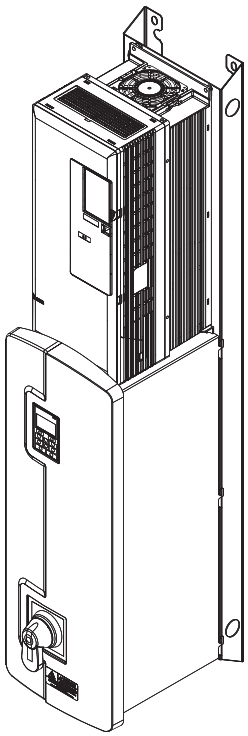
YASKAWA

Yaskawa AC Drive - Z1000 Bypass Network Protocol

Apogee® FLN
Technical Manual

Type: Z1B1☐

To properly use the product, read this manual thoroughly and retain for easy reference, inspection, and maintenance. Ensure the end user receives this manual.



APOGEE ANYWHERE™

MANUAL NO. TOEP YAICOM 10A

Warnings and Cautions

This Section provides warnings and cautions pertinent to this product that if not heeded, may result in personal injury, fatality or equipment damage. Yaskawa is not responsible for consequences of ignoring these instructions.

⚠ WARNING

YASKAWA manufactures component parts that can be used in a wide variety of industrial applications. The selection and application of YASKAWA products remain the responsibility of the equipment designer or end user. YASKAWA accepts no responsibility for the way its products are incorporated into the final system design. Under no circumstances should any YASKAWA product be incorporated into any product or design as the exclusive or sole safety control. Without exception, all controls should be designed to detect faults dynamically and to fail safely under all circumstances. All products designed to incorporate a component part manufactured by YASKAWA must be supplied to the end user with appropriate warnings and instructions as to that part's safe use and operation. Any warnings provided by YASKAWA must be promptly provided to the end user. YASKAWA offers an express warranty only as to the quality of its products in conforming to standards and specifications published in the YASKAWA manual. NO OTHER WARRANTY, EXPRESS OR IMPLIED, IS OFFERED. YASKAWA assumes no liability for any personal injury, property damage, losses, or claims arising from misapplication of its products.

⚠ WARNING

Read and understand this manual before installing, operating, or servicing this drive. All warnings, cautions, and instructions must be followed. Qualified personnel must perform all activity. The drive must be installed according to this manual and local codes.

Do not connect or disconnect wiring while the power is on. Do not remove covers or touch circuit boards while the power is on. Do not remove or insert the digital operator while power is on.

Before servicing, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. Status indicator LEDs and Digital Operator display will be extinguished when the DC bus voltage is below 50 VDC. To prevent electric shock, wait at least 5 minutes after all indicators are OFF and measure DC bus voltage level to confirm that it is at a safe level.

Do not perform a withstand voltage test on any part of the unit. This equipment uses sensitive devices and may be damaged by high voltage.

The drive is not suitable for circuits capable of delivering more than the specified RMS symmetrical amperes. Install adequate branch short circuit protection per applicable codes. Refer to the specification. Failure to do so may result in equipment damage and/or personal injury.

Do not connect unapproved LC or RC interference suppression filters, capacitors, or over voltage protection devices to the output of the drive. Capacitors may generate peak currents that exceed drive specifications.

To avoid unnecessary fault displays, caused by contactors or output switches placed between drive and motor, auxiliary contacts must be properly integrated into the control logic circuit.

YASKAWA is not responsible for any modification of the product made by the user, doing so will void the warranty. This product must not be modified.

Verify that the rated voltage of the drive matches the voltage of the incoming power supply before applying power.

To meet CE directives, proper line filters and proper installation are required.

Some drawings in this manual may be shown with protective covers or shields removed, to describe details. These must be replaced before operation.

Observe Electrostatic Discharge Procedures when handling the drive and drive components to prevent ESD damage.

The attached equipment may start unexpectedly upon application of power to the drive. Clear all personnel from the drive, motor and machine area prior to applying power. Secure covers, couplings, shaft keys, machine beds and all safety equipment before energizing the drive.

Introduction

This manual explains the specifications and handling of the APOGEE FLN protocol for the Yaskawa model Z1000 Bypass. The Z1000 Bypass with the APOGEE FLN protocol connects the Z1000 Bypass to an APOGEE FLN network and facilitates the exchange of data.

This document pertains to the Yaskawa Z1000 Bypass.

To ensure proper operation of this product, read and understand this manual. For details on installation and operation of the Z1000 Bypass or details on specific Z1000 Bypass parameters, refer to the ***Z1000 Bypass User Manual***, document reference **SIEPYAIZ1B01**. All technical manuals and support files are available on for download at www.yaskawa.com.

For more information on the APOGEE FLN protocol, please visit www.sbt.siemens.com.

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Chapter 1 Installation

This chapter covers the initial set-up procedure for the Z1000 Bypass on an APOGEE FLN network.

APOGEE FLN Set-Up

A Yaskawa America, Inc. representative is responsible for proper configuration of the Bypass for its primary application, while a Siemens Building Technologies, Inc. representative is responsible for field panel programming to make use of the Bypass functionality in the building automation system. As such, there must be coordination between the Yaskawa America and Siemens Building Technologies representatives to ensure that the programming of the drive is consistent with the particular application requirements. After verifying that the drive installation and wiring are correct, apply power to the drive. Table 1.1 below lists the parameters and their values required for proper APOGEE FLN communication and control.

◆ Z1000 Bypass Parameter Settings for APOGEE FLN Communications

Table 1.1 - Drive Communication Parameter Settings

Parameter Number	Digital Operator Display	Settings for APOGEE FLN Communication
Z1-07	**Reference Source**	**2: Serial Com**
Z1-08	**Run Source**	**2: Serial Com**
Z3-02	**Serial Comm Adr**	**Select the Bypass address**
Z3-03	**Serial Baud Rate**	**2: 4800 Baud**
Z3-01	**Protocol Select**	**2: P1**

⚠ CAUTION

A Yaskawa representative should set the drive parameters to their appropriate values. Changes made to the parameters other than what is listed in the table above can result in damaging the drive or building equipment.

Programming The Z1000 Bypass For APOGEE FLN

Refer to the ***Z1000 Bypass User Manual*, SIEPYAIZ1B01,** for detailed information on using the Z1000 Operator.

Chapter 2 Network Connection

This chapter discusses how to connect the Z1000 Bypass to an APOGEE FLN network.

Physical Connection

◆ Network Cable Connection

Follow the instructions below to connect the bypass to a MEMOBUS/Modbus network.

1. With the power shut off, connect the communications cable to the bypass controller and the master. Use terminal TB3 for MEMOBUS/Modbus.

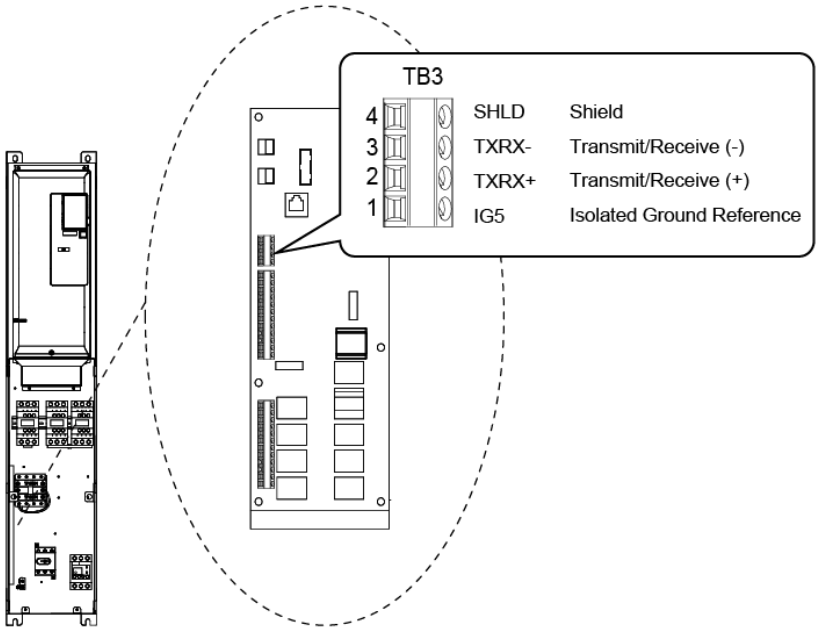

Figure D.2 Serial Communications Cable Connection Terminal (TB3)

Note: Separate the communications cables from the main circuit cables and other wiring and power cables. Use shielded cables for the communications cables, and properly shielded clamps to prevent problems caused by electrical interference.

2. Check or set the termination resistor selection at all slaves. Use the description in the ***Network Termination*** section for slaves that are Z1000 Bypasses.
3. Switch the power on.
4. Set the parameters needed for serial communications (Z3-01 through Z3-11) using the digital operator.
5. Shut the power off and wait until the display on the digital operator goes out completely.
6. Turn the power back on.
7. The bypass is now ready to begin communicating with the master.

◆ Wiring Diagram for Multiple Connections

Figure D.3 explains the wiring diagrams for multiple connections using P1 communication.

■ RS-485 Interface

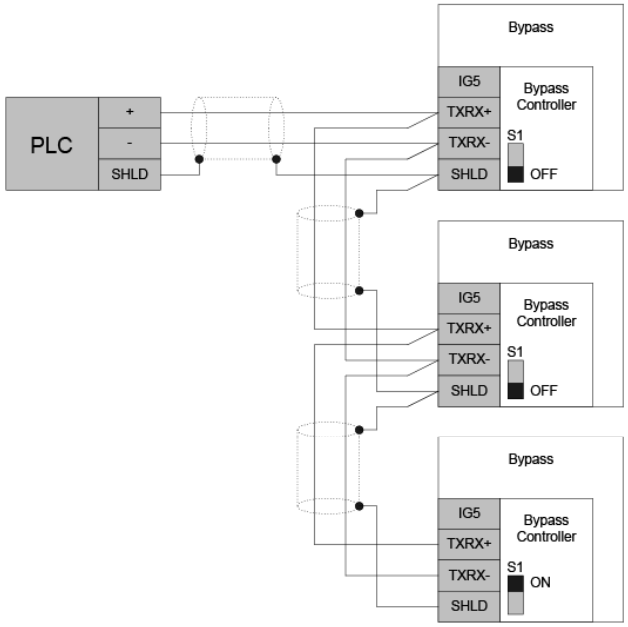

Figure D.3 Connection Diagram for Multiple Connections

Note: Turn on DIP switch S1 on the bypass controller located at the end of the network. If S1 is missing, then an external 120 ohm resistor must be placed across terminals TXRX+ and TXRX-. All other slave devices must have this DIP switch set to the OFF position (or if S1 is missing, no external resistor must be used).

◆ Network Termination

The two ends of the P1 network line have to be terminated with a 120 ohm resistor between the TXRX+ and TXRX- signals. The Z1000 Bypass has a built in termination resistor that can be enabled or disabled using DIP switch S1. If a bypass is located at the end of a network line, enable the termination resistor by setting DIP switch S1 to the ON position. Disable the termination resistor on all slaves that are not located at the network line end.

Note: Some bypass controllers do not have DIP switch S1. If this is the case, then an external 120 ohm resistor must be placed across the TXRX+ and TXRX- signals if the bypass controller is at the end of a network line.

◆ Recommended Cable

Table A.4 - APOGEE FLN Cable Specifications	
Specification	Description
Cable Configuration	Twisted Shielded Pair
Gauge	18-20 AWG (Solid or Stranded)
Wire Lay	Minimum 6 twists per foot
Shields	100% foil with drain wire
NEC Type	UL Type CMP
Temperature	60°C or higher

Cable lengths cannot exceed 500 feet at 4800 baud.

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Chapter 3 APOGEE FLN Strategies

This chapter covers APOGEE FLN point functionality, examples of calculating new slope and intercept values and fault numbers.

Slope and Intercept Conversion

Several drive parameters are available for monitoring purposes. These include FREQ OUTPUT (Point 3), SPEED (Point 5), CURRENT (Point 6), TORQUE (Point 7), POWER (Point 8), DRIVE TEMP (Point 9), KWH (Point 10), and RUN TIME (Point 12). These points can be unbundled for monitoring or used in various global control strategies.

◆ Drive Controlled Feedback

The most typical application is Supervisory Control. The sensor for the control variable (e.g., water temperature) is hard-wired to the drive and the control device (fan) is modulated using the PI control loop that is built into the drive. The setpoint for the control variable (water temperature set point) is unbundled and commanded by the field panel, based on some building control strategy implemented in PPCL.

When this strategy is used, the point to unbundle and command for the set point is INPUT REF 1 (Point 60). The control variable (e.g., water temperature) can be monitored by unbundling PI FEEDBACK (Point 62). These points are provided in units of percent, where 0% and 100% correspond to the range of the sensor being used to measure the control variable. These points have default units in Hz. If other units are required, unbundle these points with appropriate slopes and intercepts. The new intercept will be equal to the lowest value of the desired range. The following formula lets you define a new slope and intercept in order to accomplish the unit conversion.

$$\text{New Slope} = \frac{(\text{Desired Range}) \times (\text{Slope of Existing Point})}{(\text{Range of Existing Point})}$$

$$\text{New Slope} = \frac{(60 - 0)\text{Hz} \times (0.01)}{(100 - 0)\%} = 0.006$$

Conversion Example

You are controlling water temperature from a cooling tower using the drive to control a fan. The temperature sensor has a range of 30°F to 250°F. To unbundle the set point (INPUT REF 1), for commanding in degrees Fahrenheit, where 0 to 60 Hz is equal to 30°F to 250°F:

New Intercept = 30 (the temperature that corresponds to 0%)

$$\text{New Slope} = \frac{(\text{Desired Range}) \times (\text{Slope of Existing Point})}{(\text{Range of Existing Point})}$$

$$\text{New Slope} = \frac{(250 - 30)°\text{F} \times (0.1)}{(100 - 0)\%} = 0.22$$

Formula Notes:

Desired Range = Range Maximum – Range Minimum

Range of Existing Point = Existing Range Maximum – Existing Range Minimum

◆ Field Panel Controlled Feedback

In this strategy, the sensor is connected to the APOGEE FLN network at a remote location, and the control loop is executed in PPCL. The drive speed command is passed from the field panel to the drive by commanding INPUT REF 1 (Point 60).

⚠ CAUTION

This strategy is not recommended because it means that the loop is being closed over the network. Delays due to processor scan time and network traffic can cause control to be degraded or lost. Damage to HVAC equipment may result.

Unbundle the FEEDBACK

To unbundle the feedback (PI FEEDBACK) for monitoring in degrees Fahrenheit:

New Intercept = 30

$$\text{New Slope} = \frac{(\text{Desired Range}) \times (\text{Slope of Existing Point})}{(\text{Range of Existing Point})}$$

$$\text{New Slope} = \frac{(250 - 30)°\text{F} \times (0.01)}{(100 - 0)\%} = 0.022$$

Formula Notes:

Desired Range = Range Maximum – Range Minimum

Range of Existing Point = Existing Range Maximum – Existing Range Minimum

◆ Other Functionality

Each of the following functions must be enabled during start-up of the Drive:

Enable the drive to run

RUN ENABLE (Point 35) can be commanded to require the drive to have a physical input (DI-2) set before the drive can run. This works in conjunction with CMD RUN.STOP (Point 24) or the CMD REV.STOP (Point 22). If RUN ENABLE (Point 35) is commanded ON then terminal for DI-2 does not need to be on and CMD RUN.STOP (Point 24) or CMD REV.STOP (point 22) needs to be commanded ON for the drive to run. If, on the other hand, RUN ENABLE (Point 35) is commanded OFF, then to run the drive the input terminal for DI-3 needs to be on and either CMD RUN.STOP (Point 24) or CMD REV.STOP (Point 22), needs to be commanded ON.

Start and stop the drive

CMD RUN.STOP (Point 24) can be commanded to run the Bypass in the forward direction. STOP.RUN (Point 23) shows the current status of the Bypass.

Change directions

CMD REV.STOP (Point 22) can be commanded to run the drive in the reverse direction (ignored in Bypass Mode). FWD.REV (Point 21) shows the current direction of the drive rotation.

⚠ CAUTION

Improper drive direction may damage HVAC equipment if parameter b1-04, Reverse Enable, is improperly set (b1-04 = 0).

Digital Outputs

MULTI OUT 1 (Point 40), MULTI OUT 2 (Point 41), and MULTI OUT 3 (Point 42) are physical digital outputs on the Bypass (DO-7 through DO-9). Their purpose depends on how the Bypass has been set-up. The Bypass can be programmed so that these points can display various limits, warnings, and status conditions. Some examples include HOA state, Drive or Bypass Mode, Fault Active, and Loss of Load detected.

Loop gain

PID P GAIN (Point 63) and PID I TIME (Point 64) are the gain and integral time parameters similar to the P and I gains in the APOGEE Terminal Equipment Controllers. The Z1000 Bypass's PI loop is structured differently than the Siemens loop, so there is not a one-to-one correspondence between the gains.

Reading and resetting faults

OK.FAULT (Point 93) shows the current status of the Bypass. FAULT CODE (Point 17) contains the code for the most current fault. LST FLT CODE (Point 66) contains the code for the previous drive fault. See table below for descriptions of the fault codes. The drive can be reset back to OK mode by commanding RESET FAULT (Point 94) to RESET.

Chapter 4 APOGEE FLN Point Database

This chapter shows the APOGEE FLN point database for Application 2721.

APOGEE FLN Point List Summary

This database is for APOGEE FLN Application 2721 and features 97 logical points: 29 Logical Analog Inputs (LAI), 35 Logical Analog Outputs (LAO), 19 Logical Digital Inputs (LDI) and 14 Logical Digital Outputs (LDO). These points configure, control or monitor the operation of the Drive.

Information to consider when referencing this table:

1. Points not listed are not used in this application.
2. A single value in a column means that the value is the same in English units and in SI units.
3. Point numbers that appear in brackets, e.g. {03}, can be unbundled at the field panel.

Table 4 .1 - APOGEE FLN Application 2721 Point Number Summary

Point Number	Point Type	Point Name	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text	Z1000 Parameter
01	LAO	CTLR ADDRESS	31	–	1	0	–	–	Z3-02
02	LAO	APPLICATION	–	–	1	0	–	–	–
{03}	LAI	FREQ OUTPUT	0	HZ	0.01	0	–	–	U1-02
{04}	LAI	PCT OUTPUT	0	PCT	0.01	0	–	–	–
{05}	LAI	SPEED	0	RPM	1	0	–	–	–
{06}	LAI	CURRENT	0	AMPS (A)	0.01	0	–	–	UB-01
{07}	LAI	TORQUE	0	PCT	0.1	0	–	–	–
{08}	LAI	POWER	0	KW	0.1	0	–	–	U1-08
{09}	LAI	DRIVE TEMP	0	DEG F / C	1	0	–	–	U4-08
{10}	LAI	DRIVE KWH	0	KWH	0.1	0	–	–	U4-10
{11}	LAI	MWH	0	MWH	1	0	–	–	U4-11
{12}	LAI	RUN TIME	0	HRS	1	0	–	–	U4-01
{13}	LAI	DC BUS VOLT	0	VOLTS (V)	1	0	–	–	U1-07
{14}	LAI	AC OUT VOLT	0	VOLTS (V)	0.1	0	–	–	U1-06
15	LAI	PAR N9.01	0	AMPS (A)	0.01	0	–	–	N9-01
{16}	LAI	RUN TIMEX10K	0	10K HR	1	0	–	–	U4-01
{17}	LAI	FAULT CODE	0	–	1	0	–	–	U2-01/UB-09
{18}	LDI	MINOR FLT	NO FLT	–	1	0	FAULT	NO FLT	U1-12 (Bit 6)
{19}	LDI	MAJOR FLT	NO FLT	–	1	0	FAULT	NO FLT	UB-06 (Bit 2)
20	LAO	OVRD TIME	1	HRS	1	0	–	–	–
{21}	LDI	FWD.REV	FWD	–	1	0	REV	FWD	U1-12 (Bit 2)
{22}	LDO	CMD REV.STOP	STOP	–	1	0	REV	STOP	–
{23}	LDI	RUN.STOP	STOP	–	1	0	RUN	STOP	UB-06 (Bit 1)
{24}	LDO	CMD RUN.STOP	STOP	–	1	0	FWD	STOP	–
{25}	LDI	ZERO SPEED	OFF	–	1	0	ON	OFF	U1-12 (Bit 1)
{26}	LDI	SPEED AGREE	NO AGR	–	1	0	AGREE	NO AGR	U1-12 (Bit 4)
{27}	LDI	DRIVE READY	NOTRDY	–	1	0	READY	NOTRDY	U1-12 (Bit 5)
{28}	LDI	LOC.REM MON	REMOTE	–	1	0	LOCAL	REMOTE	UB-05
{29}	LDO	DAY.NGT	DAY	–	1	0	NGT	DAY	–
30	LAO	CURRENT LMT	0	AMPS (A)	0.01	0	–	–	E2-01
31	LAO	ACCEL TIME	0	SEC	0.1	0	–	–	C1-01
32	LAO	DECEL TIME	0	SEC	0.1	0	–	–	C1-02
33	LDO	LOCK PANEL	UNLOCK	–	1	0	LOCK	UNLOCK	–
35 <*I*>	LDO	RUN ENABLE	STOP	–	1	0	ENABLE	STOP	Bypass DI-2
36	LAO	STALL PRE RN	90	PCT	1	30	–	–	L3-06
37	LAO	STALL PRE AC	120	PCT	1	0	–	–	L3-02
38	LAO	FREQ UP LIM	100	PCT	0.1	0	–	–	D2-01
39	LAO	FREQ LOW LIM	0	PCT	0.1	0	–	–	D2-02

Table 4 .1 - APOGEE FLN Application 2721 Point Number Summary									
Point Number	Point Type	Point Name	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text	Z1000 Parameter
{40}	LDI	MULTI OUT 1	OFF	–	1	0	ON	OFF	UB-03 (Bit 6) Bypass DO-7
{41}	LDI	MULTI OUT 2	OFF	–	1	0	ON	OFF	UB-03 (Bit 7) Bypass DO-08
{42}	LDI	MULTI OUT 3	OFF	–	1	0	ON	OFF	UB-03 (Bit 8) Bypass DO-9
{43}	LDI	SAFETY ILOCK	OFF	–	1	0	ON	OFF	UB-05 (Bit 7)
{44}	LDO	MF INP 1	OFF	–	1	0	ON	OFF	Bypass DI-3
{45}	LDO	MF INP 2	OFF	–	1	0	ON	OFF	Bypass DI-4
{46}	LDO	MF INP 3	OFF	–	1	0	ON	OFF	Bypass DI-5
{47}	LDO	MF INP 4	OFF	–	1	0	ON	OFF	Bypass DI-6
{48}	LDO	MF INP 5	OFF	–	1	0	ON	OFF	Bypass DI-7
49	LAO	JUMP FREQ 1	0	HZ	0.1	0	–	–	D3-01
50	LAO	JUMP FREQ 2	0	HZ	0.1	0	–	–	D3-02
51	LAO	JUMP FREQ 3	0	HZ	0.1	0	–	–	D3-03
52	LAO	JUMP FREQ BW	0	HZ	0.1	0	–	–	D3-04
53	LAO	NUM AUTOSTRT	0	–	1	0	–	–	L5-01
54	LAO	POWER LOSS RT	0.1	SEC	0.1	0	–	–	L2-02
55	LAO	RUN OP MODE	1	–	1	0	–	–	Z1-08
56	LAO	REF OP MODE	1	–	1	0	–	–	Z1-07
57	LAO	OPER DISP MD	0	–	1	0	–	–	o1-03
{58}	LDI	MF IN 1 MON	OFF	–	1	0	ON	OFF	UB-02 (Bit 2) Bypass DI-3
{59}	LDI	MF IN 2 MON	OFF	–	1	0	ON	OFF	UB-02 (Bit 3) Bypass DI-4
{60}	LAO	INPUT REF 1	0	HZ	0.01	0	–	–	–
61	LAO	INPUT REF 2	0	HZ	0.01	0	–	–	D1-02
{62}	LAI	PID FEEDBACK	0	PCT	0.01	0	–	–	U5-01
63	LAO	PID P GAIN	2	–	0.01	0	–	–	b5-02
64	LAO	PID I TIM	0.5	SEC	0.1	0	–	–	b5-03
65	LDO	PID MODE SEL	DISABLE	–	1	0	ENABLE	DISABLE	b5-01
{66}	LAI	LST FLT CODE	0	–	1	0	–	–	U2-02
{67}	LAI	FREF.FLT	0	HZ	0.01	0	–	–	U2-03
{68}	LAI	OUT FREQ FLT	0	HZ	0.01	0	–	–	U2-04
{69}	LAI	OUT CUR.FLT	0	AMPS (A)	0.01	0	–	–	U2-05
70	LAO	RD PARAM NUM	1	–	1	0	–	–	–
71	LAI	RD PARAM DAT	0	–	1	0	–	–	–
72	LAO	WR PARAM NUM	1	–	1	0	–	–	–
73	LAO	WR PARAM DAT	0	–	1	0	–	–	–
{74}	LDI	MF IN 3 MON	OFF	–	1	0	ON	OFF	UB-02 (Bit 4) Bypass DI-5
{75}	LAI	OUT VOLT.FLT	0	VOLTS (V)	0.1	0	–	–	U2-07
{76}	LAI	DC BUS.FLT	0	VOLTS (V)	1	0	–	–	U2-08
{77}	LAI	OUT PWR.FLT	0	KW	0.1	0	–	–	U2-09
{78}	LDI	MF IN 4 MON	OFF	–	1	0	ON	OFF	UB-02 (Bit 5) Bypass DI-6
{79}	LAI	PID DEVIATE	0	PCT	0.01	0	–	–	U5-02
80	LAO	PID I LIMIT	100	PCT	0.1	0	–	–	b5-04
81	LAO	PID UP LIMIT	100	PCT	0.1	0	–	–	b5-06
82	LAO	PID OFFS ADJ	100	PCT	0.1	-100	–	–	b5-07
83	LAO	PID PRI DYTM	0	SEC	0.1	0	–	–	b5-08

Table 4 .1 - APOGEE FLN Application 2721 Point Number Summary									
Point Number	Point Type	Point Name	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text	Z1000 Parameter
84	LAO	PID FB RMDS	0	–	1	0	–	–	b5-12
85	LAO	PID FB RMDL	0	PCT	1	0	–	–	b5-13
86	LAO	PID FB RMDT	1	SEC	0.1	0	–	–	b5-14
{87}	LAI	PID OUT CAP	0	PCT	0.01	0	–	–	U5-14
{88}	LAI	PID REF	0	PCT	0.01	0	–	–	U5-04
{89}	LAI	COMM ERR CD	0	–	1	0	–	–	U1-19
90	LDO	COMM FLT ENA	ENABLE	–	1	0	ENABLE	DISABLE	Z3-11
91	LAO	CBL LOSS FRQ	0	HZ	0.01	0	–	–	Z3-10
92	LAO	CBL LOSS TMR	2	SEC	0.1	0	–	–	Z3-06
{93}	LDI	OK.FAULT	OK	–	1	0	FAULT	OK	UB-06 (Bit 2)
{94}	LDO	RESET FAULT	NO	–	1	0	RESET	NO	–
{95}	LDI	DRV COMM ERR	NO FLT	–	1	0	FAULT	NO FLT	–
{96}	LDO	EXTERNAL FLT	OK	–	1	0	FAULT	OK	–
{97}	LDI	MF IN 5 MON	OFF	–	1	0	ON	OFF	UB-02 (Bit 6) Bypass DI-7
{99}	LAI	ERROR STATUS	0	–	1	0	–	–	–

<1> Note: For pt 35 to work properly, set Z2-02=22 Run Enable (Safety)

Chapter 5 Cable Loss Behavior

This chapter describes the configurable cable loss feature of the Z1000 Bypass.

Cable Loss Configuration and Behavior

This section describes the configurable cable loss feature of the drive. This feature offers a user maximum flexibility in determining the drive's response to a loss of communication.

Drive Behavior at Loss of Communication

After some interval without receipt of a message, the drive can be configured to respond in one of the following manners:

Continue at last speed

Continue at last speed with Alarm

Continue at preset speed

Ramp to Stop with FB14 fault

Coast to Stop with FB14 fault

Emergency Stop with FB14 fault

APOGEE FLN Points

Three APOGEE FLN points are used to select the desired behavior:

POINT 92 – CBL LOSS TMR

POINT 91 – CBL LOSS FRQ

POINT 90 – COMM FLT ENA

Table 5.1 - Cable Loss Behavior Summary

Behavior	F6-03	Z3-05	CBL LOSS TMR (Point 92)	CBL LOSS FRQ (Point 91)	COMM FLT ENA (Point 90)
Decelerate to stop (stop time in C1-02) **FB14 Fault.** **Note:** In Bypass mode, bypass contactor will open and motor will coast to stop.	0	3	Timeout Interval	X	On
Coast to stop **FB14 Fault.** **Note:** In Bypass mode, bypass contactor will open and motor will coast to stop.	1	3	Timeout Interval	X	On
Fast stop (stop time in C1-09) **FB14 Fault.** **Note:** In Bypass mode, bypass contactor will open and motor will coast to stop.	2	3	Timeout Interval	X	On
Continue at last speed	3	0	0	X	X
Continue at last speed with Alarm	3	1	Timeout Interval	X	On
Continue at preset speed with Alarm	3	4	Timeout Interval	Preset Speed	On

Notes:

1. Communication must first be established and then lost for these features to function as described. If a Bypass is powered-up without a cable connected or with the master controller offline, a communications timeout does not occur.
2. For modes which describe the Bypass running after a communications timeout, a run command must have been issued (RUN ENABLE (Point 35) = 'On' and either CMD RUN.FWD (Point 22) = 'On' or CMD RUN.REV (Point 24) = 'On') prior to loss of communications. For safety purposes, the drive will not automatically restart from a stopped condition. If a user requires the drive to restart automatically, additional external wiring is required to accomplish this (consult factory).

Upon expiration of the communications timeout interval, a CE (Communication Error) fault will be declared and will remain until communication is restored.

Continue at Last Speed

In this mode, CBL LOSS TMR (POINT 92) is set to **0**, disabling the cable loss feature. The other two settings CBL LOSS FRQ (POINT 91) and COMM FLT ENA (POINT 90) are ignored. If communication is lost, the drive simply maintains its last commanded state. The drive will not display an alarm or fault to indicate it has lost communication. This behavior can also be achieved by setting parameter Z3-05 to "0".

Continue at Last Speed with Alarm

For this condition, COMM FLG ENA (Point 90) must be enabled and CBL LOSS TMR (Point 91) should be set to something other than 0. An AL14 Serial Communications Alarm is shown.

Continue at Preset Speed with Alarm

In this mode, CBL LOSS TMR (POINT 92) is set to the desired interval, CBL LOSS FRQ (POINT 91) is set to the desired preset speed and Z3-05 is set to "4". If the time between messages exceeds the timeout interval, the drive's speed command, INPUT REF 1, (Point 60) is set to the CBL LOSS FRQ (POINT 91) and the drive continues running at this new speed. COMM FLT ENA (POINT 90) must be set to 'On'.

Stop with Fault (FB14)

COMM FLT ENA (POINT 90) must be set to 'On'. In this mode, CBL LOSS TMR (POINT 92) is set to the desired interval and parameter F6-03 is set to a value of 0,1 or 2. If the time between messages exceeds the timeout interval, the drive's speed command, INPUT REF 1, (Point 60) is set to **0**. The stopping method is determined by the setting of F6-03. An **FB14** drive fault will be set and an EF0 will be sent to the drive. The drive behavior is determined by the setting of parameter F6-03.

F6-03 = 0 selects Ramp to Stop. The deceleration time or the slope of the ramp is determined by the setting of drive parameter C1-02.

F6-03 = 1 selects Coast to Stop. The drive does not attempt to control the rate of deceleration.

F6-03 = 2 selects Fast Stop. The deceleration time is determined by the setting of drive parameter C1-09.

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Chapter 6 Mailbox Function

This chapter defines the APOGEE FLN points that read and write Z1000 Bypass parameters.

Mailbox Function Points

◆ Reading a Drive Parameter

Two points are defined for reading any drive parameter:

#70 Specifies the parameter to be read from

#71 Reports the value of the parameter specified in Point #70

When this point is read, it retrieves data from the parameter and sends it to the controller

Example:

Writing a value of 387 (183 hex) to Point #70 specifies drive parameter b1-04. Reading Point #71 returns the current setting of parameter b1-04 to the controller

Writing to a Drive Parameter

Two points are defined for writing to any drive parameter:

#72 Specifies the parameter to be written to

#73 Entry location of the value to be written to the parameter specified in Point #72

When this point is written to, it will write the value to the drive. An enter or accept command does not need to be sent for the data to be taken by the drive. The behavior of the write is the same as with the digital operator. If the drive is running, there are a limited number of drive parameters that can be written to.

Example:

Writing a value of 387 (183 hex) to Point #72 specifies drive parameter b1-04. Writing a value of 1 to Point #73 enables the drive for reverse run.

Chapter 7 Drive faults

This chapter defines fault codes for the Z1000 Drive and Bypass.

Fault Codes

◆ Communications Fault

Table A.6 - Drive Faults			
Fault	Description	Cause	Corrective Action
FB14	Communication Error	Connection is broken or master has stopped communicating	Check all connections Verify all APOGEE FLN software configurations

◆ Z1000 Bypass Faults

Table A.7 - Bypass Faults			
Fault Code	Fault Name	Fault Code	Fault Name
0002H	Undervoltage (Uv1)	001BH	Input Phase Loss (PF)
0003H	Control Power Supply Undervoltage (Uv2)	001CH	Output Phase Loss (LF)
0004H	Soft Charge Circuit Fault (Uv3)	001DH	Motor Overheat (PTC input) (oH3)
0006H	Ground Fault (GF)	001EH	Digital Operator Connection (oPr)
0007H	Overcurrent (oC)	001FH	EEPROM Write Error (Err)
0008H	Overvoltage (ov)	00A0H	ASIC Code Error (CPF31)
0009H	Heatsink Overheat (oH)	00A1H	ASIC Start-up Error (CPF32)
000AH	Heatsink Overheat (oH1)	00A2H	Watch-dog Error (CPF33)
000BH	Motor Overload (oL1)	00A3H	ASIC Power/Clock Error (CPF34)
000CH	Drive Overload (oL2)	00A4H	External A/D Converter Error (CPF35)
000DH	Overtorque Detection 1 (oL3)	00A9H	Control Circuit Error (CPF40)
0020H	Motor Overheat (PTC input) (oH4)	00AAH	Control Circuit Error (CPF41)
0021H	MEMOBUS/Modbus Communication Error (CE)	00ABH	Control Circuit Error (CPF42)
0022H	Option Communication Error (bUS)	00ACH	Control Circuit Error (CPF43)
0027H	Option External Fault (EF0)	00ADH	Control Circuit Error (CPF44)
0028H	PI Feedback Loss (FbL)	00AEH	Control Circuit Error (CPF45)
0029H	Undertorque Detection 1 (UL3)	0101H	Option Compatibility Error (oFA00)
002BH	High Slip Braking Overload (oL7)	0102H	Option Not Properly Connected (oFA01)
0030H	Hardware Fault (including oFx)	0106H	A/D Conversion Error (oFA05)
0036H	Output Current Imbalance (LF2)	0107H	Option Response Error (oFA06)
0037H	Pullout Detection (Sto)	0111H	Option RAM Fault (oFA10)
003BH	Too Many Speed Search Restarts (SEr)	0112H	Option Operation Mode Fault (SLMOD) (oFA11)
0041H	PI Feedback Loss (FbH)	0113H	Drive Receive CRC Error (oFA12)
0042H	External Fault 1, Input Terminal S1 (EF1)	0114H	Drive Receive Frame Error (oFA13)
0043H	External Fault 2, Input Terminal S2 (EF2)	0115H	Drive Receive Abort Error (oFA14)
0046H	Current Offset Fault (CoF)	0116H	Option Receive CRC Error (oFA15)
0047H	PLC Detection Error 1 (PE1)	0117H	Option Receive Frame Error (oFA16)
0048H	PLC Detection Error 2 (PE2)	0118H	Option Receive Abort Error (oFA17)
004DH	Output Voltage Detection Fault (voF)	0131H	Comm. ID Error (oFA30)
0052H	Node Setup Fault (nSE)	0132H	Model Code Error (oFA31)
005AH	Motor Underload Protection (UL6)	0133H	Sumcheck Error (oFA32)
0083H	A/D Conversion Error (CPF02)	0134H	Comm. Option Timeout Waiting for Response(oFA33)
0084H	PWM Data Fault (CPF03)	0135H	MEMOBUS Timeout (oFA34)
0087H	EEPROM Memory Data Error (CPF06)	0136H	Drive Timeout Waiting for Response (oFA35)
0088H	Terminal Board Connection Error (CPF07)	0137H	CI Check Error (oFA36)

Table A.7 - Bypass Faults				
0089H	EEPROM Serial Communication Fault (CPF08)		0138H	Drive Timeout Waiting for Response (oFA37)
008CH	RAM Fault (CPF11)		0139H	Control Command Selection Error (oFA38)
008DH	Flash Memory Circuit Exception (CPF12)		013AH	Drive Timeout Waiting for Response (oFA39)
008EH	Watchdog Circuit Exception (CPF13)		013BH	Control Response Selection 1 Error (oFA40)
008FH	Control Circuit Fault (CPF14)		013CH	Drive Timeout Waiting for Response (oFA41)
0091H	Clock Fault (CPF16)		013DH	Control Response Selection 2 Error (oFA42)
0092H	Timing Fault (CPF17)		013EH	Control Response Selection Error (oFA43)
0093H	Control Circuit Fault (CPF18)		0401H	Time Not Set (TIM)
0094H	Control Circuit Fault (CPF19)		0402H	Operator Battery Low (bAT)
0095H	Hardware Fault at Power Up (CPF20)		0403H	Time Data Error (TdE)
0096H	Hardware Fault at Communication Start Up (CPF21)		0404H	Time Interval Error (TiE)
0097H	A/D Conversion Fault (CPF22)		0405H	Overvoltage 2 (ov2)
0098H	PWM Feedback Fault (CPF23)		0407H	External Fan Fault (Fn1)
0099H	Drive Unit Signal Fault (CPF24)		1389H	Safety Open
009AH	Terminal Board is Not Properly Connected. (CPF25)		138AH	BAS InterLock Open
009BH	ASIC BB Circuit Error (CPF26)		138BH	External Fault (EFB)
009CH	ASIC PWM Setting Register Error (CPF27)		138CH	NA
009DH	ASIC PWM Pattern Error (CPF28)		138DH	Motor Overload
009EH	ASIC On-delay Error (CPF29)		138EH	Ext Motor1 Overload
009FH	ASIC BBON Error (CPF30)		138FH	Ext Motor2 Overload
0010H	Braking Resistor Overheat (rH)		1390H	PL Brownout
0011H	External Fault at Input Terminal S3 (EF3)		1391H	PL Blackout
0012H	External Fault at Input Terminal S4 (EF4)		1392H	No Bypass to Drive Communications
0013H	External Fault at Input Terminal S5 (EF5)		1393H	Bypass Board Hardware Error
0014H	External Fault at Input Terminal S6 (EF6)		1394H	Option Board Communication Fault
0015H	External Fault at Input Terminal S7 (EF7)		1395H	Loss of Load
-	-		1396H	Serial Communications Timeout

Yaskawa AC Drive - Z1000 Bypass Network Protocol

Apogee® FLN
Technical Manual

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