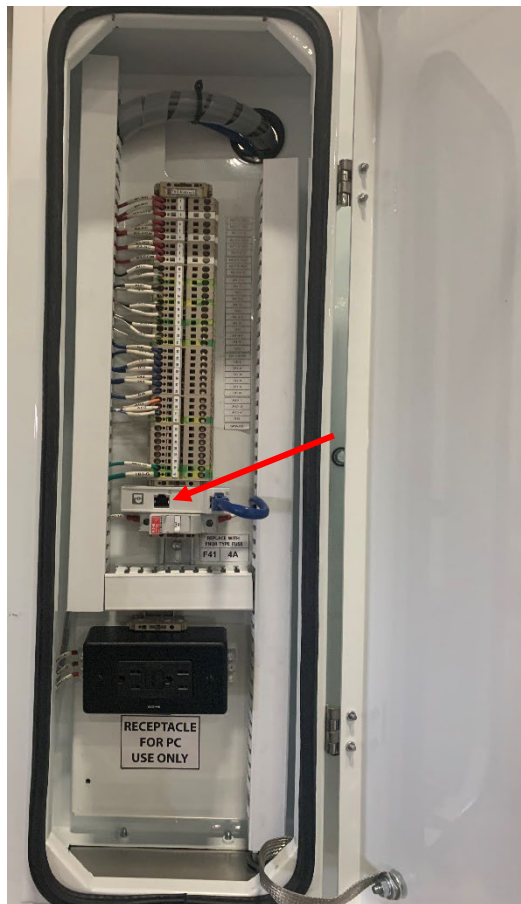
Figure 4-11: Control Junction Box

2. In your computer, set the Ethernet link to **192.168.1.10** via the usual Windows Network setup.

NOTE	This IP address can be any value if it is on the same subnet and is unique on the local network.
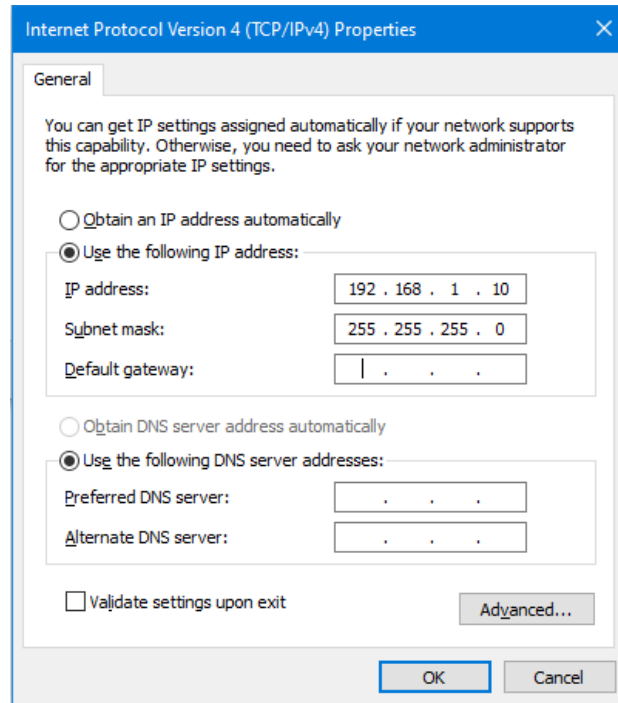
Figure 4-12: Setting the Ethernet link in Window Network Setup

3. Open the CCW application.
4. Click menu item **Communications > Configure Drivers.**
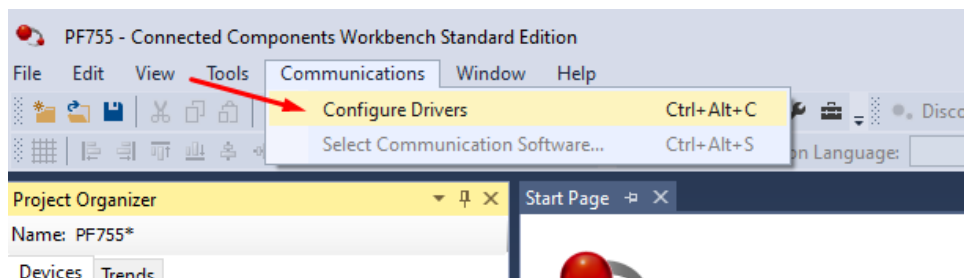
Figure 4-13: Communication > Configure Drivers

5.   The driver should be shown under **Configured Drivers**. Else, add the driver from the **Available Drive Types** box. Select Ethernet/IP driver. Then click **Configure.**
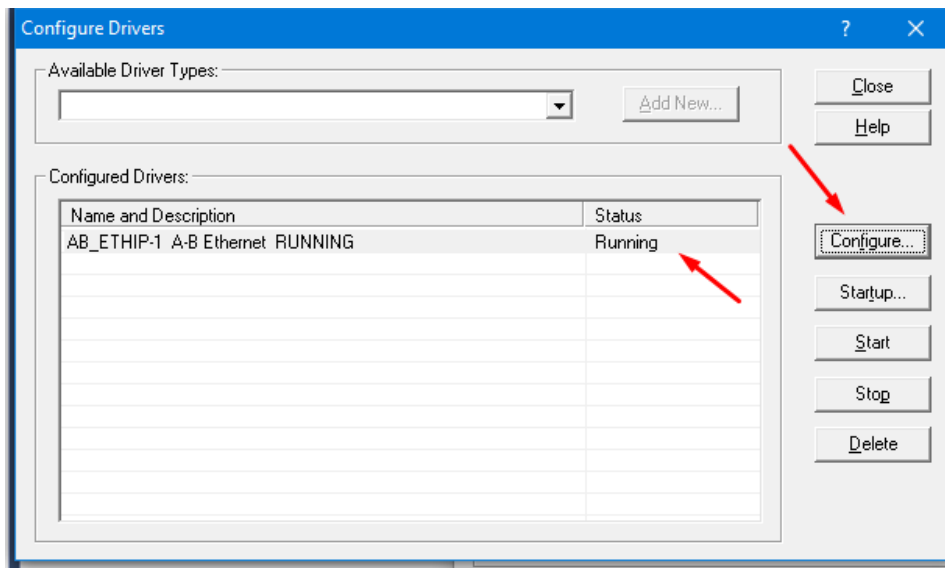
Figure 4-14: Configure Drivers

6.   In the **Ethernet/IP Settings** window, select **Browse Local Subnet** and choose the Ethernet connection which you set up in Windows—the one with IP address **192.16.8.10.**
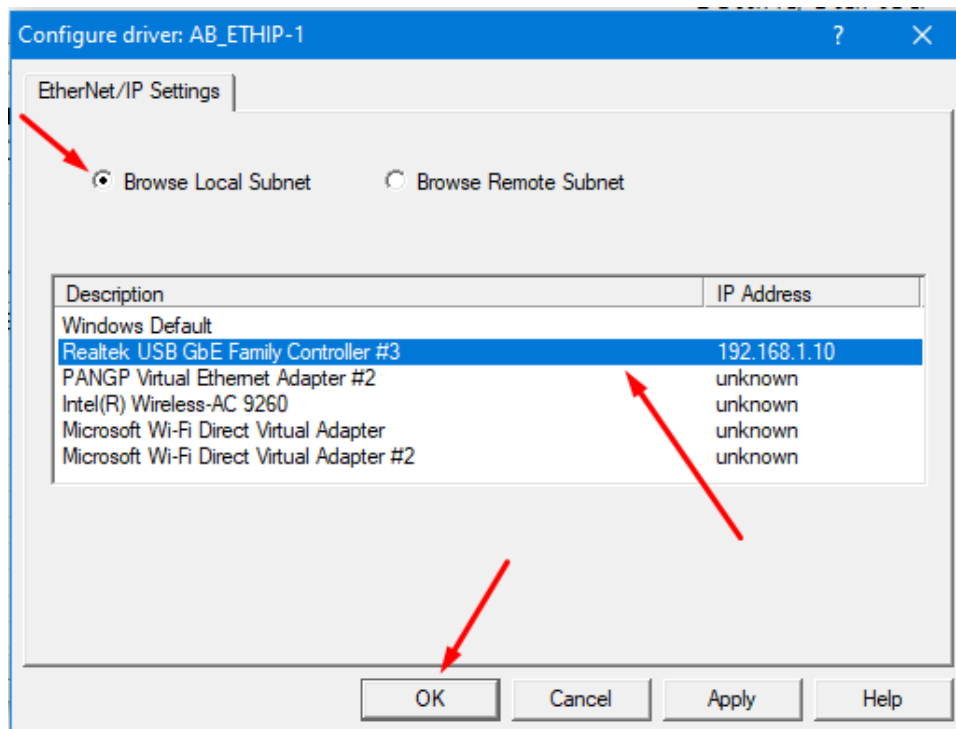
Figure 4-15: Configure Drivers - Ethernet/IP Settings

7.   Close the **Configure Drivers** window.
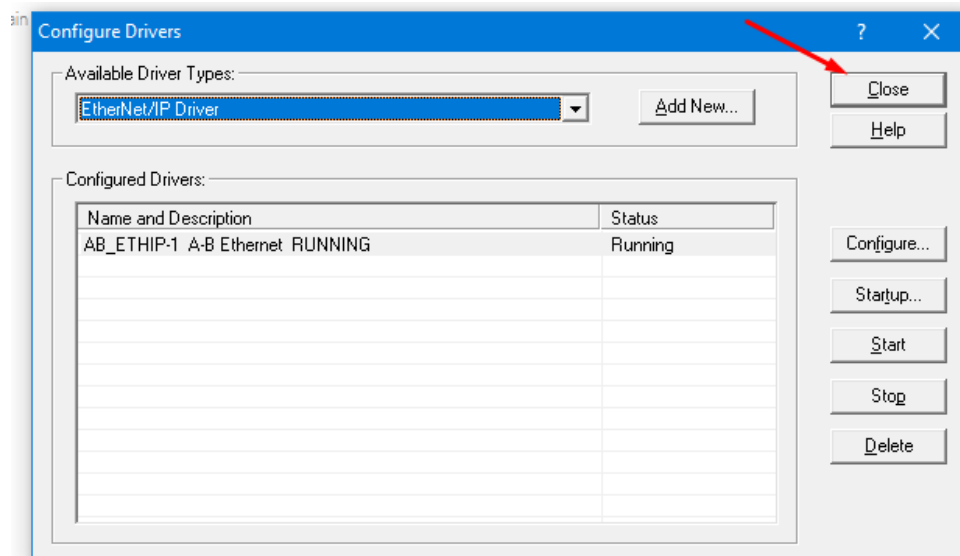
Figure 4-16: Closing Configure Drivers Window

8.   Click on **Device Toolbox** in the top right corner of CCW.

(If this is not shown in the top right corner of CCW, click menu item **View > Device Toolbox**.)
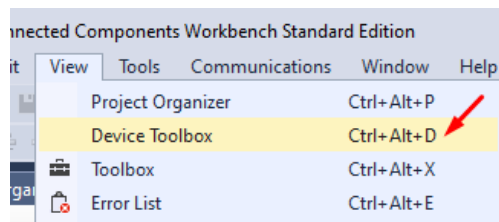
Figure 4-17: View > Device Toolbox

9.   Click on the **+** sign beside the **Discover** option.

10. Click **Browse Connections.**
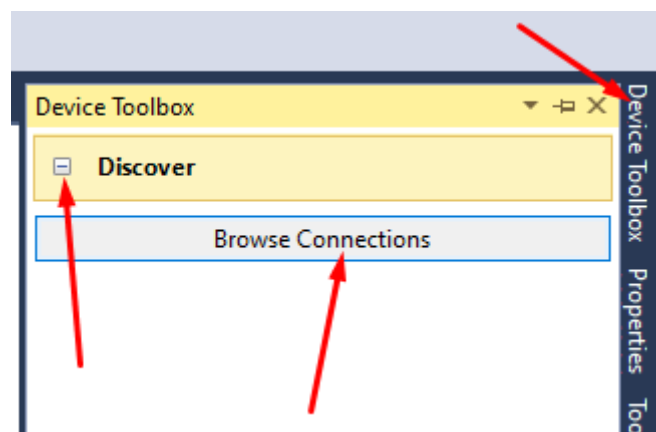
Figure 4-18: Device Toolbox

11. In the browser, you should see **AB_ETHIP-1**. Click the **+** sign beside it.

12. Select the **PowerFlex 755**, with the IP address that we set up for PF755 (**192.168.1.13**). This is the IP address we set up with the rotary switches for the drive's built-in Ethernet port.

    Then click **OK**.
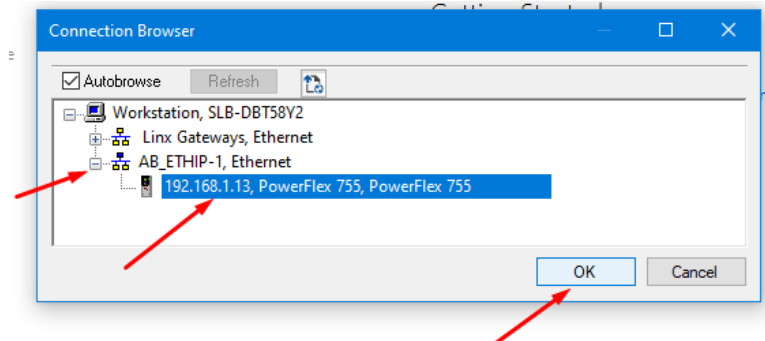
Figure 4-19: Connection Browser

CCW will attempt to connect to the drive.
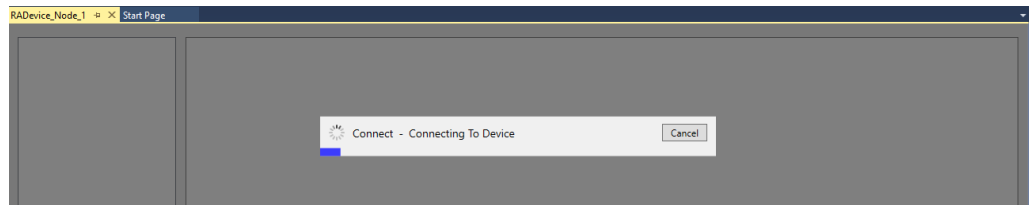
Figure 4-20: Connecting to Drive

13. Once communication with the drive is established, the drive configuration will be displayed. Confirm the drive configuration is correct.
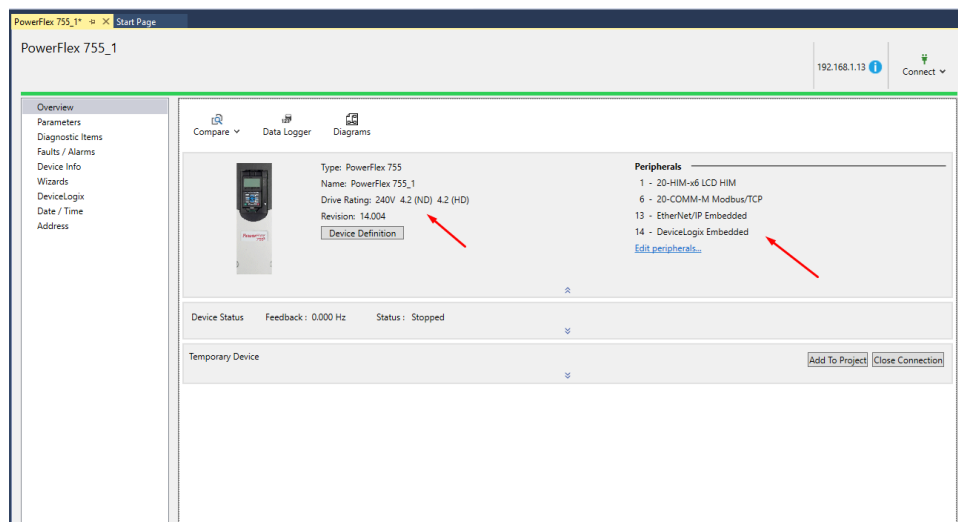
Figure 4-21: Drive Overview in CCW

4.4.2 CONFIGURING THE 20-COMM-M CARD

1. Click **Parameter** and filter out **6- 20-COMM-M.**
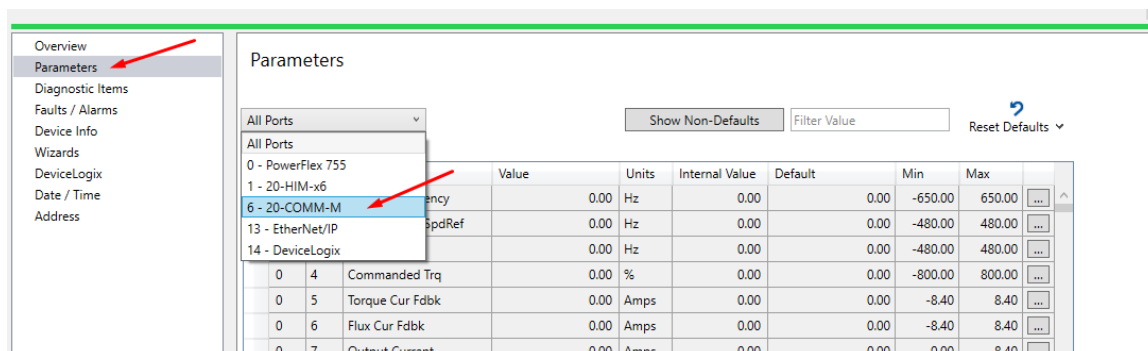
Figure 4-22: Parameter > 6-20-COMM-M

2. Set parameter Port **6**, **#3 (BootP)** to **0 Disabled.**
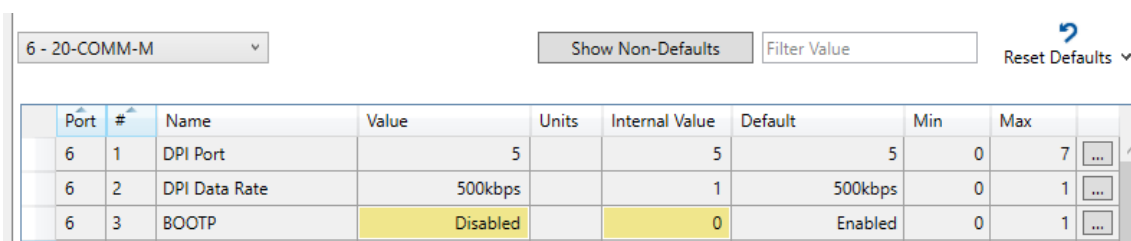
Figure 4-23: Disabling BOOTP

At this point, the 20-COMM-M card needs to be reset or power cycled for the new settings to take effect.

3. To reset, set parameter **P22 (Reset Module)** to **1**. Wait a few seconds for it to return to **0.**
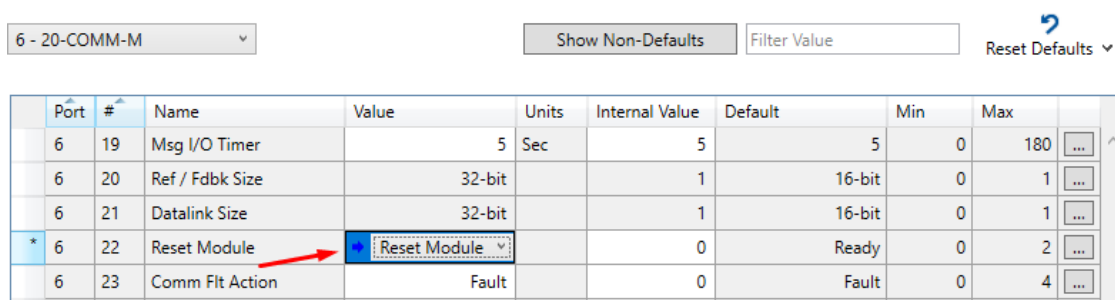
Figure 4-24: Reset Module

4. You can now set the IP address:

    a. Set parameters **P4 – P7 (IP Addr)** to **192.168.1.12**. This is the target address we set up in the Modbus TCP card.

    b. Set parameters **P8 – P11 (Subnet Cfg)** to **255.255.255.0.**

    c. Leave Parameters **P12 – P15 (Gateway Cfg)** at **0.0.0.0**.

Parameters

6 - 20-COMM-M				Show Non-Defaults	Filter Value		Reset Defaults v

Port	#	Name	Value	Units	Internal Value	Default	Min	Max	
6	1	DPI Port	6		6	5	0	7	...
6	2	DPI Data Rate	500kbps		1	500kbps	0	1	...
6	3	BOOTP	Disabled		0	Enabled	0	1	...
6	4	IP Addr Cfg 1	192		192	0	0	255	...
6	5	IP Addr Cfg 2	168		168	0	0	255	...
6	6	IP Addr Cfg 3	1		1	0	0	255	...
6	7	IP Addr Cfg 4	12		12	0	0	255	...
6	8	Subnet Cfg 1	255		255	0	0	255	...
6	9	Subnet Cfg 2	255		255	0	0	255	...
6	10	Subnet Cfg 3	255		255	0	0	255	...
6	11	Subnet Cfg 4	0		0	0	0	255	...
6	12	Gateway Cfg 1	0		0	0	0	255	...
6	13	Gateway Cfg 2	0		0	0	0	255	...
6	14	Gateway Cfg 3	0		0	0	0	255	...
6	15	Gateway Cfg 4	0		0	0	0	255	...

Figure 4-25: Setting IP Address, Subnet and Gateway of 20-COMM-M

5. The controller should start communicating with the drive. If it is not, cycle the power to the drive.

4.4.3   SAVING A PARAMETER FILE WITH CCW

1. Connect to the E30 drive using the **Discover** function.

	Connected Components Workbench Standard
File	Edit View Tools Communications
New...	Ctrl+N
Open...	Ctrl+O
Close	
Add Device...	
Discover...	**Ctrl+Alt+R**
Save	Ctrl+S
Save Project As...	
Import Project...	
Export Project...	
Import Device	▶
Recent Projects	▶
Sample Projects...	
Exit	Alt+F4
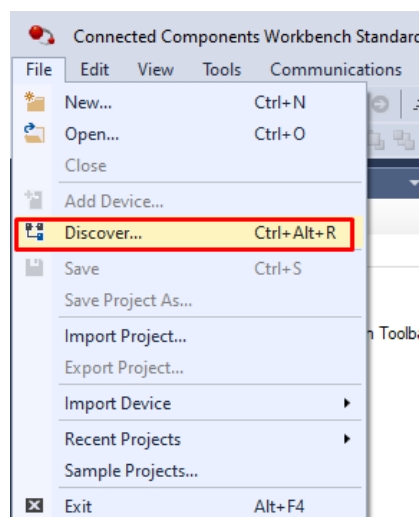
Figure 4-26: CCW Discover Function

2. In the **Overview** tree, click the **Add to Project** button in the **Temporary Device** group box.

NOTE	This action will automatically add the currently connected drive and its peripherals to a project.
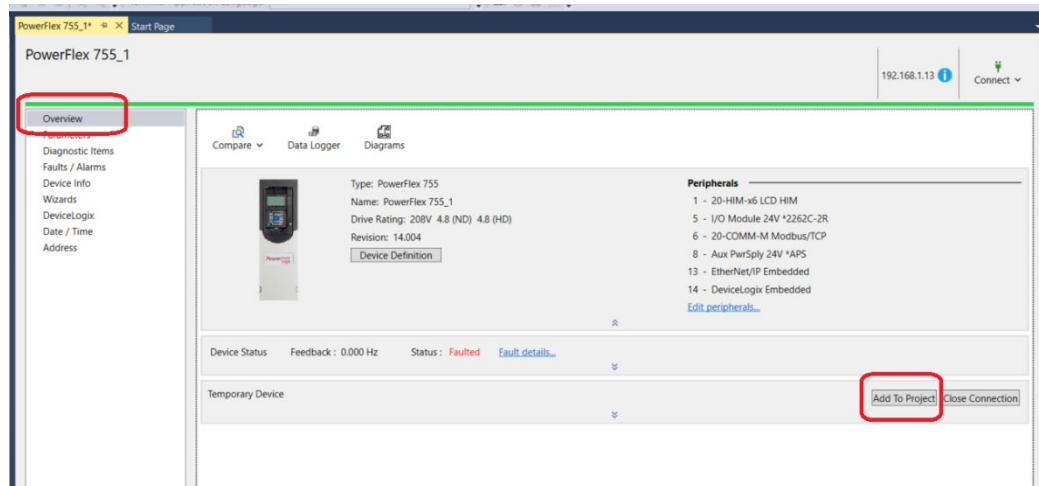
Figure 4-27: Add to Project

3. You can now export the project.

NOTE	Notice that the **Temporary Device** group box has disappeared. This is because we have already added the PF755 and peripherals to our project, which means it is no longer temporary.
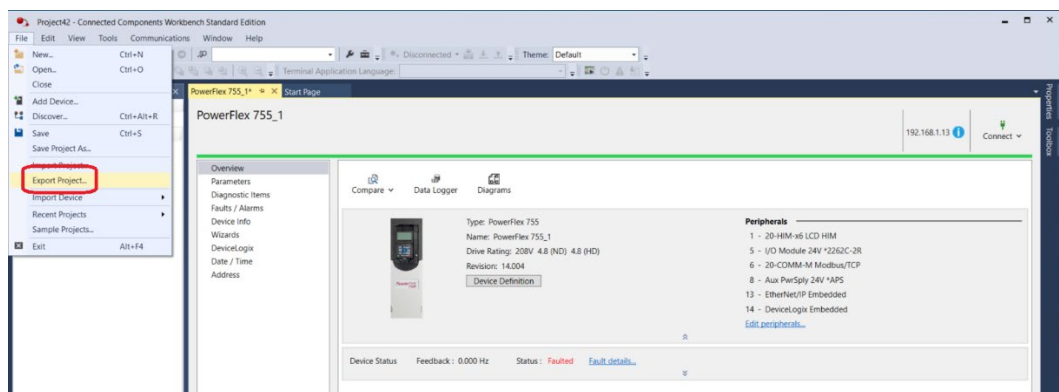
Figure 4-28: Export Project

Section 5: **VSD Setup**

Configure the **Device Function** where the drive is connected by selecting *Instruct E30* under **Function**.
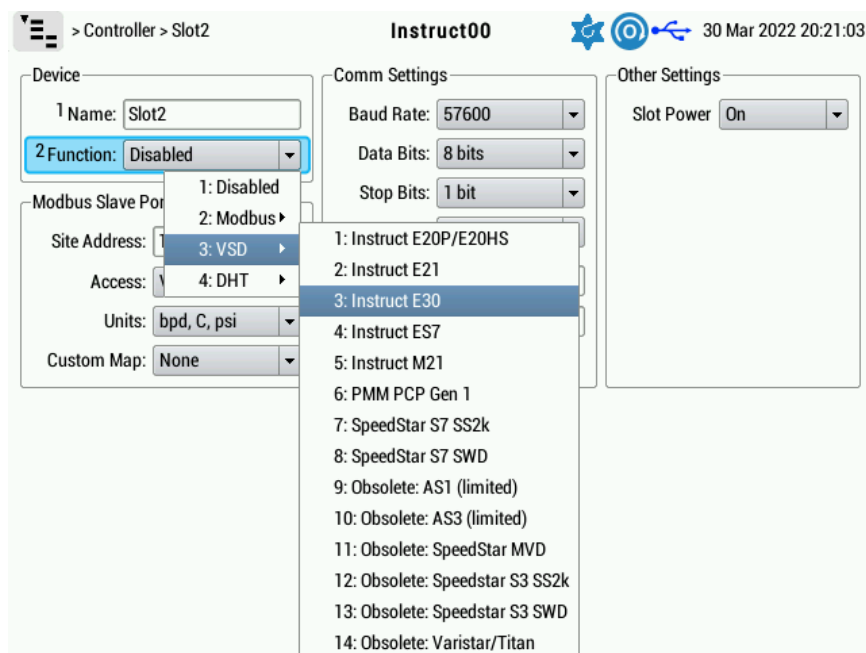
Figure 5-1: Controller Port Configuration

5.1   BASIC VSD CONFIGURATION

Access the following settings with the navigation sequence **Menu > VSD > Configure**.
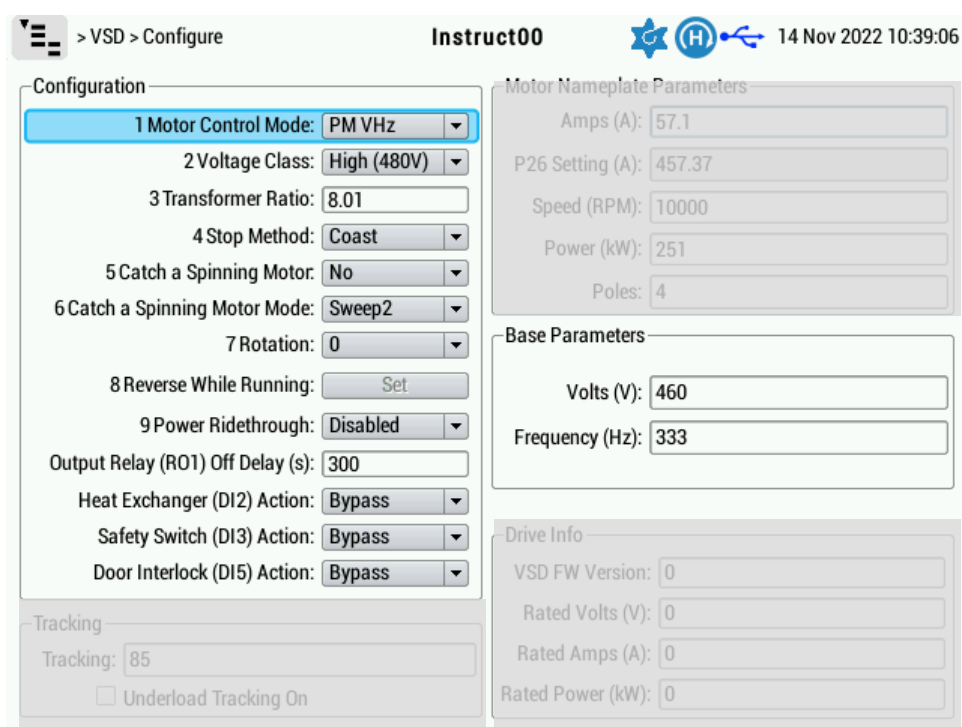
Figure 5-2: VSD Configuration

TERM	DEFINITION
Motor Control Mode	Selects the motor type and motor control mode. **InductionVHz:** Induction Motor, volts per Hertz control mode. **PM VHz:** Permanent Magnet Motor, volts per Hertz control mode. Available on FW 1.124r008 and higher
Voltage Class	Selects the voltage class operation of the drive. By default, this is set to 480V. If the supply voltage is 400V, user can change this setting to 400V to increase the drive ampacity. Before changing it to 400V, it is important to ensure all components in the drive package have enough capacity for this additional ampacity.
Transformer Ratio	This is determined by secondary voltage/primary voltage. Note this is the opposite of the way the ES7 VSDs are set up. For example, if the secondary voltage were 3000V and the primary voltage were 480V, the transformer ratio would be 6.25.
Stop Method	This parameter controls how the VSD stops the motor in a shutdown that is manually triggered or automatically triggered. The two options are: **Coast**: Power is removed from the motor allowing it to coast to a stop. **Decel**: The VSD powers the motor to a controlled stop according to deceleration time that is set.
Catch a Spinning Motor	This feature will catch the back-spinning ESP by first synchronizing the output speed with the drive output and bring the ESP back to zero speed before accelerating back up in the normal direction. As of this writing, this feature is not recommended to be used. ⚠️ **CAUTION** — **Potential Severity: Light** **Potential Loss: Assets, Process** **Hazard Category: Electrical** As of the release of this manual, this feature is not recommended to be used. If required, please contact LCS Support for further clarifications.
Catch A Spinning Motor Mode	This parameter sets the mode of CASM: **Enhanced**: This advanced mode performs the reconnect function quickly **Sweep:** This frequency sweep mode is used with output sine filter. **Sweep2:** This frequency sweep mode is used with output sine filter as well, and when the motor frequencies above 120Hz.
Rotation	Allows for a drive to operate in forward or reverse rotation of the ESP
Reverse while running	Selecting this feature will allow the ESP to reverse in the opposite direction while running. Once activated, the VSD first slows down the ESP to zero speed with the defined deceleration time, and then reverses the rotation bit and accelerates in the opposite direction with the defined acceleration time.
Power Ride Through	Enable or Disable the Power Ride Through feature of the VSD. When enabled, it allows a VSD to continue running through power sags without trips.
Output Relay (RO1) Off Delay (s)	Add off delay in seconds to the Relay RO1 of the drive IO card. This relay is to control the enclosure cooling fans.

TERM	DEFINITION
	Depending on construction of the drive, a physical off delay relay may be provided and connected to R01. This parameter can be set to 0 when a physical off delay relay is installed. Otherwise, the delay can be implemented in the software with this parameter.
Heat Exchanger (DI2) Action	Select the action for a heat exchanger alarm. This is a normally closed contact and connected to the DI2 of the drive I/O card. The action can be *1. Bypass*, *2. Log*, *3. Stop*, or *4. Stop and Log*.
Safety Switch (DI3) Action	Select the action for a safety switch alarm. This is a normally closed circuit and has contacts from step-up transformer door switch and auxiliary breaker of a 12-pulse drive connected in series. This circuit is connected to the DI3 of the drive I/O card. The action can be *1. Bypass, 2. Log, 3. Stop, or 4. Stop and Log*.
Door Interlock (DI5) Action	Select the action for a Door Interlock Bypassed. This is a normally opened contact and connected to the DI5 of the drive I/O card. The action can be *1. Bypass*, or *2. Log*.
Base Voltage	This parameter sets the maximum value of the output voltage of the drive. This value is the VSD output voltage at the base frequency. The output voltage should **never** be set higher than the input voltage. The actual output voltage will be influenced by the input voltage of the VSD. This parameter **cannot** be changed while the drive is running.
Base Frequency	This parameter sets the frequency at which the VSD is providing the maximum output voltage. This parameter **cannot** be changed while the drive is running.

5.1.1 MOTOR NAMEPLATE PARAMETERS

Figure 5-3: Asynchronous Configuration

Enter the motor nameplate parameters as required by the drive.

TERM	DEFINITION
Amps	Motor nameplate **Amps** This parameter **cannot** be changed while the drive is running.
P26 Setting	This is a read-only parameter which displays the motor nameplate **Amps** at the primary side of the step-up transformer. It is a reading of **Amps** multiplied by **Transformer Ratio**.
Speed	Motor nameplate speed in RPM. This parameter **cannot** be changed while the drive is running.
Power	Motor nameplate power in kW. This parameter **cannot** be changed while the drive is running.
Poles	Motor poles. This parameter **cannot** be changed while the drive is running.

NOTE	In the background, the controller uses the **Base Voltage** and **Base Frequenc**y values to set the motor nameplate voltage and frequency parameters in the E30 drive. The reason for doing this is that the drive uses the nameplate voltage and frequency to determine the V-Hz slope in the motor control. The **Base Voltage** and **Base Frequency** terminology will be more appropriate to users who are familiar with the controller operation.

5.2   STARTING FEATURES CONFIGURATION

1. Access the starting features with the navigation sequence **Menu > VSD > Expert**.

Figure 5-4: Starting Features

2. Set the **Rocking Cycles** to **0** to deactivate the rocking start. **Rocking Start** should only be used as a last resort for starting in case of a stuck pump or during a pump start-up in sanded well conditions.

3. Start the drive with default **Voltage Boost** of 1%. Should you encounter starting issues, increase this value gradually, i.e., 1 to 2%, and try starting again.

5.3   DRIVE RESET (ONLY WHEN NECESSARY)

In most of the cases, the drive and its peripherals reset is not required.

The drive reset is done directly through the drive's HIM panel or CCW bypassing the ESP controller. After resetting a drive's peripherals to factory default (in procedures 5.3.2 and 5.3.3), the ESP controller settings would be different from the peripherals' settings. When this happens, the controller will trigger *VSD SYNC* alarm when it starts the drive. One way to avoid this is to reconfigure the device function (per Section 4.1). When the device function is reconfigured, the Instruct would reinitialize itself and write back the settings to drive.

If the factory default reset is performed on 20-COMM-M card, the procedure in 4.4.2 shall be performed to configure back the 20-COMM-M card.

5.3.1   RESETTING THE DRIVE/ PERIPHERALS

The drive or any of its connected peripherals can be reset by removing and restoring power to the drive (power cycling). If this is not convenient or cannot be done because of application circumstances, the HIM can be used to reset the drive/peripherals. Follow these steps to reset the drive or any of its peripherals.

1. Access the **Status** screen on HIM.
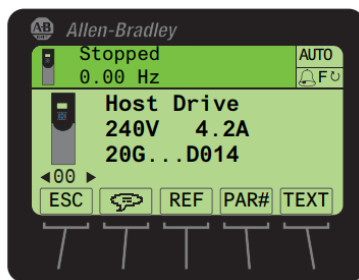
2. Use the ⟨4⟨ or ⟩6⟩ key to scroll to the port of the device you want to reset (for example, Port 00 for the host drive).

3. Press the 🗁 key to display its last-viewed folder.

4. Use the ⟨4⟨ or ⟩6⟩ key to scroll to the **DIAGNOSTIC** folder.

5. Use the ⌄2 or ⌃8 key to select **Reset Device**.

6. Press the ⑤ (**Enter**) key to display a popup dialog asking if you want to reset the device.

7. Press the **ENTER** soft key to affirm and reset the device or press the **ESC** soft key to cancel.

5.3.2   RESETTING TO FACTORY DEFAULTS (WITH HIM)

1. Access the **Status** screen on HIM.
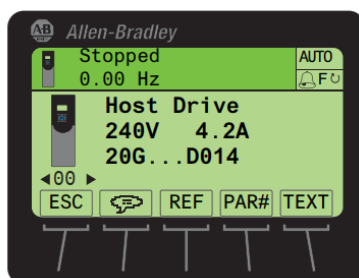
2. Use the 4◄ or ►6 key to scroll to the port of the device whose parameters you want to set to factory defaults (for example, Port 00 for the host drive or the respective port number for one of the drive's connected peripherals).

3. Press the 📁 key to display its last-viewed folder.

4. Use the 4◄ or ►6 key to scroll to the **MEMORY** folder.

5. Use the ▼2 or ▲8 key to select **Set Defaults**.

6. Press the 5 (**Enter**) key to display the **Set Defaults** popup box (see examples below).
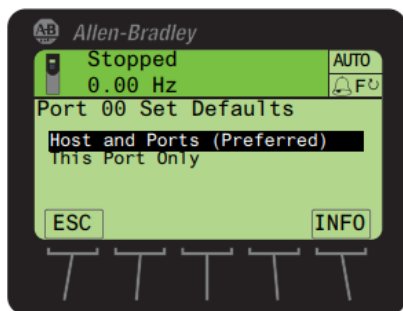
For Host Drive
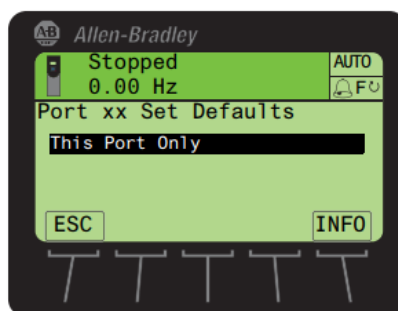
For Connected Peripheral

7. Use the ▼2 or ▲8 key to select the appropriate action.

    •   **Host and Ports (Preferred):** Selects the host device and all ports for a factory default action.

    •   **This Port Only**: Selects only this port for a factory default action.

NOTE	For a description of a selected menu item, press the **INFO** soft key.

8. Press the 5 (**Enter**) key to display the warning popup box to reset defaults.

'Host and Ports (Preferred)' Popup Box   'This Port Only' Popup Box
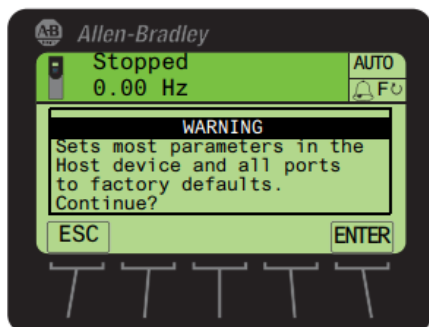
Press the **ENTER** soft key to affirm and set most parameters for the host drive and port devices to factory defaults — or press the **ESC** soft key to cancel
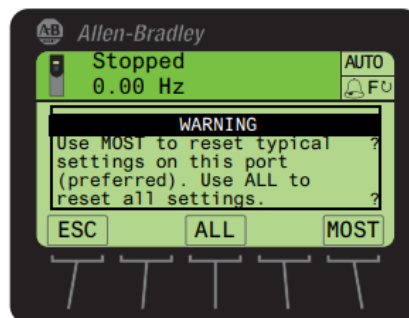
Press the **MOST** soft key to set most settings for the selected port device to factory defaults. Press the **ALL** soft key to set all settings for the selected port device to factory defaults—or press the **ESC** soft key to cancel.

5.3.3 RESETTING TO FACTORY DEFAULTS (WITH CCW)

1. To reset a port to factory default with CCW, click *Parameters*, then *Reset Defaults*.
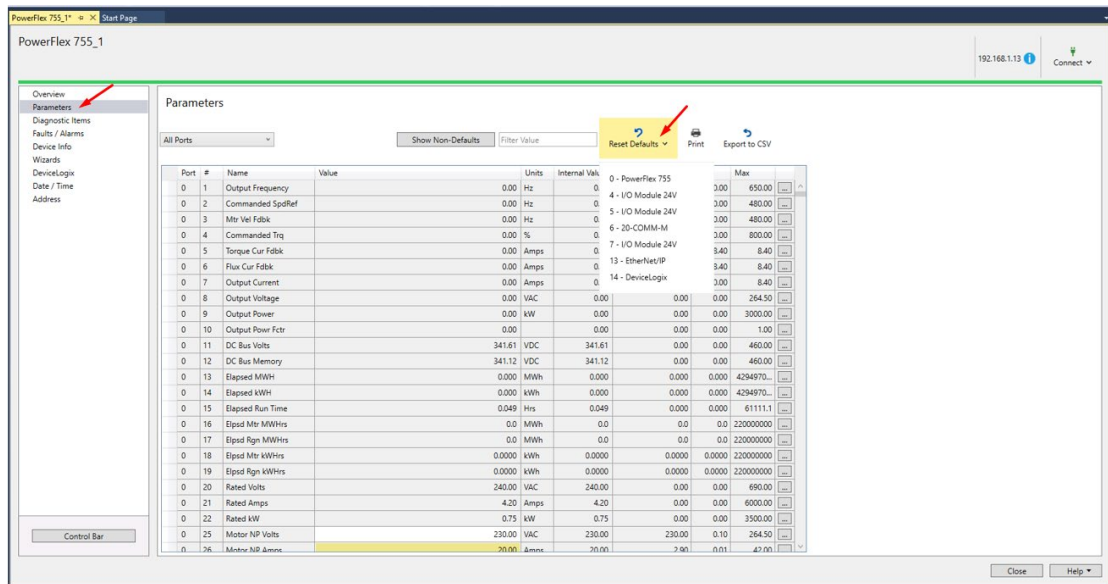
2. Select the Port that you would like to reset to default settings.
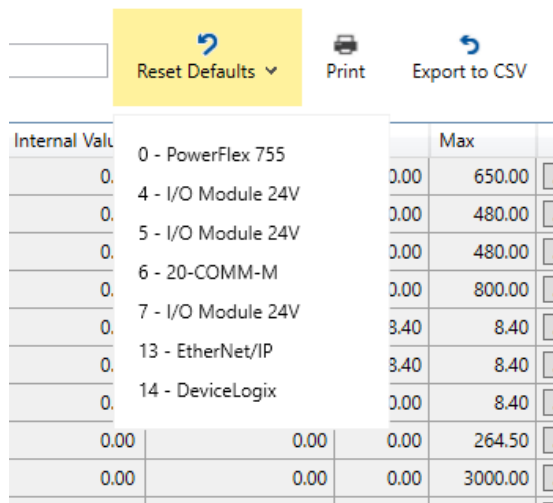
3. Click OK to proceed. Some port may provide more options for resetting to default.
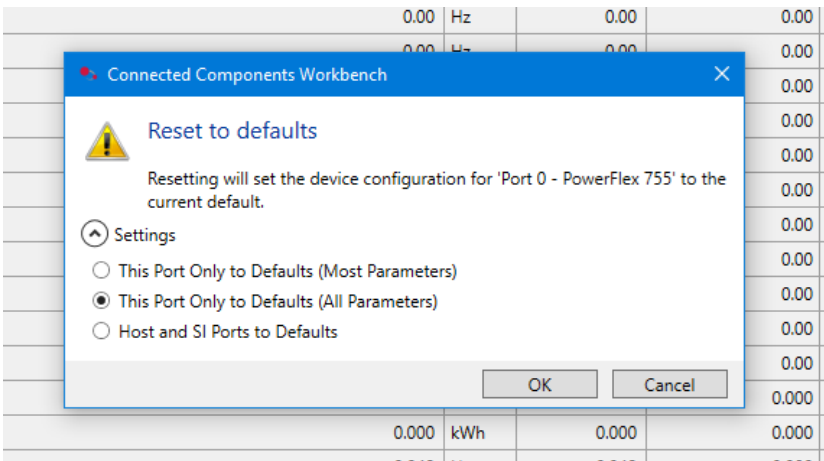
Section 6: **VSD Commissioning**

This section describes the procedures for starting up and commissioning new VSD installations.

6.1   CONTROLLER/VSD VERIFICATION

For the VSD, perform all relevant Start-up and Commissioning steps as detailed in the *INSTRUCT E30 Low Voltage VSD Manual* (LCS-ENG-M0006).

1. Verify that power is available on the controller. Simply check whether the **Power Status LED** is lit.

2. Verify that communication between the drive inverter control board and the controller is established properly. To do this, ensure that **VSD Comm (*)** alarm does not appear along with other active alarms. If **VSD Comm*** appears, go to the **Alarms** screen, and select **Unlatch**. Then ensure that the **VSD Comm (*)** alarm has disappeared.

NOTE	This step assumes that the controller has been set up properly for a VSD application. If communication was not set up for a VSD, **VSD Comm*** will not appear.

3. If the **VSD Comm** display still blinks, do the following.

    a. Check that the proper communication cable is used between the controller and the Drive Control Unit and that it is securely connected. Also ensure that the cable is firmly connected at both ends.

    b. If an option card is being used to interface with the VSD, ensure that the correct Communication Card is used, and it has been inserted properly into one of the controller expansion card slots. Both screws on the card face plate should be screwed in until the face plate is flush with the controller side wall.

    c. Check the **Function** setting of the communications port connected to the VSD or expansion card slot where the Communication Card is inserted. All default communication settings should be used. A factory reset may be required if they have been changed.

NOTE	This step assumes that the controller has been set up properly for a VSD application.

6.2   CONTROLLER PARAMETER SETUP

1. Go to the **VSD Speed** screen (**Menu > VSD > Speed**), and set at least the following parameters:

    - **VSD Speed Source**

      For most applications, setting this to **Target Speed** means the drive will run on the speed entered in **Target Speed** parameter. Setting this to **Analog In 1/2/3/4** means the running speed will be following the signal level connected to the selected Analog Input channel.

    - **Target Speed**

      Set as the desired operating speed.

    - **Maximum Speed**

      Set according to the application requirement.

    - **Minimum Speed**

      Set according to the application requirement.

        It should be set at the minimum frequency where the ESP can still pump fluid to surface. This needs to be confirmed through the DesignPro software or other sizing program.

    - **Start-up Frequency**

      Set according to the application requirement.
      It should be set between 7-10 Hz for most ESP applications, while around 3 Hz for PMM applications. Setting this too low could lead to the pump stalling during start-up.

- **Carrier Frequency**

    Set 2kHz, for operating frequency up to 120Hz.
    Set 4kHz, for operating frequency above 300Hz.
    For operating frequency between 120Hz to 300Hz, the optimum carrier frequency to be
    determined. Contact LCS Support for latest updates.

2. Go into the **VSD Time** screen (**Menu > VSD > Time**) and set the following parameters at the minimum.

   - **Ramp Frequency and Accel Time**

       Should be set to reflect how fast or slow the user would like to ramp up from **Start-Up Frequency** to **Target Speed**

   - **Decel Time**

       Should be set as per the formula shown in Table 2-1: VSD Control Parameters if **Stop Mode** is set to **DECEL**

   - **Access/Decel Pattern**

       Default should be set to **Linear**

3. Go to the **VSD Configure** screen (**Menu > VSD > Configure**) and set the parameters according to the application. Refer to Section 5:VSD Setup.

4. Go to the **VSD Expert** screen (**Menu > VSD > Expert**) and set the parameters according to the application.

5. Enable the **Tracking Underload** feature, which can be accessed through the **VSD Configure** screen (**Menu > VSD > Configure**).

6. Go to the **VSD Alarms** screen (**Menu > VSD > Alarms**), set the **Motor Current Hi** and **Motor Current Lo** setpoints, along with their associated protection setup: number of allowed auto restarts, auto restart delay, and bypass time during start-up. By default, for overload, the number of auto restart attempts should be set to zero.

7. Go to the **Controller Settings/Info** screen (**Menu > Controller > Settings/Info**), set the **Supply Voltage Hi** alarm and **Supply Voltage Lo** protection setpoints associated with **Supply Volt level**, along with their associated protection setup: number of allowed auto restarts, auto restart delay, and bypass time during start-up. This only applies to the controller supply voltage.

6.3   STARTUP PROCEDURES

To start up the controller, perform the following steps:

1. Ensure that all the steps in 6.1 Controller/VSD Verification have been carried out and no problems are encountered.

2. Set up the controller with all the minimum parameters described in 6.2 Controller Parameter Setup section.

3. Verify that no alarm(s) are active and/or latched and the unit is not locked out. If any of these condition(s) are active, unlock the unit, unlatch the active latched alarm(s), and clear all other active alarm(s) by rectifying their cause(s).

   a. Select **HAND/AUTO** operation mode, and then press **START**. If the unit is locked out or any alarm is still latched, the **START** button will not appear in the display when **HAND/AUTO** mode is selected.

   b. Calibrate the **VSD Motor Amps** reading by adjusting **Transformer Ratio**. Do this by comparing the displayed initial **VSD Motor Amps** value to the average of three-phase measured motor current obtained using a multimeter.

   c. Reset the **Underload** and **Overload** current settings of the VSD. The settings should be a percent of the stable **VSD Motor Amps** on the final set **Target Speed**.

- Underload = 85%

- Overload = 110%

d. Once all external signals and subsystems have been connected to the drive, run the drive for a reasonable period to confirm proper operation and that no faults or shutdowns occur.

e. Download the configuration/history/data for future reference.

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Appendix A: **Drive Warnings and Automatic Trips**

The controller provides several types of warnings and automatic trips. Refer to the following table:

TABLE A-1: WARNINGS AND AUTOMATIC TRIPS

Alarm 1	Alarms of type 1 indicate that a condition exists. Type 1 alarms are configurable.
Alarm 2	Alarms of type 2 indicate that a configuration error exists, and the drive cannot be started. Type 2 alarms are non-configurable.
Configurable	The parameter identified in the *Configuration Parameter* column in the following tables enables/disables the event action. The available options are: • Ignore (0) – No action is taken • Alarm (1) – Type 1 alarm indicated • Flt Minor (2) – Minor fault indicated. If running, drive continues to run • Enable with P950 [Minor Flt Cfg] – If not enabled, acts like a major fault • FltCoastStop (3) – Major fault indicated. Coast to Stop • Flt RampStop (4) – Major fault indicated. Ramp to Stop • Flt CL Stop (5) – Major fault indicated. Current Limit Stop • FltNonRest (6) – Major fault indicated. Cycle power to clear the fault
Resettable	This type of fault can be cleared. The *Resettable Fault* entry in the *Type* column identifies a resettable fault.
Non-resettable	This type of fault normally requires drive or motor repair. The cause of the fault must be corrected before the fault can be cleared. The fault will be reset on power-up after repair. The *Non-reset Fault* entry in the *Type* column identifies a non-resettable fault.

This appendix groups information about the drive warning and trip parameters by their event numbers.

NOTE	Event No. 0 (zero) does not have an entry.

You must have CCW to access these parameters. You use the controller to update most the following parameters.

Event No.	2	**Configuration Parameter**	157 [DI Aux Fault]
Fault/Alarm Text	Auxiliary Input	**Auto Reset**	Yes
Type	Resettable Fault	**Auto Clear**	Yes
Fault Action	Coast	**Emergency Protection Override**	Bit 5 "PERIFFits"
Description/Actions			
An auxiliary input interlock is open. A condition within the application is not allowing the drive to energize the motor, and the digital input that is assigned in P157 [DI Aux Fault] has forced this fault.			

Event No.	3	Configuration Parameter	449 [Power Loss Actn]
Fault/Alarm Text	Power Loss	Auto Reset	Yes
Type	Configurable	Auto Clear	Yes
Fault Action	N/A	Emergency Protection Override	Bit 1 "Line Faults"
Description/Actions			

The DC bus voltage remained below the [Pwr Loss n Level] of nominal for longer than the time programmed in [Pwr Loss n Time].

Event No.	4	Configuration Parameter	460 [UnderVltg Action]
Fault/Alarm Text	UnderVoltage	Auto Reset	Yes
Type	Configurable	Auto Clear	Yes
Fault Action	N/A	Emergency Protection Override	Bit 1 "Line Faults"
Description/Actions			

If the bus voltage indicated in P11 [DC Bus Volts] falls below the value set in P461 [UnderVltg Level] an undervoltage condition exists.

Event No.	5	Configuration Parameter	N/A
Fault/Alarm Text	OverVoltage	Auto Reset	Yes
Type	Resettable Faults	Auto Clear	Yes
Fault Action	Coast	Emergency Protection Override	Bit 1 "Line Faults"
Description/Actions			

The DC bus voltage exceeded the maximum value. See P11 [DC Bus Volts].

Event No.	7	Configuration Parameter	410 [Motor OL Actn]
Fault/Alarm Text	Motor Overload	Auto Reset	Yes
Type	Configurable	Auto Clear	Yes
Fault Action	N/A	Emergency Protection Override	Bit 0 "Load Faults
Description/Actions			

An internal electronic overload trip has occurred. See P7 [Output Current], P26 [Motor NP Amps, P413 [Mtr OL Factor], and/or P414 [Mtr OL Hertz].

Event No.	8	Configuration Parameter	N/A
Fault/Alarm Text	Heatsink OvrTemp	Auto Reset	Yes
Type	Resettable Fault	Auto Clear	Yes
Fault Action	Coast	Emergency Protection Override	Bit 2 "PwrStrucFlts"
Description/Actions			

The heatsink temperature has exceeded 100% of the drive temperature. Heatsink over temperature occurs between 115–120 °C. The exact value is stored in drive firmware. See P943 [Drive Temp Pct] and/or P944 [Drive Temp C].

Event No.	9	Configuration Parameter	N/A
Fault/Alarm Text	Trnsistr OvrTemp	Auto Reset	Yes
Type	Resettable Fault	Auto Clear	Yes
Fault Action	Coast	Emergency Protection Override	N/A
Description/Actions			

The output transistors have exceeded the maximum operating temperature. See P941 [IGBT Temp Pct] and/or P942 [IGBT Temp C]. If using the drive on a chiller plate, P38 [PWM Frequency] must be set to 2 kHz.

Event No.	10	Configuration Parameter	N/A
Fault/Alarm Text	DynBrake OvrTemp	Auto Reset	N/A
Type	Alarm 1	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			

The dynamic brake resistor has exceeded its maximum operating temperature. Check settings of parameters P382 [DB Resistor Type] through P385 [DB ExtPulseWatts].

Event No.	12	Configuration Parameter	N/A
Fault/Alarm Text	HW OverCurrent	Auto Reset	Yes
Type	Resettable Fault	Auto Clear	Yes
Fault Action	Coast	Emergency Protection Override	Bit 0 "Load Faults"
Description/Actions			

The drive output current has exceeded the hardware current limit. Check the motor and external wiring to the drive output terminals for a grounded condition. Check the programming. Check for excess load, and other causes of excess current. Perform Insulation Resistance (IR) test the wiring to motor.

Event No.	13	Configuration Parameter	N/A
Fault/Alarm Text	Ground Fault	Auto Reset	Yes
Type	Resettable Fault	Auto Clear	Yes
Fault Action	Coast	Emergency Protection Override	Bit 0 "Load Faults
Description/Actions			

A current path to earth ground greater than 25% of drive rating has occurred. Check the motor and external wiring to the drive output terminals for a grounded condition. Check the programming. Check for excess load, and other causes of excess current. Perform Insulation Resistance (IR) test the wiring to motor.

Event No.	14	Configuration Parameter	466 [Ground Warn Actn]
Fault/Alarm Text	Ground Warning	Auto Reset	N/A
Type	Configurable	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	Bit 0 "Load Faults"
Description/Actions			

The ground current has exceeded the level set in P467 [Ground Warn Lvl].

Event No.	15	Configuration Parameter	441 [Load Loss Action]
Fault/Alarm Text	Load Loss	Auto Reset	N/A
Type	Configurable	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	Bit 0 "Load Faults"
Description/Actions			

The output torque current is below the value programmed in P442 [Load Loss Level] for a time greater than the time programmed in P443 [Load Loss Time].

Event No.	17	Configuration Parameter	462 [InPhase LossActn]
Fault/Alarm Text	Input Phase Loss	Auto Reset	N/A
Type	Configurable	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	Bit 1 "Line Faults"
Description/Actions			

The DC bus ripple has exceeded a preset level. Make these checks and adjustments in this order:

- Check input impedance balance.

- Increase the setting of P463 [InPhase Loss Lvl] to make the drive less sensitive.

- Tune the bus regulator or speed regulator to mitigate the effects of dynamic cyclic loads on DC bus ripple.

- Disable the fault by setting P462 [InPhase LossActn] to 0 "Ignore" and use an external phase loss detector such as a Bulletin 809S relay.

Event No.	18	Configuration Parameter	250 [PTC Cfg]
Fault/Alarm Text	Motor PTC Trip	Auto Reset	Yes
Type	Configurable	Auto Clear	Yes
Fault Action	N/A	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			

Motor PTC (Positive Temperature Coefficient) over temperature.

Event No.	19	Configuration Parameter	N/A
Fault/Alarm Text	Task Overrun	Auto Reset	N/A
Type	Alarm 1	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			

System resource utilization is at or above 90% of capacity.

Event No.	20	Configuration Parameter	N/A
Fault/Alarm Text	TorqPrySpd Band	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 10 "TorgPrvFlts"
Description/Actions			

The difference between P2 [Commanded SpdRef] and P3 [MtrVel Fdbk] has exceeded the level programmed in P1105 [Speed Dev Band] for a time greater than the time programmed in P1106 [SpdBand Intgrtr].

Event No.	21	Configuration Parameter	444 [OutPhaseLossActn]]
Fault/Alarm Text	Output PhaseLoss	Auto Reset	Yes
Type	Configurable	Auto Clear	Yes
Fault Action	N/A	Emergency Protection Override	Bit 0 "Load Faults"
Description/Actions			

The current in one or more phases has been lost or remains below the threshold set in P445 [Out PhaseLossLvl] for 1 second. Decreasing the threshold makes the drive less sensitive to tripping. A decreased threshold is necessary when the motor is smaller than the drive rating.

If TorqProve™ is active, the current in one or more phases has been lost or remains below a threshold for five msecs. The phases are checked at start to be sure that torque is delivered to the load. If the drive is faulting on start, increase P44 [FluxUp Time].

If TorqProve is active, and the brake is slipping, this fault occurs. When TorqProve is used, before the signal to the brake is applied to release it, the flux-up time is used to check the three phases. The angle is adjusted to be sure that current is flowing through all three phases. If the motor moves during this test, the brake is not holding, and a phase loss can occur. If TorqProve is active, and no brake is present, this fault occurs.

Check for an open output contactor.

ATTENTION: If a PM motor is used and motor phase is lost, lower P445 [OutPhaseLossLvl] to 0 if TorqProve is not used or the drive output (motor) contacts are not used. Otherwise, lower P445 [OutPhaseLossLvl] until the drive can start and run without faulting.

Event No.	24	Configuration Parameter	409 [Dec Inhibit Actn]]
Fault/Alarm Text	Decel Inhibit	Auto Reset	N/A
Type	Configurable	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	Bit 0 "Load Faults"
Description/Actions			

The drive is not following a commanded deceleration because it is attempting to limit the bus voltage.

For high inertia loads, set P621 [Slip RPM at FLA] to 0 (V/Hz and SVC modes only).

Event No.	25	Configuration Parameter	N/A
Fault/Alarm Text	OverSpeed Limit	Auto Reset	Yes
Type	Resettable Fault	Auto Clear	Yes
Fault Action	Coast	Emergency Protection Override	Bit 0 "Load Faults"
Description/Actions			

The motor operating speed exceeds the limit set by the maximum speed setting P524 [Overspeed Limit]. For forward motor rotation, this limit is P520 [Max Fwd Speed] + P524 [Overspeed Limit]. For reverse motor rotation, this limit is P521 [Max Rev Speed] - P524 [Overspeed Limit]. When flux vector control modes are selected in P35 [Motor Ctrl Mode], P131 [Active Vel Fdbk] determines the motor operating speed. For all other non-flux vector control modes, P1 [Output Frequency] determines the motor operating speed.

Event No.	26	Configuration Parameter	N/A
Fault/Alarm Text	Brake Slipped	Auto Reset	N/A
Type	Alarm 1 Alarm 2	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			

Alarm 1 Type:

The encoder movement has exceeded the level in P1110 [Brk Slip Count] after the brake was set and the brake slip maneuver is controlling the drive. (Drive is active.) Cycle power to the drive to reset.

Alarm 2 Type:

The encoder movement has exceeded the level in P1110 [Brk Slip Count] after the brake was set and the brake slip maneuver is finished. (Drive is stopped.) Cycle power to the drive to reset.

Event No.	27	**Configuration Parameter**	N/A
Fault/Alarm Text	Torq Prove Cflct	**Auto Reset**	N/A
Type	Alarm 2	**Auto Clear**	N/A
Fault Action	N/A	**Emergency Protection Override**	N/A
Description/Actions			

When P1100 [Trq Prove Cfg] is enabled, these parameters must be properly configured:

• P35 [Motor Ctrl Mode]

• P125 [Pri Vel Fdbk Sel] and P135 [Mtr Psn Fdbk Sel] must be set to a valid feedback device. The feedback device does not have to be the same device. However, Open Loop and Simulation Feedback are not considered valid feedback devices.

If parameters 125 and 135 are set to a feedback module, verify that the module parameters are set properly. On the module, the feedback loss action CANNOT be set to 0 "Ignore." It does not work in PM FV mode, and it does not work with single-ended or channel A only encoders.

Event No.	28	**Configuration Parameter**	N/A
Fault/Alarm Text	TP Encls Config	**Auto Reset**	N/A
Type	Alarm 2	**Auto Clear**	N/A
Fault Action	N/A	**Emergency Protection Override**	N/A
Description/Actions			

Encoderless TorqProve has been enabled but the application concerns of encoderless operation have not read and understood.

Event No.	29	**Configuration Parameter**	263 [Anlg In0 LssActn]
Fault/Alarm Text	Analog in Loss	**Auto Reset**	N/A
Type	Configurable	**Auto Clear**	N/A
Fault Action	N/A	**Emergency Protection Override**	Bit 8 "Board Faults"
Description/Actions			

Analog input has a lost signal.

Event No.	30	Configuration Parameter	292 [R00 LifeEvntActn]]
Fault/Alarm Text	Relay0 Life	Auto Reset	N/A
Type	Configurable	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			
Predictive maintenance			

Event No.	33	Configuration Parameter	348 [Auto Restrt Tries]
Fault/Alarm Text	AuRsfs Exhausted	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			
The drive unsuccessfully attempted to reset a fault and resume running for the programmed number of tries.			

Event No.	34	Configuration Parameter	438 [Power Loss Actn]
Fault/Alarm Text	AutClrFltExhaust	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 8 "Board Faults""
Description/Actions			
Auto Clear Faults Exhausted This fault indicates when the running Auto clear faults retry value has exceeded parameter 338 [AutoClrFlt Tries], provided bit 1 in parameter 347 [Auto Retry Fault] is set.			

Event No.	35	Configuration Parameter	N/A
Fault/Alarm Text	IPM OverCurrent	Auto Reset	Yes
Type	Resettable Fault	Auto Clear	Yes
Fault Action	Coast	Emergency Protection Override	Bit 0 "Load Faults"
Description/Actions			
The current magnitude has exceeded the trip level set by P1640 [IPM Max Cur]. Set this value to 0 only when the drive is set to the V/Hz or SVC mode.			

Event No.	36	Configuration Parameter	N/A
Fault/Alarm Text	SW Overcurrent	Auto Reset	Yes
Type	Resettable Fault	Auto Clear	Yes
Fault Action	Coast	Emergency Protection Override	Bit 0 "Load Faults""
Description/Actions			

The drive output current has exceeded the 1 ms current rating. This rating is greater than the 3 second current rating and less than the hardware overcurrent fault level. It is typically 200–250% of the drive continuous rating.

Event No.	Fault/Alarm Text	Type	Fault Action	Auto Reset	Auto Clear	Emergency Protection Override
38	Phase U to Grnd	Resettable Fault	Coast	N/A	N/A	Bit O "Load Faults"
39	Phase V to Grnd					
40	Phase W to Grnd					
Description/Actions						

A phase to ground fault has been detected between the drive and motor in this phase. Rotate U/T1, V/T2, W/T3 connections.

- If the problem follows the wire, suspect a field wiring problem.
- If no change, suspect a problem with the drive.

Event No.	Fault/Alarm Text	Type	Fault Action	Auto Reset	Auto Clear	Emergency Protection Override
41	Phase UV Short	Resettable Fault	Coast	N/A	N/A	Bit O "Load Faults"
42	Phase VW Short					
43	Phase WU Short					
Description/Actions						

Excessive current has been detected between these two output terminals. Rotate U/T1, V/T2, W/T3 connections.

- If the problem follows the wire, suspect a field wiring problem.
- If no change, suspect a problem with the drive.

Event No.	Fault/Alarm Text	Type	Fault Action	Auto Reset	Auto Clear	Emergency Protection Override
44	Phase UNegToGrnd	Resettable Fault	Coast	N/A	N/A	Bit O "Load Faults"
45	Phase VNegToGrnd					
46	Phase WNegToGrnd					
		Description/Actions				

A phase to ground fault has been detected between the drive and motor in this phase. Rotate U/T1, V/T2, W/T3 connections.

- If the problem follows the wire, suspect a field wiring problem.

- If no change, suspect a problem with the drive.

Event No.	48	**Configuration Parameter**	N/A
Fault/Alarm Text	System Defaulted	**Auto Reset**	N/A
Type	Resettable Fault	**Auto Clear**	N/A
Fault Action	Coast	**Emergency Protection Override**	Bit 8 "Board Faults"
	Description/Actions		

The drive was commanded to write default values.

Event No.	49	**Configuration Parameter**	N/A
Fault/Alarm Text	Drive Powerup	**Auto Reset**	N/A
Type	N/A	**Auto Clear**	N/A
Fault Action	N/A	**Emergency Protection Override**	N/A
	Description/Actions		

A Power Up Marker in the Fault Queue indicating that the drive power cycled

Event No.	51	**Configuration Parameter**	N/A
Fault/Alarm Text	Clr Fault Queue	**Auto Reset**	N/A
Type	N/A	**Auto Clear**	N/A
Fault Action	N/A	**Emergency Protection Override**	N/A
	Description/Actions		

Indication that the fault queue has been cleared

Event No.	55	Configuration Parameter	N/A
Fault/Alarm Text	Clr Bd Overtemp	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			

The temperature sensor on the main control board detected excessive heat.

Event No.	58	Configuration Parameter	N/A
Fault/Alarm Text	Module Defaulted	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			

The module was commanded to write default values.

Event No.	59	Configuration Parameter	N/A
Fault/Alarm Text	Invalid Code	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			

Internal error

Event No.	61	Configuration Parameter	435 [Shear Pin 1 Actn]
Fault/Alarm Text	Shear Pin 1	Auto Reset	Yes
Type	Configurable	Auto Clear	Yes
Fault Action	N/A	Emergency Protection Override	Bit 0 "Load Faults"
Description/Actions			

The programmed value in P436 [Shear Pin1 Level] has been exceeded.

Event No.	62	Configuration Parameter	438 [Shear Pin 1 Actn]
Fault/Alarm Text	Shear Pin 2	Auto Reset	Yes
Type	Configurable	Auto Clear	Yes
Fault Action	N/A	Emergency Protection Override	Bit 0 "Load Faults"
Description/Actions			
The programmed value in P439 [Shear Pin2 Level] has been exceeded.			

Event No.	Fault/Alarm Text	Type	Fault Action	Auto Reset	Auto Clear	Emergency Protection Override
64	Drive Overload	Alarm 1	N/A	N/A	N/A	N/A
		Resettable Fault	Coast	Yes	Yes	Bit 2 "PwrStrucflts"
Description/Actions						

Alarm 1 Type:

P940 [Drive OL Count] has exceeded 50 % but is less than 100 %.

Resettable Fault Type and Coast Fault Action:

P940 [Drive OL Count] has exceeded 100 %. Reduce the mechanical load on the drive. Inverter fiber-optic connection is not detected on Frame 8 drive.

This fault can occur on power-up if the control detects that no inverter is detected via the fiber-optic communication on a Frame 8 drive.

Event No.	66	Configuration Parameter	1172 [TorqAlarmLevel]
Fault/Alarm Text	OW Torq Level	Auto Reset	N/A
Type	Alarm 1	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			
Oil Well Torque Level If the Torque goes above P1172 [TorqAlarm Level] then the alarm condition exists.			

Event No.	67	Configuration Parameter	N/A
Fault/Alarm Text	Pump Off	Auto Reset	N/A
Type	Alarm 1	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			
Pump Off condition has been detected.			

Event No.	68	Configuration Parameter	1185 [TorgAlarmLoLvl]
Fault/Alarm Text	OW Torq Level Lo	Auto Reset	N/A
Type	Alarm 1	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			
Oil Well Torque Level Low If the Torque goes below P1185 [TorqAlarm LoLvl] then the alarm condition exists.			

Event No.	71	Configuration Parameter	N/A
Fault/Alarm Text	Port 1 Adapter	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 11 "Port1-3 Flts"
Description/Actions			
The DPI communications option has a fault. See device event queue.			

Event No.	Fault/Alarm Text	Type	Fault Action	Auto Reset	Auto Clear	Emergency Protection Override
72	Port 2 Adapter	N/A	N/A	N/A	N/A	Bit 11 "Port1-3 Flts"
73	Port 3 Adapter	N/A	N/A	N/A	N/A	Bit 11 "Port1-3 Flts"
74	Port 4 Adapter	N/A	N/A	N/A	N/A	Bit 12 "Port 4 Flts"
75	Port 5 Adapter	N/A	N/A	N/A	N/A	Bit 13 "Port 5 Flts
76	Port 6 Adapter	N/A	N/A	N/A	N/A	Bit 14 "Port 6 Flts
Description/Actions						
The DPI communications option has a fault. See device event queue.						

Event No.	Fault/Alarm Text	Type	Fault Action	Auto Reset	Auto Clear	Emergency Protection Override
77	IR Volts Rage	Alarm 2	N/A	N/A	N/A	N/A
		Resettable Fault	Coast	N/A	N/A	Bit 8 "Board Faults"
Description/Actions						

Alarm 2 Type:

The value for P73 [IR Voltage Drop], which is calculated from the motor nameplate data, is not within the range of acceptable values, as determined by the Calculated Autotune procedure.

Check the motor nameplate data against parameters P25 [Motor NP Volts] through P30 [Motor NP Power].

Resettable Fault Type and Coast Fault Action:

The measured value for P73 [IR Voltage Drop] is not within the range of acceptable values, as determined by the Static or Rotate Autotune procedure.

Event No.	Fault/Alarm Text	Type	Fault Action	Auto Reset	Auto Clear	Emergency Protection Override
78	FluxAmpsRef Range	Alarm 2	N/A	N/A	N/A	N/A
		Resettable Fault	Coast	N/A	N/A	Bit 8 "Board Faults"
Description/Actions						

For the Alarm 2 Type:

The value for flux amps exceeds the value programmed in P26 [Motor NP Amps], as calculated by the Autotune procedure.

Check motor nameplate data against parameters P25 [Motor NP Volts] through P30 [Motor NP Power]

For the Resettable Fault Type and Coast Fault Action:

The value for flux amps exceeds the value programmed in P26 [Motor NP Amps], as measured by the Static or Rotate Autotune procedure.

Event No.	79	Configuration Parameter	N/A
Fault/Alarm Text	Excessive Load	**Auto Reset**	N/A
Type	Resettable Fault	**Auto Clear**	N/A
Fault Action	Coast	**Emergency Protection Override**	Bit 8 "Board Faults"
Description/Actions			

The motor did not come up to speed in the allotted time during Autotune.

Event No.	80	Configuration Parameter	N/A
Fault/Alarm Text	AutoTune Aborted	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			
The Autotune function was manually cancelled, or a fault occurred.			

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
81	Port 1 DPI Loss	Resettable Fault	Coast	324 [Logic Mask]	N/A	N/A	Bit 11 "Port1-3 Flts"
82	Port 2 DPI Loss	N/A	N/A	N/A	N/A	N/A	Bit 11 "Port1-3 Flts"
83	Port 3 DPI Loss	N/A	N/A	N/A	N/A	N/A	Bit 11 "Port1-3 Flts"
84	Port 4 DPI Loss	N/A	N/A	N/A	N/A	N/A	Bit 12 "Port 4 Flts
85	Port 5 DPI Loss	N/A	N/A	N/A	N/A	N/A	Bit 13 "Port 5 Flts
86	Port 6 DPI Loss	N/A	N/A	N/A	N/A	N/A	Bit 14 "Port 6 Flts
Description/Actions							
The DPI port stopped communicating. Check connections and drive grounding.							

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
87	IXo VoltageRange	Alarm 2	N/A	N/A	N/A	N/A	N/A
		Resettable Fault	Coast	N/A	N/A	N/A	Bit 8 "Board Faults"
Description/Actions							

For the Alarm 2 Type:

The default for P70 [Autotune] is 1 "Calculate" and the voltage that is calculated for motor inductive impedance exceeds 25 % of the value of P25 [Motor NP Volts].

For the Resettable Fault Type and Coast Fault Action:

P70 [Autotune] is set to 2 "Static Tune" or 3 "Rotate Tune" and the voltage that is measured for motor inductive impedance exceeds 25 % of the value of P25 [Motor NP Volts].

Event No.	91	Configuration Parameter	See option module for configuration parameter number.
Fault/Alarm Text	Pri VelFbak Loss	Auto Reset	N/A
Type	Configurable	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	Bit 9 "Fdbk Faults"
Description/Actions			

A Feedback Loss has been detected for the source of P127 [Pri Vel Feedback]. The feedback loss could be due to a problem detected by the feedback option module selected by P125 [Pri Vel Fdbk Sel] or due to a loss in communication between the feedback option module and main control board. The source of primary velocity feedback must be configured not to fault if the feedback loss switchover feature is used.

Event No.	93	Configuration Parameter	N/A
Fault/Alarm Text	Hw Enable Check	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			

The hardware enable is disabled (a jumper is installed) but indicates not enabled

Event No.	94	Configuration Parameter	See option module for configuration parameter number.
Fault/Alarm Text	Alt VelFdbk Loss	Auto Reset	N/A
Type	Configurable	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	Bit 9 "Fdbk Faults"
Description/Actions			

A Feedback Loss has been detected for the source of P128 [Alt Vel Fdbk Sel]. The feedback loss could be due to a problem detected by the feedback option module selected by P128 [Alt Vel Fdbk Sel], or due to a loss in communication between the feedback option module and main control board.

Event No.	95	Configuration Parameter	See option module for configuration parameter number.
Fault/Alarm Text	Aux VelFdbk Loss	Auto Reset	N/A
Type	Configurable	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	Bit 9 "Fdbk Faults"
Description/Actions			

A Feedback Loss has been detected for the source of P132 [Aux Vel Fdbk Sel]. The feedback loss could be due to a problem detected by the feedback option module selected by P132 [Aux Vel Fdbk Sel], or due to a loss in communication between the feedback option module and main control board

Event No.	96	Configuration Parameter	See option module for configuration parameter number.
Fault/Alarm Text	PositionFdbkLoss	Auto Reset	N/A
Type	Configurable	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	Bit 9 "Fdbk Faults"
Description/Actions			

A Feedback Loss has been detected for the source of P847 [Psn Fdbk]. The feedback loss could be due to a problem detected by the feedback option module selected by P135 [Mtr Psn Fdbk Sel], or due to a loss in communication between the feedback option module and main control board.

Event No.	97	Configuration Parameter	635 [Spd Options Ctrl] Bit 7 "Auto Tach SW"
Fault/Alarm Text	Auto Tach Switch	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 9 "Fdbk Faults"
Description/Actions			

Indication that either of the two following conditions exists:

- Tach switch has occurred, and alternate feedback device has failed.

- Tach switch has not occurred, Auto Tach Switch Option is enabled, and both primary and alternate devices have failed.

Event No.	100	Configuration Parameter	N/A
Fault/Alarm Text	Parameter Chksum	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			

The checksum read from the non-volatile storage does not match the checksum calculated. The data are set to the default value

Event No.	101	Configuration Parameter	N/A
Fault/Alarm Text	PwrDn NVS Blank	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			

Internal data error.

- Reset parameter defaults. See publication 20HIM-UM001 for instructions.

- Reload parameters.

- If problem persists, replace main control board. Fault normally occurs after a flash update to correct F117 fault.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
102	NVS Not Blank	Resettable Fault	Coast	N/A	N/A	N/A	Bit 8 "Board Faults"
103	PwrDn NVS Incomp	Resettable Fault	Coast	N/A	N/A	N/A	Bit 8 "Board Faults"
Description/Actions							

Internal data error

Event No.	104	Configuration Parameter	N/A
Fault/Alarm Text	Pwr Brd Checksum	Auto Reset	N/A
Type	Non-reset Fault	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			

The checksum read from the non-volatile storage does not match the checksum calculated. The data are set to the default value.

Event No.	106	Configuration Parameter	N/A
Fault/Alarm Text	Incompat MCB PB	Auto Reset	N/A
Type	Non-reset Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	N/A
Description/Actions			

The main control board did not recognize the power structure. Flash with newer Application revision.

Event No.	107	Configuration Parameter	N/A
Fault/Alarm Text	Replaced MCB PB	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			

The main control board was moved to another power structure. The data are set to the default values.

Event No.	108	Configuration Parameter	N/A
Fault/Alarm Text	Anlg Cal Chksum	Auto Reset	N/A
Type	Non-reset Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	N/A
Description/Actions			

The checksum read from the analog calibration data does not match the checksum calculated. Replace main control board.

Event No.	110	Configuration Parameter	N/A
Fault/Alarm Text	Ivld Pwr Bd Data	Auto Reset	N/A
Type	Non-reset Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	N/A
Description/Actions			

Power structure data invalid:

- Verify ribbon cable connection between the main control board and the power interface board.

- Replace power interface board.

Event No.	111	Configuration Parameter	N/A
Fault/Alarm Text	PwrBd Invalid ID	Auto Reset	N/A
Type	Non-reset Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	N/A
Description/Actions			

Power structure ID invalid:

- Verify ribbon cable connection between the main control board and the power interface board.

- Replace power interface board.

Event No.	112	Configuration Parameter	N/A
Fault/Alarm Text	PwrBd App MinVer	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			

Power structure needs newer Application revision. Flash with newer Application revision.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
113	Tracking DataErr	Resettable Fault	Coast	N/A	N/A	N/A	Bit 8 "Board Faults"
115	PwrDn Table Full	Resettable Fault	Coast	N/A	N/A	N/A	Bit 8 "Board Faults"
116	PwrDnEntry2Large	Resettable Fault	Coast	N/A	N/A	N/A	Bit 8 "Board Faults"
117	PwrDnChksm	Resettable Fault	Coast	N/A	N/A	N/A	Bit 8 "Board Faults"
118	PwrBd PwrDn Chks	Resettable Fault	Coast	N/A	N/A	N/A	Bit 8 "Board Faults"
Description/Actions							
Internal data error							

Event No.	124	Configuration Parameter	N/A
Fault/Alarm Text	App ID Changed	**Auto Reset**	N/A
Type	Resettable Fault	**Auto Clear**	N/A
Fault Action	Coast	**Emergency Protection Override**	Bit 8 "Board Faults"
Description/Actions			
Application Firmware changed. Verify Application revision.			

Event No.	125	Configuration Parameter	N/A
Fault/Alarm Text	Using Backup Apps	**Auto Reset**	N/A
Type	Resettable Fault	**Auto Clear**	N/A
Fault Action	Coast	**Emergency Protection Override**	Bit 8 "Board Faults"
Description/Actions			
Application did not flash correctly. Reflash.			

Event No.	134	Configuration Parameter	N/A
Fault/Alarm Text	Start On PowerUp	Auto Reset	N/A
Type	Alarm 1	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			
When P345 [Start At PowerUp] is enabled, an alarm is set for the time programmed in P346 [PowerUp Delay].			

Event No.	137	Configuration Parameter	323 [Prchrg Err Cfg]
Fault/Alarm Text	Ext Prechrg Err	Auto Reset	N/A
Type	Configurable	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	Bit 1 "Line Faults"
Description/Actions			
The seal contact on the external precharge contactor has opened (as signalled by P190 [DI Prchrg Seal]) while the drive was running (PWM was active).			

Event No.	138	Configuration Parameter	321 [Prchrg Control] 190 [DI Prchrg Seal] 189 [DI Precharge]
Fault/Alarm Text	Precharge Open	Auto Reset	Yes
Type	Resettable Fault	Auto Clear	Yes
Fault Action	Coast	Emergency Protection Override	Bit 1 "Line Faults"
Description/Actions			
The internal precharge was commanded to open while the drive was running (PWM was active). The internal fault latch is automatically cleared when PWM is disabled.			

Event No.	141	Configuration Parameter	N/A
Fault/Alarm Text	Auto Enc Angle	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			
P78 [Encdrlss AngComp] is out of range.			

Event No.	142	Configuration Parameter	N/A
Fault/Alarm Text	Autn Spd Rstrct	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			
Frequency limit settings are preventing the drive from reaching a suitable speed during an Inertia Tune test.			

Event No.	143	Configuration Parameter	N/A
Fault/Alarm Text	Autotune CurReg	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			
Calculated values for P96 [VCL Cur Reg Kp] and/or P97 [VCL Cur Reg Ki] are out of range.			

Event No.	144	Configuration Parameter	N/A
Fault/Alarm Text	Autotune Inertia	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			
Results from the Inertia Tune test out of range for P76 [Total Inertia].			

Event No.	145	Configuration Parameter	N/A
Fault/Alarm Text	Autotune Travel	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			
When P77 [Inertia Test Lmt] is set, the Inertia Tune test was prevented from reaching a suitable speed to run the test.			

Event No.	152	Configuration Parameter	N/A
Fault/Alarm Text	No Stop Source	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 5 "PERIFFlts"
Description/Actions			
Last stop source has been removed.			

Event No.	155	Configuration Parameter	N/A
Fault/Alarm Text	Bipolar Conflict	Auto Reset	N/A
Type	Alarm 2	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			
P308 [Direction Mode] is set to 1 "Bipolar" or 2 "Rev Disable" and one or more digital inputs is enabled for direction control.			

Event No.	157	Configuration Parameter	N/A
Fault/Alarm Text	DigIn Cfg B	Auto Reset	N/A
Type	Alarm 2	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			
Digital input conflict. Input functions that cannot exist simultaneously have been selected (for example run and start). Correct Digital Input configuration.			

Event No.	158	Configuration Parameter	N/A
Fault/Alarm Text	DigIn Cfg C	Auto Reset	N/A
Type	Alarm 2	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			
Digital input conflict. Input functions that cannot be assigned to the same digital input have been selected (for example run and stop). Correct Digital Input configuration.			

Event No.	161	Configuration Parameter	N/A
Fault/Alarm Text	Sleep Config	Auto Reset	N/A
Type	Alarm 2	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			

There is a Sleep/Wake configuration error. With Sleep Wake Mode = Direct. Possible causes include:

Drive is stopped and Wake Level < Sleep Level. Stop=CF, Run, Run Fwd, or Run Rev is not configured in Digital Input functions.

Event No.	162	Configuration Parameter	N/A
Fault/Alarm Text	Waking	Auto Reset	N/A
Type	Alarm 1	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			

The Wake timer is counting toward a value that starts the drive.

Event No.	168	Configuration Parameter	N/A
Fault/Alarm Text	HeatSinkUnderTmp	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	Bit 2 "PwrStrucFlts"
Description/Actions			

Heatsink temperature sensor is reporting a value below -18.7 °C (-1.66 °F) or the sensor feedback circuit is open. See P943 [Drive Temp Pct] and/or P944 [Drive Temp C].

Event No.	169	Configuration Parameter	N/A
Fault/Alarm Text	PWM Freq Reduced	Auto Reset	N/A
Type	Alarm 1	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			

The PWM Frequency has been reduced from the value set in P38 [PWM Frequency] due to excessive IGBT junction temperatures. See also P420 [Drive OL Mode].

Event No.	170	Configuration Parameter	N/A
Fault/Alarm Text	CurLimit Reduced	Auto Reset	N/A
Type	Alarm 1	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			

The current limit value has been reduced from the value set in [Current Limit n] due to excessive IGBT junction temperatures or P940 [Drive OL Count] = 95 %.

See also P420 [Drive OL Mode].

Event No.	171	Configuration Parameter	N/A
Fault/Alarm Text	Adj Vltg Ref	Auto Reset	N/A
Type	Alarm 1	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			

Invalid adjustable-voltage reference selection conflict.

Event No.	175	Configuration Parameter	N/A
Fault/Alarm Text	Travel LimCflct	Auto Reset	N/A
Type	Non-reset Fault	Auto Clear	N/A
Fault Action	Current Limit Stop	Emergency Protection Override	N/A
Description/Actions			

Travel limits are in conflict. Both the forward and reverse travel limits indicate that they are simultaneously active.

If digital limits (hardware signals) are in use, ensure that the following forward and reverse digital input pairs are not both off simultaneously: fwd/rev decel travel limit digital inputs and fwd/rev end stop travel limit digital inputs. The travel limit digital inputs are meant to be connected to normally closed switch contacts, so the digital input status reads an off (0 = False) bit status when the machine is on limit and the switch contact opens. A possible cause for this condition is loss of common power to both the forward and reverse travel limit switches.

If software travel limits are in use, check the state of the fwd/ rev travel limit bits in P1101 [Trq Prove Setup]. These bits read an on (1 = Enabled) bit status when the machine is on limit.

Bit 2 "Decel Fwd" and Bit 4 "Decel Rev" should not be on simultaneously. Similarly, Bit 3 "End Stop Fwd" and Bit 5 "End Stop Rev" should not be on simultaneously.

Event No.	176	**Configuration Parameter**	N/A
Fault/Alarm Text	Home Config	**Auto Reset**	N/A
Type	Alarm 2	**Auto Clear**	N/A
Fault Action	N/A	**Emergency Protection Override**	N/A
Description/Actions			
Home to Torque config conflict			

Event No.	177	**Configuration Parameter**	N/A
Fault/Alarm Text	Profiling Active	**Auto Reset**	N/A
Type	Alarm 1	**Auto Clear**	N/A
Fault Action	N/A	**Emergency Protection Override**	N/A
Description/Actions			
The Profile/Indexer is active.			

Event No.	178	**Configuration Parameter**	N/A
Fault/Alarm Text	Homing Active	**Auto Reset**	N/A
Type	Alarm 1	**Auto Clear**	N/A
Fault Action	N/A	**Emergency Protection Override**	N/A
Description/Actions			
The Homing function is active.			

Event No.	179	**Configuration Parameter**	N/A
Fault/Alarm Text	Home Not Set	**Auto Reset**	N/A
Type	Alarm 1	**Auto Clear**	N/A
Fault Action	N/A	**Emergency Protection Override**	N/A
Description/Actions			
The Home position was not set before profile operation.			

Event No.	181	Configuration Parameter	N/A
Fault/Alarm Text	Fwd End Limit	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Current Limit Stop	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			

The selected digital input for one of the end limit switches, P196 [DI Fwd End Limit] or P198 [DI Rev End Limit], has detected a falling edge and P313 [Actv SpTqPs Mode] is not set to 1 "Speed Reg."

If digital limits (hardware signals) are in use, ensure that the digital inputs are connected to normally closed contacts.

When the end limit is reached the contacts open.

Event No.	182	Configuration Parameter	N/A
Fault/Alarm Text	Rev End Limit	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Current Limit Stop	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			

The selected digital input for one of the end limit switches, P196 [DI Fwd End Limit] or P198 [DI Rev End Limit], has detected a falling edge and P313 [Actv SpTqPs Mode] is not set to 1 "Speed Reg."

If digital limits (hardware signals) are in use, ensure that the digital inputs are connected to normally closed contacts.

When the end limit is reached the contacts open.

Event No.	185	Configuration Parameter	N/A
Fault/Alarm Text	Freq Conflict	Auto Reset	N/A
Type	Alarm 2	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			

Indicates that the values of P520 [Max Fwd Speed] and P521 [Max Rev Speed] are in conflict with the value of P63 [Break Frequency].

Event No.	186	Configuration Parameter	N/A
Fault/Alarm Text	VHz Neg Slope	Auto Reset	N/A
Type	Alarm 2	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			

Indicates that the V/Hz curve segment resulted in a negative V/Hz slope.

See P60 [Start Acc Boost] through P63 [Break Frequency].

Event No.	187	Configuration Parameter	N/A
Fault/Alarm Text	VHz Boost Limit	Auto Reset	N/A
Type	Alarm 2	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			

Indication that one of the two following conditions exists:

- P60 [Start/Acc Boost] and P61 [Run Boost] are greater than P25 [Motor NP Volts] x 0.25 when P65 [VHz Curve] = 0 "Custom V/Hz."

- P61 [Run Boost] is greater than P25 [Motor NP Volts] x 0.25 when P65 [VHz Curve] = 1 "Fan/Pump.

Event No.	190	Configuration Parameter	N/A
Fault/Alarm Text	PM Fv Pri Fdbk	Auto Reset	N/A
Type	Alarm 2	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			

Indicates a control mode and primary-feedback device configuration error. P35 [Motor Ctrl Mode] is set to the permanent magnet flux vector "PM FV" control mode, P125 [Pri Vel Fdbk Sel] is set to P137 [Open Loop Fdbk] (port 0).

Event No.	191	Configuration Parameter	N/A
Fault/Alarm Text	PM FV Alt Fdbk	Auto Reset	N/A
Type	Alarm 2	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			

Indicates a control mode and alternate-feedback device configuration error. P35 [Motor Ctrl Mode] is set to the permanent magnet flux vector "PM FV" control mode, P635 [Spd Options Ctrl] is set to bit 7 "Auto Tach SW," P128 [Alt Vel Fdbk Sel] is set to P137 [Open Loop Fdbk] (port 0).

Event No.	192	Configuration Parameter	N/A
Fault/Alarm Text	Fwd Spd Lim Cfg	Auto Reset	N/A
Type	Alarm 2	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			

The forward speed reference is out of range.

Verify the settings of P38 [PWM Frequency] and P520 [Max Fwd Speed]. Lower carrier frequencies reduce the output frequency range.

Verify that P522 [Min Fwd Speed] is less than or equal to P520 [Max Fwd Speed].

Event No.	193	Configuration Parameter	N/A
Fault/Alarm Text	Rev Spd Lim Cfg	Auto Reset	N/A
Type	Alarm 2	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			

The reverse speed reference is out of range.

Verify the settings of P38 [PWM Frequency] and P521 [Max Rev Speed]. Lower carrier frequencies reduce the output frequency range.

Verify that P523 [Min Rev Speed] is greater than or equal to P521 [Max Rev Speed].

Event No.	194	Configuration Parameter	N/A
Fault/Alarm Text	PM Offset Conflict	Auto Reset	N/A
Type	Alarm 2	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			
Both P80 [PM Cfg] bit 0 "AutoOfstTest" and bit 2 "StaticTestEn" are set. Select only one.			

Event No.	195	Configuration Parameter	N/A
Fault/Alarm Text	IPMSpdEstErr	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 9 "Fdbk Faults"
Description/Actions			
Speed Estimator failed to track High-Speed angle			

Event No.	196	Configuration Parameter	N/A
Fault/Alarm Text	PM FS Cflct	Auto Reset	N/A
Type	Alarm 2	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			
Attempted to set P356 [FlyingStart Mode] to 2 "Sweep" with a permanent magnet motor selected in P35 [Motor Ctrl Mode].			

Event No.	197	Configuration Parameter	N/A
Fault/Alarm Text	PM Offset Failed	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 0 "PwrStrucFlts"
Description/Actions			
Indicates that the PM Offset test failed due to interruption of the test before completion, or the motor movement failed to reach the proper amount of rotation during the test. The test is rescheduled when this fault occurs. If failure occurred because of movement limitations, increase the [PM OfstTst Cur]. If this solution fails to correct the problem, the load on the motor may be too large.			

Event No.	201	Configuration Parameter	N/A
Fault/Alarm Text	SpdReg DL Err	Auto Reset	N/A
Type	Alarm 2	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			

Attempted to establish a Datalink to P644 [Spd Err Flt BW], P645 [Speed Reg KP], or P647 [Speed Reg Ki] and P636 [Speed Reg BW] is set to a value other than zero.

Event No.	202	Configuration Parameter	N/A
Fault/Alarm Text	AltSpdReg DL Err	Auto Reset	N/A
Type	Alarm 2	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			

Attempted to establish a Datalink to P649 [Alt Speed Reg Kp], P650 [Alt Speed Reg Ki], or P651 AltSpdErr FltrBW] and P648 [Alt Speed Reg BW] is set to a value other than zero.

Event No.	203	Configuration Parameter	N/A
Fault/Alarm Text	Port 13 Adapter	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 6 "ENET PrtFlts""
Description/Actions			

The embedded Ethernet/IP adapter has a fault. See Ethernet event queue.

Event No.	204	Configuration Parameter	N/A
Fault/Alarm Text	Port 14 Adapter	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 7 "DevLogixFlts""
Description/Actions			

The DeviceLogix adapter has a fault.

Event No.	205	Configuration Parameter	N/A
Fault/Alarm Text	DPI Transport Err	Auto Reset	N/A
Type	Alarm 1	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			
A DPI Communication Error has occurred.			

Event No.	210	Configuration Parameter	N/A
Fault/Alarm Text	HW Enbl Jmpr Out	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			
A Safety Option module is present and ENABLE Jumper is removed. Install the jumper. This fault occurs only on frames1–7.			

Event No.	211	Configuration Parameter	N/A
Fault/Alarm Text	Safety Brd Fault	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			

A Safety Option module has indicated a fault. Verify that ENABLE Jumper is installed. Reset or power cycle drive.

Safe Speed Monitor (20-750-S1):

- See P67 [Fault Status] on page 308 for more information on the fault statuses.
- See publication 750-RM001 for more information.

Safe Torque Off (20-750-S):

- If DC power drops below 17V DC "Not Enable" is indicated.
- If voltage drops below 11V DC the module faults.
- See publication 750-UM002 for more information.

ATEX (20-750-ATEX):

- Possible hardware damage
- The motor to the thermal sensor is shorted.
- Excessive EMC noise due to improper grounding/shielding
- See publication 750-UM003 for more information.

Event No.	211	Configuration Parameter	N/A
Event No.	212	Configuration Parameter	N/A
Fault/Alarm Text	Safety Jmpr Out	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			
SAFETY Jumper is not installed, and a Safety Option module is not present. Install the jumper.			

Event No.	213	Configuration Parameter	N/A
Fault/Alarm Text	Safety Jumper In	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 8 "Board Faults"
Description/Actions			
SAFETY Jumper is installed, and a Safety Option module is present. Remove the jumper.			

Event No.	214	Configuration Parameter	N/A
Fault/Alarm Text	SafetyPortCnflct	Auto Reset	N/A
Type	Alarm 2	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			
Allowable number of safety options exceeded. Only one Safety Option module can be installed at a time.			

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
224	Port 4 Comm Loss	Resettable Fault	Coast	N/A	N/A	N/A	Bit 12 "Port 4 Flts"
225	Port 5 Comm Loss	N/A	N/A	N/A	N/A	N/A	Bit 13 "Port 5 Flts"
226	Port 6 Comm Loss	N/A	N/A	N/A	N/A	N/A	Bit 14 "Port 6 Flts"
227	Port 7 Comm Loss	N/A	N/A	N/A	N/A	N/A	Bit 15 "Port 7 Flts"
228	Port 8 Comm Loss	N/A	N/A	N/A	N/A	N/A	Bit 16 "Port 8 Flts"
229	Port 9 Comm Loss	N/A	N/A	N/A	N/A	N/A	Bit 17 "Port 9 Flts"
230	Port 10 Comm Loss	N/A	N/A	N/A	N/A	N/A	N/A
231	Port 11 Comm Loss	N/A	N/A	N/A	N/A	N/A	N/A
232	Port 12 Comm Loss	N/A	N/A	N/A	N/A	N/A	N/A
233	Port 13 Comm Loss	N/A	N/A	N/A	N/A	N/A	Bit 6 "ENET PrtFlts"
234	Port 14 Comm Loss	N/A	N/A	N/A	N/A	N/A	Bit 7 "DevLogixFlts"
Description/Actions							

The device at the port has stopped communicating with the main control board.

- Verify that the device is present and functional.

- Verify network connections.

- Verify options that are installed in ports 4–8 are seated in the port and secured with mounting screws.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
244	Port 4 Cfg	Alarm 2	N/A	N/A	N/A	N/A	N/A
245	Port 5 Cfg						
246	Port 6 Cfg						
247	Port 7 Cfg						
248	Port 8 Cfg						
249	Port 9 Cfg						
250	Port 10 Cfg						
251	Port 11 Cfg						
252	Port 12 Cfg						
253	Port 13 Cfg						
254	Port 14 Cfg						
Description/Actions							

The main control board does not have the correct option in the port.

Option may not be compatible with product or MCB firmware must be updated to support it. Option may have to be moved or removed, accept option configuration change.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
264	Port 4 Checksum	Resettable Fault	Coast	N/A	N/A	N/A	Bit 12 "Port 4 Fits"
265	Port 5 Checksum		N/A	N/A	N/A	N/A	Bit 13 "Port 5 Fits"
266	Port 6 Checksum		N/A	N/A	N/A	N/A	Bit 14 "Port 6 Fits"
267	Port 7 Checksum		N/A	N/A	N/A	N/A	Bit 15 "Port 7 Fits"
268	Port 8 Checksum		N/A	N/A	N/A	N/A	Bit 16 "Port 8 Fits"
269	Port 9 Checksum		N/A	N/A	N/A	N/A	Bit 17 "Port 9 Fits"
270	Port 10 Checksum		N/A	N/A	N/A	N/A	N/A
271	Port 11 Checksum		N/A	N/A	N/A	N/A	N/A
272	Port 12 Checksum		N/A	N/A	N/A	N/A	N/A
273	Port 13 Checksum		N/A	N/A	N/A	N/A	N/A
274	Port 14 Checksum		N/A	N/A	N/A	N/A	N/A
Description/Actions							
An option module storage checksum failed. Option data have been set to default values.							

Event No.	281	Configuration Parameter	N/A
Fault/Alarm Text	Enet Checksum	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 6 "ENET PrtFlts"
Description/Actions			
Ethernet/IP storage checksum failed. Data set to default values			

Event No.	282	Configuration Parameter	N/A
Fault/Alarm Text	DLX Checksum	Auto Reset	N/A
Type	Resettable Fault	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	Bit 7 "DevLogixFlts"
Description/Actions			
DeviceLogix storage checksum failed. Data set to default values			

Event No.	290	**Configuration Parameter**	N/A
Fault/Alarm Text	Prev Maint Reset	**Auto Reset**	N/A
Type	Alarm 1	**Auto Clear**	N/A
Fault Action	N/A	**Emergency Protection Override**	N/A
Description/Actions			
Predictive maintenance function has reset an elapsed life parameter.			

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
291	HSFan Life	Configurable	N/A	493 [HSFan EventActn]	N/A	N/A	Bit 8 "Board Faults"
292	InFan Life	Configurable	N/A	500 [InFan EventActn]	N/A	N/A	Bit 8 "Board Faults
293	MtrBrng Life	Configurable	N/A	506 [MtrBrngEventActn]	N/A	N/A	Bit 8 "Board Faults
294	MtrBrng Lube	Configurable	N/A	510 [MtrLubeEventActn]	N/A	N/A	Bit 8 "Board Faults
295	MachBrng Life	Configurabel	N/A	515 [MtrBrngEventActn]	N/A	N/A	Bit 8 "Board Faults
296	MachBrng Lube	Configurable	N/A	519 [MchLubeEventActn]	N/A	N/A	Bit 8 "Board Faults
Description/Actions							
Predictive maintenance function has reached the event level. Perform maintenance.							

Event No.	300	**Configuration Parameter**	N/A
Fault/Alarm Text	Emer Ovr Act	**Auto Reset**	N/A
Type	N/A	**Auto Clear**	N/A
Fault Action	N/A	**Emergency Protection Override**	N/A
Description/Actions			
Emergency Override Active. Emergency Override is currently active.			

Event No.	301	**Configuration Parameter**	N/A
Fault/Alarm Text	Emer Ovr Not Act	**Auto Reset**	N/A
Type	N/A	**Auto Clear**	N/A
Fault Action	N/A	**Emergency Protection Override**	N/A
Description/Actions			
Emergency Override Not Active. Emergency Override is not currently active.			

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
307	Port 7 Invalid Card	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
308	Port 8 Invalid Card						
Description/Actions							
Option not valid in that port. Remove option module.							

Event No.	310	**Configuration Parameter**	N/A
Fault/Alarm Text	Regeneration OK	**Auto Reset**	N/A
Type	Resettable Fault	**Auto Clear**	N/A
Fault Action	Coast	**Emergency Protection Override**	N/A
Description/Actions			
The drive has detected that the 'Regeneration OK' input has transition to an 'inactive' state.			

Event No.	315	**Configuration Parameter**	Configured with Logix Controller
Fault/Alarm Text	Excess Psn Err	**Auto Reset**	N/A
Type	Configurable	**Auto Clear**	N/A
Fault Action	N/A	**Emergency Protection Override**	N/A
Description/Actions			
The absolute maximum Position Error value has been exceeded.			

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
318	OutCurShare PhU	Alarm 1	N/A	N/A	N/A	N/A	N/A
319	OutCurShare PhV						
320	OutCurShare PhW						
Description/Actions							
There is output current sharing imbalance between parallel inverters in the phase indicated that is greater than 15% of the inverter rated current.							

Event No.	322	Configuration Parameter	20 (Port 10) [Recfg Acknowledge]
			21 (Port 10) [Effcty I Rating]
Fault/Alarm Text	N-1 Operation	**Auto Reset**	N/A
Type	Alarm 1	**Auto Clear**	N/A
Fault Action	N/A	**Emergency Protection Override**	N/A
Description/Actions			
Drive is operating with fewer inverters than the original parallel configuration.			

Event No.	324	Configuration Parameter	N/A
Fault/Alarm Text	DC Bus Mismatch	**Auto Reset**	N/A
Type	Non-reset Fault	**Auto Clear**	N/A
Fault Action	Coast	**Emergency Protection Override**	N/A
Description/Actions			
There is a bus voltage imbalance between parallel inverters that is greater than 50V DC.			

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
327	HS Temp Imbal U	Alarm 1	N/A	N/A	N/A	N/A	N/A
328	HS Temp Imbal V						
329	HS Temp Imbal W						
Description/Actions							
There is a heatsink temperature imbalance between parallel inverters in the phase indicated that is greater than 11.5° C (52.7° F).							

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
331	I1 Comm Loss	Resettable Fault	Coast	N/A	N/A	N/A	N/A
332	I2 Comm Loss						
333	I3 Comm Loss						
Description/Actions							
A communications fault has occurred between the main control board and the power layer interface board on inverter *n*.							

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
341	C1 Comm Loss	Resettable Fault	Coast	N/A	N/A	N/A	N/A
342	C2 Comm Loss						
343	C3 Comm Loss						
Description/Actions							
A communications fault has occurred between the main control board and the converter gate board on converter *n*.							

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
351	In Cur Share L1	Alarm 1	N/A	N/A	N/A	N/A	N/A
352	In Cur Share L2						
353	In Cur Share L3						
Description/Actions							
There is an input current sharing imbalance between parallel converters in the AC line indicated that is greater than 15% of the converter rated current.							

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
357	In Vlt Imbal L12	Alarm 1	N/A	N/A	N/A	N/A	N/A
358	In Vlt Imbal L23						
359	In Vlt Imbal L31						
Description/Actions							
There is an input line voltage imbalance between parallel converters in the AC lines indicated that is greater than 5% of the converter rated voltage.							

Event No.	360	Configuration Parameter	N/A
Fault/Alarm Text	N-1 See Manual	**Auto Reset**	N/A
Type	Resettable Fault	**Auto Clear**	N/A
Fault Action	Coast	**Emergency Protection Override**	Bit 8 "Board Faults"
Description/Actions			
The number of active inverters has been reduced from the original parallel configuration.			

Event No.	361	Configuration Parameter	N/A
Fault/Alarm Text	Rerate See Manual	**Auto Reset**	N/A
Type	Resettable Fault	**Auto Clear**	N/A
Fault Action	Coast	**Emergency Protection Override**	Bit 8 "Board Faults"
Description/Actions			
The drive rating has changed from the original parallel configuration.			

Event No.	362	Configuration Parameter	N/A
Fault/Alarm Text	Cnv/Inv Mismatch	**Auto Reset**	N/A
Type	Alarm 2	**Auto Clear**	N/A
Fault Action	N/A	**Emergency Protection Override**	N/A
Description/Actions			
There is a voltage class mismatch between the installed parallel inverters and converters.			

Event No.	363	Configuration Parameter	N/A
Fault/Alarm Text	CBP/Inv Mismatch	Auto Reset	N/A
Type	Alarm 2	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			
There is a voltage class mismatch between the installed parallel inverters and common DC bus precharge units.			

Event No.	364	Configuration Parameter	N/A
Fault/Alarm Text	CBP Num Mismatch	Auto Reset	N/A
Type	Alarm 2	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			
The number of active inverters and active common DC bus precharge units does not match.			

Event No.	365	Configuration Parameter	N/A
Fault/Alarm Text	Zero Cnv/Prechrg	Auto Reset	N/A
Type	Alarm 2	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			
No converter or common DC bus precharge unit exists.			

Event No.	366	Configuration Parameter	N/A
Fault/Alarm Text	Cnv Num Mismatch	Auto Reset	N/A
Type	Alarm 2	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			
The number of active inverters and active converters does not match.			

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
371	P1 Comm Loss	Resettable Fault	Coast	N/A	N/A	N/A	N/A
372	P2 Comm Loss						
Description/Actions							
A communications fault has occurred between the main control board and the DC precharge control board on the common DC bus precharge unit *n*.							

Event No.	380	Configuration Parameter	N/A
Fault/Alarm Text	PWM FPGA Overrun	Auto Reset	N/A
Type	Alarm 1	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			
The time limit on the PWM write to the FPGA was exceeded.			

Event No.	900	Configuration Parameter	N/A
Fault/Alarm Text	900	Auto Reset	N/A
Type	Automatic Drive Reset	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	N/A
Description/Actions			
Critical input exception. Contact technical support.			

Event No.	901	Configuration Parameter	N/A
Fault/Alarm Text	Machine Check	Auto Reset	N/A
Type	Automatic Drive Reset	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	N/A
Description/Actions			
Internal error. Replace the main control board.			

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
902	Data Storage Error	Automatic Drive Reset	Coast	N/A	N/A	N/A	N/A
903	Instruction Storage Error						
Description/Actions							
Cache memory corrupt. Replace the main control board.							

Event No.	905	**Configuration Parameter**	N/A
Fault/Alarm Text	Alignment Error	**Auto Reset**	N/A
Type	Automatic Drive Reset	**Auto Clear**	N/A
Fault Action	Coast	**Emergency Protection Override**	N/A
Description/Actions			
Pointer is pointing to a non-boundary member. Obtain test points and check grounding.			

Event No.	906	**Configuration Parameter**	N/A
Fault/Alarm Text	Program Error	**Auto Reset**	N/A
Type	Automatic Drive Reset	**Auto Clear**	N/A
Fault Action	Coast	**Emergency Protection Override**	N/A
Description/Actions			
Bad memory read. Check grounding or replace the main control board.			

Event No.	907	**Configuration Parameter**	N/A
Fault/Alarm Text	Floating Point Unit Not On	**Auto Reset**	N/A
Type	Automatic Drive Reset	**Auto Clear**	N/A
Fault Action	Coast	**Emergency Protection Override**	N/A
Description/Actions			
Firmware issue. Obtain test points.			

Event No.	909	**Configuration Parameter**	N/A
Fault/Alarm Text	Aux Processor Not On	**Auto Reset**	N/A
Type	Automatic Drive Reset	**Auto Clear**	N/A
Fault Action	Coast	**Emergency Protection Override**	N/A
Description/Actions			
Auxiliary processor interrupt. Contact technical support.			

Event No.	912	**Configuration Parameter**	N/A
Fault/Alarm Text	Watchdog	**Auto Reset**	N/A
Type	Automatic Drive Reset	**Auto Clear**	N/A
Fault Action	Coast	**Emergency Protection Override**	N/A
Description/Actions			
The timer counted down, reached 0, and fault occurred. Replace the main control board.			

Event No.	913	**Configuration Parameter**	N/A
Fault/Alarm Text	Data TLB Error	**Auto Reset**	N/A
Type	Automatic Drive Reset	**Auto Clear**	N/A
Fault Action	Coast	**Emergency Protection Override**	N/A
Description/Actions			
Processor attempted to access non-boundary memory. Check grounding or replace the main control board.			

Event No.	914	**Configuration Parameter**	N/A
Fault/Alarm Text	Instruction TLB Error	**Auto Reset**	N/A
Type	Automatic Drive Reset	**Auto Clear**	N/A
Fault Action	Coast	**Emergency Protection Override**	N/A
Description/Actions			
Processor attempted to access non-boundary memory. Check grounding or replace the main control board.			

Event No.	916	Configuration Parameter	N/A
Fault/Alarm Text	FPGA Failed to Load	Auto Reset	N/A
Type	Automatic Drive Reset	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	N/A
Description/Actions			
MCB failed to load on power-up. Replace the main control board.			

Event No.	917	Configuration Parameter	964 [CRC Flt Cfg] only
Fault/Alarm Text	FPGA CRC Failure	Auto Reset	N/A
Type	Resettable Fault (753) Disabled (755 LP) Automatic Drive Reset (755 HP)	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	N/A
Description/Actions			
Change fault configuration (753). Replace the main control board.			

Event No.	918	Configuration Parameter	N/A
Fault/Alarm Text	Control Task Overrun	Auto Reset	N/A
Type	Automatic Drive Reset	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	N/A
Description/Actions			
Carrier frequency changes when passing through 7 Hz. In P40 [Mtr Option Cfg], set the PWM to 2 kHz or turn on the "PWM FreqLock" Bit 9. Or flash the drive to 8.001.			

Event No.	919	Configuration Parameter	N/A
Fault/Alarm Text	System Task Overrun	Auto Reset	N/A
Type	Automatic Drive Reset	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	N/A
Description/Actions			
The control task is not finished and being told to run again. If fault does not clear, replace the main control board.			

Event No.	920	Configuration Parameter	N/A
Fault/Alarm Text	5 mSec Task Overrun	Auto Reset	N/A
Type	Automatic Drive Reset	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	N/A
Description/Actions			
The control task not finished and being told to run again. If fault does not clear, replace the main control board.			

Event No.	921	Configuration Parameter	N/A
Fault/Alarm Text	Control Task Stall	Auto Reset	N/A
Type	Automatic Drive Reset	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	N/A
Description/Actions			
Control task stalled. Check grounding or replace the main control board.			

Event No.	922	Configuration Parameter	N/A
Fault/Alarm Text	System Task Stall	Auto Reset	N/A
Type	Automatic Drive Reset	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	N/A
Description/Actions			
System task stalled. Check grounding or replace the main control board.			

Event No.	923	Configuration Parameter	N/A
Fault/Alarm Text	5 mSec Task Stall	Auto Reset	N/A
Type	Automatic Drive Reset	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	N/A
Description/Actions			
5 msec task stalled. Check grounding or replace the main control board.			

Event No.	924	Configuration Parameter	N/A
Fault/Alarm Text	Background Task Stall	Auto Reset	N/A
Type	Automatic Drive Reset	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	N/A
Description/Actions			
Background task stalled. Check grounding or replace the main control board.			

Event No.	925	Configuration Parameter	N/A
Fault/Alarm Text	Stack Overflow	Auto Reset	N/A
Type	Automatic Drive Reset	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	N/A
Description/Actions			
Firmware overflow. Obtain test points.			

Event No.	926	Configuration Parameter	N/A
Fault/Alarm Text	Ethernet Error	Auto Reset	N/A
Type	Automatic Drive Reset	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	N/A
Description/Actions			
Ethernet error. Contact technical support.			

Event No.	927	Configuration Parameter	N/A
Fault/Alarm Text	CIP Motion Error	Auto Reset	N/A
Type	Automatic Drive Reset	Auto Clear	N/A
Fault Action	Coast	Emergency Protection Override	N/A
Description/Actions			
Integrated motion error. Contact technical support.			

Event No.	14037	Configuration Parameter	52 [DLX Prog Cond]
Fault/Alarm Text	Net IO Tiimeout	Auto Reset	N/A
Type	Configurarable	Auto Clear	N/A
Fault Action	N/A	Emergency Protection Override	N/A
Description/Actions			
DeviceLogix has been disabled.			

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10101	I1 Comm Loss	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
10201	I2 Comm Loss						
10301	I3 Comm Loss						
Description/Actions							

Indicates that the communication connection from the fiber optic interface board to the power layer interface board has been lost. Once the root cause of the communication fault has been resolved, power must be cycled, or a drive reset must be initiated to clear this fault.

- Verify the status of the Fiber Loss pin segment of the power-layer interface board LED.
- Verify that the fiber optic cables are properly connected to the transceivers.
- Verify that the transceivers are properly seated in the ports.
- Verify that the fiber optic cable is not cracked or broken.
- Verify that power is applied to the fiber optic interface board and power layer interface board.

ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into fiber-optic ports or fiber-optic cable connectors. Remove power from the drive before disconnecting fiber optic cables

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10102	I1 Thermal Const	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
10202	I2 Thermal Const						
10302	I3 Thermal Const						
Description/Actions							

The thermal model data sent to the power layer interface board are incorrect.

- Verify that the inverter is the correct rating for the drive.
- Compare the firmware revisions of the power layer interface and control board for compatibility.
- If necessary, reflash the application firmware in control board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10102	I1 Thermal Const	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
10202	I2 Thermal Const						
10302	I3 Thermal Const						

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10103	I1 HSF an Slow	Alarm 1	N/A	N/A	N/A	N/A	N/A
10203	I1 HSF an Slow						
10303	I1 HSF an Slow						

Description/Actions
The inverter heatsink fan is running below normal operating speed. • Verify the actual fan speed in [In HSFan Speed] (Port 10). • Check for debris in the fan. If necessary, clean the fan and housing. • Check for noise at the fan, indicating motor bearing failure. • Verify that the fan power and feedback connections are not lose or disconnected. • Replace the fan, if necessary.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10104	I1 Overcurr Upos	Resettable fault	Coast	N/A	Yes	Yes	N/A
10204	I2 Overcurr Upos						
10304	I3 Overcurr Upos						
10105	I1 Overcurr UNeg						
10205	I2 Overcurr UNeg						
10305	I3 Overcurr UNeg						
10106	I1 Overcurr VPos						
10206	I2 Overcurr VPos						
10306	I3 Overcurr VPos						
10107	I1 Overcurr VNeg						
10207	I2 Overcurr VNeg						
10307	I3 Overcurr VNeg						
10108	I1 Overcurr WPos						
10208	I2 Overcurr WPos						
10308	I3 Overcurr WPos						
10109	I1 Overcurr WNeg						
10209	I2 Overcurr WNeg						
10309	I3 Overcurr WNeg						
Description/Actions							

An instantaneous overcurrent (IOC) has occurred in the U, V, or W phase, positive or negative leg.

• Reduce the mechanical load.

• Check the motor and connections.

• With motor disconnected, run the drive-in open loop, in V/Hz mode and check for sufficient output phase-to-phase voltages. If an IOC occurs immediately after restarting the drive, check the appropriate current sensor.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10110	I1 Bus Overvolt	Resettable fault	Coast	N/A	Yes	Yes	N/A
10210	I2 Bus Overvolt						
10310	I3 Bus Overvolt						
Description/Actions							

The DC bus has exceeded the maximum value.

- Verify the correct voltage on the AC input line.

- Reduce the mechanical load and/or rate of deceleration.

- Compare the DC bus voltage displayed in [In DC Bus Volt] (port 10), in [Cn DC Bus Volt] (port 11), and with a meter using the DC+ and DC- test points at the top of the inverter. If the measurements do not match, the components that are used for DC bus voltage feedback sensing can be damaged or incorrect. Replace the power supply, power control, and power-layer interface circuit boards.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10111	I1 Ground Fault	Resettable fault	Coast	N/A	Yes	Yes	N/A
10211	I2 Ground Fault						
10311	I3 Ground Fault						
Description/Actions							

A current path to earth ground greater than 25 % of drive rating has occurred.

- Perform a Megger or surge test on a disconnected motor. Replace the motor, if necessary.

- Check the output phase current displayed in [In U Phase Curr], [In V Phase Curr], and [In W Phase Curr] (port 10) for an imbalance. [In Gnd Current] (port 10) is the calculated (not measured) ground current based on the phase currents.

- If the ground fault happens immediately when the drive is started, view the values of the output phase current parameters (noted in the second bullet) when running the drive with a light load or perform a trending analysis.

- Reseat the rating plug and current transducer wiring harness.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10112	I1 IGBT OvrTemp	Resettable fault	Coast	N/A	Yes	Yes	N/A
10212	I2 IGBT OvrTemp						
10312	I3 IGBT OvrTemp						
			Description/Actions				

An IGBT over temperature has been detected. This power layer interface board calculated this value based on the NTC temperature plus a rise based on recent currents through the inverter.

- Check the NTC temperature that is displayed in [In Heatsink Temp] (port 10) and verify that it is not near the limit. If this value is near the limit, check for cooling problems caused by a blocked or slow heatsink fan.

- Check the output phase current displayed in [In U Phase Curr], [In V Phase Curr], and [In W Phase Curr] (port 10) for an imbalance.

- Check for high-current operation at low speeds, since nearly all current goes through one IGBT in this case.

- Replace the power layer interface board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10113	I1 HS OvrTemp	Resettable fault	Coast	N/A	Yes	Yes	N/A
10213	I2 HS OvrTemp						
10313	I3 HS OvrTemp						
			Description/Actions				

A heatsink over temperature has occurred in inverter 1.

- Verify that the NTC is not disconnected or shorted.

- Check for cooling problems - the heatsink cooling fan is running slow, the enclosure filter or heatsink fins are dirty, or the ambient temperature is too high.

- Check the NTC resistance with a meter. If the resistance is correct, replace the power layer interface board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10114	I1 Main PS Low	Resettable fault	Coast	N/A	N/A	N/A	N/A
10214	I2 Main PS Low						
10314	I3 Main PS Low						
Description/Actions							

The main power supply is producing a low voltage. The inverter power board provides +/- 24V for the stirring fans, LEMs, and floating supply for the gate driver boards. This fault can occur during a power-down sequence.

- If this fault occurs when the drive is started, check the stirring fans for a short.

- Disconnect the individual loads that are powered by this board and look for a short or excessive current.

- Replace the inverter power supply board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10115	I1 lPwrIF PS Low	Resettable fault	Coast	N/A	N/A	N/A	N/A
10215	I2 lPwrIF PS Low						
10315	I3 lPwrIF PS Low						
Description/Actions							

The local power supply is producing a low voltage. The inverter power supply board generates +/-12V from the system power supply and provides power to the power control and power layer interface (PLI) boards.

- Check for a short on the power layer interface or backplane board and replace as necessary.

- If no short is present on the power layer interface or backplane board, replace the inverter power board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10116	I1 Sys PS Low	Alarm 1	N/A	N/A	N/A	N/A	N/A
10216	I2 Sys PS Low						
10316	I3 Sys PS Low						
Description/Actions							

A system power supply under voltage has occurred.

- Using a meter, check for 24V on the inverter power supply board. Replace the board if necessary.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10117	I1 SysPS Overcur	Resettable Fault	Coast	N/A	N/A	N/A	N/A
10217	I2 SysPS Overcur						
10317	I3 SysPS Overcur						
Description/Actions							

A system power supply over current has occurred. This fault can occur during a power-down sequence.

- Check the wiring harness from the inverter power supply board to the converter gate firing board and control pod for shorts/reversals.
- Check for a short on incoming power to the converter gate firing board or fiber interface board.
- Disconnect P6 on the inverter power board to remove the load from this power supply. If the breaker remains tripped, replace the inverter power supply board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10118	I1 HSFan PS Low	Alarm 1	N/A	N/A	N/A	N/A	N/A
10218	I2 HSFan PS Low						
10318	I3 HSFan PS Low						
Description/Actions							

A heatsink fan power-supply undervoltage has occurred.

- Check for 230V supply on the inverter power supply board at connector P6. If there is voltage, replace the inverter power supply board.
- If there is no voltage, check the control power transformer, its primary and secondary fuses, and wiring harness.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10119	I1 CT Harness	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
10219	I2 CT Harness						
10319	I3 CT Harness						
Description/Actions							

The drive has detected a connection loss to a current transducer.

- Verify that the current transducer wiring harness is connected to J22, J23, and J24 on the power interface board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10120	I1 PLI OvrTemp	Resettable Fault	Coast	N/A	Yes	Yes	N/A
10220	I2 PLI OvrTemp						
10320	I3 PLI OvrTemp						
Description/Actions							

The power-layer interface circuit board is over temperature.

- Verify that the ambient temperature is not too high.

- Verify that the stirring fans are operational.

- Check the temperature sensor test point on the power layer interface board to verify that the output is within range. If necessary, replace the power layer interface board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10121	I1 PSBrd OvrTemp	Resettable Fault	Coast	N/A	Yes	Yes	N/A
10221	I2 PSBrd OvrTemp						
10321	I3 PSBrd OvrTemp						
Description/Actions							

The power supply board is over temperature.

- Verify that the ambient temperature is not too high.

- Verify that the stirring fans are operational.

- Check the temperature sensor test point on the power layer interface board to verify that the output is within range. The temperature sensor is on the inverter power supply board, but the A/D processing is on the power layer interface board. If necessary, replace the inverter power supply board. If this problem persists after replacing the inverter power supply board, replace the power layer interface board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10122	I1 InFan1 Slow	Alarm 1	N/A	N/A	N/A	N/A	N/A
10222	I2 InFan1 Slow						
10322	I3 InFan1 Slow						
10123	I1 InFan2 Slow	Resettable Fault					
10223	I2 InFan2 Slow						
10323	I3 InFan2 Slow						
Description/Actions							

Stirring fan 1 is under speed.

- Visually verify that fan 1 is turning.

- Check the measured fan speed displayed in [In InFan n Speed] (port 10).

- Check the wiring harness to the stirring fans to verify that the power and tachometer signals are connected.

- If necessary, replace both stirring fans. When the fans are replaced, the elapsed hours, displayed in [In PredMainReset] (port 10) must be reset.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10124	I1 NTC Open	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
10224	I2 NTC Open						
10324	I3 NTC Open						
Description/Actions							

An NTC open condition has occurred.

- Check the ribbon cable that runs between the backplane board and gate driver board for loose connections or damage. The capacitor bank must be removed to check this cable.

- If the drive is located in cold conditions, raise the ambient temperature.

- Check the power-layer interface board test points for the individual phase NTC temperatures to determine which is open.

- Reseat the power layer interface board. If this problem persists, replace the power layer interface board.

Event No.	Fault/Alarm Text	Type	Fault Action	Auto Reset	Auto Clear	Emergency Protection Override
10125	I1 Incompat UBrd	Non-reset Fault	Coast	N/A	N/A	N/A
10225	I2 Incompat UBrd					
10325	I3 Incompat UBrd					
10126	I1 Incompat VBrd					
10226	I2 Incompat VBrd					
10326	I3 Incompat VBrd					
10127	I1 Incompat WBrd					
10227	I2 Incompat WBrd					
10327	I3 Incompat WBrd					
Description/Actions						

The power layer interface and power control board do not detect the correct gate driver board on the U, V, or W phase. This fault can occur during a power down sequence.

- Check the ribbon cable that runs between the backplane board and gate driver board for loose connections or damage and verify that the correct gate driver board is installed. The capacitor bank must be removed to check this cable and the board.

- Reflash the control board.

- Check the rating plug.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10128	I1 Incompat Brdn	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
10228	I2 Incompat Brdn						
10328	I3 Incompat Brdn						
Description/Actions							

The drive detected an incompatible burden resistor.

- Verify that the correct rating plug is installed. Reseat the rating plug.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10129	I1 DC Bus Imbal	Resettable Fault	Coast	N/A	N/A	N/A	N/A
10229	I2 DC Bus Imbal						
10329	I3 DC Bus Imbal						

Description/Actions

Either the lower or upper leg of the capacitor bank is getting too much voltage (based on the bus voltage, measured voltage across the lower leg, and a calculation to find the voltage across the upper leg) or the voltage sensing components are damaged.

- Check the value of the bus bleeder resistor and bus balancing resistor and replace as necessary.

- Inspect the capacitor bank for leakage or damage and replace as necessary. Replacing the capacitor bank assembly also replaces the bus balancing resistor.

- Measure the voltage on each half of the bus to confirm the calculations. If the bus measurements aren't correct, replace the power interface board and/or inverter power supply board.

ATTENTION: The DC bus voltage can only be measured when the drive is energized. Servicing energized equipment can be hazardous. Severe injury or death can result from electrical shock, burn, or unintended actuation of controlled equipment. Follow Safety related practices of NFPA 70E, ELECTRICAL SAFETY FOR EMPLOYEE WORKPLACES. DO NOT work alone on energized equipment!

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10130	I1 Curr Offset	Alarm 1	N/A	N/A	N/A	N/A	N/A
10230	I2 Curr Offset						
10330	I3 Curr Offset						

Description/Actions

The calculated current offset for any phase is larger than expected.

- Check the current sensor offset reading inverter test point and power supply. If necessary, replace the current sensor.

- If this problem persists, replace the inverter power supply board and/or the power layer interface board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10131	I1 Fault Q Full	Resettable Fault	Coast	N/A	N/A	N/A	N/A
10231	I2 Fault Q Full						
10331	I3 Fault Q Full						
Description/Actions							
The fault queue is full. There are at least three other faults in the queue. Troubleshooting and clearing the existing faults makes room for additional faults in the queue (if any). This fault can occur during a power-down sequence							

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10132	I1 Incompat PS	Resettable Fault	Coast	N/A	N/A	N/A	N/A
10232	I2 Incompat PS						
10332	I3 Incompat PS						
Description/Actions							

The drive has detected an incompatible power supply for the drive AC input rating.

- Check the power supply and replace it if incorrect.

- If the power supply is correct, reflash the control board.

- If this problem persists, replace the inverter power supply board or power layer interface board.

Event No.	Fault/Alarm Text	Type	Fault Action	Auto Reset	Auto Clear	Emergency Protection Override
10134	I1 UBrd Fault	Resettable Fault	Coast	N/A	N/A	N/A
10234	I2 UBrd Fault					
10334	I3 UBrd Fault					
10135	I1 VBrd Fault					
10235	I2 VBrd Fault					
10336	I3 VBrd Fault					
10136	I1 WBrd Fault					
10236	I2 WBrd Fault					
10336	I3 WBrd Fault					
Description/Actions						

The power supply on the U, V, or W phase gate driver board has failed.

- If this fault occurred on this phase only, replace the appropriate gate driver board.

- If this fault occurred on all three phases, check the 24V power supply on the inverter power supply board that feeds the gate driver boards and replace the inverter power supply board if necessary.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10137	I1 Flash Failed	Resettable Fault	Coast	N/A	N/A	N/A	N/A
10237	I2 Flash Failed						
10337	I3 Flash Failed						
Description/Actions							

This fault will be asserted if an attempt to flash the FPGA configuration device fails.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
10138	I1 Powering Down	Resettable Fault	Coast	N/A	N/A	N/A	N/A
10238	I2 Powering Down						
10338	I3 Powering Down						
Description/Actions							

This fault will be asserted at 80% of the rated DC bus voltage.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11101	C1 Precharge	Alarm 1	N/A	N/A	N/A	N/A	N/A
11201	C2 Precharge	Non-reset Fault	Coast				
11301	I3 Precharge						

Description/Actions

1. The AC line voltage is in the range of 50–300V (for 400V class drives) or 50–400V (for 600V class drives). Precharge begins when the AC line voltage reaches 300V or 400V.

2. The drive has been in precharge for more than 12 seconds. If the "Cn Precharge" alarm persists for more than 30 seconds the drive will fault. Following powerup or a fault reset, the converter does not issue any voltage-related alarms until the AC input voltage exceeds 50V to prevent an alarm when a customer-supplied auxiliary power supply is used.

3. The DC bus open circuit test can be cycling. If this test cycles for more than 10 seconds, event 144/244 "Cn DC Bus Open" occurs.

Alarm 1:

• Check the line voltage displayed in [Cn L12 Line Volt], [Cn L23 Line Volt], and [CV L31 Line Volt] (port 11).

• Check the phase current displayed in [Cn L1 Phase Curr], [Cn L2 Phase Curr], and [Cn L3 Phase Curr] (port 11) and the bus voltage in [Cn DC Bus Volt] (port 11). Line current, line voltage, and bus voltage sensing are all performed on the converter gate firing board. If this alarm persists, replace the converter gate firing board.

Non-reset Fault:

• Verify that the current transducers have not all failed. If necessary, replace all three current transducers.

• Verify that the DC link inductor has not failed. If necessary, replace the DC link choke.

• Verify that the converter line and DC bus wiring is connected.

• Verify that the capacitor bank is properly installed and connected.

Event No.	Fault/Alarm Text	Type	Fault Action	Auto Reset	Auto Clear	Emergency Protect Override
11102	C1 Phase Loss L1	Alarm 1	N/A	N/A	N/A	N/A
11202	C2 Phase Loss L1					
11302	C3 Phase Loss L1					
11103	C1 Phase Loss L2					
11203	C2 Phase Loss L2					
11303	C3 Phase Loss L2					
11104	C1 Phase Loss L3					
11204	C2 Phase Loss L3					
11304	C3 Phase Loss L3					
Description/Actions						

The AC line-to-line voltages are imbalanced, indicating an open AC input phase.

• Check for an upstream AC line loss.

• Verify that the AC input line wiring is properly connected.

• Check the wiring harness to the converter gate firing board for loose connections and/or damage. If necessary, replace the converter gate-firing board wiring harness.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11111	C1 SCR Ovr Temp	Resettable Fault	Coast	N/A	Yes	Yes	N/A
11211	C2 SCR Ovr Temp						
11311	C3 SCR Ovr Temp						
Description/Actions							

An alarm occurs if the calculated SCR temperature exceeds 125 °C (257 °F) and a fault occurs when the calculated SCR temperature exceeds 135 °C (275 °F).

• Check for cooling problems: the heatsink cooling fan is running slow, the enclosure filter or heatsink fins are dirty, or the ambient temperature is too high.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11112	C1 HS Ovr Temp	Alarm 1	N/A	N/A	N/A	N/A	N/A
11212	C2 HS Ovr Temp	Resettable Fault	Coast		Yes	Yes	
11312	C3 HS Ovr Temp						
Description/Actions							

An alarm when the heatsink temperature exceeds 95 °C (203 °F) and a fault when the heatsink temperature exceeds 100 °C (212 °F).

- Check the NTC for a short or verify that it is connected.

- Measure the resistance of the NTC. The reading should be approximately 11.5 Ω, at room temperature.

- Check for cooling problems: the heatsink cooling fan is running slow, the enclosure filter or heatsink fins are dirty, or the ambient temperature is too high.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11113	C1 TVSS Blown	Alarm 1	N/A	N/A	N/A	N/A	N/A
11213	C2 TVSS Blown						
11313	C3 TVSS Blown						
Description/Actions							

An alarm occurs if the calculated SCR temperature exceeds 125 °C (257 °F) and a fault occurs when the calculated SCR temperature exceeds 135 °C (275 °F).

- Check for cooling problems: the heatsink cooling fan is running slow, the enclosure filter or heatsink fins are dirty, or the ambient temperature is too high.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11114	C1 Blower Speed	Alarm 1	N/A	N/A	N/A	N/A	N/A
11214	C2 Blower Speed						
11314	C3 Blower Speed						
Description/Actions							

The converter cooling fan is running below normal operating speed.

- Check for debris in the fan. If necessary, clean the fan and housing.

- Check for noise at the fan, indicating motor bearing failure.

- Verify that the fan power and feedback connections are not lose or disconnected.

- Replace the fan, if necessary.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11114	C1 Blower Speed	Alarm 1	N/A	N/A	N/A	N/A	N/A
11214	C2 Blower Speed						
11314	C3 Blower Speed						

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11115	C1 Line Dip	Alarm 1	N/A	N/A	N/A	N/A	N/A
11215	C2 Line Dip						
11315	C3 Line Dip	Resettable Fault	Coast		Yes	Yes	

Description/Actions

The bus voltage has fallen below the value specified in P451 [Pwr Loss A Level] or P454 [Pwr Loss B Level] (port 0) minus 20 volts. Until the converter has established communications with the main control board, this value defaults to 180V below the converter bus memory. The converter stops firing the SCRs until the nominal value of the DC bus voltage for the present AC line voltage is within 60 volts of P12 [DC Bus Memory] (port 0). If the line dip condition persists for more than 60 seconds the alarm becomes a fault.

- Verify the power wiring connections.

- Compare the actual DC bus voltage to the value displayed in [Cn DC Bus Volt]. If the values are different, replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11116	C1 Minimum Line	Alarm 1	N/A	N/A	N/A	N/A	N/A
11216	C2 Minimum Line						
11316	C3 Minimum Line						

Description/Actions

The AC line voltage is less than 280V (for a 400V class drive) / 400V (for a 600V class drive).

- The AC line voltage must exceed 320V / 440V to recover from this alarm.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11117	C1 Line Freq	Alarm 1	N/A	N/A	N/A	N/A	N/A
11217	C2 Line Freq						
11317	C3 Line Freq	Resettable Fault	Coast				

Description/Actions

The measured line frequency is out of the range (below 40 Hz, or above 65 Hz). This alarm becomes a fault if the condition persists for more than 30 seconds.

- Check the incoming power line frequency.

- Check the wiring harness to the converter gate firing board for loose connections and/or damage and replace if necessary.

- If the wiring harness is properly connected and not damaged, replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11118	C1 Single Phase	Alarm 1	N/A	N/A	N/A	N/A	N/A
11218	C2 Single Phase						
11318	C3 Single Phase	Resettable Fault	Coast				

Description/Actions

The converter was intentionally powered up in single-phase mode with only AC phase L1-L2 present. Intentional single-phase mode is only detected at the initial application of AC line voltage. Application of 3-phase voltage after the converter has entered single-phase mode results in the single-phase alarm becoming a fault.

- Verify that only one phase is applied to a drive-in single-phase mode.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11134	C1 Overcurrent	Resettable Fault	Coast	N/A	N/A	N/A	N/A
11234	C2 Overcurrent						
11334	C3 Overcurrent						

Description/Actions

The peak AC input current has exceeded 3000 A for five-line cycles.

- Verify that the current transducers are connected.

- Check the wiring harness to the converter gate firing board for loose connections or damage and replace if necessary.

- If the current transducers are properly connected and the wiring harness for the gate firing board is OK, replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11134	C1 Overcurrent	Resettable Fault	Coast	N/A	N/A	N/A	N/A
11234	C2 Overcurrent						
11334	C3 Overcurrent						

- Check for an open SCR or DC bus short.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11135	C1 Ground Fault	Resettable Fault	Coast	N/A	Yes	Yes	N/A
11235	C2 Ground Fault						
11335	C3 Ground Fault						

Description/Actions

The converter input ground current (peak) has exceeded the threshold set P16 [Gnd Cur Flt Lvl] (port 11) for five-line cycles. A possible internal short in the drive between a phase, ground, or the DC bus can have occurred.

- Verify that the current transducer wiring harness is connected to the converter gate firing board and that they are functioning properly. If necessary, replace all three current transducers (CTs).

- If the current transducer wiring harness is connected and the CTs are functioning properly, replace the converter gate firing board.

- To determine if there is an imbalance between the phases, view the input phase current values in [Cn L1 Phase Curr], [Cn L2 Phase Curr], and [Cn L3 Phase Curr] (port 11). [Cn Gnd Current] (port 11) is the calculated (not measured) ground current based on the phase currents. If necessary, use trending when the ground fault occurs upon drive power-up.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11136	C1 HS NTC Open	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
11236	C2 HS NTC Open						
11336	C3 HS NTC Open						

Description/Actions

The converter heatsink NTC is open. The heatsink NTC is mounted on the converter heatsink and is wired to the converter gate firing board. An open NTC is assumed when the heatsink temperature is below -40 °C (-40 °F).

- Check for loose connections or damage to the NTC wiring harness.

- Measure the resistance of the NTC and verify that it is within range.

- If the NTC wiring harness and resistance measurement is OK, replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11137	C1 HS NTC Short	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
11237	C2 HS NTC Short						
11337	C3 HS NTC Short						
Description/Actions							

The converter heatsink NTC is shorted. The heatsink NTC is mounted on the converter heatsink and is wired to the converter gate firing board. A shorted NTC is assumed when the heatsink temperature is above 200 °C (392 °F).

- Check for loose connections or damage to the NTC wiring harness.

- Measure the resistance of the NTC and verify that it is within range.

- If the NTC wiring harness and resistance measurement is OK, replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11138	C1 Brd Ovr Temp	Resettable Fault	Coast	N/A	Yes	Yes	N/A
11238	C2 Brd Ovr Temp						
11338	C3 Brd Ovr Temp						
Description/Actions							

The gate firing board is over temperature. This fault occurs when the gate firing board temperature exceeds 70 °C (158 °F).

- Check the cabinet fan wiring harness for loose connections or damage and that the fan is running. If necessary, replace the fan wiring harness and/or fan.

- Lower the ambient temperature.

- Replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11139	C1 Brd NTC Open	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
11239	C2 Brd NTC Open						
11339	C3 Brd NTC Open						
Description/Actions							

The converter gate firing board NTC is open. An open NTC is assumed when the temperature is below -40 °C (-40 °F).

- Replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11140	C1 Brd NTC Short	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
11240	C2 Brd NTC Short						
11340	C3 Brd NTC Short						
Description/Actions							

The converter gate firing board NTC is shorted. A shorted NTC is assumed when the temperature is above 200 °C (392 °F).

•   Replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11141	C1 Power Supply	Resettable Fault	Coast	N/A	N/A	N/A	N/A
11241	C2 Power Supply						
11341	C3 Power Supply						
Description/Actions							

A power supply input voltage (24V input and/or +/-12V internal supply) is operating outside of the acceptable range.

•   Check input power to the converter gate firing board. The following thresholds are used:

24V is below 20.1V

12V is below 10.0V

12V is above 15.0V

-12V is above -10.0V

•   If the power supply voltage is within the acceptable range, replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11142	C1 Comm Loss	Resettable Fault	Coast	N/A	N/A	N/A	N/A
11242	C2 Comm Loss						
11342	C3 Comm Loss						
		Description/Actions					

The converter gate firing board lost communications (through the power layer interface board) to the main control board. Once the root cause of the communication fault has been resolved, power must be cycled, or a drive reset must be initiated to clear this fault.

• Verify that the fiber optic cables are properly connected to the transceivers.

• Verify that the transceivers are properly seated in the ports.

• Verify that the fiber optic cable is not cracked or broken.

• Verify that power is applied to the fiber optic interface board, gate firing board, and power layer interface board. If necessary, replace the fiber optic interface, gate firing board, and/or power layer interface board.

ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into fiber-optic ports or fiber-optic cable connectors. Remove power from the drive before disconnecting fiber optic cables.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11143	C1 Firmware Fit	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
11243	C2 Firmware Fit						
11343	C3 Firmware Fit						
		Description/Actions					

A firmware fault has occurred.

• Reset the drive. If this fault persists, replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11144	C1 DC Bus Open	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
11244	C2 DC Bus Open						
11344	C3 DC Bus Open						
Description/Actions							

The DC bus voltage did not rise above 12V (for 400V class drives) or 20V (for

600V class drives) as the SCRs began to ramp on. In this case, the converter tries to turn on the SCRs for approximately 10 seconds before issuing this fault. Event 101/201 "Cn Precharge" is issued following the first retry.

- Verify that the current transducers have not all failed. If necessary, replace all three current transducers.
- Verify that the DC link inductor has not failed. If necessary, replace the DC link choke.
- Verify that the converter line and DC bus wiring is connected.
- Verify that the capacitor bank is properly installed and connected.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11145	C1 DC Bus Short	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
11245	C2 DC Bus Short						
11345	C3 DC Bus Short						
Description/Actions							

The peak current has exceeded 150 % of the converter rating during the precharge sequence. Peak charging current is normally limited to 50 % of the converter rating.

- Check for a DC bus short, internally, and externally.
- Verify that the wiring harness to P10 on the converter gate firing board is connected and not damaged. Replace the harness as necessary.
- Verify that the capacitor bank is properly installed and connected.
- Check for an IGBT short and replace as necessary.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11146	C1 CT Harness	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
11246	C2 CT Harness						
11346	C3 CT Harness						
Description/Actions							

A current transducer (CT) wiring harness connection loss has been detected.

- Verify that the CT wiring harness is not damaged and is connected to P6 on the converter gate firing board. Replace the wiring harness if necessary.

- If this problem persists, replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11147	C1 LFuse Harness	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
11247	C2 LFuse Harness						
11347	C3 LFuse Harness						
Description/Actions							

A line-fuse wiring harness connection loss has been detected.

- Verify that the line fuse wiring harness is not damaged and is connected to P7 on the converter gate firing board. Replace the wiring harness if necessary.

- If this problem persists, replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Auto Reset	Auto Clear	Emergency Protection Override
11148	C1 Line Fuse L1	Non-reset Fault	Coast	N/A	N/A	N/A
11248	C2 Line Fuse L1					
11348	C3 Line Fuse L1					
11149	C1 Line Fuse L2					
11249	C2 Line Fuse L2					
11349	C3 Line Fuse L2					
11150	C1 Line Fuse L3					
11250	C2 Line Fuse L3					
11350	C3 Line Fuse L3					
Description/Actions						

The line fuse for Line *n* has blown.

- Check the fuse and replace if necessary.

- Verify that the line fuse wiring harness for line 1 is not damaged and is connected to P7 on the converter gate firing board. Replace the wiring harness if necessary.

- If this problem persists, replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11157	C1 BFuse Harness	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
11257	C2 BFuse Harness						
11357	C3 BFuse Harness						
Description/Actions							

A bus-fuse wiring harness connection loss has been detected.

- Check the bus fuse harness and replace if necessary.

- If this problem persists, replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11158	C1 BFuse Pos	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
11258	C2 BFuse Pos						
11358	C3 BFuse Pos						
Description/Actions							

The DC+ bus fuse is blown.

• Check the DC+ bus fuse and wiring harness and replace if necessary.

• If this problem persists, replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11159	C1 BFuse Neg	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
11259	C2 BFuse Neg						
11359	C3 BFuse Neg						
Description/Actions							

The DC- bus fuse is blown.

• Check the DC- bus fuse and wiring harness and replace if necessary.

• If this problem persists, replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11160	C1 Command Stop	Resettable Fault	Coast	N/A	Yes	Yes	N/A
11260	C2 Command Stop						
11360	C3 Command Stop						
Description/Actions							

The main control board has commanded the converter gate firing board to stop due to an asymmetrical bus condition.

• Check the DC bus connections and wiring.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11161	C1 AC Line High	Resettable Fault	Coast	N/A	N/A	N/A	N/A
11261	C2 AC Line High						
11361	C3 AC Line High						
Description/Actions							

The AC line voltage has exceeded 565V (for 400V class drives) or 815V (for 600V class drives), which corresponds to the nominal bus voltage of 799V DC (for 400V class drives) or 1150V DC (for 600V class drives). This fault is intended to protect the capacitor bank from an overvoltage condition especially if a 400V class drive is inadvertently placed in a 600V system.

•   Verify the incoming line voltage.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11162	C1 Line Loss	Resettable Fault	Coast	N/A	Yes	Yes	N/A
11262	C2 Line Loss						
11362	C3 Line Loss						
Description/Actions							

An AC line loss has occurred.

•   Monitor the incoming AC line for low voltage or line power interruption.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11163	C1 Fault Q Full	Resettable Fault	Coast	N/A	N/A	N/A	N/A
11263	C2 Fault Q Full						
11363	C3 Fault Q Full						
Description/Actions							

The fault queue is full. There are at least three other faults in the queue.

•   Troubleshooting and clearing the existing faults make room for additional faults in the queue (if any).

Event No.	Fault/Alarm Text	Type	Fault Action	Auto Reset	Auto Clear	Emergency Protection Override
11101	P1 Precharge	Alarm 1	N/A	N/A	N/A	N/A
11201	P2 Precharge					
11301	P3 Precharge					
		Resettable Fault	Coast			
Description/Actions						

Alarm 1 Type:

The DC bus delta voltage (Vbus_in - Vbus_out) is greater than 25V
when the moulded case switch (MCS) is open. This alarm is suppressed when the Precharge Fault is present.

Resettable Fault Type and Coast Fault Action:

The DC bus voltage did not meet the conditions that are required to close the moulded case switch (MCS) within the timeout period.

1. DC bus input is not overvoltage.
2. DC bus input is not undervoltage.
3. **DC bus delta voltage (Vbus_in - Vbus_out) is less than 25V.**

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11115	P1 Bus Dip	Alarm 1	N/A	N/A	N/A	N/A	N/A
11215	P2 Bus Dip						
11315	P3 Bus Dip						
Description/Actions							

Only occurs when the drive is offline or in stand-alone mode. The bus voltage has dipped more than 180V below the drive bus memory. The alarm is released when the bus voltage rises back to within 60V of the drive bus memory.

Event No.	Fault/Alarm Text	Type	Fault Action	Auto Reset	Auto Clear	Emergency Protection Override
11119	P1 240 V AC Loss	Alarm 1	N/A	N/A	N/A	N/A
11219	P2 240 V AC Loss					
11319	P3 240 V AC Loss					
		Resettable Fault	Coast			
Description/Actions						

Alarm 1 Type:

240V AC not present while the drive is in the inactive state. This alarm is suppressed when the 240V AC Loss Fault is present.

Resettable Fault Type and Coast Fault Action:

240V AC was lost while in the active state. Active state is whenever the drive is not stopped, for example, the moulded case switch (MCS) is opening or closing or is closed.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11120	P1 240V AC Discon	Alarm 1	N/A	N/A	N/A	N/A	N/A
11220	P2 240V AC Discon						
11320	P3 240V AC Discon						
Description/Actions							

The 240V AC disconnect is open when the pre-charge controller is in the ready state (MCS is not closed).

Event No.	Fault/Alarm Text	Type	Fault Action	Auto Reset	Auto Clear	Emergency Protection Override
11121	P1 Bus Undervolt	Alarm 1	N/A	N/A	N/A	N/A
11221	P2 Bus Undervolt					
11321	P3 Bus Undervolt					
		Resettable Fault	Coast			
Description/Actions						

Alarm 1 Type:

The input bus voltage is below 400V DC while the moulded case switch (MCS) is open. Hysteresis level 420V DC. This alarm is suppressed when the Bus Undervoltage Fault is present.

Resettable Fault Type and Coast Fault Action:

The bus input voltage fell below 400V while the moulded case switch
(MCS) was closed. Hysteresis level at 420V. The system SMPS cuts out near 340V DC.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11122	P1 Bus Overvolt	Alarm 1	N/A	N/A	N/A	N/A	N/A
11222	P2 Bus Overvolt						
11322	P3 Bus Overvolt						
Description/Actions							

The input bus voltage exceeds 820V DC. Hysteresis level 800V DC.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11123	P1 Door Open	Alarm 1	N/A	N/A	N/A	N/A	N/A
11223	P2 Door Open						
11323	P3 Door Open						
Description/Actions							

Door closure contact is open.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11130	P1 MCS ShuntTrip	Resettable Fault	Coast	N/A	N/A	N/A	N/A
11230	P2 MCS ShuntTrip						
11330	P3 MCS ShuntTrip						
Description/Actions							
The moulded case switch (MCS) auxiliary contact did not open within 1 second following the shunt trip coil activation.							

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11131	P1 MCS CloseFail	Resettable Fault	Coast	N/A	N/A	N/A	N/A
11231	P2 MCS CloseFail						
11331	P3 MCS CloseFail						
Description/Actions							
The moulded case switch (MCS) auxiliary contact did not close within 2 seconds following the close coil activation.							

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11132	P1 MCSAuxContact	Resettable Fault	Coast	N/A	N/A	N/A	N/A
11232	P2 MCSAuxContact						
11332	P3 MCSAuxContact						
Description/Actions							
The moulded case switch (MCS) auxiliary contact was open when the MCS was closed or closed when the MCS was open. If the MCS Failed to Close Fault is present, then this fault is not reported.							

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11133	P1 MCS Closed	Resettable Fault	Coast	N/A	N/A	N/A	N/A
11233	P2 MCS Closed						
11333	P3 MCS Closed						
Description/Actions							

The voltage across the moulded case switch (MCS) when it was closed exceeded 10V.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11138	P1 Brd Overtemp	Resettable Fault	Coast	N/A	Yes	Yes	N/A
11238	P2 Brd Overtemp						
11338	P3 Brd Overtemp						
Description/Actions							

The gate firing board is over temperature. This fault occurs when the gate firing board temperature exceeds 70 °C (158 °F).

- Check the cabinet fan wiring harness for loose connections or damage and that the fan is running. If necessary, replace the fan wiring harness and/or fan.

- Lower the ambient temperature.

- Replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11139	P1 Brd NTC Open	Non-reset Fautt	Coast	N/A	N/A	N/A	N/A
11239	P2 Brd NTC Open						
11339	P3 Brd NTC Open						
Description/Actions							

The converter gate firing board NTC is open. An open NTC is assumed when the temperature is below -40 °C (-40 °F).

- Replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11140	P1 Brd NTC Short	Non-reset Fautt	Coast	N/A	N/A	N/A	N/A
11240	P2 Brd NTC Short						
11340	P3 Brd NTC Short						
Description/Actions							

The converter gate firing board NTC is shorted. A shorted NTC is assumed when the temperature is above 200 °C (392 °F).

• Replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11141	P1 Power Supply	Resettable Fault	Coast	N/A	N/A	N/A	N/A
11241	P2 Power Supply						
11341	P3 Power Supply						
Description/Actions							

A power supply input voltage (24V input and/or +/-12V internal supply)

is operating outside of the acceptable range.

• Check input power to the converter gate firing board. The following thresholds are used:

24V is below 20.1V

12V is below 10.0V

12V is above 15.0V

-12V is above -10.0V

• If the power supply voltage is within the acceptable range, replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11142	P1 Comm Loss	Resettable Fault	Coast	N/A	N/A	N/A	N/A
11242	P2 Comm Loss						
11342	P3 Comm Loss						
Description/Actions							

The converter gate firing board lost communications (through the power layer interface board) to the main control board. Once the root cause of the communication fault has been resolved, power must be
cycled or a drive reset must be initiated to clear this fault.

- Verify that the fiber optic cables are properly connected to the transceivers.

- Verify that the transceivers are properly seated in the ports.

- Verify that the fiber optic cable is not cracked or broken.

- Verify that power is applied to the fiber optic interface board, gate firing board, and power layer interface board. If necessary, replace the fiber optic interface, gate firing board, and/or power layer interface board.

ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into fiber-optic ports or fiber-optic cable connectors. Remove power from the drive before disconnecting fiber-optic cables.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11143	P1 Firmware Fit	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
11243	P2 Firmware Fit						
11343	P3 Firmware Fit						
Description/Actions							

A firmware fault has occurred.

- Reset the drive. If this fault persists, replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11145	P1 DC Bus Short	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
11245	P2 DC Bus Short						
11345	P3 DC Bus Short						
Description/Actions							

The peak current has exceeded 150 % of the converter rating during the precharge sequence. Peak charging current is normally limited to 50 % of the converter rating.

- Check for a DC bus short, internally, and externally.

- Verify that the wiring harness to P10 on the converter gate firing board is connected and not damaged. Replace the harness as necessary.

- Verify that the capacitor bank is properly installed and connected.

- Check for an IGBT short and replace as necessary.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11157	P1 BFuse Harness	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
11257	P2 BFuse Harness						
11357	P3 BFuse Harness						
Description/Actions							

A bus-fuse wiring harness connection loss has been detected.

- Check the bus fuse harness and replace if necessary.

- If this problem persists, replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11158	P1 BFuse Pos	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
11258	P2 BFuse Pos						
11358	P3 BFuse Pos						
Description/Actions							

The DC+ bus fuse is blown.

- Check the DC+ bus fuse and wiring harness and replace if necessary.

- If this problem persists, replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11159	P1 BFuse Neg	Non-reset Fault	Coast	N/A	N/A	N/A	N/A
11259	P2 BFuse Neg						
11359	P3 BFuse Neg						
Description/Actions							

The DC- bus fuse is blown.

- Check the DC- bus fuse and wiring harness and replace if necessary.

- If this problem persists, replace the converter gate firing board.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11160	P1 Command Stop	Resettable Fault	Coast	N/A	Y	Y	N/A
11260	P2 Command Stop						
11360	P3 Command Stop						
Description/Actions							

The main control board has commanded the converter gate firing board to stop due to an asymmetrical bus condition.

- Check the DC bus connections and wiring.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Reset	Auto Clear	Emergency Protection Override
11163	P1 Fault Q Full	Resettable Fault	Coast	N/A	N/A	N/A	N/A
11263	P2 Fault Q Full						
11363	P3 Fault Q Full						
Description/Actions							

The fault queue is full. There are at least three other faults in the queue.

- Troubleshooting and clearing the existing faults make room for additional faults in the queue (if any).

The following table lists the 1300*n* events. Only parameters that have values are shown.

Event No.	Fault/Alarm Text	Description/Actions
13001	No Event	Text that is displayed in an empty event queue entry.
13002	Device Power Up	Power was applied to the adapter.
13003	Device Reset	The adapter was reset.
13004	EEPROM CRC Error	The EEPROM checksum/CRC is incorrect, which limits adapter functionality. Default parameter values must be loaded to clear this condition.
13005	App Updated	The adapter application firmware was flash updated.
13006	Boot Updated	The adapter boot firmware was flash updated.
13007 — 13024	Reserved	
13205	DPI Manual Reset	The adapter was reset.
13026 — 13028	Reserved	
13029	Net Link Up	A network link was available for the adapter.
13030	Net Link Down	The network link was removed from the adapter.
13031	Net Dup Address	The adapter uses the same IP address as another device on the network.
13032	Net Comm Fault	The adapter detected a communications fault on the network.
13033	Net Sent Reset	The adapter received a reset from the network.
13034	Net IO Close	An I/O connection from the network to the adapter was closed.
13035	Net Idle Fault	The adapter received "idle" packets from the network.
13036	Net IO Open	An I/O connection from the network to the adapter has been opened.
13037	Net IO Timeout	An I/O connection from the network to the adapter has timed out.
13038	Net IO Size Err	The adapter received an incorrectly sized I/O packet.
13039	PCCC IO Close	The device sending PCCC Control messages to the adapter has set the PCCC Control Timeout to zero.
13040	PCCC IO Open	The adapter has begun receiving PCCC Control messages (the PCCC Control
13041	PCCC IO Timeout	Timeout was previously set to a non-zero value).
13042	Msg Ctrl Open	The adapter has not received a PCCC Control message for longer than the PCCC Control Timeout.
13043	Msg Ctrl Close	The timeout attribute in either the CIP Register or Assembly object was written with a non-zero value, allowing control messages to be sent to the adapter.
13044	Msg Ctrl Timeout	The timeout attribute in either the CIP Register or Assembly object was written with a zero value, disallowing control messages to be sent to the adapter.
13045	Peer IO Open	The timeout attribute in either the CIP Register or Assembly object elapsed between accesses of those objects.
13046	Peer IO Timeout	The adapter received the first Peer I/O message.
13047 — 13054	Reserved	
13055	BOOTP Response	The adapter received a response to its BOOTP request.
13056	E-mail Failed	The adapter encountered an error attempting to send a requested e-mail
13057	Option Card Flt	message.
13058	Module Defaulted	The adapter experienced a generic fault condition (drive only).
13059	Net Memory Mgmt	The adapter has been set to defaults.

The following table lists the *xx*00*n* events. Only parameters that have values are shown.

Event No.	Fault/Alarm Text	Type	Fault Action	Configuration Parameter	Auto Clear	Description/Actions
xx000	No entry					
xx001	Analog In Loss	Configurable	N/A	P53/P63 [Anlg InX LssActn]	Yes	Analog input has a lost signal.
xx002	Motor PTC Trip	Configurable	N/A	P40 [PTC Cfg	Yes	Motor PTC (Positive Temperature Coefficient) over temperature.
xx005	Relay0 Life	Configurable	N/A	P106 [RO0 LifeEvntActn]	N/A	Predictive maintenance.
xx006	Relay1 Life	Configurable	N/A	P116 [RO1 LifeEvntActn	N/A	Predictive maintenance.
xx010	Anlg Cal Chksum	Non-Reset Fault	Coast	N/A	N/A	The checksum read from the analog calibration data does not match the checksum calculated. Replace option module.
xx058	Module Defaulted	Fault	Coast	N/A	N/A	Module was commanded to write default values.
xx058	Module Defaulted	Fault	Coast	N/A	N/A	Module was commanded to write default values.

Appendix B: **Modbus TCP Card Settings Snapshot**

There are several software revisions of Modbus TCP card and MBMSetup script only runs for the version it recognizes. Once the script has finished running, the final settings of the card should be as shown below.

Modbus TCP card v3.3.0.3

```
C:\Users\BWong3>c:\MBM\mbmsetup.exe COM32 192.168.1.11 192.168.1.12
mbmsetup version 1.2
Please reset Modbus TCP Card now...
Searching for Modbus TCP card...
Found Modbus TCP card...
MB TCP Card software V3.3.0.3
  Recognized card software: yes

Network Configuration Sequence:
1192.168.1.11<Enter>ny255.255.255.0<Enter>n
Serial & Mode Sequence:
22<Enter>1<Enter>1<Enter>57600,8,n,1<Enter>
Modem/Pin Sequence:
31<Enter>1<Enter>1<Enter>
Advanced Modbus Sequence:
42<Enter>1<Enter>50<Enter>5000<Enter>0<Enter>n
Unit ID Sequence:
510<Enter>0<Enter>d1d1d1d1d1a1<Enter>255<Enter>192.168.1.12<Enter>e



Modbus/TCP to RTU Bridge Setup
1) Network/IP Settings:
     IP Address ................. 192.168.1.11
     Default Gateway ............ --- not set ---
     Netmask .................... 255.255.255.0
2) Serial & Mode Settings:
     Protocol ................... Modbus/RTU,Master attached
     Serial Interface ........... 57600,8,N,1,RS232
3) Modem/Configurable Pin Settings:
     CP1 ...... Not Used
     CP2 ...... Not Used
     CP3 ...... Not Used
4) Advanced Modbus Protocol settings:
     MB/TCP Exception Codes ..... Yes (return 00AH and 00BH)
     Char, Message Timeout ...... 00050msec, 05000msec
5) Unit ID -> IP Address Table:
     Close Idle Sockets ......... 10sec
     Redundant Entry Retry ...... Feature Disabled
     001-255: 192.168.1.12
7) Security Settings:
     SNMP ....................... Enabled
     SNMP Community Name ........ public
     Telnet Setup ............... Enabled
     TFTP Download .............. Enabled
     Port 77FEh ................. Enabled
     Web Server ................. Enabled
     Enhanced Password .......... Disabled
     Port 77F0h ................. Enabled

D)efault settings, S)ave, Q)uit without save
Select Command or parameter set (1..7) to change:

Parameters saved, Restarting ...

Finished mbmsetup version 1.2
```

Modbus TCP card v3.3.0.6

```
C:\Users\BWong3>c:\MBM\mbmsetup.exe COM32 192.168.1.11 192.168.1.12
mbmsetup version 1.2
Please reset Modbus TCP Card now...
Searching for Modbus TCP card...
Found Modbus TCP card...
MB TCP Card software V3.3.0.6
  Recognized card software: yes

Network Configuration Sequence:
1192.168.1.11<Enter>ny255.255.255.0<Enter>n
Serial & Mode Sequence:
22<Enter>1<Enter>1<Enter>57600,8,n,1<Enter>
Modem/Pin Sequence:
31<Enter>1<Enter>1<Enter>
Advanced Modbus Sequence:
42<Enter>1<Enter>50<Enter>5000<Enter>0<Enter>n
Unit ID Sequence:
510<Enter>0<Enter>d1d1d1d1d1a1<Enter>255<Enter>192.168.1.12<Enter>e




Modbus/TCP to RTU Bridge Setup
1) Network/IP Settings:
     IP Address ................ 192.168.1.11
     Default Gateway ........... --- not set ---
     Netmask ................... 255.255.255.0
2) Serial & Mode Settings:
     Protocol .................. Modbus/RTU,Master attached
     Serial Interface .......... 57600,8,N,1,RS232
3) Modem/Configurable Pin Settings:
     CP1 ...... Not Used
     CP2 ...... Not Used
     CP3 ...... Not Used
4) Advanced Modbus Protocol settings:
     MB/TCP Exception Codes ..... Yes (return 00AH and 00BH)
     Char, Message Timeout ...... 00050msec, 05000msec
5) Unit ID -> IP Address Table:
     Close Idle Sockets ......... 10sec
     Redundant Entry Retry ...... Feature Disabled
     001-255: 192.168.1.12
7) Security Settings:
     SNMP ...................... Disabled
     Telnet Setup .............. Enabled
     TFTP Download ............. Enabled
     Port 77FEh ................ Enabled
     Web Server ................ Enabled
     Enhanced Password ......... Enabled
     Port 77F0h ................ Enabled

D)efault settings, S)ave, Q)uit without save
Select Command or parameter set (1..7) to change:

Parameters saved, Restarting ...

Finished mbmsetup version 1.2
```

Modbus TCP card v4.0.0.3

```
C:\Users\BWong3>c:\MBM\mbmsetup.exe COM32 192.168.1.11 192.168.1.12
mbmsetup version 1.2
Please reset Modbus TCP Card now...
Searching for Modbus TCP card...
Found Modbus TCP card...
MB TCP Card software V4.0.0.3
  Recognized card software: yes

Network Configuration Sequence:
1192.168.1.11<Enter>ny255.255.255.0<Enter>n
Serial & Mode Sequence:
22<Enter>1<Enter>1<Enter>57600,8,n,1<Enter>502<Enter>
Modem/Pin Sequence:
31<Enter>1<Enter>1<Enter>
Advanced Modbus Sequence:
42<Enter>1<Enter>50<Enter>5000<Enter>0<Enter>n
Unit ID Sequence:
510<Enter>0<Enter>d1d1d1d1d1a1<Enter>255<Enter>192.168.1.12<Enter>e



Modbus/TCP to RTU Bridge Setup
1) Network/IP Settings:
     IP Address ................. 192.168.1.11
     Default Gateway ............ --- not set ---
     Netmask .................... 255.255.255.0
2) Serial & Mode Settings:
     Protocol ................... Modbus/RTU,Master attached
     Serial Interface ........... 57600,8,N,1,RS232
     Modbus Port No ............. 502
3) Modem/Configurable Pin Settings:
     CP1 ...... Not Used
     CP2 ...... Not Used
     CP3 ...... Not Used
4) Advanced Modbus Protocol settings:
     MB/TCP Exception Codes ..... Yes (return 00AH and 00BH)
     Char, Message Timeout ...... 00050msec, 05000msec
5) Unit ID -> IP Address Table:
     Close Idle Sockets ......... 10sec
     Redundant Entry Retry ...... Feature Disabled
     001-255: 192.168.1.12
7) Security Settings:
     SNMP ....................... Disabled
     Telnet Setup ............... Enabled
     TFTP Download .............. Enabled
     Port 77FEh ................. Enabled
     Web Server ................. Enabled
     Enhanced Password .......... Enabled
     Port 77F0h ................. Enabled
     Telnet Authentication ...... Disabled
8) Expert Settings:
     TCP Re-transmission timeout  500 ms

D)efault settings, S)ave, Q)uit without save
Select Command or parameter set (1..7) to change:

Parameters saved, Restarting ...

Finished mbmsetup version 1.2
```

B.4

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Appendix C: **E30 and Controller Support Resources**

PRODUCT DOCUMENTATION

This manual describes using an INSTRUCT ESP Intelligent Controller to configure the E30 Drive. For the individual product manuals:

- LCS-ENG-M0006 INSTRUCT E30 Low Voltage VSD Installation, Operation & Maintenance Manual
- LCS-ENG-M0009 INSTRUCT ESP Intelligent Controller Installation, Operation & Maintenance Manual

GUIDES AND RELEASE NOTES

General guides, best practices, technical alerts, and software release notes for:

- INSTRUCT E30 Drive documentation is available at InTouch 7754390 Reference Page.
- INSTRUCT ESP Intelligent Controller documentation is available at InTouch 6023027 Reference Page.

TECHNICAL SUPPORT

You can reach us via the Lift Control Systems Custom Service email:

liftcontrolsystems@sensiaglobal.com

- For Schlumberger customers, an InTouch ticket should be raised to Well Production System – ALS-ESP Surface Electrical helpdesk.

Business Line: *

| Well Production Systems   ∨ |

Related To: *

| ALS - ESP Surface Electrical   ∨ |

HOW TO REACH US

You can find more information about Sensia, E30 Drive and INSTRUCT ESP Intelligent Controller information here:

Sensia Home Page: https://www.sensiaglobal.com/

Sensia Lift Control Solutions Page: https://www.sensiaglobal.com/Sensia-Lift-Control-Systems

Sensia Lift Control Drives Page: https://www.sensiaglobal.com/sensia-lift-control-systems/artificial-lift-variable-speed-drives/esp-variable-speed-drives

Sensia ESP Controller Page: https://www.sensiaglobal.com/sensia-lift-control-systems/artificial-lift-intelligent-controllers/esp-intelligent-controllers

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