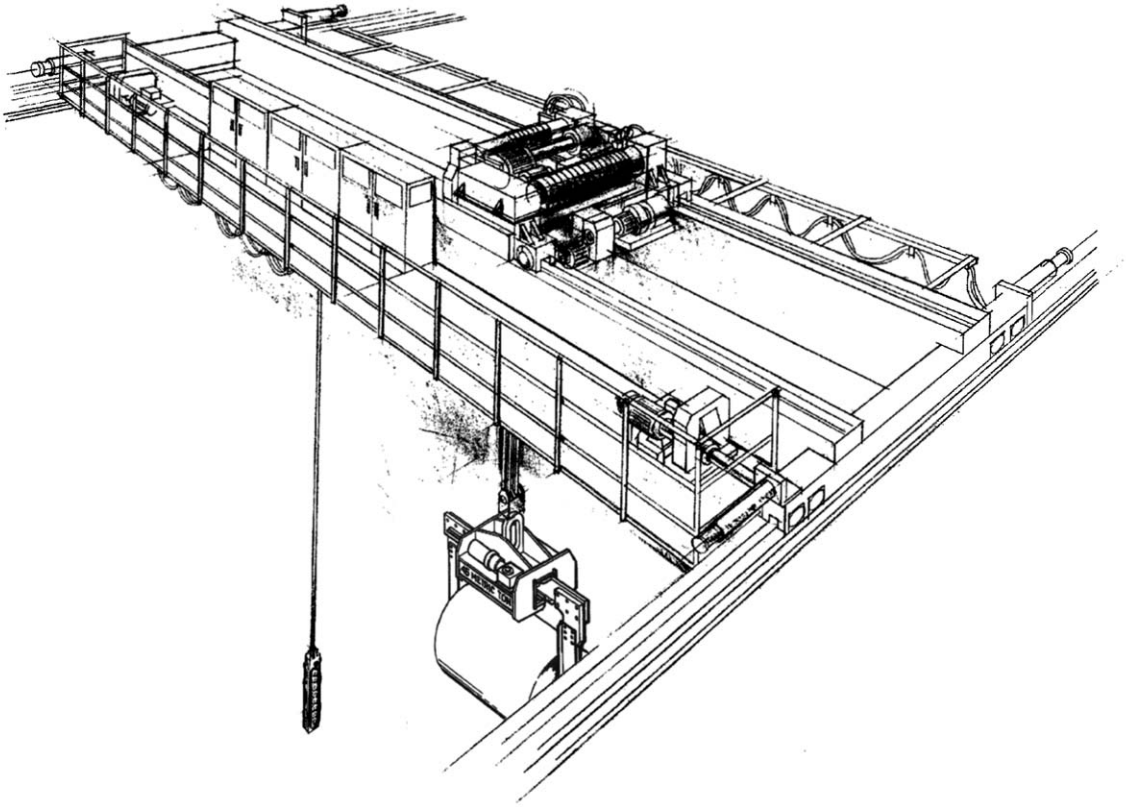

IMPULSE•G+

Series 3

Adjustable Frequency Crane Controls

Instruction Manual

MAGNETEK
MATERIAL HANDLING

Software # 8001.6 December 2010
Part Number: 140-10258-R5

DANGER, *WARNING*, *CAUTION*, and *NOTE* Statements

DANGER, WARNING, CAUTION, and *Note* statements are used throughout this manual to emphasize important and critical information. You must read these statements to help ensure safety and to prevent product damage. The statements are defined below.

DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.

WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It may also be used to alert against unsafe practices.

NOTE: A NOTE statement is used to notify installation, operation, programming, or maintenance information that is important, but not hazard-related.

Disclaimer of Warranty

Magnetek, hereafter referred to as Company, assumes no responsibility for improper programming of a drive by untrained personnel. A drive should only be programmed by a trained technician who has read and understands the contents of this manual. Improper programming of a drive can lead to unexpected, undesirable, or unsafe operation or performance of the drive. This may result in damage to equipment or personal injury. Company shall not be liable for economic loss, property damage, or other consequential damages or physical injury sustained by the purchaser or by any third party as a result of such programming. Company neither assumes nor authorizes any other person to assume for Company any other liability in connection with the sale or use of this product.

For information on Magnetek's product warranties by product type, please visit www.magnetekmh.com.

WARNING

Improper programming of a drive can lead to unexpected, undesirable, or unsafe operation or performance of the drive.

Contents:

Chapter 6: Troubleshooting

Appendix A: Parameter Listing

chapter **1**

Introduction

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WARNING

Do not touch any circuitry components while the main AC power is on. In addition, you must wait until the red “CHARGE” LED is out before performing any service on that unit. (As you look at the face of the circuitry, the “CHARGE” LED is located in the lower right corner of the board.) It may take as long as 10 minutes for the charge on the main DC bus capacitors to drop to a safe level.

Do not check signals during operation.

Do not connect the main output terminals (U/T1, V/T2, W/T3) to the incoming, three-phase AC source.

Before executing Auto-Tuning, ensure that the motor is disconnected from the drive train and the electric brake is released. If the electric brake cannot be released, you must ensure that the brake is disengaged for the entire tuning process.

Read and understand this manual before installing, operating, or servicing this Drive. All warnings, cautions, and instructions must be followed. All activity must be performed by qualified personnel. 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. The charge indicator LED will extinguish when the DC bus voltage is below 50VDC. To prevent electric shock, wait at least five minutes after all indicators are OFF and measure DC bus voltage level to confirm 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 suitable for circuits capable of delivering not more than 100,000 RMS symetrical Amperes, 240VAC maximum (200V Class) and 480VAC maximum (400V Class). Install adequate branch circuit short circuit protection per applicable codes. Failure to do so may result in equipment damage and/or personal injury.

Do not connect unapproved LC or RC interference suppresion filters, capacitors, or overvoltage protection devices to the output of the Drive. These devices may generate peak currents that exceed Drive specifications.

The instructions in the next three chapters apply to most IMPULSE•G+ Series 3 crane, hoist, and monorail applications. However, you need to carefully evaluate your specific situation and ensure that you follow NEC codes and your local wiring practices.

These chapters tell you how to install IMPULSE•G+ Series 3 and, to some extent, the components that it interconnects. It explains how to: assess the drive's environment, mount the drive, and wire the drive circuits. It's important to develop a "plan of attack" for both the mounting and wiring since each task has an effect on the other one. To assist you, "IMPULSE•G+ Series 3 Wiring Practices" is included.

NOTE: If your IMPULSE•G+ Series 3 is part of an Magnetek pre-engineered motor control panel, disregard this chapter and turn to Chapter 4.

Introduction

Assessing the System Requirements

It is important to know how you're going to use the drive before you start installation and wiring. You will need to know your requirements for the following components:

- Speed control method(s)
- Braking method(s)
- Power source voltage, number of phases, and kVA rating
- Power source location
- Wire size
- Grounding location and method

Assessing the Drive Environment

When you choose a location for IMPULSE•G+ Series 3, perform the following steps:

1. Ensure that a 220 or 230VAC (-15% to +10%) three-phase power source is available for a 230VAC-rated drive, and that a 380, 400, 415, 440, or 460VAC (-15% to +10%) three-phase power source is available for a 460VAC-rated drive.
2. Ensure that the drive-to-motor wiring distance is less than 150 ft. unless appropriate reactors, filters, and/or an inverter duty motor is used.
3. If required, install reactors.

   When connecting a drive (230VAC/460VAC, Model 2085-G+/4045-G+ and smaller) to a large-capacity power supply transformer (500kVA or greater, or more than 10 times the inverter kVA rating), or when switching a phase-advancing capacitor, excessive peak current can flow through the input power supply circuit. To prevent damage to the rectifier section in such cases, install a DC reactor between drive Terminals 1 and 2, or an AC reactor on the input side. Installing reactors also improves the power factor on the power supply side.
4. Ensure that the drive circuit wiring is protected or isolated from:
   - Ambient temperatures outside the range of +14°F to +140°F (-10°C to +60°C)*.
   - Rain or moisture
   - Corrosive gases or liquids
   - Direct sunlight
   - Severe mechanical vibration
5. Ensure that the drive is housed in an appropriate NEMA-rated enclosure.
6. For severe-duty applications (for example—long lifts) or with 75-HP-or-greater motors, ensure that the drive control system is adequately cooled, even though the ambient temperature limit is not exceeded. For more information, contact Magnetek.

* 2 kHz carrier frequency

IMPULSE•G+ Series 3 General Specifications

230V Class

Specification	Specification Values and Information for Each 230V-Class Model												
	2007	2009	2015	2023	2031	2045	2058	2071	2085	2145	2215	2283	2346
Rated current (A)	7	9.6	15	23	31	45	58	71	85	145	215	283	346
Capacity (kVA)	2.7	3.7	5.7	8.8	12	17	22	27	32	55	82	110	130

460V Class

Specification	Specification Values and Information for Each 460V-Class Model																			
	4002	4003	4005	4008	4012	4017	4024	4031	4039	4045	4060	4075	4091	4112	4150	4180	4260	4304	4370	4477	4590
Rated current (A)	2.1	3.7	5.3	8.7	12.5	17	24	31	39	45	60	75	91	112	150	180	260	304	370	477	590
Capacity (kVA)	1.6	2.8	4.0	6.6	9.5	13	18	24	30	34	46	57	69	85	110	140	200	230	280	390	510

230V and 460V Classes

Specification	Specification Value and Information for All Models
Certification	UL, CUL
Crane Duty Classification	Rated for CMAA Crane Duty Class A - F only (or equivalent)
Rated input power supply volts & freq	3-phase 200/208/220/230VAC or 380/400/415/440/460V/480VAC
Allowable input voltage fluctuation	+10% or -15% of nominal
Allowable input frequency fluctuation	±5% of nominal
Control method	Fully digital; sine-wave, pulse-width–modulated
Maximum output voltage (VAC)	Max output voltage 3-phase, 200/208/220/230VAC; 380/400/415/440/460V/480VAC (proportional to input voltage).
Rated frequency (Hz)	Up to twice motor nameplate RPM (Swift-Lift) 150 Hz standard (400 Hz, consult factory)
Output speed control range	100:1 - Open loop vector, 40:1 - V/F
Output frequency accuracy	.01%—with digital reference command .1%—with analog reference command; 10 bits/10V
Frequency reference resolution	Digital: .01 Hz; analog: .03 Hz (at 60 Hz)
Output frequency resolution	.01 Hz
Overload capacity	150% of rated load for 1 min
Remote frequency reference sources	0–10VDC (20kΩ); 4–20mA (250Ω); ±10VDC serial (RS-485)
Accel/decel times	0.1 to 6000.0 sec—4 sets; 8 parameters are independently adjustable
Braking torque	150% or more with dynamic braking
Motor overload protection	UL recognized electronic thermal overload relay; field-programmable
Overcurrent protection level	200% of rated current
Circuit protection	Ground fault and blown-fuse protection
Overvoltage protection level	410/820VDC
Undervoltage protection level	190/380VDC

Specification	Specification Value and Information for All Models
Heatsink overtemperature	Thermostat trips at 105°C
Torque limit selection	Separate functions for FORWARD, REVERSE, REGEN.; all selectable from 0–300%
Stall prevention	Separate functions for accel, decel, at-speed, and constant horsepower region
Other protection features	Lost output phase, failed-oscillator, mechanical overload, and internal braking transistor failure.
DC bus voltage indication	Charge LED is on until DC bus voltage drops below 50VDC
Location	Indoors; requires protection from moisture, corrosive gases, and liquids
Ambient operating temperature	14°to 140°F (-10°to 60°C)* 14°to 149°F (-10°to 65°C)**
Storage temperature	-4° to 158°F (-20° to 70°C)
Humidity	95% relative; noncondensing
Vibration	1 G less than 20 Hz; 0.2 G for 20–50 Hz
Elevation	3300 Ft. (1000M) or less

* 2kHz carrier frequency
** Maximum rated temperature of 65°C at the drive chassis with factory approved air handling system

AC Reactor Specifications

Reactors, both as input (line) and output (load) devices, protect adjustable frequency drives, motors, and other load devices against excessive voltage and current.

The following guidelines may help determine input and output reactor requirements:

- The following table is only a guideline. The motor FLA should not exceed the reactor FLA.
- Install an input reactor if the power source is greater than 500kVA.
- Install an output reactor if the distance between the drive and the motor exceeds 150 feet.
- Install an output reactor if a device, such as a power limit switch, is used to disconnect the motor from the drive.
- Install one output reactor per drive for a multiple-drive arrangement requiring reactor protection.
- For a multiple drive arrangement, an input reactor for each drive is recommended for optimal protection. However, if the drives are within two drive sizes of each other, a single input reactor can be used. The reactor must be rated at amperage equal to or greater than the sum of the amperage for all the drives.

230V Class

Model Number	230V Part Number	Maximum Amps of Reactor
2007-G+S3	REA230-2	8
2009-G+S3	REA230-3	12
2015-G+S3	REA230-5	18
2023-G+S3	REA230-7.5	25
2031-G-S3	REA230-10	35
2045-G+S3	REA230-15	45
2058-G+S3	REA230-20	55
2071-G+S3	REA230-25	80
2085-G+S3	REA230-30	80
2145-G+S3	REA230-50	130

Model Number	230V Part Number	Maximum Amps of Reactor
2215-G+S3	REA230-75	200
2283-G+S3	REA230-100	250
2346-G+S3	REA230-125	320

460V Class

Model Number	460 V Part Number	Maximum Amps of Reactor
4002-G+S3	REA460-1	2
4003-G+S3	REA460-2	4
4005-G+S3	REA460-5	8
4008-G+S3	REA460-5	8
4012-G+S3	REA460-7.5	12
4017-G+S3	REA460-10	18
4024-G+S3	REA460-15	25
4031-G+S3	REA460-20	35
4039-G+S3	REA460-25	35
4045-G+S3	REA460-30	45
4060-G+S3	REA460-40	55
4075-G+S3	REA460-50	80
4091-G+S3	REA460-60	80
4112-G+S3	REA460-75	100
4150-G+S3	REA460-100	130
4180-G+S3	REA460-150	200
4260-G+S3	REA460-200	250
4304-G+S3	REA460-250	320
4370-G+S3	REA460-300	400
4477-G+S3	REA460-400	500
4590-G+S3	REA460-500	600

Interface Specifications

IMPULSE•G+ Series 3 is designed to interface with 120VAC user input and output devices through the GIF7 interface board. This eliminates the need for an additional interface relay or isolation circuitry.

The GIF7 has eight optically isolated input terminals which can be used to connect with the user input device. Terminals S1 and S2 are always used for the directional run commands (Forward and Reverse, Up and Down). The remaining six terminals are multi-function terminals, and are used for speed control and other characteristics. Multi-function terminals can be assigned various functions and performance characteristics without having to rewire the drive.

A maximum of 3 inputs shall be capable of continuously remaining in the on state, as is the case with normally closed fail-safe limit switches and overload type devices. It is recommended wherever possible that these inputs be spaced out in such a way that two or more N.C. inputs are not right next to each other. For four position geared limited switches, a G5IN4 option card is recommended.

G5IN4 card has four additional input terminals, which can have a total of 14 sets of input selections. The individual terminals can be enabled/disabled within a set. For program information refer to Chapter 5, Programming Advanced Features.

The drive has four 250VAC, 1.0 Amp relays for output devices. It includes three programmable multi-function output terminals.

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chapter 2

Installation

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WARNING

•When preparing to mount the IMPULSE•G+ Series 3 drive, lift it by its base. Never lift it by the front cover.

•Mount the drive on nonflammable material.

•The IMPULSE•G+ Series 3 drive generates heat. For the most effective cooling possible, mount it vertically. For more details, refer to the "IMPULSE•G+ Series 3 Dimensions/Heat Loss—Open Chassis" in this chapter.

•When mounting units in an enclosure, install a fan or other cooling device to keep the enclosure temperature below 140°F (60°C)*.

Failure to observe these Warnings may result in equipment damage.

This chapter explains the following:

1. Choosing a location
2. IMPULSE•G+ Series 3 components and external devices
3. Drive environment
4. Drive installation

In addition, this section will cover information on the components that interconnect with IMPULSE•G+ Series 3.

Choosing a Location

Be sure that the drive is mounted in a location protected against the following conditions:

- Extreme cold and heat. Use only within the ambient temperature range: +14 to 140°F (-10 to 60°C)*
- Direct sunlight (not for use outdoors)
- Rain, moisture
- High humidity
- Oil sprays, splashes
- Salt spray
- Dust or metallic particles in the air
- Corrosive gases (e.g. sulfurized gas or liquids)
- Radioactive substances
- Combustibles (e.g. thinner, solvents, etc.)
- Physical shock, vibration
- Magnetic noise (e.g. welding machines, power devices, etc.)

*2 kHz carrier frequency

IMPULSE•G+ Series 3 System Components And External Devices

Optional Drive Components

- G5IN4 Control Input Card
- DO-08 Control Output Board
- DO-02 Control Output Relay Board
- AI-14B Analog Input Card

As-Required Drive Components

- AC reactor—line or load
- DC bus reactor
- External dynamic braking resistor(s)
- External dynamic braking unit

Required External Devices

- Motor
- User input device (pendant, joystick, PC, PLC, radio, or infrared control)
- External circuit protection devices (fuses or circuit breakers) (See “Suggested Circuit Protection Specifications and Wire Size” in Chapter 3.)
- R-C surge suppressors on contactor coils

Long Time Storage/Capacitor Reforming

Powering up the drives every six months is quite beneficial. Over longer periods of time without power, the drives' electrolytic DC bus capacitors require reformation, especially if stored in an area of high temperatures. Capacitor reforming is required if drives are stored without power for more than 2 to 3 years. This process can be avoided by powering up the drive bi-annually for 30 to 60 minutes.

NOTE: Bus cap reforming alone may not restore full drive functionality after 2 to 3 years of storage without power.

Inverter drives contain large bus capacitors that have the potential to be reformed. However, printed circuit boards also contain electrolytic capacitors that may not function after several years without power. Magnetek recommends replacing the PCBs should the drive's functionality not be restored after bus cap reforming.

Capacitor Storage and their Reforming Process

The electrical characteristics of aluminum electrolytic capacitors are dependent on temperature; the higher the ambient temperature, the faster the deterioration of the electrical characteristics (i.e., leakage current increase, capacitance drop, etc.). If an aluminum electrolytic capacitor is exposed to high temperatures such as direct sunlight, heating elements, etc., the life of the capacitor may be adversely affected. When capacitors are stored under humid conditions for long periods of time, the humidity will cause the lead wires and terminals to oxidize, which impairs their solderability. Therefore, aluminum electrolytic capacitors should be stored at room temperature, in a dry location and out of direct sunlight.

In the event that a capacitor has been stored in a high ambient environment for more than 2 or 3 years, a voltage treatment reformation process to electrolytic capacitors may have to be performed. When stored above room temperatures for long periods of time, the anode foil may react with the electrolyte, increasing the leakage current. After storage, the application of even normal voltages to these capacitors may result in higher than normal leakage currents. In most cases the leakage current levels will decrease in a short period of time as the normal chemical reaction within the capacitor occurs. However, in extreme cases, the amount of gas generated may cause the safety vent to open.

Capacitors, when used in inverter drives that are stored for long periods of time, should be subjected to a voltage treatment/reforming process as noted below, which will reform the dielectric and return the leakage current to the initial level.

Inverter Bus Capacitor Reforming Procedure:

1. Remove the fuse from the 8PCB tap change card for this procedure. (models 4150-G+S3 to 4590-G+S3 only).
2. Connect the inverter inputs L1, L2, and L3 to a variac.
3. Make sure the variac voltage setting is turned down so that when input power is applied to the variac, the output of the variac will be at or near 0 volts.
4. Apply power to the variac, listening for abnormal sounds and watching for abnormal visual indications in the drive. If the variac has an output current indication, make sure the current is very near zero with zero or a steady output voltage applied.

5. Slowly turn the variac up, increasing the variac's output voltage to nominal rated input voltage over a time period of 2 to 3 minutes. In other words, ramp the voltage up at a rate of approximately 75 to 100 volts/minute for 230 VAC units and 150 to 200 volts/minute for 460 VAC units.
6. Let the output voltage remain at rated voltage for 30 to 60 minutes while keeping close watch for abnormal signs within the inverter. While increasing the variac's output voltage, the current will momentarily increase as current is necessary to charge the capacitors.
7. Once 30 to 60 minutes elapse, remove power and package the drive for shipment.

If any abnormal indications occur during this process, it is recommended that the process be repeated. Otherwise, this completes the capacitor reforming procedure.

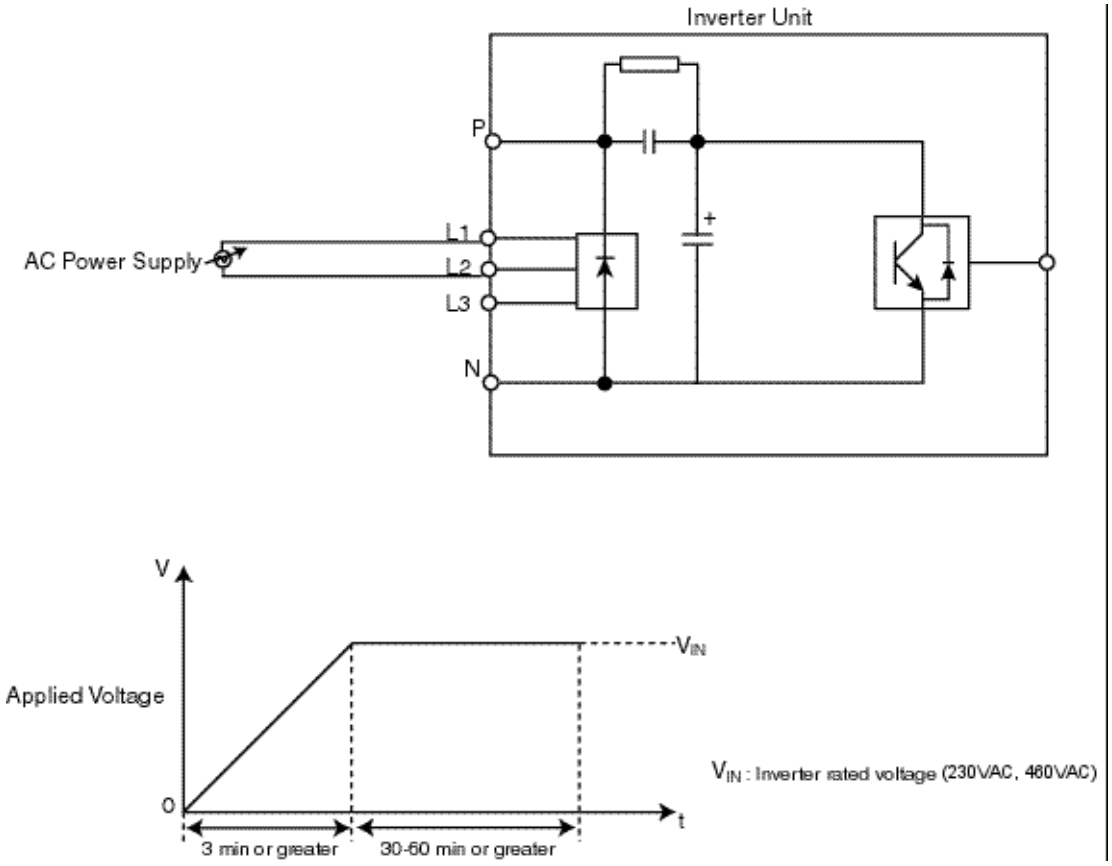

Figure 2-1: Long Time Storage

Installing the Drive

To install IMPULSE•G+ Series 3:

1. Ensure the drive will be used in a proper environment. Refer to page 1-5.
2. Review "IMPULSE•G+ Series 3 Terminal Diagram".
3. Determine the sizes and connection locations for the drive components and external devices that need to be wired. Locate the ground.
4. Determine the position of the subpanel.
5. Ensure that the drive is positioned vertically so that the heat can dissipate properly.
6. Ensure that the air can flow freely around the heat sink as shown below in Figure 2-2.

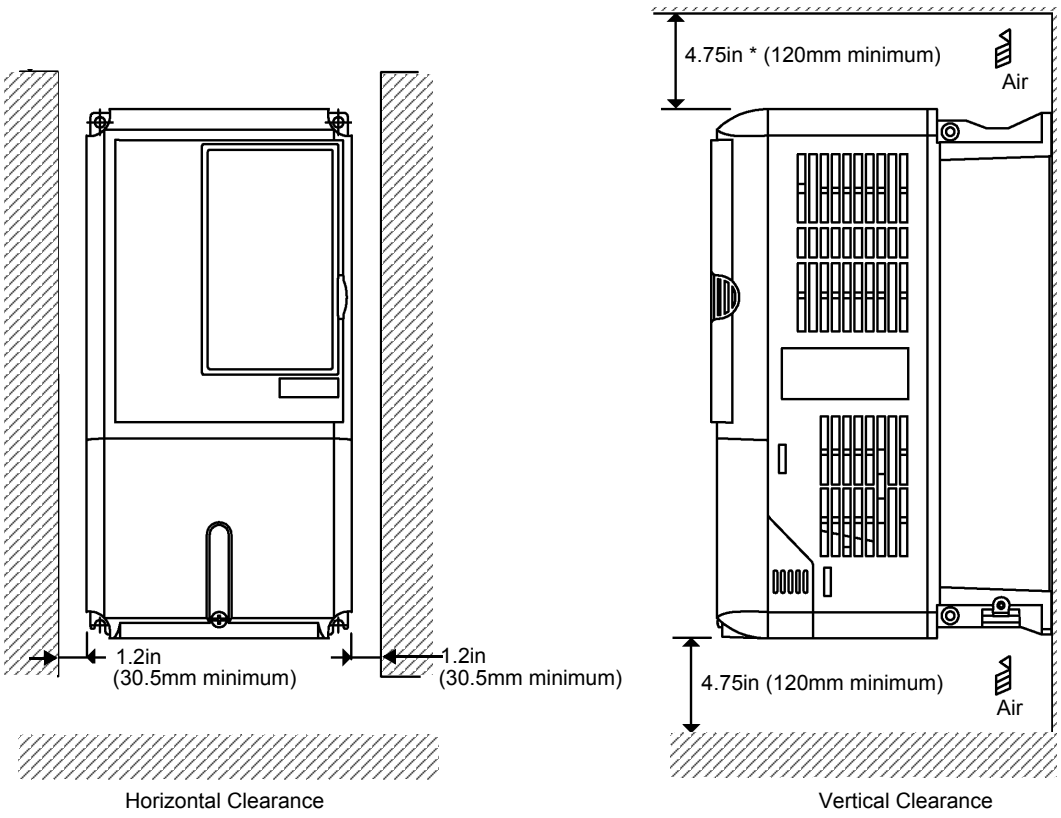

Figure 2-2

NOTE:

- *The recommended clearances at the top, bottom, and both sides of the inverter are the same for both open chassis and NEMA 1 enclosures.*
- *Allowable intake air temperature: 14°F to 140°F (-10°C to +60°C)*
- *If necessary, a heater or air conditioner must be used to maintain the temperature range listed above.*
- *For drive model 4590-G+S3, the top clearance is 11.8 inches.*

7. Lay out the wire runs. Size the wire according to NEC Table 610-14(a). At a minimum, use #16 AWG for control wiring and #12 AWG for power wiring. When performing this step:
   - Ensure that the drive control circuit and power circuit wires are perpendicular to each other at any point they cross.
   - Keep power and control festoon wiring in separate cables.
   - Separate control drive circuit and power circuit wiring on the terminal block strip.
8. Obtain the appropriate hardware for mounting.
9. Mount the subpanel or surface to which you are mounting the drive. (Contact Magnetek if you need advice on mounting, especially for larger drives.)
10. Fasten the drive and components to the subpanel.
11. Remove the terminal cover.
12. Follow the wiring practices outlined in Chapter 3.

IMPULSE•G+ Series 3 Dimensions/Heat Loss—Open Chassis

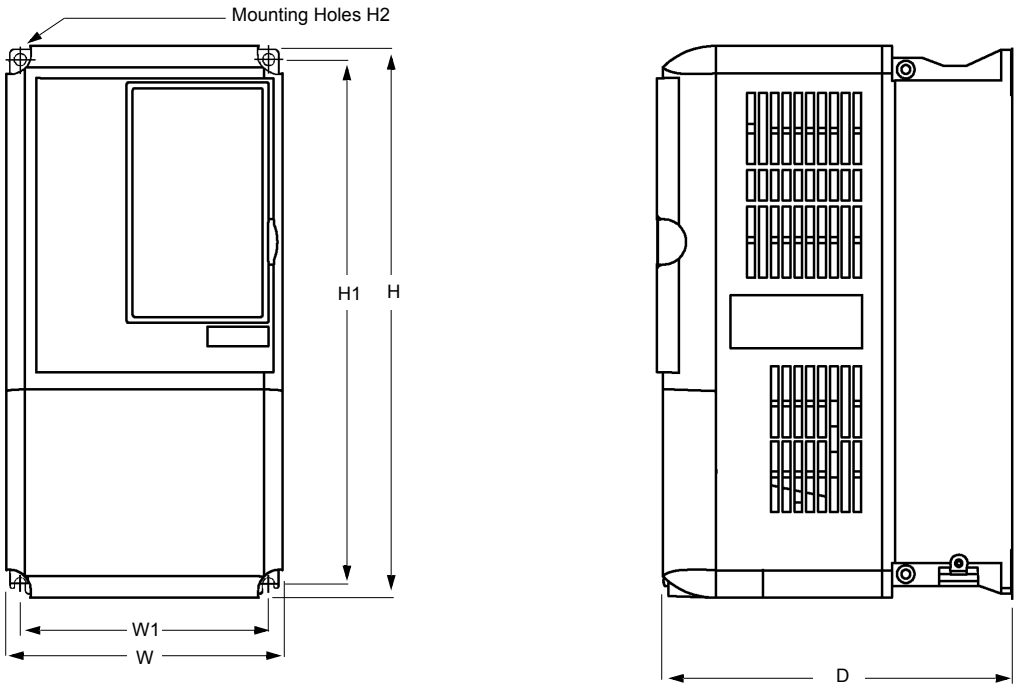

Figure 2-3: Open Chassis

NOTE: Some models are shipped with metal enclosures that can be removed and discarded.

230V Class

	Overall Dimensions in inches and (mm)			Mounting Dimensions in inches and (mm)				Heat Loss (W)
Model	**W**	**H**	**D**	**W1**	**H1**	**H2**	**Wt Lbs**	**Total**
2007-G+S3	5.51 (140)	11.02 (280)	6.30 (160)	4.95 (126)	10.47 (266)	0.28 (7)	6.6	98
2009-G+S3	5.51 (140)	11.02 (280)	6.30 (160)	4.95 (126)	10.47 (266)	0.28 (7)	6.6	127
2015-G+S3	5.51 (140)	11.02 (280)	7.09 (180)	4.95 (126)	10.47 (266)	0.28 (7)	8.8	134
2023-G+S3	5.51 (140)	11.02 (280)	7.09 (180)	4.95 (126)	10.47 (266)	0.28 (7)	8.8	184
2031-G+S3	7.87 (200)	11.81 (300)	7.87 (200)	7.32 (186)	11.22 (285)	0..28 (7)	13.2	332
2045-G+S3	7.87 (200)	12.20 (310)	7.87 (200)	7.32 (186)	11.22 (285)	0.28 (7)	15.4	525
2058-G+S3	9.45 (240)	13.78 (350)	8.27 (210)	8.50 (216)	13.19 (335)	0.30 (7.62)	24.2	598
2071-G+S3	9.45 (240)	14.96 (380)	8.27 (210)	8.50 (216)	13.19 (335)	0.30 (7.62)	24.2	680
2085-G+S3	10.0 (254)	21.06 (535)	10.24 (260)	7.68 (195)	15.16 (385)	0.30 (7.62)	53	835
2145-G+S3	14.76 (375)	23.62 (600)	11.81 (300)	9.84 (250)	22.64 (575)	0.49 (12.5)	125	1431
2215-G+S3	17.72 (450)	28.54 (725)	13.78 (350)	12.80 (325)	27.56 (700)	0.49 (12.5)	189	2207

	Overall Dimensions in inches and (mm)			Mounting Dimensions in inches and (mm)				Heat Loss (W)
Model	**W**	**H**	**D**	**W1**	**H1**	**H2**	**Wt Lbs**	**Total**
2283-G+S3	17.72 (450)	28.54 (725)	13.78 (350)	12.80 (325)	27.56 (700)	0.49 (12.5)	191	2800
2346-G+S3	19.69 (500)	33.46 (850)	14.17 (360)	14.57 (370)	32.28 (820)	0.59 (15)	238	3158

460V Class

	Overall Dimensions in inches and (mm)			Mounting Dimensions in inches and (mm)				Heat Loss (W)
Model	**W**	**H**	**D**	**W1**	**H1**	**H2**	**Wt Lbs**	**Total**
4002-G+S3	5.51 (140)	11.02 (280)	6.30 (160)	4.95 (126)	10.47 (266)	0.28 (7)	6.6	58
4003-G+S3	5.51 (140)	11.02 (280)	6.30 (160)	4.95 (126)	10.47 (266)	0.28 (7)	6.6	84
4005-G+S3	5.51 (140)	11.02 (280)	7.09 (180)	4.95 (126)	10.47 (266)	0.28 (7)	8.8	115
4008-G+S3	5.51 (140)	11.02 (280)	7.09 (180)	4.95 (126)	10.47 (266)	0.28 (7)	8.8	148
4012-G+S3	5.51 (140)	11.02 (280)	7.09 (180)	4.95 (126)	10.47 (266)	0.28 (7)	8.8	208
4017-G+S3	7.87 (200)	11.81 (300)	7.87 (200)	7.32 (186)	11.22 (285)	.28 (7)	13.2	307
4024-G+S3	7.87 (200)	11.81 (300)	7.87 (200)	7.32 (186)	11.22 (285)	.28 (7)	13.2	390
4031-G+S3	9.45 (240)	13.78 (350)	8.27 (210)	8.5 (215)	13.19 (335)	0.30 (7.5)	22	465
4039-G+S3	9.45 (240)	13.78 (350)	8.27 (210)	8.5 (215)	13.19 (335)	0.30 (7.5)	22	590
4045-G+S3	10.98 (275)	17.72 (450)	10.24 (260)	8.66 (220)	17.13 (435)	0.30 (7.5)	53	653
4060-G+S3	10.98 (275)	17.72 (450)	10.24 (260)	8.66 (220)	17.13 (435)	0.30 (7.5)	53	988
4075-G+S3	12.80 (325)	21.65 (550)	11.22 (285)	10.24 (260)	21.06 (535)	0.30 (7.5)	88	1133
4091-G+S3	12.80 (325)	21.65 (550)	11.22 (285)	10.24 (260)	21.06 (535)	0.30 (7.5)	88	1287
4112-G+S3	12.80 (325)	21.65 (550)	11.22 (285)	10.24 (260)	21.06 (535)	0.30 (7.5)	88	1682
4150-G+S3	17.72 (450)	28.54 (725)	13.78 (350)	12.80 (325)	27.56 (700)	0.49 (12.5)	194	1847
4180-G+S3	17.72 (450)	28.54 (725)	13.78 (350)	12.80 (325)	27.56 (700)	0.49 (12.5)	196	2287
4260-G+S3	19.69 (500)	33.46 (850)	14.17 (360)	14.57 (370)	32.28 (820)	0.59 (15)	265	3393
4304-G+S3	22.64 (575)	36.06 (916)	14.88 (373)	17.52 (445)	33.66 (855)	0.59 (15)	352	3935
4370-G+S3	27.95 (710)	51.38 (1305)	16.26 (413)	10.63 (270)	50.00 (1270)	0.79 (20)	572	3964
4477-G+S3	27.95 (710)	51.38 (1305)	16.26 (413)	10.63 (270)	50.00 (1270)	0.79 (20)	616	5509
4590-G+S3	36.06 (916)	58.07 (1475)	16.26 (413)	14.37 (365)	56.70 (1440)	0.79 (20)	891	8320

chapter 3

Wiring

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IMPULSE•G+ Series 3 Wiring Practices

WARNING

Before you wire the drive, review the following practices to help ensure that your system is wired properly.

- Connect the incoming three-phase AC source to terminals R/L1, S/L2, T/L3.
- Connect the Motor leads to terminals U/T1, V/T2, W/T3.
- Ensure that the drive-to-motor wiring distance is less than 150 ft unless appropriate reactors, filters, and/or inverter duty motor is used.
- If a device that can interrupt power is installed between the drive and the motor, install a reactor on the output side of the drive.
- On external user input devices, use hard contact inputs rather than solid-state inputs.
- If the power source is 500 kVA or greater, or more than 10 times the inverter kVA rating, ensure that there is at least 3 percent impedance between the power source and the drive input. To accomplish this, you can install a DC reactor between inverter terminals 1 and 2, or use an AC line reactor on the input of the drive. If you don't provide enough impedance, excessive peak currents could damage the input power supply circuit.
- If the user input device is a PLC TRIAC output, use a 5-KW, 5-W resistor between the signal and L2 (X2).
- Comply with "Suggested Circuit Protection Specifications" on page 3-6.
- Use time delay fuses, which are sized at 150% of drive's continuous-rated current, for drive input protection.
- Use appropriate R-C or MOV type surge absorbers across the coil of all contactors and relays in the system. Failure to do so could result in noise-related, nuisance fault incidents.
- Use external dynamic braking resistors for all applications.
- Do not ground the drive with any large-current machines.
- Before you use any welding or high-current machines near the crane, disconnect all line and ground wiring.
- Do not use output contactors between the drive and the motor.
- Do not let the wiring leads come in contact with the drive enclosure.
- Do not connect power factor correction capacitors to the drive input or output.
- Hard-wire the drive and motor (e.g., festoon cable). Do not use sliding collector bars.
- When a user input device or interface board is remote, use shielded cable between the drive input terminals and the interface output terminals or user input device(s).
- Before turning on the drive, check the output circuit (T1, T2 and T3) for possible short circuits and ground faults.
- Increase the wire size by one gauge for every 250 feet (76.2 meters) between the drive and motor; suggested for center driven cranes, trolleys, and bridges. (Voltage drop is significant at low frequencies.)

- When using more than one transformer for the drive's power, properly phase each transformer.
- To reverse the direction of rotation, program B3-04 = 1 (exchange phases) or interchange any two motor leads (U/T1, V/T2 or W/T3). (Changing R/L1, S/L2 or T/L3 will not affect the shaft rotation direction.)
- Use shielded cable for all low-level DC speed reference signals (0 to10VDC, 4 to 20 mA). Ground the shield only at the drive side.
- Please observe National Electrical Code (NEC) guidelines when wiring electrical devices.

NOTE: Failure to observe these warnings may result in equipment damage.

IMPULSE•G+ Series 3 Typical Connection Diagram

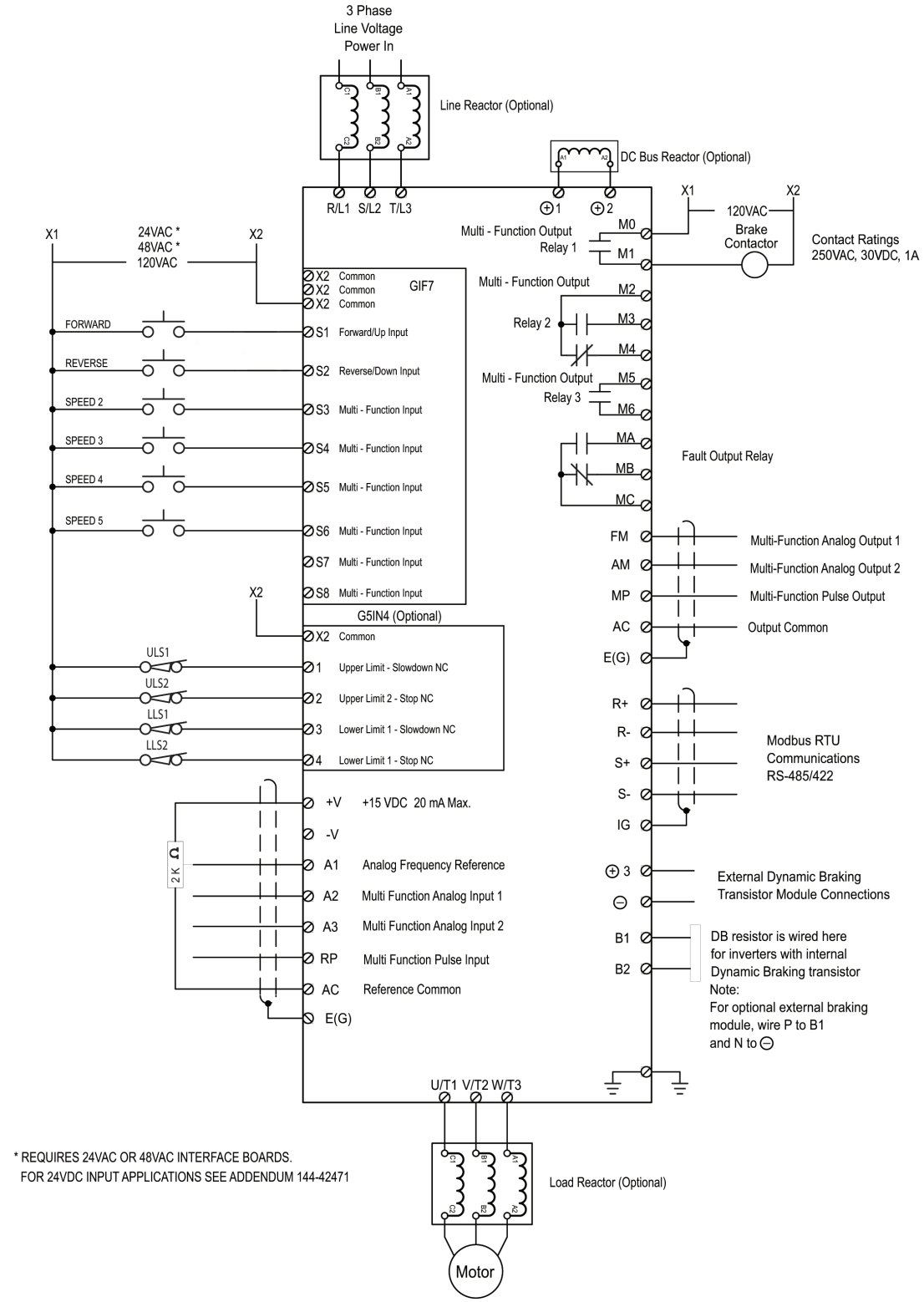


Figure 3-1: IMPULSE•G+ Series 3 Terminal Diagram

Suggested Circuit Protection Specifications and Wire Size

In order to comply with most safety standards, some circuit protective devices should be used between the incoming three-phase power supply and the IMPULSE•G+ Series 3. These devices can be thermal, magnetic, or molded-case breakers (MCCB); or "slow-blow" type fuses such as "CCMR" or "J."

CAUTION:

The following guidelines are only suggested values. Always conform to local electrical codes and wiring practices.

Model #	Continuous HD Input Amps	Time Delay Input Fuse (A)	Time Delay Input Fuse Class	Inverse Time Molded/Case Circuit Breaker[3]	Recommended Gauge[1, 4] Power Circuit Wiring	Control Wiring	Ground Copper[2]
230VClass							
2007-G+-S3	8.4	12	CC	15	12	16/14	12
2009-G+-S3	11.5	15	CC	20	12	16/14	12
2015-G+-S3	18	25	CC	30	12	16/14	10
2023 -G+S3	24	30	J	45	12	16/14	10
2031-G+S3	37	45	J	60	8	16/14	10
2045-G+S3	52	60	J	70	6	16/14	10
2058-G+S3	68	80	J	110	4	16/14	8
2071-G+S3	84	100	J	125	2	16/14	8
2085-G+S3	94	125	J	150	2	16/14	6
2145-G+S3	160	200	J	250	2/0	16/14	6
2215-G+S3	237	300	J	350	250 2-2/0	16/14	4
2283-G+S3	317	400	J	450	350 2-3/0	16/14	2
2346-G+S3	381	500	J	600	400 2-250	16/14	2
460VClass							
4002-G+S3	2.5	3.5	CC	15	12	16/14	12
4003-G+S3	4.4	6	CC	15	12	16/14	12
4005-G+S3	6.4	9	CC	15	12	16/14	12
4008-G+S3	10.4	15	CC	20	12	16/14	12
4012-G+S3	15	20	CC	25	12	16/14	12
4017-G+S3	20	25	J	35	12	16/14	10
4024-G+S3	29	35	J	45	10	16/14	10
4031-G+S3	37	45	J	60	8	16/14	10
4039-G+S3	47	50	J	70	6	16/14	10

1) NFPA 70 National Electric Code 2008. 430.122(a) and Table 610-14(a) 40°C, 60-minute, copper 50°C ambient
2) NFPA 70 National Electric Code 2008. Table 250.122.
3) NFPA 70 National Electric Code 2008. Table 430.52.
4) NFPA 70 National Electric Code 2008. Table 315(b)(2)(a).

Model #	Continuous HD Input Amps	Time Delay Input Fuse (A)	Time Delay Input Fuse Class	Inverse Time Molded/Case Circuit Breaker[3]	Recommended Gauge[1, 4] Power Circuit Wiring	Control Wiring	Ground Copper[2]
4045-G+S3	50	60	J	80	6	16/14	10
4060-G+S3	66	80	J	100	4	16/14	8
4075-G+S3	83	100	J	125	2	16/14	8
4091-G+S3	100	125	J	175	1	16/14	6
4112-G+S3	120	150	J	225	1/0	16/14	6
4150-G+S3	198	200	J	300	3/0	16/14	6
4180-G+S3	2383	250	J	350	250 2-2/0	16/14	4
4260-G+S3	286	350	J	500	350 2-3/0	16/14	2
4304-G+S3	334	400	J	600	350 2-4/0	16/14	2
4370-G+S3	407	500	J	700	500 2-250	16/14	2
4477-G+S3	457	700	J	900	500 2-300 4-3/0	16/14	1/0
4590-G+S3	649	800	J	1000	4-250	16/14	1/0

1) NFPA 70 National Electric Code 2008. 430.122(a) and Table 610-14(a) 40°C, 60-minute, copper 50°C ambient
2) NFPA 70 National Electric Code 2008. Table 250.122.
3) NFPA 70 National Electric Code 2008. Table 430.52.
4) NFPA 70 National Electric Code 2008. Table 315(b)(2)(a).

Power Circuit Wiring Procedures

To wire the power circuit for IMPULSE•G+ Series 3:

1. Run the three-phase power supply wires through an appropriate enclosure hole.
2. Referring to "Suggested Circuit Protection Specifications—IMPULSE•G+ Series 3" and the following two tables, connect the three-phase power supply wires to a circuit protection system.
3. Connect the three-phase power supply wires from the circuit protection Terminals L1, L2 and L3.
4. From Terminals T1, T2 and T3, connect the power output wires to the motor. If a load reactor is used, connect these output wires to the reactor input instead; then connect the reactor output to the motor.

   NOTE: If a device that can interrupt power is installed between the drive and the motor, install a reactor on the output side of the drive.

5. For Models 4150-G+S3 and greater, ensure the jumper plug is inserted in the printed-circuit board (8PCB), which is underneath the control board, as follows:

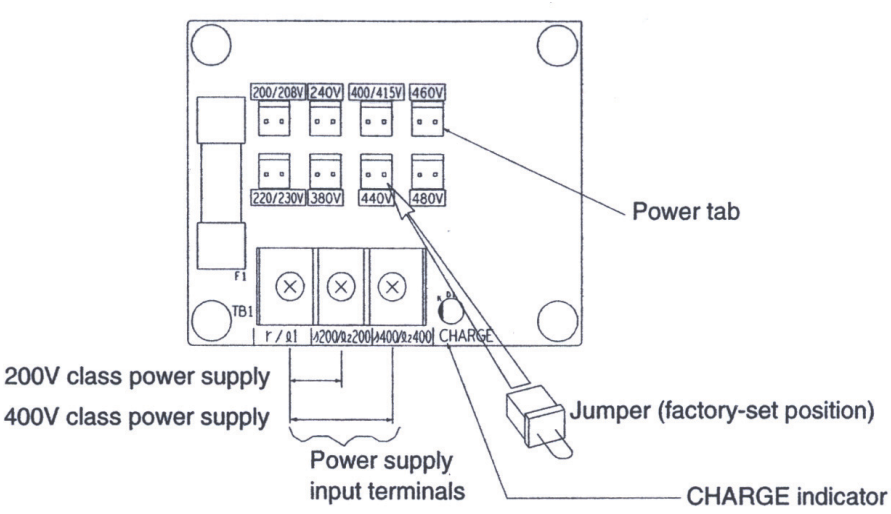


Figure 3-2: Models 4150-G+S3 to 4590-G+S3

230V Class Terminal Functions

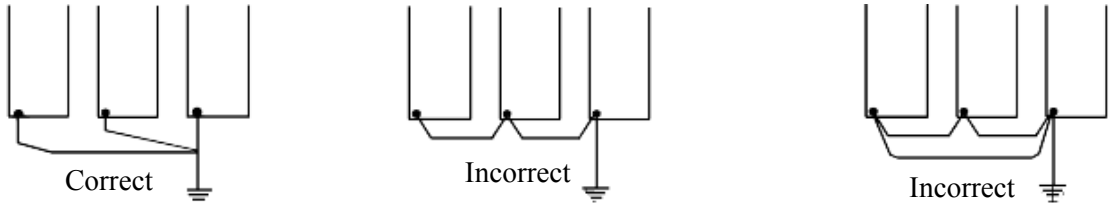
	Model	2007-G+ to 2071-G+	2085-G+	2145-G+	2180-G+ to 2346-G+
	Rated Current	7 to 71 Amps	85 Amps	145 Amps	180 to 346 Amps
Terminal	R/L1	Main circuit input power supply			
	S/L2				
	T/L3				
	U/T1	Inverter output			
	V/T2				
	W/T3				
	B1	Braking resistor	n/a		
	B2				
	⊖	DC reactor (⊕1–⊕2) DC Power supply (⊕1–⊖)	DC power supply (⊕1–⊖) Braking unit (⊕3–⊖) *Link choke standard for models CIMR 2022~2110		DC power supply (⊕1–⊖) Braking unit (⊕3–⊖) (⊕1 and ⊕2 terminals not provided)
	⊕1				
	⊕2				
	⊕3				
	r (*l* 1)	n/a		Cooling fan power supply	
	s (*l* 2)				
	⏚	Ground terminal (Ground resistance: 100 Ω or less)			

460V Class Terminal Functions

	Model	4002-G+ to 4039-G+	4045-G+ to 4112-G+	4150-G+ to 4304-G+	4477-G+ to 4590-G+
	Rated Current	2.1 to 39 Amps	45 to 112 Amps	150 to 304 Amps	477 to 590 Amps
Terminal	R/L1	Main circuit input power supply			
	S/L2				
	T/L3				
	U/T1	Inverter output			
	V/T2				
	W/T3				
	B1	Braking resistor	n/a		
	B2				
	⊖	DC reactor (⊕1–⊕2) DC power supply (⊕1– ⊖)	DC power supply (⊕1– ⊖) Braking unit (⊕3– ⊖) *Link choke standard for models CIMR 4030~4300		
	⊕1				
	⊕2				
	⊕3	n/a			
	s (*l* 1)	n/a	n/a	n/a	
	r (*l* 2)			Cooling fan power supply (Control power supply) r–s200: 200 to 230VAC input r–s400: 380 to 460VAC input	
	s200		n/a		
	s400				
	⏚	Ground terminal (Ground resistance: 10 Ω or less)			

Grounding

6. Connect terminal G to the common panel ground. Use ground wiring as specified in “Suggested Circuit Protection and Wire Size” on page 3-6, and keep the length as short as possible.
   - Ground Resistance: 230V class; 100W or less, 460V or greater class; 10W or less.
   - Never run the IMPULSE•G+ Series 3 drive ground wires in common with welding machines, or other high-current electrical equipment.
   - When more than one drive is used for the same system, ground each directly or daisy-chain to the ground pole. Do not loop the ground wires.



Grounding of three IMPULSE G+ Series 3 Drives

Figure 3-3: Grounding

Control Circuit Terminals
Control Circuit board GIF7

DIP Switch S1 and Jumper CN15

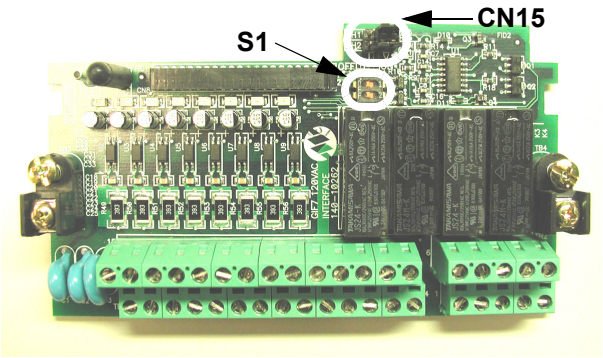


Figure 3-4: DIP Switch S1 and Jumper CN15 Location

Table 1: Terminal and Wire Specifications

Terminal Symbol	Terminal Screw	Clamping Torque Lb-in (N-m)	Wire Range AWG (mm^2)
J1	M3	4.2 to 5.3 (0.5 to 0.6)	26 to 16 (Stranded: 0.14 to 1.5) (Solid: 0.14 to 1.5)

Dip Switch S1

DIP Switch S1 is described in this section. The functions of DIP switch S1 are shown in the table below.

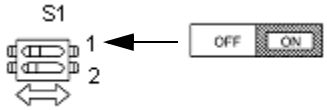
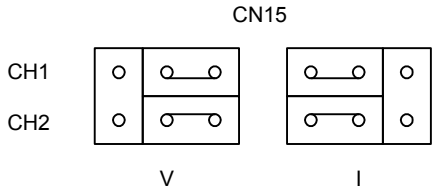


Figure 3-5: DIP Switch S1 Function

DIP Switch S1		
Name	**Function**	**Setting**
S1-1	RS-485 and RS-422 terminating resistance	OFF: No terminating resistance **(default)** ON: Terminating resistance of 110 Ohm
S1-2	Input method for analog input A2	OFF: 0 to 10VDC or -10 to 10VDC (internal resistance: 20K) **(default)** ON: 4-20mA (internal resistance: 250 Ohm)

Jumper CN15

Jumper CN15 is described in this section. The jumper position of CH1 and CH2 determines the signal level of the multi-function analog output FM and AM, respectively. The functions and positions of CN15 are shown in the table below.



Jumper CN15		
Name	**Multi-function Analog Output**	**Output Range**
CH1	FM	V: 0 to 10VDC or -10 to +10VDC **(default)** I: 4 to 20mA
CH2	AM	V: 0 to 10VDC or -10 to +10VDC **(default)** I: 4 to 20mA

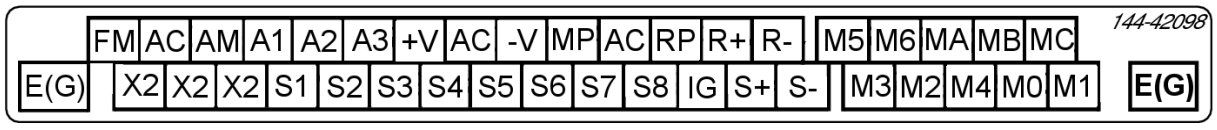
Control Circuit Terminals

The table below outlines the functions of the control circuit terminals.

Classification	Terminal	Signal Function	Description		Signal Level
Sequence Input Signal	S1	Forward run/stop	Forward run when closed, stop when open		120 VAC ±10%
	S2	Reverse run/stop	Reverse run when closed, stop when open		
	S3	Speed 2*	Multi-function contact inputs (H1-01 to H1-06) *Programmable input		
	S4	Speed 3*			
	S5	Speed 4*			
	S6	Speed 5*			
	S7	External Fault*			
	S8	M-Speed Gain 1*			
	X2	Control Input Common			
Analog Input Signal	+V	+15VDC Power supply output	For analog command +15VDC power supply		+15VDC (Allowable current 20 mA max.)
	-V	-15VDC Power supply output	For analog command -15VDC power supply		-15VDC (Allowable current 20 mA max.)
	A1	Master frequency reference	-10 to +10VDC/-100% to 100% 0 to +10VDC/0 to 100%		-10 to +10V (20k Ohm), 0 to +10V/(20k Ohm)
	A2	Multi-function analog reference	4 to 20 mA/0 to 100% -10 to +10VDC/-100% to 100% 0 to 10VDC/0 to 100%	Multi-function analog reference (H3-09)	4 to 20mA (250 Ohm) -10 to +10V (20k Ohm), 0 to +10V/(20k Ohm)
	A3	Multi-function analog input	-10 to +10VDC/-100% to +100% 0 to +10 VDC/0 to 100%	Auxiliary analog input (H3-05)	-10 to +10V (20k Ohm), 0 to +10V/(20k Ohm)
	AC	Common terminal for control circuit	0VDC		–
	E(G)	Connection to shield sheath of signal lead	–		–
Relay Output Signal	M0	Brake output N.O. Contact	Multi-function output (H2-01 to H2-03)		Dry contact Contact capacity: 250VAC, 1A or less 30VDC, 1A or less
	M1				
	M2	N.O./N.C. Contact			
	M3				
	M4				
	M5	Fault annunciate			
	M6				
	MA	Fault contact output (NO/NC contact)	Terminals MA & MC N/O; closed at major faults Terminals MB & MC N/C open at major fault		
	MB				
	MC				

Classification	Terminal	Signal Function	Description		Signal Level
Analog Output Signal	FM	Multi-Function Analog Output 1	0 to ± 10VDC	Multi-function analog monitor (H4-01 to H4-03)	0 to ±10VDC Max. ±5% 2mA or less
	AC	Common			
	AM	Multi-Function Analog Output 2	0 to ± 10VDC	Multi-function analog monitor 2 (H4-04 to H4-06)	0 to ±10VDC Max. ±5% 2mA or less
Pulse I/O Signal	RP	Pulse Input	Pulse input frequency reference	Function set by H6-01	0 to 32kHz (3k) ±5% High level voltages 3.5 to 13.2 Low level voltages 0.0 to 0.8 Duty Cycle (on/off) 30% to 70%
	MP	Pulse Monitor	Pulse output frequency	Function set by H6-06	0 to 32kHz ±5% output (load: 1.5k)
RS-485/422	R+	Modbus communication input	For 2-wire RS-485, jumper R+ and S+ and jumper R- and S-		Differential input, PHC isolation
	R-				
	S+	Modbus communication output			Differential output, PHC isolation
	S-				
	IG	Signal Common			

Control Circuit Terminal Diagram



c h a p t e r 4

Getting Started

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Overview

With its easy-to-use keypad and X-Press Programming, IMPULSE•G+ Series 3 makes it easy to get up and running right away. In addition to explaining the keypad and X-Press Programming, this chapter explains how to view the scroll settings, get into the programming mode, and program speeds.

Checks Before Powering

After mounting and interconnections are completed, verify:

- Correct connections.
- Correct input power supply. (No voltage drop or imbalance, source kVA ≤ 500, unless a line reactor is used.)

WARNING

DO not power 230V-rated drives with 460V power.

- No short circuit conditions.
- No loose screw terminals. (Check especially for loose wire clippings.)
- Proper load conditions.

Precautions

- Only start the motor if motor shaft rotation is stopped.
- Even with small loading, never use a motor whose nameplate amperage exceeds the inverter rated current.

DANGER

Extreme caution should be used if braking method is set to decelerate to stop. If deceleration time is too long, equipment could run into end stop device, causing damage to equipment or injury to personnel.

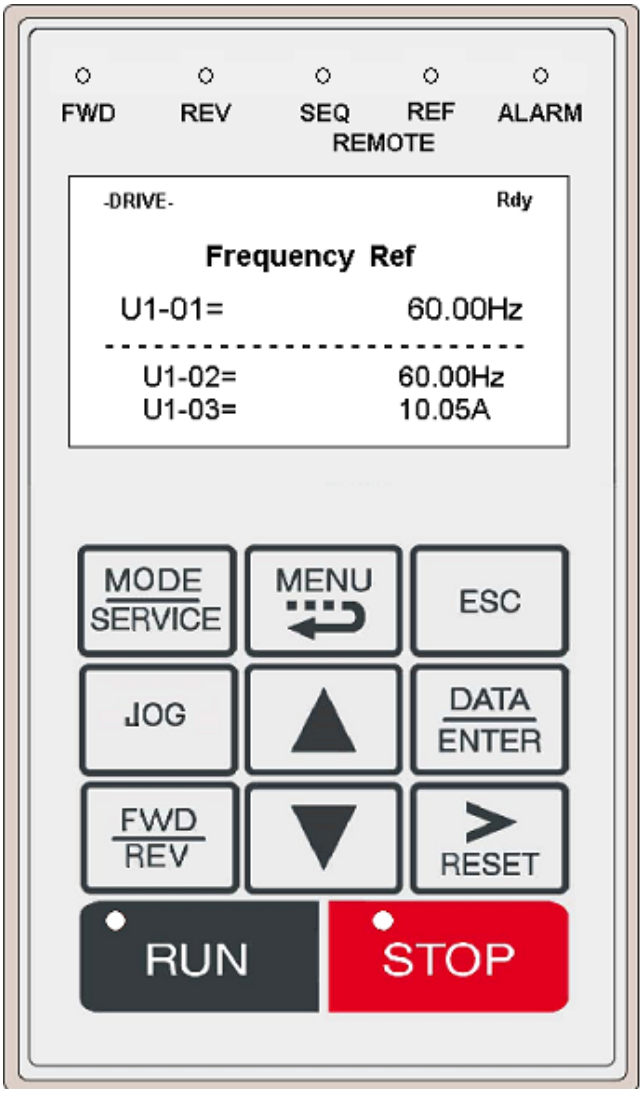
Using the Keypad

With five 16-character lines available, the keypad display makes it possible to view fault codes and change parameter settings. Parameter settings, with their parameter codes, are displayed in most cases. In addition, the parameter description is included on the top line of the display. The keypad enables you to:

- Program the various drive parameters.
- Monitor the functions of the drive.
- Read alpha-numeric fault-diagnostic indications.
- Operate the drive using the keypad (local operation).

WARNING

Because of the additional potential hazards that are introduced when any drive is operated locally, we advise you to avoid operating it this way. If you do operate the drive locally, be aware that the crane or hoist will move when you press the RUN button. If you have questions, contact Magnetek.



Keypad LED and Button Functions

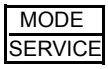
Some of the keypad buttons, whose functions are described below, are dual-purpose. The dual-purpose keys have one function when used in a view-only mode, and another function when used in a programming mode.

This LED lights when a fault has occured, flashes when an alarm has occured.

This LED lights when the FORWARD command is given.

This LED lights when the REVERSE command is given.

- The SEQ LED lights when selecting the RUN command from the control circuit terminals or communication option card.
- The REF LED lights when the **Speed Reference** is input through control circuit terminals or communication option card.



- Pressing this key toggles between the mode display and the phone number for Magnetek's Service Department.
- Also toggles between REMOTE and LOCAL (operate from keypad) operation when O2-01 is set to 1.
- Pressing the key 3 times resets the maintenance timer, U1-52.

Displays the four keypad functions: operation, programming, modified constants and auto-tunning.

Backs up to the previous display (before the DATA/ENTER key is depressed).

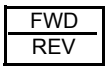
Jog run is enabled when local operation is selected.

Selects the next parameter group, parameter or parameter setting. It also increases the blinking digit of a parameter setting.

Selects the previous parameter group, parameter or parameter setting. It also decreases the blinking digit of a parameter setting.

Selects the digit—from left to right—to be changed (indicated by blinking). It also resets the operation at faults.

Selects mode or parameter. Displays each parameter's set value. By pressing this key again, the set value is entered.



Selects forward or reverse run when LOCAL operation is selected.

- Pressing this key initiates run command when LOCAL operation is selected.
- The red LED lights steadily during run.

- Pressing this key initiates Base Block stop command.
- The red LED lights steadily when drive is at stop; blinks when Run command is active but output frequency reference is zero; off when drive output is controlling motor speed.

Parameters

There are hundreds of parameters that determine how the drive functions. These parameters are programmed in the drive's software as measurable values or options—both of which will be referred to in this manual as *settings*. While some of these parameters are associated with one setting, others are tied to a number of possible settings.

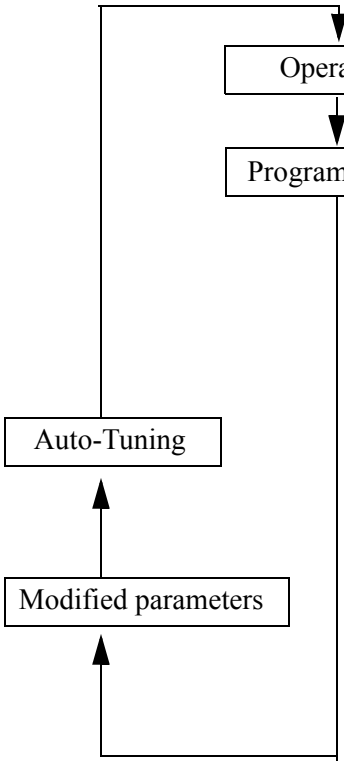
NOTE: The terms "constant" and "parameter" have the same meaning.

Before shipping the drive, Magnetek programmed initial settings in the drive's software so that most, if not all, of the crane system requirements are supported. However, if it is necessary to change the initial settings, Magnetek recommends that only qualified crane system technicians program the drive. This can be accomplished by using the **Password** and **Access Level** features. For more information on these security features, see Initialization Set-up on page 4-9.

The drive can be programmed to allow personnel with limited crane system knowledge to program only certain parameters, called **User Parameters**. To select these parameters, see "User Parameters (A2-XX)".

Two other features to be aware of are **Initialize Parameters** (A1-05) and **User Defaults** (O2-03). Both these features are related and can revert back to previously saved parameter settings. This is especially helpful when anumber of programming changes were made, but the previous settings may still be needed. To program these features, see "Initialize Parameters (A1-05)" and "User Defaults (02-03)".

IMPULSE•G+ Series 3 Structure of Parameters



Group	Function	
Monitor	U1	Monitor
	U2	Fault Trace
	U3	Fault History
Initialize	A1	Initialization Parameters
	A2	User-Defined Parameters
Application	B1	Preset References
	B2	Reference Limits
	B3	Sequence/Reference Source
	B4	Trim Control Level
	B5	Acceleration/Deceleration
	B6	Speed Search
	B8	Jump Frequencies
Special Function	C1	Quick Stop/Reverse Plug Simulation
	C2	Micro Speed
	C3	Travel Limits
	C5	Load Check
	C6	Swift-Lift
	C7	Torque Limit
	C8	Brake Answerback
	C9	G5IN4 Setup
	C10	Weight Measurement
	C12	Delay Timers
	C13	Inching Timers
Tuning	D1	Braking
	D2	Automatic Slip Compensation
	D4	Automatic Speed Regulator Tuning
	D6	Droop Control
	D8	Dwell Function
	D9	S-Curve Acceleration/Deceleration
	D11	Hunting Prevention
Motor	E1	V/F Pattern 1
	E2	Motor Set-up
	E3	Motor 2 Method
	E3	Motor 2 V/F Pattern
	E4	Motor 2 Set-up
Options	F2	Analog Input 14 Set-up
	F3	Digital Input Option Set-up
	F4	Analog Output Option Set-up
	F5	Digital Output 2 Set-up
	F5	Digital Output 8 Set-up
	F6	Communication Option Set-Up
Terminal	H1	Digital Inputs
	H2	Digital Outputs
	H3	Analog Inputs
	H4	Analog Outputs
	H5	Serial Communication Set-up
	H6	Pulse I/O Set-up
Protection	L1	Motor Overload
	L2	Under voltage level
	L3	Stall Prevention
	L4	Ref Detection
	L6	Torque Detection
	L8	Hardware Protection
	L9	Automatic Reset
Operator	O1	Monitor Selection
	O2	Keypad Key Selection
	O3	Clear History
	O4	Copy Function

Parameter Modes

All parameters are organized under four modes:

Operation Mode

Drive operation is enabled. Drive status LED is lit.

Programming Mode

Parameter access levels, control method, motion, speed control mode, and passwords are selected.

Parameters are set/read. Items to be set/read vary depending on the access level setting.

Auto-Tuning Mode

Motor parameters are automatically set by entering tuning data (motor nameplate values) when using open loop vector control method.

Modified Constants Mode

Only parameters that have been changed from the factory settings are set/read.

Initialization Set-up

Language Selection (A1-00)

This allows for the language selection for the digital operator display, as follows:

Setting	Description
0	English
1	French
2	Spanish

Parameter Access Level (A1-01)

This parameter allows the “masking” of parameters according to user level. See the following table:

Setting	Description
0	Operation Only
1	User Program - Accesses parameters selected by OEM (A2-01 to A2-32).
2	Advanced Level - For advanced programming in special applications.

Refer to the parameter code table in Chapter 5 for available parameters at each level.

Control Method Selection (A1-02)

Select the control method best suited for your application.

Setting	Description
0	V/F Control—For general purpose and multiple motor applications.
2	Open Loop Vector—For applications requiring precise speed control, quick response and higher torque at low speeds (150% torque below 1 Hz). An auto-tune must be performed on open loop vector applications.

NOTE: An auto-tune must be performed for all open loop vector applications. Refer to the Auto-Tuning section on page 4-14.

Select Motion (A1-03)

Set this parameter to match the motion of application. See tables 4.1 and 4.2 (X-Press Programming) for details.

Setting	Description
0	Traverse - Decelerate to stop upon removal of RUN command.
1	Standard Hoist - Immediate stop upon removal of RUN command

Speed Reference (A1-04)

This parameter will automatically define the input terminals for the selections listed below. See tables 4.1 and 4.2 (X-Press Programming) for details.

Setting	Description
0	2-SPD Multi-step — Defines Terminal 3 = 2nd speed.
1	3-SPD multi-step — Defines Terminals 3 and 4 as speeds 2 and 3 respectively.
2	5-SPD Multi-step — Defines Terminals 3-6 as speeds 2-5.
3	2-Step infinitely variable — Terminals 1 and 2 = b1-01 (Reference 1) and speed hold. Terminal 3 = Accelerate.
4	3-Step infinitely variable — Terminals 1 and 2 = b1-01 (Reference 1). Terminal 3 = Speed Hold. Terminal 4 =Accelerate.
5	Uni-polar analog — Terminals 1 and 2 = A directional input. Terminal A1 = 0-10V. Terminal A2 = 4-20mA.
6	Bi-polar analog — Terminal A1 = Run Command. Terminal A1 = direction and frequency -10 to +10VDC.
7	Defines Terminals 3-8 as not used. Use this setting if using the G5IN4 option card for inputting speed references.
8	Serial option card. Sets terminals to “not used.”

Parameters Changed by X-Press Programming

Table 4-1: Traverse (A1-03= 0)

A1-04	Description	B1-01	B1-02	B1-03	B1-04	B1-05	B1-06	B1-07	B1-08	B1-09	B1-10	B1-11	B1-12	B1-13	B1-14	B1-15	B1-16	B1-17	B1-18	B2-01	B2-03	B3-03	B5-01	B5-02
		Speed 1	Speed 2	Speed 3	Speed 4	Speed 5	Speed 6	Speed 7	Speed 8	Speed 9	Speed 10	Speed 11	Speed 12	Speed 13	Speed 14	Speed 15	Speed 16	Jog Ref	Ref Priority	Ref. Upper Limit	Ref. Lower Limit	Stopping Method	Accel Time 1	Decel Time 1
0	2-Speed Multi-Step	20.00	60.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	0	100.0	2.0	0	10.0	10.0
1	3-Speed Multi-Step	15.00	30.00	60.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	0	100.0	2.0	0	10.0	10.0
2	5-Speed Multi-Step	6.00	15.00	30.00	45.00	60.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	0	100.0	2.0	0	10.0	10.0
3	2-Step Infinitely Variable	6.00	0.00	0.00	0.00	60.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	0	100.0	2.0	0	10.0	10.0
4	3-Step Infinitely Variable	6.00	0.00	0.00	0.00	60.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	0	100.0	2.0	0	10.0	10.0
5	Uni-Polar Analog	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	1	100.0	2.0	0	10.0	10.0
6	Bi-Polar Analog	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	1	100.0	2.0	0	10.0	10.0
7	G5IN4 Opt. Card	15.00	30.00	60.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	0	100.0	2.0	0	10.0	10.0
8	Serial Opt. Card	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	1	100.0	2.0	0	10.0	10.0

A1-04	Description	C1-01	C3-07	C8-10	D9-01	D9-02	D9-03	E1-03	H1-01	H1-02	H1-03	H1-04	H1-05	H1-06	H2-01	H2-02	H2-03	H3-01	H3-05
		Quick Stop 0/1	Action @ LL2/UL2	Load Float Time	S-Curve Accel at Start	S-Curve Accel at End	S-Curve Decel at Start	V/F Selection	Terminal S3 Select	Terminal S4 Select	Terminal S5 Select	Terminal S6 Select	Terminal S7 Select	Terminal S8 Select	Terminal M1 / M2 Select	Terminal M3 / M4 Select	Terminal M5 / M6 Select	Terminal A1 Signal	TerminalA 3 Select
0	2-Speed Multi-Step	0	2	0	1.50	1.50	1.50	01	00	0F	0F	0F	0F	0F	00	0F	0F	0	1F
1	3-Speed Multi-Step	0	2	0	1.50	1.50	1.50	01	00	01	0F	0F	0F	0F	00	0F	0F	0	1F
2	5-Speed Multi-Step	0	2	0	1.50	1.50	1.50	01	00	01	02	03	0F	0F	00	0F	0F	0	1F
3	2-Step Infinitely Variable	0	2	0	1.50	1.50	1.50	01	05	0F	0F	0F	0F	0F	00	0F	0F	0	1F
4	3-Step Infinitely Variable	0	2	0	1.50	1.50	1.50	01	04	05	0F	0F	0F	0F	00	0F	0F	0	1F
5	Uni-Polar Analog	0	2	0	1.50	1.50	1.50	01	0F	0F	0F	0F	0F	0F	00	0F	0F	0	1F
6	Bi-Polar Analog	0	2	0	1.50	1.50	1.50	01	0F	0F	0F	0F	0F	0F	00	0F	0F	1	1F
7	G5IN4 Opt. Card	0	2	0	1.50	1.50	1.50	01	0F	0F	0F	0F	0F	0F	00	0F	0F	0	1F
8	Serial Opt. Card	0	2	0	1.50	1.50	1.50	01	0F	0F	0F	0F	0F	0F	00	0F	0F	0	1F

Parameters Changed by X-Press Programming

Table 4-2: Standard Hoist (A1-03 = 1)

A1-04	Description	B1-01	B1-02	B1-03	B1-04	B1-05	B1-06	B1-07	B1-08	B1-09	B1-10	B1-11	B1-12	B1-13	B1-14	B1-15	B1-16	B1-17	B1-18	B2-01	B2-03	B3-03	B5-01	B5-02
		Speed 1	Speed 2	Speed 3	Speed 4	Speed 5	Speed 6	Speed 7	Speed 8	Speed 9	Speed 10	Speed 11	Speed 12	Speed 13	Speed 14	Speed 15	Speed 16	Jog Ref	Ref Priority	Ref. Upper Limit	Ref. Lower Limit	Stopping Method	Accel Time 1	Decel Time 1
0	2-Speed Multi-Step	20.00	60.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	0	100.0	2.0	1	5.0	3.0
1	3-Speed Multi-Step	15.00	30.00	60.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	0	100.0	2.0	1	5.0	3.0
2	5-Speed Multi-Step	6.00	15.00	30.00	45.00	60.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	0	100.0	2.0	1	5.0	3.0
3	2-Step Infinitely Variable	6.00	0.00	0.00	0.00	60.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	0	100.0	2.0	1	5.0	3.0
4	3-Step Infinitely Variable	6.00	0.00	0.00	0.00	60.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	0	100.0	2.0	1	5.0	3.0
5	Uni-Polar Analog	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	1	100.0	2.0	1	5.0	3.0
6	Bi-Polar Analog	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	1	100.0	2.0	1	5.0	3.0
7	G5IN4 Opt. Card	15.00	30.00	60.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	0	100.0	2.0	1	5.0	3.0
8	Serial Opt. Card	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	1	100.0	2.0	1	5.0	3.0

A1-04	Description	C1-01	C3-07	C8-10	D9-01	D9-02	D9-03	E1-03	H1-01	H1-02	H1-03	H1-04	H1-05	H1-06	H2-01	H2-02	H2-03	H3-01	H3-05
		Quick Stop 0/1	Action @ LL2/UL2	Load Float Time	S-Curve Accel at Start	S-Curve Accel at End	S-Curve Decel at Start	V/F Selection	Terminal S3 Select	Terminal S4 Select	Terminal S5 Select	Terminal S6 Select	Terminal S7 Select	Terminal S8 Select	Terminal M1 / M2 Select	Terminal M3 / M4 Select	Terminal M5 / M6 Select	Terminal A1 Signal	Terminal A3 Select
0	2-Speed Multi-Step	0	1	0	0.50	0.50	0.50	0A	00	0F	0F	0F	0F	0F	00	0F	0F	0	1F
1	3-Speed Multi-Step	0	1	0	0.50	0.50	0.50	0A	00	01	0F	0F	0F	0F	00	0F	0F	0	1F
2	5-Speed Multi-Step	0	1	0	0.50	0.50	0.50	0A	00	01	02	03	0F	0F	00	0F	0F	0	1F
3	2-Step Infinitely Variable	0	1	0	0.50	0.50	0.50	0A	05	0F	0F	0F	0F	0F	00	0F	0F	0	1F
4	3-Step Infinitely Variable	0	1	0	0.50	0.50	0.50	0A	04	05	0F	0F	0F	0F	00	0F	0F	0	1F
5	Uni-Polar Analog	0	1	0	0.50	0.50	0.50	0A	0F	0F	0F	0F	0F	0F	00	0F	0F	0	1F
6	Bi-Polar Analog	0	1	0	0.50	0.50	0.50	0A	0F	0F	0F	0F	0F	0F	00	0F	0F	1	1F
7	G5IN4 Opt. Card	0	1	0	0.50	0.50	0.50	0A	0F	0F	0F	0F	0F	0F	00	0F	0F	0	1F
8	Serial Opt. Card	0	1	0	0.50	0.50	0.50	0A	0F	0F	0F	0F	0F	0F	00	0F	0F	0	1F

Initial Parameters (A1-05)

Use this parameter to reset the inverter to its factory default settings.

Setting	Description
0	No Initialization (factory default)
1110	User Initialization - resets the inverter to user-specified initial values. To set user-specified initial values, make all required changes to parameter settings, and then set 02-03 to "1". The inverter will memorize all current settings as the user-specified initial values. Up to 50 changed parameters can be stored.

Password Entry (A1-06)

This parameter enables the user to set a password that inhibits the programming of parameters *A1-01* to *A1-03*. This function is useful when used in conjunction with the access level parameter *A1-01*. To set the password, press the MENU and RESET buttons at the same time and the display will change from *A1-06* to *A1-07*. Program in a password number, then if *A1-06* is not the same as *A1-07* parameter *A1-01* to *A1-03* cannot be changed. When *A1-06* is the same as *A1-07*, then *A1-01* to *A1-03* can be changed.

User Parameters (A2-01 through 32)

The user can select up to 32 parameters for quick-access programming. By setting the user access level (*A1-01*) to "User Program," only the parameters selected in function A2 can be accessed by the user. To assign a parameter as a user parameter, go to the A2 level in the initialize menu. Once the A2 parameters are set and *A1-01* is programmed to "User Program," only the parameters visible in the program menu will be assigned to an A2 parameter.

Auto-Tuning

A standard Auto-Tune should be performed only when the control method is open loop vector (A1-02 = 2).

CAUTION

The brake output is not energized during Auto-Tuning. The brake must be manually released and set when Auto-Tuning is complete.

The IMPULSE•G+ Series 3 can adapt to nearly all motors manufactured worldwide with its automatic tuning function. The inverter asks the user for minimal motor information, and then guides the user through a quick simple tuning process. Ideally, perform a standard Auto-Tune with the motor uncoupled from the load. When the motor cannot be disconnected from the load, perform a static or non-rotating Auto-Tune.

NOTE: Contact Magnetek service department if an auto-tune can not be performed.

Parameter Code	Display	Description	Default Setting
T1-00	Select Motor	Selects between motor 1 or 2 (Available only when H1-XX=41)	1
T1-01	Tuning Mode Sel	Selects Tuning Method	0
	0 Standard Tuning (preferred method - motor will rotate)		
	1 Tune - no rotate (first operation should be no load)		
	2 Term Resistance (used to obtain motor lead resistance)		
T1-02	Rated Horsepower	Sets the motor size in HP (note: kW = HP x .746)	kVA dependent
T1-03	Rated Voltage	Sets motor rated voltage in VAC	kVA dependent
T1-04	Rated Current	Sets motor rated current in Amps	kVA dependent
T1-05	Rated Frequency	Sets motor rated frequency in Hertz	60.0 Hz
T1-06	Number of Poles	Sets the number of motor poles	4
T1-07	Rated Speed	Sets motor rated speed in RPM	1750 RPM

After scrolling through the tuning parameters using the Up Arrow key, depress the RUN key to begin auto-tuning. During tuning, “Tuning Proceeding” flashes on the digital operator display. When complete, “Tune Successful”, is displayed. Depress the Menu key to exit auto-tuning mode. Please refer to the “Fault Display and Corrective Actions at Auto-Tuning” section if “Tune Successful” is not displayed.

NOTE: If the STOP key is depressed during tuning, auto-tuning is interrupted and the motor coasts to a stop. The data changed during tuning returns to its original values.

chapter 5

Programming Advanced Features

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Application

- B1 Preset References
- B2 Reference Limits
- B3 Sequence/Reference Source
- B4 Trim Control Level
- B5 Acceleration/Deceleration
- B6 Phase Loss Detection
- B8 Jump Frequencies

Preset Reference

Parameter Code	Display	Function	Range	Initial Value	Access Level
B1-01*	Reference 1	Sets the frequency of Minimum Speed/Speed 1.	0.00–150.00 Hz**	15.00	Adv
B1-02*	Reference 2	Sets the Speed 2 frequency.	0.00–150.00 Hz	30.00	Adv
B1-03*	Reference 3	Sets the Speed 3 frequency.	0.00–150.00 Hz	60.00	Adv
B1-04*	Reference 4	Sets the Speed 4 frequency.	0.00–150.00 Hz	0.00	Adv
B1-05*	Reference 5	Sets the Speed 5 frequency.	0.00–150.00 Hz	0.00	Adv
B1-06*	Reference 6	Sets the Speed 6 frequency.	0.00–150.00 Hz	0.00	Adv
B1-07*	Reference 7	Sets the Speed 7 frequency.	0.00–150.00 Hz	0.00	Adv
B1-08*	Reference 8	Sets the Speed 8 frequency.	0.00–150.00 Hz	0.00	Adv
B1-09*	Reference 9	Sets the Speed 9 frequency.	0.00–150.00 Hz	0.00	Adv
B1-10*	Reference 10	Sets the Speed 10 frequency.	0.00–150.00 Hz	0.00	Adv
B1-11*	Reference 11	Sets the Speed 11 frequency.	0.00–150.00 Hz	0.00	Adv
B1-12*	Reference 12	Sets the Speed 12 frequency.	0.00–150.00 Hz	0.00	Adv
B1-13*	Reference 13	Sets the Speed 13 frequency.	0.00–150.00 Hz	0.00	Adv
B1-14*	Reference 14	Sets the Speed 14 frequency.	0.00–150.00 Hz	0.00	Adv
B1-15*	Reference 14	Sets the Speed 15 frequency.	0.00–150.00 Hz	0.00	Adv
B1-16*	Reference 16	Sets the Speed 16 frequency.	0.00–150.00 Hz	0.00	Adv
B1-17*	Jog Reference	Jog Control and Inching Control frequency reference.	0.00–150.00 Hz	6.00	Adv
B1-18*	Ref Priority *0 Digital Ref Only* *1 Analog Ref Only* *2 Higher Ref Sel*	Determines whether the digital or analog frequency reference is used. ***NOTE:*** *When using Higher Reference Select, 2-Step Infinitely Variable should NOT be used for a Speed Reference setting in parameter A1-04. The two functions are not intended to work in conjunction.*		0	Adv

** Initial value is determined by X-Press Programming (Table 4.1-4.2). **Maximum frequency above 150 Hz is available; consult Magnetek.*

Table 5-1: Multi-Step Speed Processing by Multi-Function Input (B1-01 ~ B1-16)

Speed Reference	Forward/Reverse Terminal 1 or 2	Multi-Step Speed 2 H1-01 ~ 06 = 0	Multi-Step Speed 3 H1-01 ~ 06 = 1	Multi-Step Speed 4 H1-01 ~ 06 = 2	Multi-Step Speed 5 H1-01 ~ 06 = 3	Fwd/Rev Jog-Fwd/Rev Inch H1-01 ~ 06 = 15, 16, 17, 18
STOP	Off	–	–	–	–	Off
B1-01 Speed Ref 1	On	Off	Off	Off	Off	Off
B1-02 Speed Ref 2	On	On	Off	Off	Off	Off
B1-03 Speed Ref 3	On	On	On	Off	Off	Off
B1-04 Speed Ref 4	On	On	On	On	Off	Off
B1-05 Speed Ref 5	On	On	On	On	On	Off
B1-06 Speed Ref 6	On	Off	On	Off	Off	Off
B1-07 Speed Ref 7	On	Off	On	On	Off	Off
B1-08 Speed Ref 8	On	Off	Off	On	Off	Off
B1-09 Speed Ref 9	On	Off	On	On	On	Off
B1-10 Speed Ref 10	On	Off	Off	On	On	Off
B1-11 Speed Ref 11	On	Off	Off	Off	On	Off
B1-12 Speed Ref 12	On	On	Off	Off	On	Off
B1-13 Speed Ref 13	On	On	On	Off	On	Off
B1-14 Speed Ref 14	On	Off	On	Off	On	Off
B1-15 Speed Ref 15	On	On	Off	On	Off	Off
B1-16 Speed Ref 16	On	On	Off	On	On	Off

Reference Limits

These parameters limit the frequency range as a percentage of maximum output frequency (E1-04).

An alternate upper limit frequency can be used during operation when a Multi-Function Input (MFI) is set to 59 (Alt F-Ref UpLimit) and the MFI is on. Alternate Upper Limit Frequency = (B2-03)% x (E1-04).

Parameter Code	Display	Function	Range	Initial Value	Access Level
B2-01	Ref Upper Limit	Sets as a percentage of the maximum output frequency (E1-04), which determines the maximum frequency at which the drive is able to run.	0.0–110%	100.0	Adv
B2-02	Ref Lower Limit	Sets as a percentage of the maximum output frequency (E1-04), which determines the minimum master frequency reference only.	0.0–110%	0.0	Adv
B2-03	Ref 1 Lower limit	Sets as a percentage of the maximum output frequency (E1-04), which determines the minimum frequency at which the drive is able to run.	0.0–110%	2.0*	Adv
B2-04	Alt Upper Limit	Alternate of B2-01 set by MFI=59.	0-110%	100.0	Adv

*Initial value set by X-Press programming.

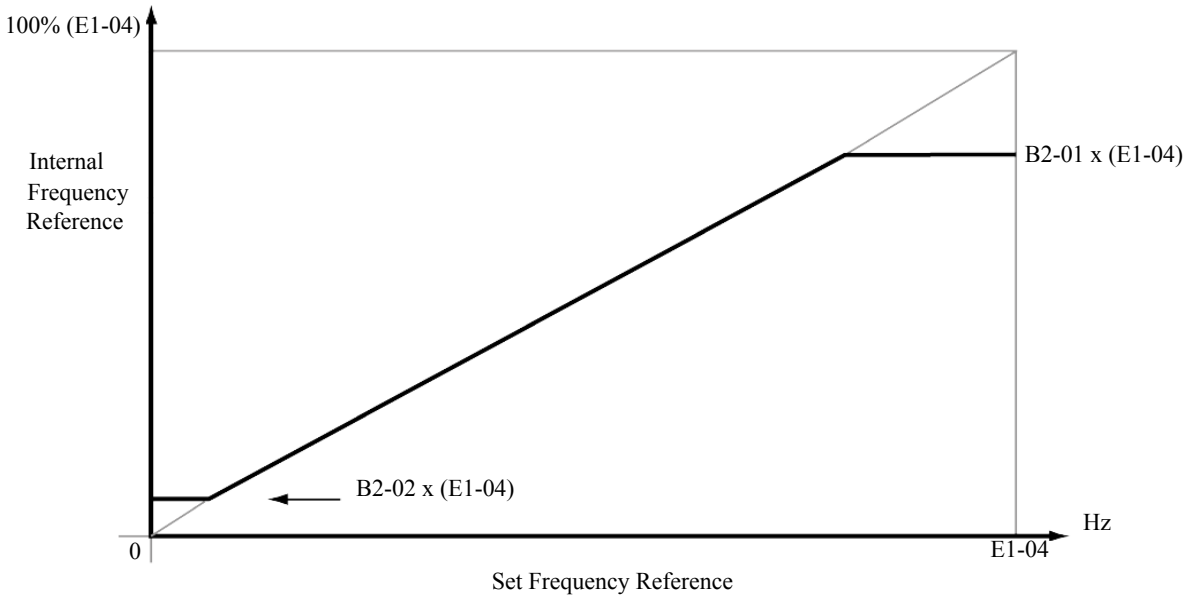


Figure 5-1: Setting Frequency Upper and Lower Limits

Sequence/Reference Source

B3-01 and B3-02 determine the source from where the frequency reference and RUN command are generated.

Parameter Code	Display	Function	Range	Initial Value	Access Level
B3-01	Reference Source	Source from where the frequency reference is generated.	0-4	1	Adv
	0 Operator	Digital operator (Keypad).			
	1 Terminals	Control circuit terminal			
	2 Communication	Serial communication (Port 6CN).			
	3 Option PCB	Optional card (Port 2CN).			
	4 Pulse Input (H6-01)	Pulse input.			
B3-02	Run Source	Source from where the RUN command is generated.	0-3	1	Adv
	0 Operator	Digital operator (Keypad).			
	1 Terminals	Control circuit terminal.			
	2 Communication	Serial communication (Port 6CN).			
	3 Option PCB	Optional card (Port 2CN).			

Stop Method

B3-03 selects the stopping method suitable for the particular application.

Parameter Code	Display	Function	Range	Initial Value	Access Level
B3-03	Stop Method	Determines stop method.	0-4	1*	Adv
	0 Decel to Stop (A1-03=0)	(Fig 5-2)			
	1 Coast to Stop (A1-03=1)	(Fig 5-3)			
	2 DC Injection to Stop				
	4 Decel with timer (Traverse mode only)	(Fig 5-4)			

** Initial value is determined by X-Press Programming (Table 4.1-4.2)*

Decel to Stop (B3-03=0)

Upon removal of the FWD or REV run command, the motor decelerates at a rate determined by the time set in deceleration time 1 (B5-02) and DC injection braking is applied after the DC injection start frequency, D1-01, has been reached. If the deceleration time is set too short or the load inertia is large, an overvoltage fault (OV) may occur during deceleration. In this case, increase the deceleration time or install an optional braking transistor and/or braking resistor.

Braking torque: without braking resistor, approximately 20% of motor rated torque; with braking option, approximately 150% of motor rated torque.

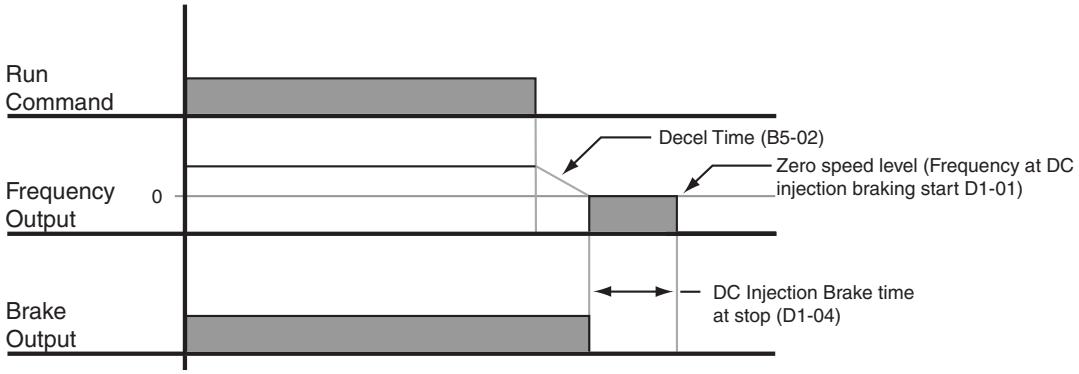


Figure 5-2: Decel to Stop

Coast to Stop (B3-03=1)

Upon removal of the FWD or REV run command, the motor starts to coast and the electric brake sets.

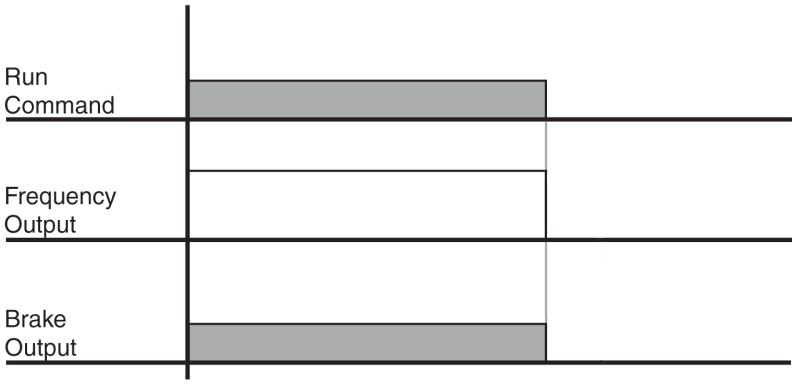


Figure 5-3: Coast to Stop

Decel w/Timer (B3-03=4)

(This option is only available in traverse motion). Upon run command removal, the motor decelerates to stop. The brake delays for a time interval (C12-02) before it is set. This option reduces brake wear for applications that involve frequent stopping and starting.

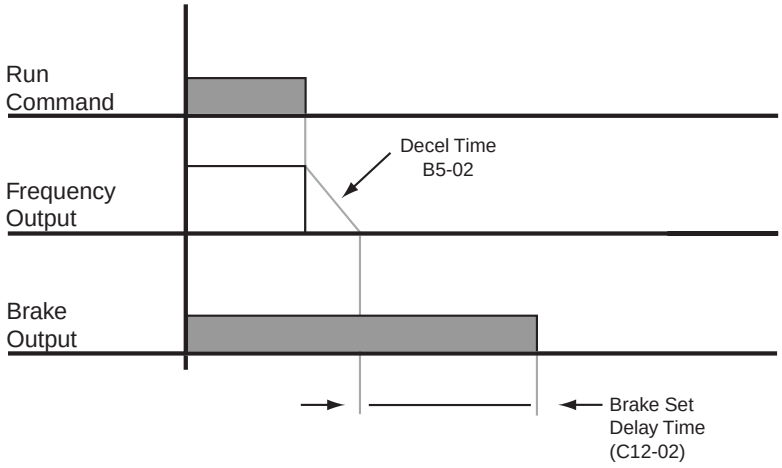


Figure 5-4: Decel w/Timer

Motor Rotation Change

This parameter allows you to change the motor direction without changing the motor leads.

Parameter Code	Display	Function	Range	Initial Value	Access Level
B3-04	Reverse Oper 0 Normal Rotation 1 Exchange Phases	Reverse motor direction	0-1	0	Adv

Input Scan Time

B3-06 selects the microprocessor scan time for reading sequence input data from the control circuit terminals. Set B3-06 to "0" when a quicker response is needed from the control circuit terminal.

Parameter Code	Display	Function	Range	Initial Value	Access Level
B3-06	Cntl Input Scans	Selects the terminal scan time	0-1	1	Adv
	0 2ms–2 scans				
	1 5ms–2 scans				

LOC/REM Run Select

If the run reference/speed reference is switched between serial mode and drive terminal mode, B3-07 determines action after the switch.

Parameter Code	Display	Function	Range	Initial Value	Access Level
B3-07	LOC/REM Run Sel	Determines action after switching Run/Speed reference source.	0-1	0	Adv
	0 Cycle Extrn Run	If the run command is present at the time when the Run/Speed reference source is switched, it requires the run command to be removed and then reapply the run command from the new source to resume the normal operation.			
	1 Accep Extrn Run	If the run command is present at the time when the Run/Speed reference source is switched, it does not require the run command from the new source to be removed. The normal operation will continue.			
B3-08	Run Command at Program		0-1	0	Adv
	0 Disabled				
	1 Enabled (B3-02=0 is Disabled)				
B3-10	Allow Run at Power UP		0-1	0	Adv
	0 Disabled				
	1 Enabled				
B4-01	MOP Ref Memory	Motor operated Pot frequency reference. Enabled when mult. function input = 38, 3D, or 3E. Will memorize previous held frequency after a re-start or power is cycled.		0	Adv
	0 Disabled				
	1 Enabled				

Trim Control Level

The trim control level is valid when the trim control increase command (setting: 45) or trim control decrease command (setting: 46) is set for a multi-function input (H1-01 to H1-06).

If the trim control increase command is ON when a frequency reference is input on the analog input, the trim control level will be added to the analog frequency reference and then that sum will be output as the output frequency. If the trim control decrease command is ON, the frequency reference will be decreased by the trim control level.

Parameter Code	Display	Function	Range	Initial Value	Access Level
B4-02	Trim Control LVL	Sets Trim Control speed level	0–100%	10	Adv

Set the trim control level as a percentage of the maximum output frequency.

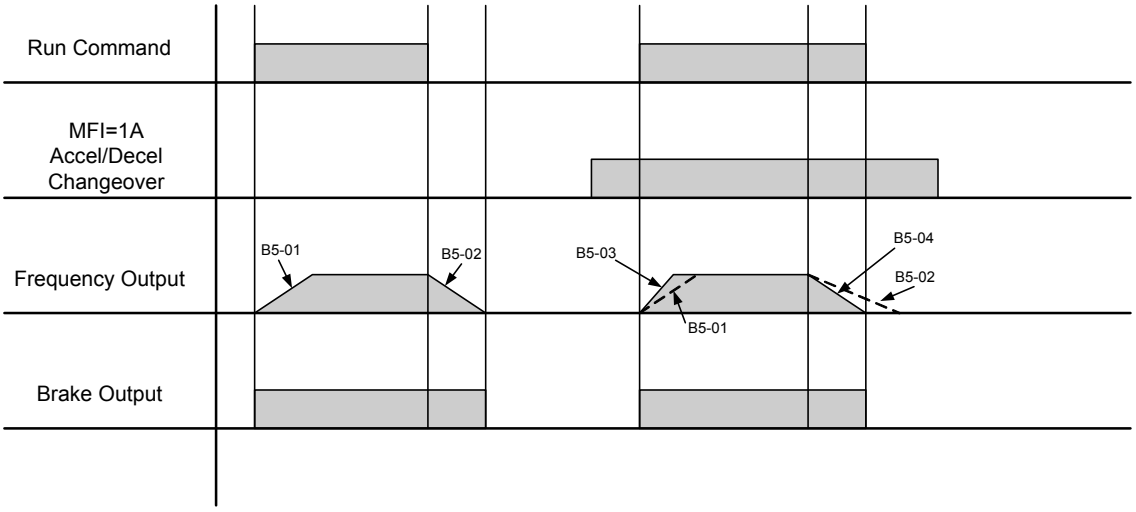
If the frequency reference minus the trim control level is less than zero, the output frequency will be zero.

Acceleration/Deceleration

Acceleration time sets the time necessary for the output frequency to accelerate from 0Hz to maximum output frequency (E1-04). Deceleration time sets the time necessary for the output frequency to decelerate from the maximum output frequency (E1-04) to 0Hz.

Parameter Code	Display	Function	Range	Initial Value	Access Level
B5-01*	Accel Time 1	Sets acceleration time.	0.0–25.5 sec	5.0	Adv
B5-02*	Decel Time 1	Sets deceleration time.	0.0–25.5 sec	3.0	Adv
B5-03	Accel Time 2	Sets alternate accel. time. Enabled by multifunction input=1A.	0.0–6000.0 sec	2.0	Adv
B5-04	Decel Time 2	Sets alternate decel. time. Enabled by multi-function input=1A.	0.0–6000.0 sec	2.0	Adv

* Initial value is determined by X-Press Programming (Table 4.1 to 4.2).



NOTE: Assume the constant B3-03 is set to "0" (Decel to Stop).

Figure 5-5: Normal Accel/Decel Time and Multiple Accel/Decel Changeover

Accel/Decel Time Switching Frequency

Accel/Decel times can be changed automatically without using multi-function inputs. When multi-function contact inputs are set for Accel/Decel selection, this command has priority over automatic change of Accel/Decel.

Parameter Code	Display	Function	Range	Initial Value	Access Level
B5-05	Accel Time N Chg	Sets acceleration time at Speed Switch frequency.	0.0–25.5 sec	2.0	Adv
B5-06	Dec Time N Chg	Sets deceleration time at Speed Switch frequency.	0.0–25.5 sec	2.0	Adv
B5-08	Fast Stop Time	Sets deceleration time for complete stop at external fault.	0.0–25.5 sec	0.5	Adv
B5-09	Acc/Dec Units	Determines acceleration and deceleration time interval and range.		1	Adv
	0 0.01sec for 0.00–2.55 sec	*Note: Setting will not change if any acc/dec time is > 255 sec.*			
	1 0.1sec for 0.0–25.5				
B5-10	Acc/Dec SW Freq	Determines acceleration/deceleration switching level	0.0–150.0Hz	120.0	Adv
B5-11	SW Freq Compare	Determines when Acceleration Time and Deceleration Time at Speed Switch Hz is enabled;	0-1	1	Adv
	0 lower SW Freq	0: B5-05/06 is enabled, N-out≤B5-10			
	1 upper SW Freq	1: B5-05/06 is enabled, N-out≥B5-10			
B5-12	*Accel Time 3*	Acceleration time when H1-01 to H1-06 = 1B	0.0-6000.0	3.0	Adv
B5-13	*Decel Time 3*	Deceleration time when H1-01 to H1-06 = 1B	0.0-6000.0	3.0	Adv
B5-14	*Accel Time 4*	Acceleration time when H1-01 to H1-06 = 1C	0.0-6000.0	3.0	Adv
B5-15	*Decel Time 4*	Deceleration time when H1-01 to H1-06 = 1C	0.0-6000.0	3.0	Adv

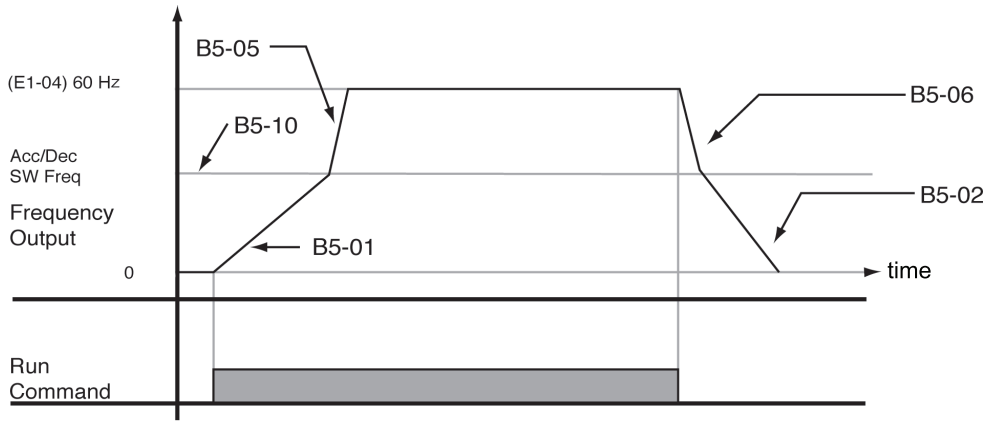


Figure 5-6: When B5-11=1 (Upper Switch Frequency)

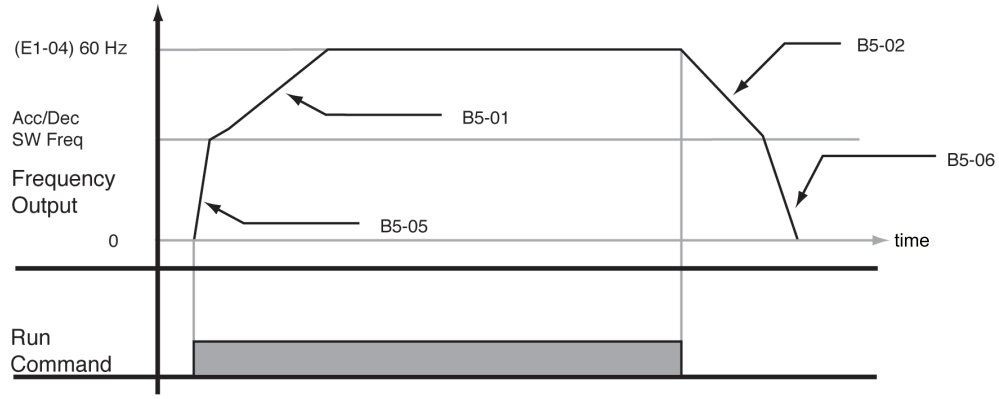


Figure 5-7: B5-11=0 (Lower Switch Frequency)

Speed Search

Parameter Code	Display	Function	Range	Initial Value	Access Level
B6-01	Spd Srch at Start	Enables/Disables speed search	0-3	2	Adv
	0 Speed Search (Estimated) Disabled *1 Speed Search (Estimated) Enabled* *2 Speed Search (Current Detect) Disabled* *3 Speed Search (Current Detect) Enabled*				
B6-02	Spd Srch Current	Speed Search Operation Current (% of inverter)	0-200%	120	Adv
B6-03	Spd Srch Dec Time	Search Deceleration Time	0.1-10 sec	2.0	Adv
B6-05	Search Delay	Delay Timer for Speed Search at Start	0.0-20.0 sec	0.2	Adv
B6-10	Srch Detect Comp	Sets the Gain for the Frequency The Drive Starts Speed Search	1.00-1.20	1.10	Adv
B6-14	Bidir Search Sel	Direction Detect Method	0-1	1	Adv
	0 Disabled - Drive Uses Reference Direction *1 Enabled - Drive Uses Detected Direction*				

Jump Frequencies

This function allows the “jumping” of critical frequencies so that the motor can operate without resonant vibrations caused by some machine systems. This function is also used for deadband control. Setting the value to 0.0 Hz disables this function.

Parameter Code	Display	Function	Range	Initial Value	Access Level
B8-01	Jump Freq 1	First of three jump frequencies.	0.0–150.0 Hz	0.0	Adv
B8-02	Jump Freq 2	Second of three jump frequencies.	0.0–150.0 Hz	0.0	Adv
B8-03	Jump Freq 3	Third of three jump frequencies.	0.0–150.0 Hz	0.0	Adv
B8-04	Jump Bandwidth	Jump frequency reference bandwidth.	0.0–20.0 Hz	1.0	Adv

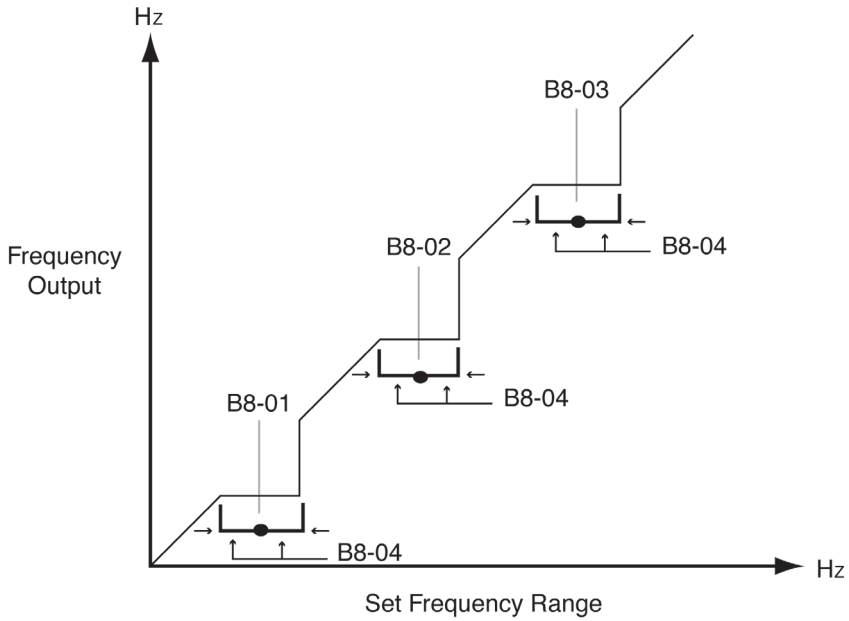


Figure 5-8: Jump Frequencies

Special Functions

- C1 Quick Stop/Reverse Plug Simulation
- C2 Micro-Positioning Control
- C3 End of Travel Limit
- C5 Load Check
- C6 Swift-Lift
- C7 Torque Limit
- C8 Brake Answerback
- C9 G5IN4 Setup
- C12 Delay Timers
- C13 Inching Control

	Motion (A1-03)			
	Traverse (A1-03=0)		Standard Hoist (A1-03=1)	
Special Function	V/F	OLV	V/F	OLV
C1: Quick Stop/Reverse Plug Simulation	Yes	Yes	Yes	Yes
C2: Micro Positioning	Yes	Yes	Yes	Yes
C3: End of Travel Limits	Yes	Yes	Yes	Yes
C5: Load Check	N/A	N/A	Yes	Yes
C6: Swift-Lift	N/A	N/A	Yes	Yes
C7: Torque Limit	No	Yes	No	Yes
C8: Brake Answerback	Yes	Yes	Yes	Yes
C9: G5IN4 Setup	Yes	Yes	Yes	Yes
C12: Delay Timers	Yes	Yes	No	No
C13: Inching Control	Yes	Yes	Yes	Yes

Quick Stop™/Reverse Plug Simulation™

The **Quick Stop Function** provides an automatic Alternate Deceleration at Stop Command.

NOTE: The Quick Stop Deceleration time differs from the normal deceleration time and is applied only when the RUN command is removed.

Parameter Code	Display	Function	Range	Initial Value	Access Level
C1-01*	Quick Stop 0/1	Determines whether Quick Stop is enabled	0-1	0	Adv
	0 Disabled				
	1 Enabled				
C1-02	Quick Stop Time	Deceleration time during Quick Stop function.	0.0–25.5 sec	1.0	Adv

* Initial value is determined by X-Press Programming (Table 4.1 to 4.2).

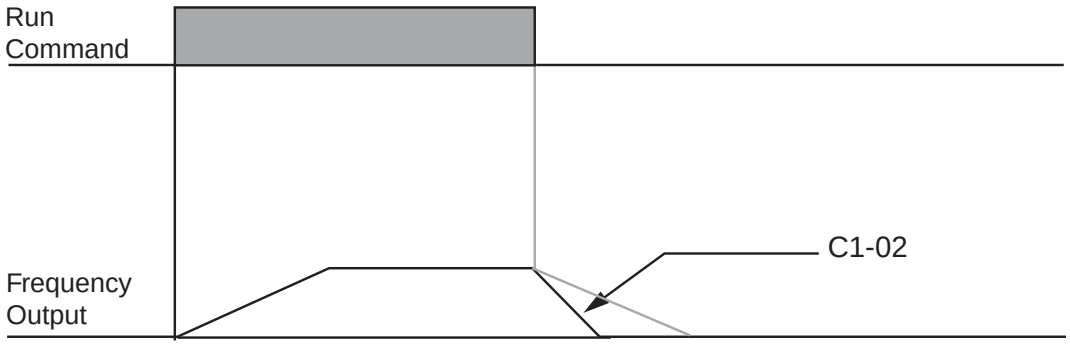


Figure 5-9: Quick Stop

The **Reverse Plug Simulation** provides an automatic alternate deceleration time/acceleration time at a change direction command. The deceleration time and the acceleration time are set independently of the normal acceleration and deceleration times.

Parameter Code	Display	Function	Range	Initial Value	Access Level
C1-03	Reverse Plug 0/1	Determines whether Reverse Plug Simulation is enabled.	0-1	0	Adv
	0 Disabled				
	1 Enabled				
C1-04	Rev-Plg Dec Time	Deceleration time during Reverse Plug Simulation.	0.0–25.5 sec	2.0	Adv
C1-05	Rev-Plg Acc Time	Acceleration time during Reverse Plug Simulation	0.0–25.5 sec	2.0	Adv

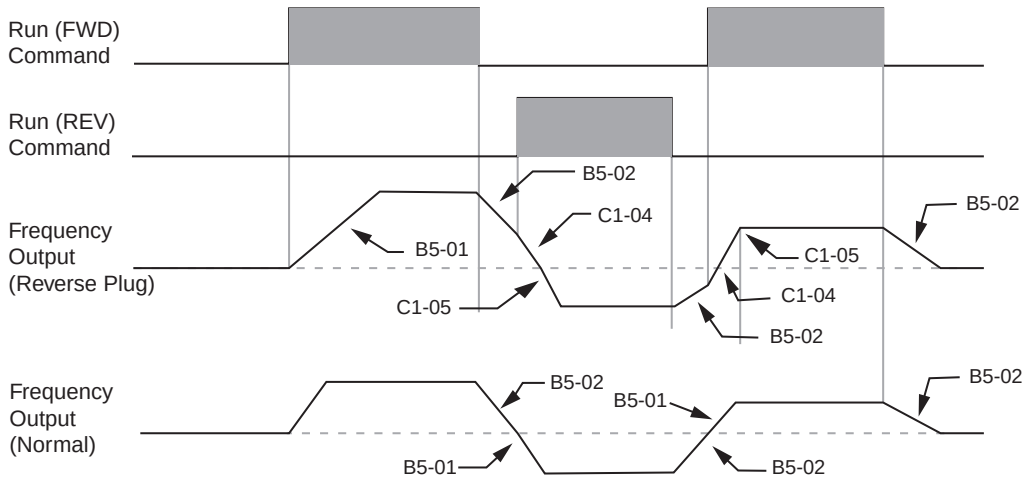


Figure 5-10: Reverse Plug Simulation

Micro-Positioning Control™

Micro-Positioning Control function can provide a reduced speed range operation for precise positioning. Enabled by a Multi-Function Input, it multiplies the normal speed reference by the Micro-Speed Gain. Two Micro-Speed Gains are available. Gain 1 (C2-01) and Gain 2 (C2-02). They can be adjusted and enabled independently.

Parameter Code	Display	Function	Range	Initial Value	Access Level
C2-01	MicroSpd Gain 1	The multiplier of the Analog or Digital Speed Reference to achieve slow-speed operation. Multi function Input = E	0.00–2.55	1.00	Adv
C2-02	MicroSpd Gain 2	An alternate multiplier of the Analog or Digital Speed Reference to achieve slow-speed operation. Multi function Input = 10	0.00–2.55	1.00	Adv

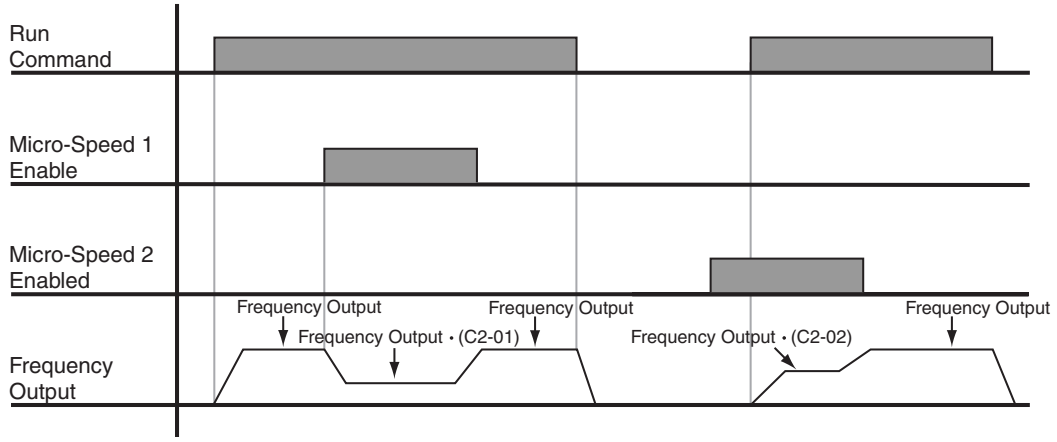


Figure 5-11: Micro-Positioning Control

NOTE: If both Micro-Speed 1 and Micro-Speed 2 are enabled, Micro-Speed 1 always takes higher priority over Micro-Speed 2.

Travel Limits

This function can automatically slow and stop a crane or hoist when it reaches the end of travel limits. Two types of limit inputs (slowdown and stop) are available in both travel directions. Inputs can be programmed through either the GIF7 or the G5IN4 card.

Parameter Code	Display	Function	Range	Initial Value	Access Level
C3-01	Up Limit 1 Speed	Speed at Upper Limit input.	0–400 Hz	6.00	Adv
C3-02	UL 1 Decel Time	Decel time to Upper Limit Speed.	0.0–25.5 sec	1.0	Adv
C3-03	UL 2 Stop Time	Decel time to STOP when Upper Limit is Input.	0.0–25.5 sec	1.0	Adv
C3-04	Low Limit 1 Speed	Speed at Lower Limit input.	0–400 Hz	6.00	Adv
C3-05	LL 1 Decel Time	Decel time to Lower Limit Speed	0.0–25.5 sec	1.0	Adv
C3-06	LL 2 Stop Time	Decel time to STOP when Lower Limit is input.	0.0–25.5 sec	1.0	Adv
C3-07*	Lmt Stop Method	Determine the stop method at Upper Limit 2 and Lower Limit 2 Input.	0-2	2*	Adv
	0 Decel to Stop				
	1 Coast to Stop				
	2 Use B3-03 Method				
C3-08	UL3 Stop Method	Weight Limit Stop Method and action when Multi Function Input = 12 or 62	0-5	4	Adv
	0 Decel/Alarm (no further raise allowed)				
	1 Coast/Alarm (no further raise allowed)				
	2 Use B3-03 /Alarm (no further raise allowed)				
	3 Decel/Fault				
	4 Coast/Fault				
	5 Use B3-03/Fault				
	Note: For setting 0, 2, 3, 5, deceleration is by B5-08.				
C3-09	Phantom Stop Method	Stopping Method when Multi Function Input = 5F and 63	0-2	1	Adv
	0 Decel to Stop				
	1 Coast to Stop				
	2 Use B3-03 Method				
C3-11	Klixon Action		0-1	0	Adv
	0 Use B3-03 Method				
	1 Allow Lower Only				

* Initial value is determined by X-Press Programming

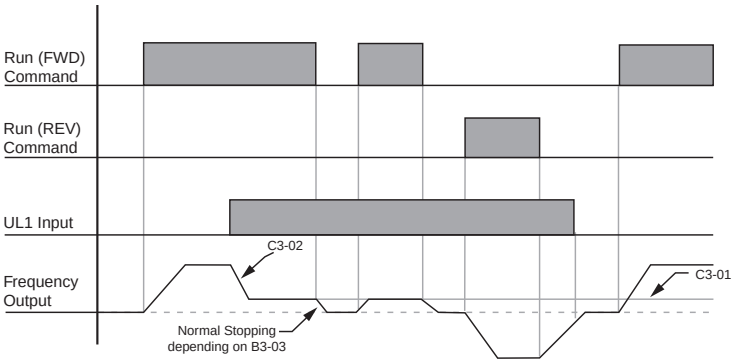


Figure 5-12: Upper Limit (UL1)

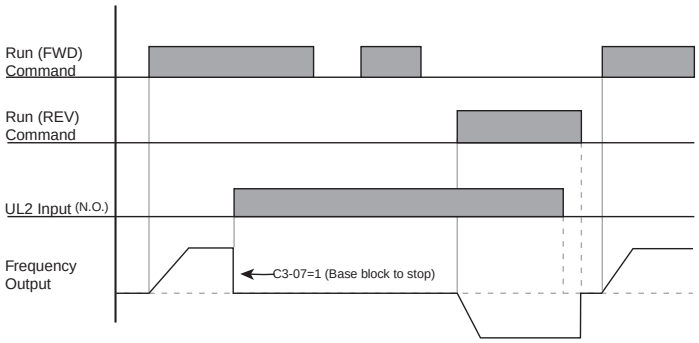


Figure 5-13: Upper Limit 2 (UL2)

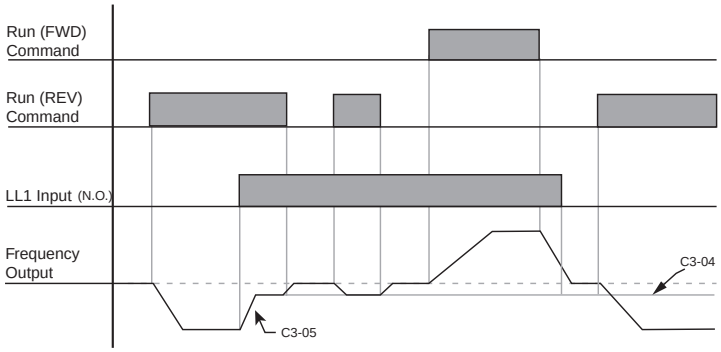


Figure 5-14: Lower Limit 1 (LL1)

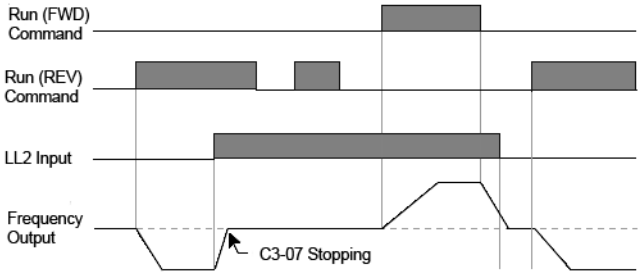


Figure 5-15: Lower Limit 2 (LL2)

Load Check

Load Check function is a load-limiting feature that ensures the programmed load limit of the hoist is not exceeded. It prevents the lifting (and potential loss) of a load that is overweight. When IMPULSE•G+ Series 3 detects an overload condition, it prevents any further rising. However, the load can be lowered at the speed that is specified by constant C5-14 (Load Check Fault speeds). When using Load Check in V/F control mode (A1-02 = 0) the settings of C5-05, C5-08, C5-10, C5-11 are compared to the current feedback (U1-03). When using Load Check in the Open Loop Vector control mode (A1-02 = 2) the Load Check set points are compared to the motor torque (U1-09).

NOTE: Precautions should be taken when using load check where two or more hoists are used to lift a single load.

Example: Use a normally closed relay from the load check output to break the raise (FWD Run) command to the other hoist(s). This will insure that all hoists stop lifting if one hoist is being overloaded. Ensure that C5-02 = 3 to prevent uneven lowering speeds, or design lowering logic accordingly.

Parameter Code	Display	Function	Range	Initial Value	Access Level
C5-01	Load Check 0/1	Determines whether Load Check is enabled.	0-1	0	Adv
	0 Disabled				
	1 Enabled				
C5-02	LC Alarm Action	Action at Load Check alarm or fault.	0-4	4	Adv
	0 Alarm Only	L.C. blinking; can continue raising			
	1 Decel to Stop	Allows lower only			
	2 Coast to Stop	Allows lower only			
	3 Fault Stop	Fault contacts change state - requires reset			
	4 Use B3-03 Method (allows Lower only)				
C5-03	Min Torque Ref	Minimum current/torque reference during acceleration that triggers Load Check.	0–100%	60	Adv
C5-04	Look Speed 1	First Load Check frequency reference.	0–150 Hz	6	Adv
C5-05	I/T Ref for LS 1	Current/Trq Reference at Look Speed 1	1-300%	160	Adv
C5-07	Look Speed 2	Second Load Check frequency reference.	0–150 Hz	20	Adv
C5-08	I/T Ref for LS 2	Current/Trq Reference at Look Speed 2	1-300%	160	Adv
C5-09	Look Speed 3	Third Load Check frequency reference.	0–150 Hz	40	Adv
C5-10	I/T Ref for LS 3	Current/Trq Reference at Look Speed 3	1-300%	160	Adv
C5-11	I/T Ref for > LS 3	Load Check Current when Output Frequency > Look Speed 3.	1-300%	160	Adv
C5-12	LC Holding Time	Time for holding Output Frequency to stabilize Output Current.	0.00–2.55 sec	1.00	Adv

Parameter Code	Display	Function	Range	Initial Value	Access Level
C5-13	LC Testing Time	Time (after the LC Setting Time) for comparing Output Current with Reference Current	0.00–2.55 sec	0.25	Adv
C5-14	LC Fault Speed	Maximum lowering speed after Load Check fault	0–30 Hz	6.0	Adv

Swift-Lift™

Swift-Lift provides additional productivity by allowing a crane or hoist to quickly move into position. The feature enables the motor to over speed when the load is less than 100 percent of the rated capacity. Swift-Lift will enable the motor to over-speed by calculating the maximum safe speed, and automatically accelerating to this speed. However, the maximum speed cannot exceed the lesser value of the Swift-Lift Maximum Output Frequency-RAISE (C6-02), Swift-Lift Maximum Output Frequency-LOWER (C6-03), and Maximum Frequency (E1-04).

NOTE: Note: Swift-Lift is disabled when in traverse applications. Maximum Frequency (E1-04) must be ≥ C6-02 and C6-03.

Parameter Code	Display	Function	Range	Initial Value	Access Level
C6-01	Swift Lift 0/1	Determines whether Swift Lift is enabled.		0	Adv
	0 Disabled				
	1 Enabled Automatic				
	2 Enabled by MFI = 13				
C6-02	Swift Lift ForSpd	Maximum Output Frequency during Swift Lift—FORWARD.	0–150 Hz	60	Adv
C6-03	Swift Lift RevSpd	Maximum Output Frequency during Swift Lift—REVERSE.	0–150 Hz	60	Adv
C6-04	SL Fwd torque	Maximum output torque below which Swift Lift—FORWARD is enabled.	0–100%	50	Adv
C6-05	SL Rev Torque	Maximum output torque below which Swift Lift REVERSE is enabled.	0–100%	30	Adv
C6-06	SL Enabling Spd	Threshold frequency at which Swift Lift is enabled.	0–150 Hz	59.0	Adv
C6-07	SL Delay Time	Delay time at enabling speed prior to torque-compare function.	0.0–25.5 sec	2.0	Adv
C6-08	SFS Acc Gain	Speed feedback acceleration multiplier.	0.1–9.9	1.0	Adv

Enable Swift-Lift Function:

2, 3, 5-Speed Multi-Step (A1-04=0, 1, or 2):

1. Set C6-01=1 or 2 to enable the **Swift-Lift Function**, 1= Enable Automatic, 2= Enable by Multi-Function Input (MFI).
2. Set C6-02 and C6-03 to determine **Swift-Lift** maximum FWD/REV output frequency.
3. Set C6-04 and C6-05 to determine **Swift-Lift** maximum enable output current.
4. Set the **Swift-Lift Enabling Speed (C6-06)** one or two hertz below the maximum normal running speed reference.

   For example: If the maximum normal running speed is at 60 Hz, set C6-06 to 59 Hz or 58 Hz as the **Swift-Lift Enabling Speed**.

5. Ensure that the **Maximum Frequency (E1-04)** is increased from 60 Hz.

Note: E1-03 must be changed to "0F" to change E1-04

2, 3 Step Infinitely Variable (A1-04=3 or 4)

1. If the system is using **2-Step** or **3-Step Infinitely Variable** as the **Speed Control Method**, the following formula is used to adjust the constant ***B2-01 (Reference Upper Limit)***.

   B2-01=60 Hz x 100 / E1-04

Uni-Polar/Bi-Polar Analog (A1-04=5 or 6)

1. If the system is using **Bi-Polar Analog** or **Uni-Polar Analog** as the **Speed Control Method**, the following formula is used to adjust the constant ***H3-02 (Gain Multiplier for Terminal A1 analog input signal). H3-10 (Gain Multiplier for Terminal A2 analog input signal).***

   H3-02=60 Hz x 100 / E1-04 or H3-10=60 Hz x 100/E1-04

WARNING

Motors and drive machinery must be capable of operating above motor base speed. Consult the motor/gearbox/hoist manufacturer before enabling Swift Lift function. Failure to observe this warning may result in damage to equipment and possible injury or death to personnel.

Torque Limit (Open Loop Vector Only)

IMPULSE•G+ Series 3 dynamically controls the torque output of the motor at all times. The Torque Limit Function limits the amount of motor torque on all four quadrants of vector control operation:

- *Forward Motoring*
- *Reverse Motoring*
- *Forward Regenerating*
- *Reverse Regenerating*

When the torque limits are reached during operation, the programmed acceleration and deceleration times become second priority.

Parameter Code	Display	Function	Range	Initial Value	Access Level
C7-01	Torq Limit Fwd	FORWARD torque limit	0–300%	150	Adv
C7-02	Torq Limit Rev	REVERSE torque limit	0–300%	150	Adv
C7-03	Torq Lmt Fwd Rgn	Regenerative torque limit at FORWARD	0–300%	180	Adv
C7-04	Torq Limit Rev Rgn	Regenerative torque limit at REVERSE	0–300%	180	Adv
C7-05	Torq Limit Gain	Used when H1-01~H1-06 = 14 and MFI is on	0–2.55	1.25	Adv

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Brake Answer Back

The following timers are used when a multi-function input is set for 58, brake answerback.

Parameter Code	Display	Function	Range	Initial Value	Access Level
C8-04	Roll Back Timer	Sets the amount of time for the brake to release and for brake feedback to be received into the Brake Answer Back Multi-Function input at start before posting BE4 alarm. It is also the time period during which the amount of roll back is checked.	0.00–2.55 sec	0.30	Adv
C8-11	Brake Set Delay	Sets the amount of time for the brake to set and for brake feedback to be removed from the Brake Answer Back Multi-Function input at stop before posting a BE5 Alarm.	0.0–25.5 sec	0.7	Adv

Optional Digital Input Set-up (G5IN4 Digital Multi-Function Inputs)

Parameter Code	Display	Function	Range	Initial Value	Access Level
C9-01	Digital In Setup *0 Disabled* *1 G5IN4/C9-02* *2 G5IN4/C9-03 - 06* *3 DI-08/C9-03 - 10 DI-08 8 CH Individual* *4 DI-16/C9-03 - 12 DI-16 Terminals 10 CH Individual* *5 Serial/C9-03 - 12 10 CH Individual*	There are several Digital Input Option (DIO) cards that may be used depending on how much I/O is required for the application. The G5IN4 provides 4 additional 120VAC inputs, the DI-08 provides 8 additional 24VDC inputs, and the DH-16H2 provides 10 additional 24VDC inputs.	0 - 5	0	Adv
C9-02	G5IN4 Setup	Determines the four settings for G5IN4 Digital Multi-Function Inputs.	0000–FFFF	0	Adv
C9-03	DIO Terminal 1	Multi-Function Digital Input (MFDI) by G5IN4/DI-08/DI-16 Options. (Hidden and Disabled when using C9-01 < 2) Same as H1-0x selection except: 04H, 05H, 15H - 19H, 1FH, 20 - 2FH, 31H, 34H, 35H, 38H, 47H, 51H, 52H, and 58H are not programmable to these terminals.	0–FF	0F	Adv
C9-04	DIO Terminal 2		0–FF	0F	Adv
C9-05	DIO Terminal 3		0–FF	0F	Adv
C9-06	DIO Terminal 4		0–FF	0F	Adv
C9-07	DIO Terminal 5		0–FF	0F	Adv
C9-08	DIO Terminal 6	MFDI by G5IN4/DI-08/DI-16 Options. (Hidden and Disabled when using C9-01 < 3)	0–FF	0F	Adv
C9-09	DIO Terminal 7		0–FF	0F	Adv
C9-10	DIO Terminal 8		0–FF	0F	Adv
C9-11	DIO Terminal 9	MFDI by G5IN4/DI-08/DI-16 Options. (Hidden and Disabled when using C9-01 < 4)	0–FF	0F	Adv
C9-12	DIO Terminal 10		0–FF	0F	Adv

The optional G5IN4 board accepts four additional multi-function inputs. The G5IN4 board has four terminals, each of which can be programmed to one of the sixteen sets of inputs. Each input in the set can be enabled or disabled.

1. Set C9-01 to 1.
2. Determine the parameter C9-02 setting by specifying the first digit (from left) and the fourth digit (from left) using tables 5-3 and 5-4. The second and third digit should always be “0”.
3. Set parameter C9-02.

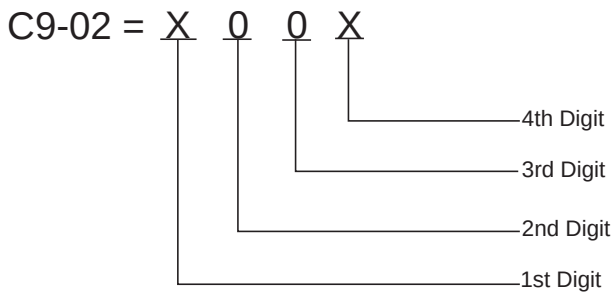

Table 5-2:
1 = 120V is present on terminal
0 = No voltage is present on terminal

MONITOR	**TERMINAL**			
U1-25	1	2	3	4
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1
A	0	1	0	1
B	1	1	0	1
C	0	0	1	1
D	1	0	1	1
E	0	1	1	1
F	1	1	1	1

**Depends on drive size.*

Table 5-3: G5IN4 Digital Multi-Function Input Sets (0 through F)

First Digit (From Left) You Enter	Multi-Function Input Assigned to Each Terminal			
	Terminal 1	**Terminal 2**	**Terminal 3**	**Terminal 4**
0	*No function*	*No function*	*No function*	*No function*
1	*Upper Limit–SLOW DOWN; Normally Closed*	*Upper Limit–STOP; Normally Closed*	*Lower Limit–SLOW DOWN; Normally Closed*	*Lower Limit–STOP; Normally Closed*
2	*Upper Limit–SLOW DOWN; Normally Open*	*Upper Limit–STOP; Normally Open*	*Lower Limit–SLOW DOWN; Normally Open*	*Lower Limit–STOP; Normally Open*
3*	*Multi-Step Speed 2*	*Multi-Step Speed 3*	*Multi-Step Speed 4*	*Multi-Step Speed 5*
4*	*Hold function (2nd step of Three-Step Infinitely Variable).*	*Acceleration function (2nd step of Two-Step Infinitely Variable or 3rd step of Three-Step Infinitely Variable).*	*Micro-Positioning Control Multiplier 1*	*Upper Limit–STOP; Normally Closed*
5	*Upper Limit–STOP Normally Closed*	*Upper Limit–SLOW DOWN; Normally Closed*	*Lower Limit–STOP; Normally Closed*	*Lower Limit–SLOW DOWN; Normally Closed*
6	*Upper Limit–STOP; Normally Open*	*Upper Limit–SLOW DOWN; Normally Open*	*Lower Limit–STOP; Normally Open*	*Lower Limit–SLOW DOWN; Normally Open*
7*	*Multi-Step Speed 5*	*Multi-Step Speed 4*	*Multi-Step Speed 3*	*Multi-Step Speed 2*
8*	*Upper Limit–STOP; Normally Closed*	*Micro-Positioning Control Multiplier 1*	*Acceleration function (2nd step or Two-Step Infinitely Variable or 3rd step of Three-Step Infinitely Variable).*	*Hold function (2nd step of Three-Step Infinitely Variable).*
9	*Upper Limit–STOP; Normally Closed*	*Lower Limit–STOP; Normally Closed*	*Micro-Positioning Control Multiplier 1*	*External base block N/O*
A	*Upper Limit–STOP; Normally Closed*	*Lower Limit–STOP; Normally Closed*	*Micro-Positioning Control Multiplier 1*	*Weight Measurement Control*
B	*Swift-Lift Enable*	*Brake answerback*	*Micro-Positioning Control Multiplier 1*	*Micro-Positioning Control Multiplier 2*
C	*External Base Block N/O*	*Phantom Fault N/O*	*Klixon N/O*	*BE6 Up Speed Limit*
D	*External Base Block N/O*	*Brake Answerback*	*Micro-Positioning Control Multiplier 1*	*Micro-Positioning Control Multiplier 2*
E	*Alternate Upper Limit Frequency Reference*	*Option/Inverter Run and Speed Reference Changeover*	*Micro-Positioning Control Multiplier 1*	*Brake Answerback*
F	*External Base Block N/C*	*Phantom Fault N/C*	*Klixon N/C*	*BE6 Up Speed Limit*

* If using the G5IN4 to input speed references, A1-04 should be set for Data 7 (G5IN4 Opt Card). This will help to avoid an OPE03 fault caused by having more than one terminal programmed with the same data.

Table 5-4:Enabling/Disabling Decision Table for C9-02

Input for Terminal 1	Input for Terminal 2	Input for Terminal 3	Input for Terminal 4	Fourth Digit (From Left) You Enter
E	D	D	D	**1**
D	***E***	D	D	**2**
E	***E***	D	D	**3**
D	D	***E***	D	**4**
E	D	***E***	D	**5**
D	***E***	***E***	D	**6**
E	***E***	***E***	D	**7**
D	D	D	***E***	**8**
E	D	D	***E***	**9**
D	***E***	D	***E***	**A**
E	***E***	D	***E***	**B**
D	D	***E***	***E***	**C**
E	D	***E***	***E***	**D**
D	***E***	***E***	***E***	**E**
E	***E***	***E***	***E***	**F**

Key Enable = ***E***
Disable = D

Weight Measurement

The IMPULSE•G+ Series 3 includes a Weight Limit Output function that can be used in hoisting applications. The drive uses a 0-10VDC analog load cell input and compares it with C10-08, to turn on a multi-function output.

Parameter Code	Display	Function	Range	Initial Value	Access Level
C10-01	Load Weight 0/1	Determines whether Load Weight is enabled.	0, 4	0	Adv
	0 Disabled				
	4 Analog Input (Load Cell) MFAI=16				
C10-03	LW Display Hold		0, 1	0	Adv
	0 Hold Display	Until next run command is on			
	1 Hold Disp 3 sec				
C10-08	Weight Limit Out	Turn on Level for MFO=33 C10-01 = 4 then % of analog input	0.0-200.0%	125%	Adv

Delay Timers

This function is used in trolley or bridge applications. It can reduce the mechanical brake wear when the operator tries to position a load. This function is available only in traverse mode and the constant B3-03 must be set to 4 (Ramp With Timer).

Parameter Code	Display	Function	Range	Initial Value	Access Level
C12-01	Brake Jog Delay	Brake set delay time at Jog Control input.	0.0–100.0 sec	0.0 sec	Adv
C12-02	Brake Run Delay	Brake set delay time at RUN input.	0.0–100.0 sec	0.0 sec	Adv

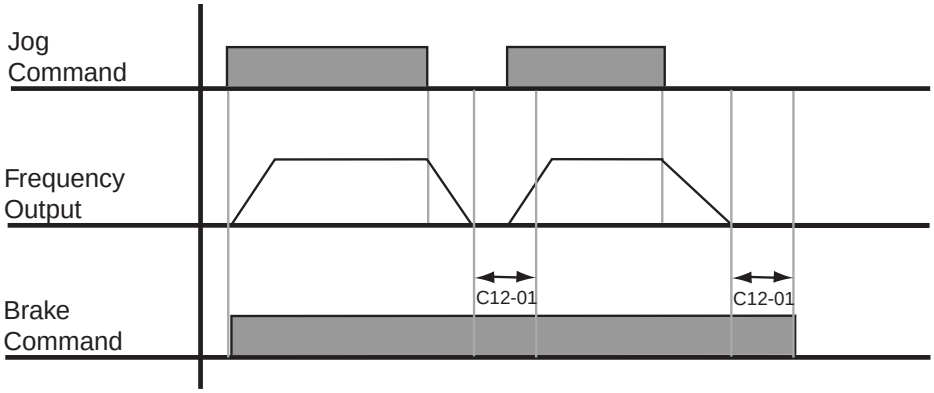

Figure 5-16: Brake Delay Timers

NOTE: The Jog control input is a multi-function input. It is enabled by programming data 15 or 16 in H1-01~06.

Timer Function

- The timer function is enabled when the timer function input (setting: 43) and the timer function output (setting: 12) are set for the multi-function input and multi-function output respectively.
- These inputs and output serve as general purpose I/O. Chattering of sensors, switches, contactors, etc., can be prevented by setting a delay time.
- When the timer function input **ON** time is longer than the value set for **C12-03** (Timer function ON-Delay Time), the timer function output turns **ON**.
- When the timer function input **OFF** time is longer than the value set for **C12-04** (Timer function OFF-Delay Time), the timer function output turns **OFF**.

Parameter Code	Display	Setting Range	Factory Default Setting	Access Level
C12-03	Delay-on timer	0.0~3000.0	0.0	Adv.
C12-04	Delay-off timer	0.0~3000.0	0.0	Adv.

Maintenance Timer

The “Maintenance Timer” is a maintenance feature that will alert an operator, for example, when the bearings need to be greased. It consists of a Multi-Function output (Data 37) that becomes active when the total running time has exceeded the amount of time (in hours) programmed in parameter C12-05 and the frequency reference will be multiplied by a programmable gain (C12-06) to slow the motion down until the bearings have been greased. An alarm will also be posted on the Keypad stating “Maintenance Required”. Once the bearings have been greased, the output and alarm message can be reset by two different methods. One method is through a Multi-Function Input programmed for Maintenance Reset (H1-01 ~ 06 = 5A) and the second method is by pressing the Mode/Service (Local/Remote) button three consecutive times with no more than 2 seconds between presses. Press enter to reset timer. A message will then appear on the keypad stating that the timer has been reset. The Multi-Function Output will turn off at this time. When C12-05 = 0, the function is disabled.

Parameter Code	Display	Function	Range	Initial Value	Access Level
C12-05	Maintenance Tmr	Maintenance Timer Trip Level	0-32767	0	Adv
C12-06	Maintenance Gain	Speed Reference Gain	0.00-1.00	0.5	Adv

Inching Control

Inching Control Function can be enabled by programming data 17, 18, and 19 respectively to the Multi-Function input terminals (H1-01~06).The frequency reference used during inching is determined by B1-17 (Jog Reference).

CAUTION

A directional input is not needed on terminals 1 or 2.

Parameter Code	Display	Function	Range	Initial Value	Access Level
C13-01	Inch Run Time	Inching Control run time.	0.00–2.55 sec	1.00	Adv
C13-02	Repeat Delay T	Inching Control repeat delay time.	0.00–2.55 sec	1.00	Adv
H1-01~06	Terminal Selection *17 Forward Inch* *18 Reverse Inch* *19 Inch Repeat*				

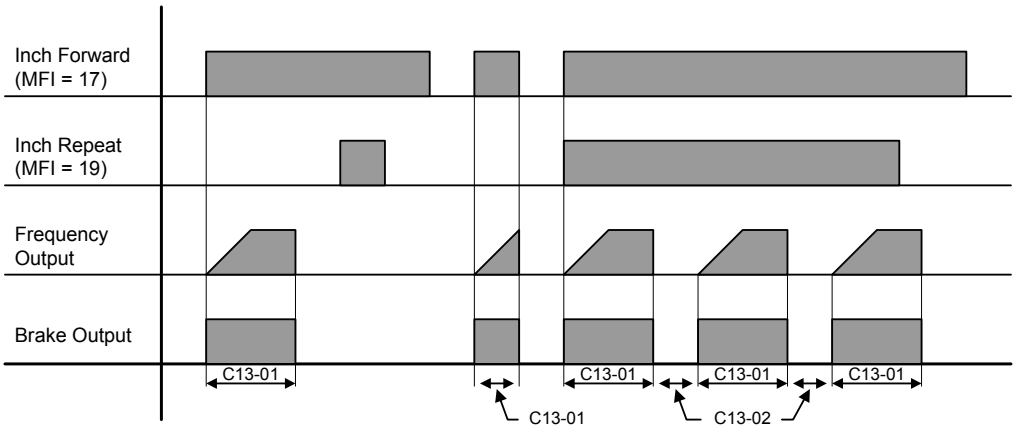

Figure 5-17: Inching Function and Inching Repeat

Tuning

- D1 DC Injection
- D2 Automatic Slip Compensation
- D3 Torque Compensation
- D4 ASR Tuning
- D5 Torque Control
- D6 Droop Control
- D8 Dwell Function
- D9 S-Curve Acceleration/Deceleration
- D12 Factory Tuning

DC Injection

DC Injection can be used to stop a motor whose rotational direction is uncertain at start-up.

With decel to stop enabled (B3-03=0), upon removal of the run command the IMPULSE•G+ Series 3 drive controls motor deceleration according to the Decel Time setting, until output frequency reaches the DC Injection Braking Start Frequency (D1-01 setting). Then the drive output is turned off and DC injection current is applied to the motor. The effective DC injection time and current should be set to provide adequate stopping without excessive motor heating. The DC injection voltage is determined by the DC injection braking current and motor impedance.

Parameter Code	Display	Function	Range	Initial Value	Access Level
D1-01	DCInj Start Freq	DC Injection braking frequency start.	0.0–10 Hz	0.5	Adv
D1-02	DCInj Current	% of Inverter rated current	0-100%	50	Adv
D1-03	DCInj Time@Start	DC Injection braking time.	0.00–10.00 sec	0.00	Adv
D1-04	DCInj Time@Stop	DC Injection braking time at stop.	0.00–10.00 sec	0.05	Adv

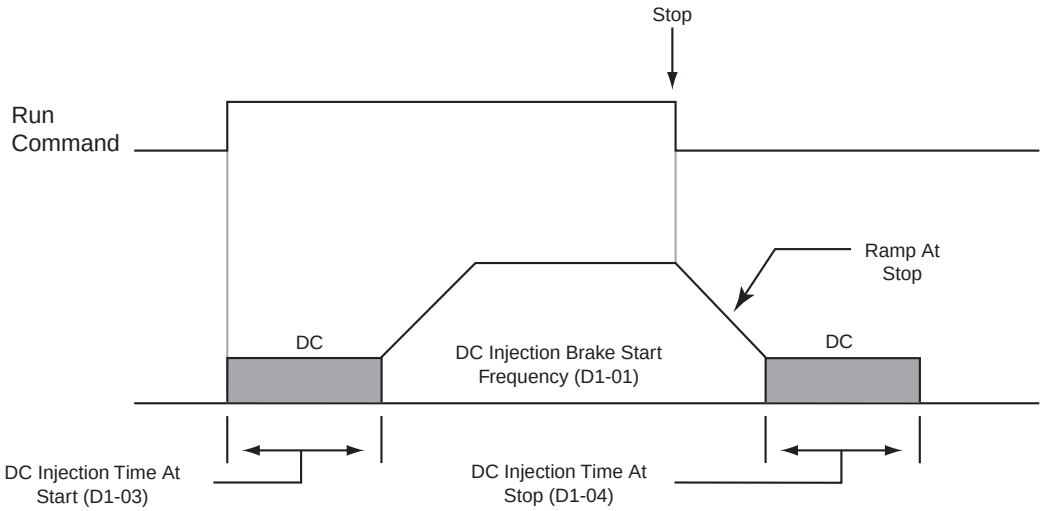

Figure 5-18: DC Braking Sequence

Automatic Slip Compensation

As the load becomes larger, the motor speed is reduced and the motor slip increases. The slip compensation function keeps the motor speed constant under varying load conditions. D2-01 sets the slip compensation gain. When the gain is “1.0”, the output frequency is increased by 1% of the E1-06 setting at rated current. A setting of “0.0” results in no slip compensation.

Parameter Code	Display	Function	Range	Initial Value	Access Level
D2-01	Slip Comp Gain	Slip compensation multiplier.	0.0–2.5	1.0 (OLV) 0 (V/F)	Adv
D2-02	Slip Comp Time	Slip compensation primary delay time	0-10000 msec	200 (OLV) 2000 (V/F)	Adv
D2-03	Slip Comp Limit	Slip compensation limit	0-250%	200	Adv
D2-04	Slip Comp Regen *0 Disabled* *1 Enabled*	Slip compensation during regeneration	0-1	0	Adv
D2-05	Slip Comp V/F *0 Include* *1 Exclude*	Slip Compensation at V/F setting	0-1	0	—

Torque Compensation

The motor torque requirement changes according to load conditions. Full-range automatic torque boost adjusts the voltage of the V/F pattern according to the required torque. The IMPULSE•G+ Series 3 automatically adjusts the voltage during constant-speed operation as well as during acceleration. See below, Figure 5-19.

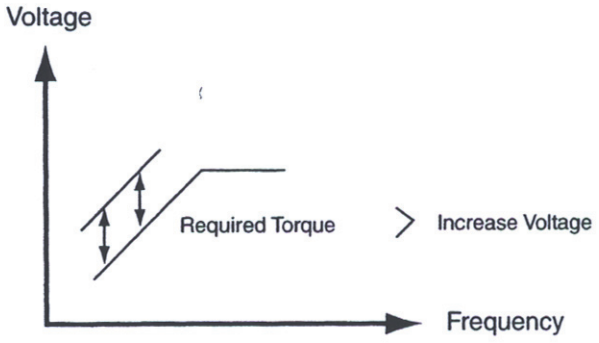

Figure 5-19: Torque Characteristics

The required torque is calculated by the inverter. This ensures tripless operation and power savings.

Output voltage α Torque compensation gain x Required torque

Normally, no adjustment is necessary for torque compensation gain. When more torque is needed, increase the torque compensation gain in one tenth (0.1) increments. Increase the setting when the wiring distance between the inverter and the motor is 100ft. or longer. If or when the motor generates excessive vibration or oscillates, decrease the torque compensation.

Increasing torque compensation gain increases motor torque, but an excessive increase may cause the following:

- Inverter fault trips due to motor overexcitation and/or
- Motor overheat or excessive vibration

Increase the torque compensation time constant in 10ms increments when the motor's output current is unstable. Decrease this value when speed response is slow.

Parameter Code	Display	Function	Range	Initial Value	V/F Access	Open Loop Vector Access
D3-01	Torq Comp Gain	Torque compensation multiplier.	0.00-2.50	1.00	Adv	Adv
D3-02	Torq Comp Time	Torque compensation time.	0.00-10000 msec	20 (OLV) 200 (V/F)	Adv	Adv
D3-03	F TorqCmp @ Start	FWD compensation at start	0.0-200%	0.0	N/A	Adv
D3-04	R TorqCmp @ Start	REV compensation at start	-200%-0.0	0.0	N/A	Adv
D3-05	TorqCmp Delay T	Torque compensation delay time at start (disabled if 4 ms or less)	0-200 ms	10ms	N/A	Adv

Dwell Function

The Dwell Function is used to temporarily hold the output frequency at a set reference for a set time. This function can be used when driving a motor with a heavy starting load. This pause in acceleration reduces traditionally high starting current. Enable by setting H1-01 ~ 06 to 65.

NOTE: This function should not be used for hoists.

Parameter Code	Display	Function	Range	Initial Value	Access Level
D8-01	Dwell Ref @ Start	Sets Dwell frequency reference at start.	0.0–150.0 Hz	0.0	Adv
D8-02	Dwell Time @ Start	Sets the time duration for the Dwell function at start.	0.0–10.0 sec	0.0	Adv
D8-03	Dwell Ref @ Stop	Sets dwell frequency Reference at stop.	0.0–150.0 Hz	0.0	Adv
D8-04	Dwell Time @ Stop	Sets the time duration for the Dwell function at stop.	0.0–10.0 sec	0.0	Adv

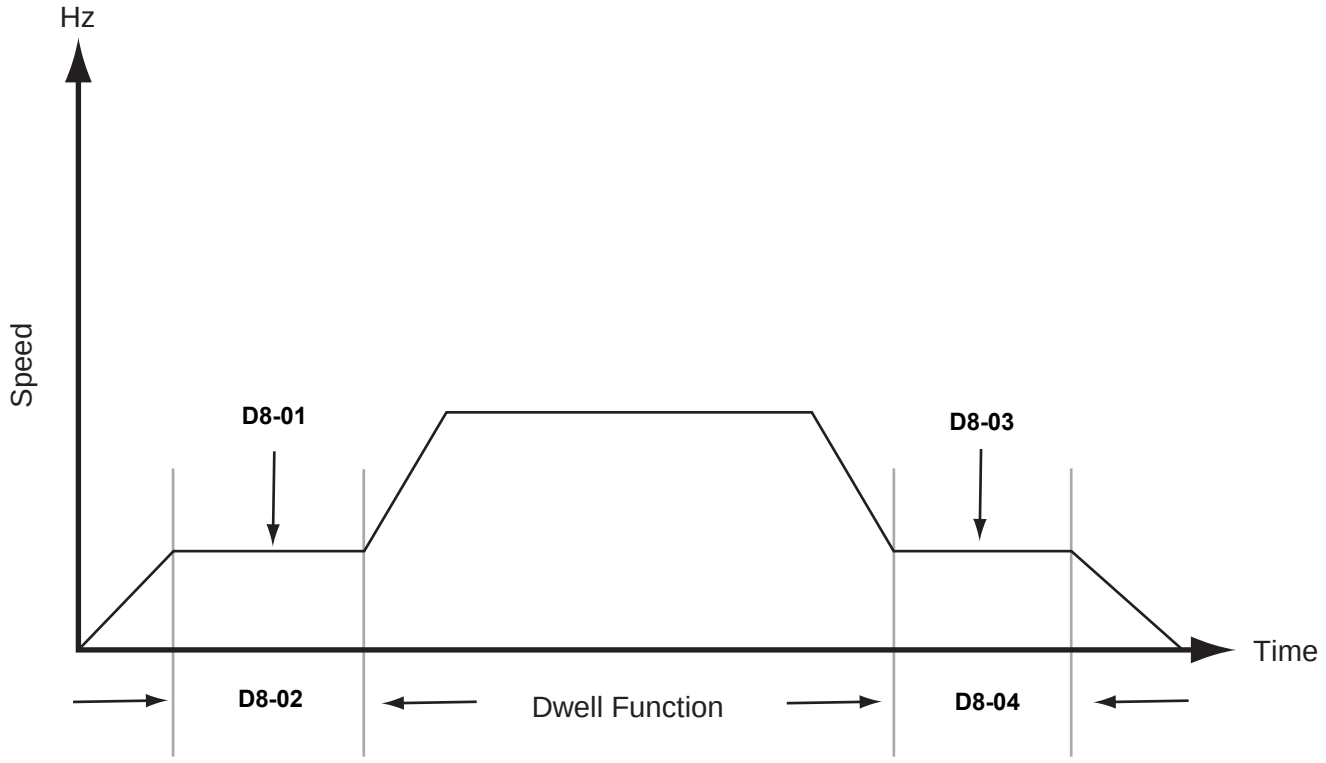

Figure 5-20: Dwell Function

S-Curve Acceleration/Deceleration

An S-Curve pattern is used to reduce shock and provide smooth transitions during machine acceleration and deceleration. S-Curve characteristic time is the time from the output frequency to the set accel/decel time. See S-Curve Characteristic timing diagrams below and on the following page.

Parameter Code	Display	Function	Range	Initial Value	Access Level
D9-01*	S-Crv Acc @ Start	Sets S-Curve time at Accel start	0.00–2.50 sec	0.5	Adv
D9-02*	S-Crv Acc @ End	Sets S-Curve time at Accel end	0.00-2.50 sec	0.5	Adv
D9-03*	S-Crv Dec @ Start	Sets S-Curve time at Decel start	0.00–2.50 sec	0.5	Adv
D9-04	S-Crv Dec @ End	Sets S-Curve time at Decel end	0.00–2.50 sec	0.20	Adv

*Initial value is determined by X-Press Programming (Table 4.1 to 4.2).

The figure below shows FWD/REV run switching during deceleration to stop. The S-curve function will add time to the acceleration and deceleration. Time to accelerate from the minimum frequency to the maximum frequency (total acceleration) = B5-01 + (D9-01 + D9-02)/2.

CAUTION

CAUTION: Accel/Decel times will be extended.

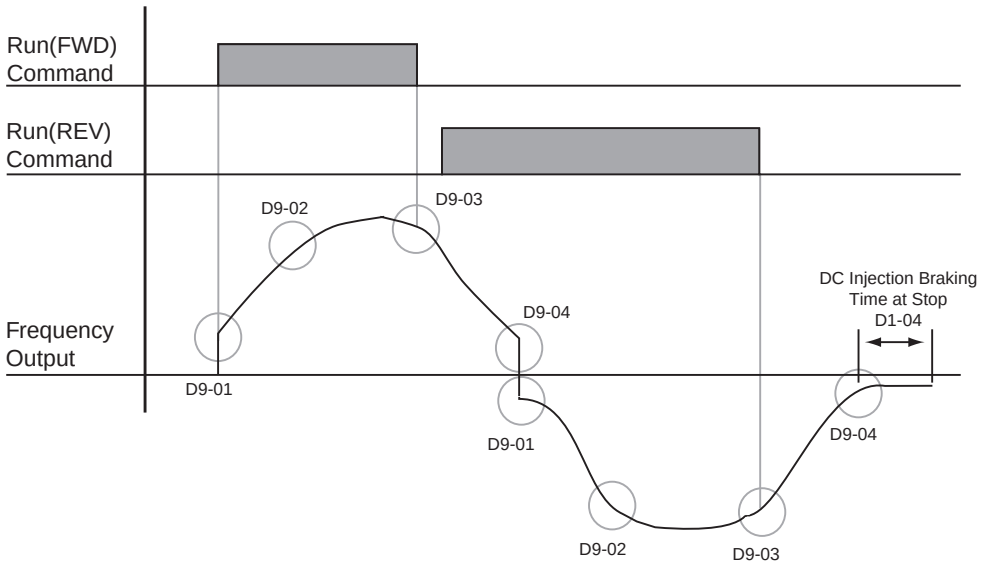

Figure 5-21: S-Curve Characteristics–FWD/REV Operation

Hunt Prevention

Occasionally, in an application, resonance between the internal control system and the mechanical system causes current instability. This is called hunting, and may cause a crane to vibrate at a lower speed (up to 30 Hz) and light load. The hunting prevention function monitors the motor flux and uses a special control circuit to “smooth out” any peaks in the output current wave form.

Increase the set value of D11-02 when hunting is present while driving a light load. Decrease the set value of D11-02 when the motor vibrates or stalls while driving a heavy load.

Parameter Code	Display	Function	Range	Initial Value	V/F Access	Open Loop Vector Access
D11-01	Hunt Prevention Select *0 Disable* *1 Enable*	Enable/Disable Hunt Prevention function	0-1	1	Adv	—
D11-02	Hunt Prevention Gain	Hunting Prevention Gain	0.00-2.50	1.00	Adv	—

Motor Parameters

- E1 V/F Pattern 1
- E2 Motor Set-up
- E3 Motor 2 V/F Pattern
- E4 Motor 2 Set-up

Voltage/Frequency Pattern

Parameter Code	Display	Function	Range	Initial[1] Value	Access Level
E1-01	Input Voltage	Sets input voltage	155-255/ 310-510	230/460	Adv

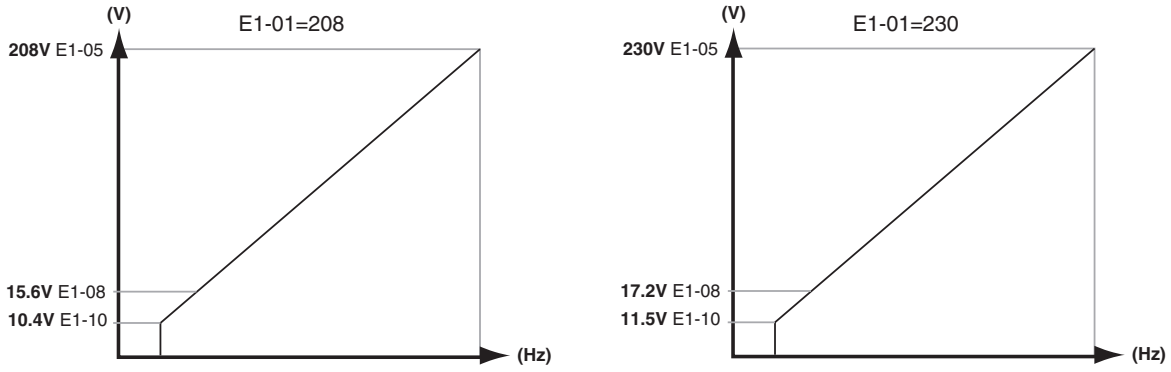

Figure 5-22: E1-01 Input Voltage

- *When using open loop vector control mode, the V/Fpattern voltage values will be adjusted by the Auto-Tuning function.*
- *Factory setting is 230 (230V units) or 460 (460V units).*

The setting E1-01 adjusts the overvoltage level, braking transistor turn on level, and the stall prevention level during deceleration.

Table 5-5:

Inverter Voltage	E1-01 Setting	Overvoltage Trip		Braking Transistor		Stall Level
		Trip	Reset	On	Off	
230	150-255	400V	380V	380V	375V	380V
460	≥400	800V	760V	760V	750V	760V
460	<400	720V	680V	660V	650V	670V

Parameter E1-01 performs the above mentioned function in both control modes.

Table 5-6: Voltage/Frequency Pattern Options - models 4001 to 4003-G+S3

E1-03	E1-04	E1-05	E1-06	E1-07	E1-08	E1-09	E1-10	E1-11	E1-12
0	50.0 Hz	460V	50.0 Hz	2.5 Hz	34.5V	1.3 Hz	20.7V	0.0 Hz	0.0V
1	60.0 Hz	460V	60.0 Hz	3.0 Hz	34.5V	1.5 Hz	20.7V	0.0 Hz	0.0V
2	60.0 Hz	460V	50.0 Hz	3.0 Hz	34.5V	1.5 Hz	20.7V	0.0 Hz	0.0V
3	72.0 Hz	460V	60.0 Hz	3.0 Hz	34.5V	1.5 Hz	20.7V	0.0 Hz	0.0V
4	50.0 Hz	460V	50.0 Hz	25.0 Hz	80.5V	1.3 Hz	18.4V	0.0 Hz	0.0V
5	50.0 Hz	460V	50.0 Hz	25.0 Hz	115.0V	1.3 Hz	20.7V	0.0 Hz	0.0V
6	60.0 Hz	460V	60.0 Hz	30.0 Hz	80.5V	1.5 Hz	18.4V	0.0 Hz	0.0V
7	60.0 Hz	460V	60.0 Hz	30.0 Hz	115.0V	1.5 Hz	20.7V	0.0 Hz	0.0V
8	50.0 Hz	460V	50.0 Hz	2.5 Hz	43.7V	1.3 Hz	25.3V	0.0 Hz	0.0V
9	50.0 Hz	460V	50.0 Hz	2.5 Hz	55.2V	1.3 Hz	29.9V	0.0 Hz	0.0V
A	60.0 Hz	460V	60.0 Hz	3.0 Hz	43.7V	1.5 Hz	25.3V	0.0 Hz	0.0V
B	60.0 Hz	460V	60.0 Hz	3.0 Hz	55.2V	1.5 Hz	34.5V	0.0 Hz	0.0V
C	90.0 Hz	460V	60.0 Hz	3.0 Hz	43.7V	1.5 Hz	25.3V	0.0 Hz	0.0V
D	120.0 Hz	460V	60.0 Hz	3.0 Hz	34.5V	1.5 Hz	20.7V	0.0 Hz	0.0V
E	150.0 Hz	460V	60.0 Hz	3.0 Hz	34.5V	1.5 Hz	20.7V	0.0 Hz	0.0V
F	60.0 Hz	460V	60.0 Hz	3.0 Hz	43.7V	1.5 Hz	25.3V	0.0 Hz	0.0V

Table 5-7: Voltage/Frequency Pattern Options - models 4005 to 4091-G+S3

E1-03	E1-04	E1-05	E1-06	E1-07	E1-08	E1-09	E1-10	E1-11	E1-12
0	50.0 Hz	460V	50.0 Hz	2.5 Hz	32.2V	1.3 Hz	16.1V	0.0 Hz	0.0V
1	60.0 Hz	460V	60.0 Hz	3.0 Hz	32.2V	1.5 Hz	16.1V	0.0 Hz	0.0V
2	60.0 Hz	460V	50.0 Hz	3.0 Hz	32.2V	1.5 Hz	16.1V	0.0 Hz	0.0V
3	72.0 Hz	460V	60.0 Hz	3.0 Hz	32.2V	1.5 Hz	16.1V	0.0 Hz	0.0V
4	50.0 Hz	460V	50.0 Hz	25.0 Hz	80.5V	1.3 Hz	13.8V	0.0 Hz	0.0V
5	50.0 Hz	460V	50.0 Hz	25.0 Hz	115.0V	1.3 Hz	16.1V	0.0 Hz	0.0V
6	60.0 Hz	460V	60.0 Hz	30.0 Hz	80.5V	1.5 Hz	13.8V	0.0 Hz	0.0V
7	60.0 Hz	460V	60.0 Hz	30.0 Hz	115.0V	1.5 Hz	16.1V	0.0 Hz	0.0V
8	50.0 Hz	460V	50.0 Hz	2.5 Hz	41.4V	1.3 Hz	20.7V	0.0 Hz	0.0V
9	50.0 Hz	460V	50.0 Hz	2.5 Hz	52.9V	1.3 Hz	25.3V	0.0 Hz	0.0V
A	60.0 Hz	460V	60.0 Hz	3.0 Hz	41.4V	1.5 Hz	20.7V	0.0 Hz	0.0V
B	60.0 Hz	460V	60.0 Hz	3.0 Hz	52.9V	1.5 Hz	29.9V	0.0 Hz	0.0V
C	90.0 Hz	460V	60.0 Hz	3.0 Hz	41.4V	1.5 Hz	20.7V	0.0 Hz	0.0V
D	120.0 Hz	460V	60.0 Hz	3.0 Hz	32.2V	1.5 Hz	16.1V	0.0 Hz	0.0V
E	150.0 Hz	460V	60.0 Hz	3.0 Hz	32.2V	1.5 Hz	16.1V	0.0 Hz	0.0V
F	60.0 Hz	460V	60.0 Hz	3.0 Hz	41.4V	1.5 Hz	20.7V	0.0 Hz	0.0V

Table 5-8: Voltage/Frequency Pattern Options - Models 4112 to 4590-G+S3

E1-03	E1-04	E1-05	E1-06	E1-07	E1-08	E1-09	E1-10	E1-11	E1-12
0	50.0 Hz	460V	60.0 Hz	2.5 Hz	27.6V	1.3 Hz	13.8V	0.0 Hz	0.0V
1	60.0 Hz	460V	60.0 Hz	3.0 Hz	27.6V	1.5 Hz	13.8V	0.0 Hz	0.0V
2	60.0 Hz	460V	60.0 Hz	3.0 Hz	27.6V	1.5 Hz	13.8V	0.0 Hz	0.0V
3	72.0 Hz	460V	60.0 Hz	3.0 Hz	27.6V	1.5 Hz	13.8V	0.0 Hz	0.0V
4	50.0 Hz	460V	60.0 Hz	25.0 Hz	80.5V	1.3 Hz	11.5V	0.0 Hz	0.0V
5	50.0 Hz	460V	60.0 Hz	25.0 Hz	115.0V	1.3 Hz	13.8V	0.0 Hz	0.0V
6	60.0 Hz	460V	60.0 Hz	30.0 Hz	80.5V	1.5 Hz	11.5V	0.0 Hz	0.0V
7	60.0 Hz	460V	60.0 Hz	30.0 Hz	115.0V	1.5 Hz	13.8V	0.0 Hz	0.0V
8	50.0 Hz	460V	60.0 Hz	2.5 Hz	34.5V	1.3 Hz	16.1V	0.0 Hz	0.0V
9	50.0 Hz	460V	60.0 Hz	2.5 Hz	46.0V	1.3 Hz	20.7V	0.0 Hz	0.0V
A	60.0 Hz	460V	60.0 Hz	3.0 Hz	34.5V	1.5 Hz	16.1V	0.0 Hz	0.0V
B	60.0 Hz	460V	60.0 Hz	3.0 Hz	46.0V	1.5 Hz	25.3V	0.0 Hz	0.0V
C	90.0 Hz	460V	60.0 Hz	3.0 Hz	34.5V	1.5 Hz	16.1V	0.0 Hz	0.0V
D	120.0 Hz	460V	60.0 Hz	3.0 Hz	27.6V	1.5 Hz	13.8V	0.0 Hz	0.0V
E	150.0 Hz	460V	60.0 Hz	3.0 Hz	27.6V	1.5 Hz	13.8V	0.0 Hz	0.0V
F	60.0 Hz	460V	60.0 Hz	3.0 Hz	34.5V	1.5 Hz	16.1V	0.0 Hz	0.0V

Table 5-9: Voltage/Frequency Pattern Options - model 2007-G+S3

E1-03	E1-04	E1-05	E1-06	E1-07	E1-08	E1-09	E1-10	E1-11	E1-12
0	50.0 Hz	230V	60.0 Hz	2.5 Hz	17.2V	1.3 Hz	10.3V	0.0 Hz	0.0V
1	60.0 Hz	230V	60.0 Hz	3.0 Hz	17.2V	1.5 Hz	10.3V	0.0 Hz	0.0V
2	60.0 Hz	230V	60.0 Hz	3.0 Hz	17.2V	1.5 Hz	10.3V	0.0 Hz	0.0V
3	72.0 Hz	230V	60.0 Hz	3.0 Hz	17.2V	1.5 Hz	10.3V	0.0 Hz	0.0V
4	50.0 Hz	230V	60.0 Hz	25.0 Hz	40.2V	1.3 Hz	9.2V	0.0 Hz	0.0V
5	50.0 Hz	230V	60.0 Hz	25.0 Hz	57.5V	1.3 Hz	10.3V	0.0 Hz	0.0V
6	60.0 Hz	230V	60.0 Hz	30.0 Hz	40.2V	1.5 Hz	9.2V	0.0 Hz	0.0V
7	60.0 Hz	230V	60.0 Hz	30.0 Hz	57.5V	1.5 Hz	10.3V	0.0 Hz	0.0V
8	50.0 Hz	230V	60.0 Hz	2.5 Hz	21.8V	1.3 Hz	12.6V	0.0 Hz	0.0V
9	50.0 Hz	230V	60.0 Hz	2.5 Hz	27.6V	1.3 Hz	14.9V	0.0 Hz	0.0V
A	60.0 Hz	230V	60.0 Hz	3.0 Hz	21.8V	1.5 Hz	12.6V	0.0 Hz	0.0V
B	60.0 Hz	230V	60.0 Hz	3.0 Hz	27.6V	1.5 Hz	17.2V	0.0 Hz	0.0V
C	90.0 Hz	230V	60.0 Hz	3.0 Hz	21.8V	1.5 Hz	12.6V	0.0 Hz	0.0V
D	120.0 Hz	230V	60.0 Hz	3.0 Hz	17.2V	1.5 Hz	10.3V	0.0 Hz	0.0V
E	150.0 Hz	230V	60.0 Hz	3.0 Hz	17.2V	1.5 Hz	10.3V	0.0 Hz	0.0V
F	60.0 Hz	230V	60.0 Hz	3.0 Hz	21.8V	1.5 Hz	12.6V	0.0 Hz	0.0V

Table 5-10: Voltage/Frequency Pattern Options - models 2009 to 2145-G+S3

E1-03	E1-04	E1-05	E1-06	E1-07	E1-08	E1-09	E1-10	E1-11	E1-12
0	50.0 Hz	230V	60.0 Hz	2.5 Hz	16.1V	1.3 Hz	8.0V	0.0 Hz	0.0V
1	60.0 Hz	230V	60.0 Hz	3.0 Hz	16.1V	1.5 Hz	8.0V	0.0 Hz	0.0V
2	60.0 Hz	230V	50.0 Hz	3.0 Hz	16.1V	1.5 Hz	8.0V	0.0 Hz	0.0V
3	72.0 Hz	230V	60.0 Hz	3.0 Hz	16.1V	1.5 Hz	8.0V	0.0 Hz	0.0V
4	50.0 Hz	230V	50.0 Hz	25.0 Hz	40.2V	1.3 Hz	6.9V	0.0 Hz	0.0V
5	50.0 Hz	230V	50.0 Hz	25.0 Hz	57.5V	1.3 Hz	8.0V	0.0 Hz	0.0V
6	60.0 Hz	230V	60.0 Hz	30.0 Hz	40.2V	1.5 Hz	6.9V	0.0 Hz	0.0V
7	60.0 Hz	230V	60.0 Hz	30.0 Hz	57.5V	1.5 Hz	8.0V	0.0 Hz	0.0V
8	50.0 Hz	230V	50.0 Hz	2.5 Hz	20.7V	1.3 Hz	10.3V	0.0 Hz	0.0V
9	50.0 Hz	230V	50.0 Hz	2.5 Hz	26.4V	1.3 Hz	12.6V	0.0 Hz	0.0V
A	60.0 Hz	230V	60.0 Hz	3.0 Hz	20.7V	1.5 Hz	10.3V	0.0 Hz	0.0V
B	60.0 Hz	230V	60.0 Hz	3.0 Hz	26.4V	1.5 Hz	14.9V	0.0 Hz	0.0V
C	90.0 Hz	230V	60.0 Hz	3.0 Hz	20.7V	1.5 Hz	10.3V	0.0 Hz	0.0V
D	120.0 Hz	230V	60.0 Hz	3.0 Hz	16.1V	1.5 Hz	8.0V	0.0 Hz	0.0V
E	150.0 Hz	230V	60.0 Hz	3.0 Hz	16.1V	1.5 Hz	8.0V	0.0 Hz	0.0V
F	60.0 Hz	230V	60.0 Hz	3.0 Hz	20.7V	1.5 Hz	10.3V	0.0 Hz	0.0V

Table 5-11: Voltage/Frequency Pattern Options - models 2215 to 2346-G+S3

E1-03	E1-04	E1-05	E1-06	E1-07	E1-08	E1-09	E1-10	E1-11	E1-12
0	50.0 Hz	230V	50.0 Hz	2.5 Hz	13.8V	1.3 Hz	6.9V	0.0 Hz	0.0V
1	60.0 Hz	230V	60.0 Hz	3.0 Hz	13.8V	1.5 Hz	6.9V	0.0 Hz	0.0V
2	60.0 Hz	230V	50.0 Hz	3.0 Hz	13.8V	1.5 Hz	6.9V	0.0 Hz	0.0V
3	72.0 Hz	230V	60.0 Hz	3.0 Hz	13.8V	1.5 Hz	6.9V	0.0 Hz	0.0V
4	50.0 Hz	230V	50.0 Hz	25.0 Hz	40.2V	1.3 Hz	5.7V	0.0 Hz	0.0V
5	50.0 Hz	230V	50.0 Hz	25.0 Hz	57.2V	1.3 Hz	6.9V	0.0 Hz	0.0V
6	60.0 Hz	230V	60.0 Hz	30.0 Hz	40.2V	1.5 Hz	5.7V	0.0 Hz	0.0V
7	60.0 Hz	230V	60.0 Hz	30.0 Hz	57.2V	1.5 Hz	6.9V	0.0 Hz	0.0V
8	50.0 Hz	230V	50.0 Hz	2.5 Hz	17.2V	1.3 Hz	8.0V	0.0 Hz	0.0V
9	50.0 Hz	230V	50.0 Hz	2.5 Hz	23.0V	1.3 Hz	10.3V	0.0 Hz	0.0V
A	60.0 Hz	230V	60.0 Hz	3.0 Hz	17.2V	1.3 Hz	8.0V	0.0 Hz	0.0V
B	60.0 Hz	230V	60.0 Hz	3.0 Hz	23.0V	1.5 Hz	12.6V	0.0 Hz	0.0V
C	90.0 Hz	230V	60.0 Hz	3.0 Hz	17.2V	1.5 Hz	8.0V	0.0 Hz	0.0V
D	120.0 Hz	230V	60.0 Hz	3.0 Hz	13.8V	1.5 Hz	6.9V	0.0 Hz	0.0V
E	150.0 Hz	230V	60.0 Hz	3.0 Hz	13.8V	1.5 Hz	6.9V	0.0 Hz	0.0V
F	60.0 Hz	230V	60.0 Hz	3.0 Hz	17.2V	1.5 Hz	8.0V	0.0 Hz	0.0V

V/F Parameters

Parameter Code	Display	Function	Range	Initial[1] Value	Access Level
E1-03	V/F Selection	Selection V/F Pattern	0-FF	0A	Adv
E1-04[3]	Max Frequency	Maximum Frequency	40.0–150.0 Hz	60.0	Adv
E1-05[2]	Max Voltage	Maximum Voltage	0.0–510.0 V	460	Adv
E1-06	Base Frequency	Motor Base Frequency	0.0–150.0 Hz	60	Adv
E1-07	Mid Fequency A	Midpoint Output Frequency A	0.0-150.0 Hz	3.0	Adv
E1-08	Mid Voltage A	Midpoint Frequency Voltage A	0.0-510.0 V	30.0	Adv
E1-09	Min Frequency	Minimum Frequency	0.0–150.0 Hz	1.5	Adv
E1-10	Min Voltage	Minimum Voltage	0.0-510.0 V	20.6	Adv
E1-11	Mid Frequency B	Midpoint Output Frequency B	0.0–150.0 Hz	0.0	Adv
E1-12	Mid Voltage B	Midpoint Output Voltage B	0.0–510.0 V	0.0	Adv
E1-13[2]	Base Voltage	Motor Base Voltage	0.0–510.0 V	0.0	Adv

* Initial value determined by X-Press Programming (Table 4.1 to 4.2).

[1] The initial value displayed here is for 460V class drives.

[2] For 230V class units, the value is half that of 460V class units.

[3] To change E1-04 "Max Frequency," E1-03 must first be set to "F".

Motor Set-up

E2 constants define motor parameters. Normally, the default settings for E2 constants are determined by kVA selection (O2-04). In open loop vector control the E2 constants will be set automatically during auto-tuning. If the control method is V/F (A1-02=0), the motor rated current should be entered into E2-01.

If auto-tuning cannot be performed, some E2 constants can be calculated using the motor's nameplate information.

Motor rated slip frequency (E2-02) can be calculated by using the following equation:

$$f_s = f - \frac{(N * P)}{120}$$

Where… f_s: slip frequency (Hz)
f: rated frequency (Hz)
N: rated motor speed (rpm)
P: number of motor poles

Motor terminal resistance E2-05 can be calculated by using the following equation:

$$r_t = r_p * \frac{273 + \left[\frac{(25°C + T_i)}{2}\right]}{273 + T_i}$$

Where… r_t: motor terminal resistance
r_p: Phase-to-Phase resistance at insulation class temperature
T_i: insulation class temperature (°C)

Parameter Code	Display	Function	Range	Initial Value	Access Level
E2-01	Motor Rated FLA	Motor-rated current	0.01–1500.0 A	*	Adv
E2-02	Motor Rated Slip	Motor-rated slip frequency	0.00-20.00 Hz	*	Adv
E2-03	No-Load Current	Motor no-load current	0.0–1500.0 A	*	Adv
E2-04	Number of Poles	Number of poles in motor	2-48	4	Adv
E2-05	Term Resistance	Motor terminal resistance	0.000–65.000 Ω	*	Adv
E2-06	Leak Inductance	Leakage Inductance	0.0–30.0%	*	Adv
E2-07	Saturation Comp 1	Core-Saturation Compensation Coefficient 1	0.00–0.50	*	Adv
E2-08	Saturation Comp 2	Core-Saturation Compensation Coefficient 2	0.00–0.75	*	Adv
E2-09	Mechanical Loss	Mechanical Torque Loss as a % of motor torque	0.0-10.0%	0.0	Adv
E2-11	Motor Rated Power	Rated output	0.0-650 kW	*	Adv

* Initial value is determined by O2-04 (kVA Selection)

This value is automatically set during auto tuning

Motor 2 Method

The Motor 2 method function allows one drive to control two separate motors which are coupled to separate motions. The output of the drive is switched from one motor to the other and a multi-function input (H1-XX=41 Motor 2 Select) informs the drive of which motor is being used. Special functions are disabled and become read only while in Motor 2. Those functions that are disabled include: Load Check (C5), Swift/Ultra Lift (C6), Weight Measurement (C10), Slack Cable (C11), Snap Shaft (C12), and Inching (C13). If encoder feedback is used with Motor 2 then use a PG-Z2 option card.

WARNING

Do not switch between motors when the drive's output is on as it will damage the unit!

Use multi-function output, 1E, as motor 2 switch over control.

Parameter Code	Display	Function	Range	Initial Value	Access Level
E3-01	Control Method	Motor 2 control method	0–2	0	Adv
	0 V/F control				
	2 Open loop vector				
E3-02	Stopping Method	Motor 2 Stopping Method	0-1	1	Adv
	0 Decel to Stop				
	1 Coast to Stop				

Motor 2 Voltage/Frequency Pattern

Parameter Code	Display	Function	Range	Initial Value	Access Level
E3-03	Max Frequency	Maximum frequency for Motor 2	40.0–150.0 Hz	60.0	Adv
E3-04	Max voltage	Maximum voltage for Motor 2	0.0–255.0 V	230.0	Adv
E3-05	Base Frequency	Base frequency for Motor 2	50.0–150.0 Hz	60.0	Adv
E3-06	Mid Frequency	Midpoint output frequency for Motor 2	0.0–150.0 Hz	3.0	Factory
E3-07	Mid Voltage	Midpoint output voltage for Motor 2	0.0–255.0 V	17.2	Factory
E3-08	Min Frequency	Minimum output frequency for Motor 2	0.0–150.0 Hz	1.5	Factory
E3-09	Min Voltage	Minimum output voltage for Motor 2	0.0–255.0 V	10.3	Factory

Motor 2 Set-up

Parameter Code	Display	Function	Range	Initial Value	Access Level
E4-01	Motor Rated FLA	Motor-rated current for Motor 2	0.0–150.0 A	*	Adv
E4-02	Motor Rated Slip	Motor-rated slip frequency for Motor 2	0.00–20.0 Hz	*	Adv
E4-03	No Load Current	Motor no-load current for Motor 2	0.0–150.0 A	*	Adv
E4-04	Number of Poles	Number of poles in motor	2-48	4	Adv
E4-05	Terminal Resistance	Motor 2 Terminal Resistance	0.000–65.000Ω	*	Adv
E4-06	Leakage Inductance	Leakage Inductance for Motor 2	0.0-40%	*	OLV
E4-07	Motor Rated Power	Motor 2 Rated kW	0.40-650kW	*	Adv

** Values automatically set at Auto Tuning*

Option Card Parameters

- *F2 Analog Input 14 Set-up*
- *F3 Digital Input Option Set-up*
- *F4 Analog Output Option Set-up*
- *F5 Digital Output 2 Set-up*
- *F6 Communication Card Set-up*

AI-14 Option Set-up

Sets CH1 to CH3 input functions when AI-14B option is connected (2CN).

When the 3CH individual input is used, parameter B3-01 is automatically set to "1" (frequency reference from control circuit terminal). The option/inverter reference selection, which is selected by a multi-function contact input (H1-XX= "1F"), is disabled when using the AI-14B option.

Parameter Code	Display	Function	Range	Initial Value	Access Level
F2-01	AI-14 Input Sel	Determines whether the 3-channel input selection is individual or additional.		0	Adv
	0 3ch Individual				
	1 3ch Additional				

Sets CH1 to CH3 input functions when AI-14B option is connected

Setting	Function	CH1 (TC1 to TC4)	CH2 (TC2 to TC4)	CH3 (TC3 to TC4)
0	3-channel individual input (factory default)	Substitute for terminals A1 & AC	Substitute for terminals A2 & AC	Substitute for terminals A3 & AC
1	3-channel additional input	Sum of CH1 to CH3 input values is used as the frequency reference value		

Digital Input Option Set-up

Selects the setting of the frequency reference input from the DI-08 and DI-16H option cards.

NOTE: B3-01 must be set to 3-option PCB when using these cards.

Parameter Code	Display	Function	Range	Initial Value	Access Level
F3-01	DI Option Setup	Selects the setting mode of the reference input from the DI-08 and DI-16H options	0–7	7	Adv
	0 BCD 1%	BCD 1% unit			
	1 BCD 0.1%	BCD 0.1% unit			
	2 BCD 0.01%	BCD 0.01% unit			
	3 BCD 1Hz	BCD 1Hz unit			
	4 BCD 0.1Hz	BCD 0.1Hz unit			
	5 BCD 0.01Hz	BCD 0.01Hz unit			
	6 BCD (5DG) 0.01Hz	Binary			
		DI–08:	255/100%		
		DI–16H, 12 bit selection:	4096/100%		
		DI–16H, 16 bit selection:	3000/100%		
	7 Binary	Set value is displayed in decimal notation			

Analog Output Option Set-up

Selects the analog output monitors for channel 1 and 2 if AO-08 and AO-12 optional card is connected to 3CN.

Parameter Code	Display	Function	Range	Initial Value	Access Level
F4-01	AO Ch1 Select	Analog output option Channel 1 selection	1–50	2	Adv
	1 Frequency Ref				
	2 Output Freq				
	3 Output Current				
	5 Motor Speed				
	6 Output Voltage				
	7 DC Bus Voltage				
	8 Output kWatts				
	9 Torque Reference				
	15 Term A1 Level				
	16 Term A2 Level				
	17 Term A3 Level				
	18 Mot SEC Current				
	19 Mot EXC Current				
	20 SFS Output				
	21 ASR Input				
	22 ASR Output				
	24 PID Feedback				
	26 Voltage Ref (Vq)				
	27 Voltage Ref (Vd)				
	29 Load Weight				
	30 SS Delta Speed				
	31 Not used				
	32 ACR (q) Output				
	33 ACR (d) Output				
	36 PID Input				
	37 PID Output				
	38 PID Setpoint				
	41 Heat Sink Temp (10V=100°C)				
	44 ASR Out w/o Filter				
F4-02	AO Ch1 Gain	Analog output Channel 1 multiplier	0.00-1000%	100%	Adv
F4-03	AO Ch2 Select	Analog output option Channel 2 selection (Same as F4-01)	1–50	3	Adv
F4-04	AO Ch2 Gain	Analog output Channel 2 multiplier	0.00-1000%	50%	Adv
F4-05	CH1 A0 Bias	Channel 1 bias	-110%-110%	0.0	Adv
F4-06	CH2 A0 Bias	Channel 2 bias	-110%-110%	0.0	Adv

Parameter Code	Display	Function	Range	Initial Value	Access Level
F4-07	AO Opt Level CH1 *0 0 to 10VDC* *1 -10 to +10VDC*	Channel 1 output signal	0-1	0	Adv
F4-08	AO Opt Level CH2 *0 0 to 10VDC* *1 -10 to +10VDC*	Channel 2 output signal	0-1	0	Adv

Digital Output Set-up with Option Card DO-02 or DO-08

Selects the multi-function output settings for channels 1 and 2 of the DO-02C option card, and channels 7 through 8 of the DO-08 option card.

Parameter Code	Display	Function	Range	Initial Value	Access Level
F5-01	DO Ch1 Select	Determines the digital output of Channel 1 (See H2-01)	0–FF	F	Adv
F5-02	DO Ch2 Select	Determines the digital output of Channel 2 (See H2-01)	0–FF	F	Adv
F5-03	DO Ch3 Select	Determines the digital output of Channel 3 (See H2-01)	0-FF	F	Adv
F5-04	DO Ch4 Select	Determines the digital output of Channel 4 (See H2-01)	0-FF	F	Adv
F5-05	DO Ch5 Select	Determines the digital output of Channel 5 (See H2-01)	0-FF	F	Adv
F5-06	DO Ch6 Select	Determines the digital output of Channel 6 (See H2-01)	0-FF	F	Adv
F5-07	DO Ch7 Select	Determines the digital output of Channel 7 (See H2-01)	0-FF	F	Adv
F5-08	DO Ch8 Select	Determines the digital output of Channel 8 (See H2-01)	0-FF	F	Adv
F5-09	DO-08 Selection *0 8 Ch Individual* *1 Binary Output* *2 Output per F5-01 ~ 08* *3 Serial Communication output*	DO-08 option card output mode selection	0-3	2	Adv

Selects the multi-function output selections for the DO-08 option.

<table>
<tr><th colspan="8">DO-08 Output Mode Selection for F7 C&H</th></tr>
<tr><th>Parameter F5-09 setting</th><th>Output Type</th><th>Terminals</th><th colspan="5">Output Contents</th></tr>
<tr><td rowspan="8">0</td><td rowspan="8">8 –Channel Individual (Fixed Data)</td><td>TD5 – TD11</td><td colspan="5">OverCurrent (SC, OC, GF)</td></tr>
<tr><td>TD6 – TD11</td><td colspan="5">OverVoltage (OV)</td></tr>
<tr><td>TD7 – TD11</td><td colspan="5">Drive Overload (OL2, OH, OH1)</td></tr>
<tr><td>TD8 – TD11</td><td colspan="5">Fuse Blown (PUF)</td></tr>
<tr><td>TD9 – TD11</td><td colspan="5">OverSpeed (OS-1, OS-2)</td></tr>
<tr><td>TD10 – TD11</td><td colspan="5">Motor Overload (OL1)</td></tr>
<tr><td>TD1 – TD2</td><td colspan="5">Brake Release</td></tr>
<tr><td>TD3 – TD4</td><td colspan="5">Limit Switch (UL1, UL2, UL3, LL1 or LL2)</td></tr>
<tr><td rowspan="11">1</td><td rowspan="11">Binary Coded</td><td rowspan="2">TD5 – TD11 (Bit 0)</td><td>Bit 3, 2, 1, 0</td><td>Output</td><td>Bit 3, 2, 1, 0</td><td>Output</td></tr>
<tr><td>0000</td><td>No Fault</td><td>1000</td><td>EF (ALL)</td></tr>
<tr><td rowspan="3">TD6 – TD11 (Bit 1)</td><td>0001</td><td>SC, OC, GF</td><td>1001</td><td>CPF (ALL)</td></tr>
<tr><td>0010</td><td>OV</td><td>1010</td><td>oL1</td></tr>
<tr><td>0011</td><td>OL2</td><td>1011</td><td>BE7</td></tr>
<tr><td rowspan="2">TD7 – TD11 (Bit 2)</td><td>0100</td><td>OH, OH1</td><td>1100</td><td>UV (ALL)</td></tr>
<tr><td>0101</td><td>OS-1, OS-2</td><td>1101</td><td>DEV-1, DEV-2</td></tr>
<tr><td rowspan="2">TD8 – TD11 (Bit 3)</td><td rowspan="2">0110</td><td rowspan="2">PUF</td><td rowspan="2">1110</td><td>PGO-1-S
PGO-1-H
PGO-2-S
PGO-2-H</td></tr>
<tr><td>0111</td><td>LF</td><td>1111</td><td>Not Used</td></tr>
<tr><td>TD9 – TD11</td><td colspan="5">Minor Fault (Alarm)</td></tr>
<tr><td>TD10 – TD11</td><td colspan="5">Inverter Ready</td></tr>
<tr><td>TD1 – TD2</td><td colspan="5">Brake Release</td></tr>
<tr><td>TD3 – TD4</td><td colspan="5">Limit Switch (UL1, UL2, UL3, LL1 or LL2)</td></tr>
<tr><td rowspan="8">2</td><td rowspan="8">8-Channel Selectable</td><td>TD5 – TD11</td><td colspan="5">F5-01 (See H2-01 ~ 03 for output selections)</td></tr>
<tr><td>TD6 – TD11</td><td colspan="5">F5-02 (See H2-01 ~ 03 for output selections)</td></tr>
<tr><td>TD7 – TD11</td><td colspan="5">F5-03 (See H2-01 ~ 03 for output selections)</td></tr>
<tr><td>TD8 – TD11</td><td colspan="5">F5-04 (See H2-01 ~ 03 for output selections)</td></tr>
<tr><td>TD9 – TD11</td><td colspan="5">F5-05 (See H2-01 ~ 03 for output selections)</td></tr>
<tr><td>TD10 – TD11</td><td colspan="5">F5-06 (See H2-01 ~ 03 for output selections)</td></tr>
<tr><td>TD1 – TD2</td><td colspan="5">F5-07 (See H2-01 ~ 03 for output selections)</td></tr>
<tr><td>TD3 – TD4</td><td colspan="5">F5-08 (See H2-01 ~ 03 for output selections)</td></tr>
<tr><td rowspan="8">3</td><td rowspan="8">Serial Com</td><td>TD5 – TD11</td><td>00000001</td><td colspan="3" rowspan="8">Through communication to register 0741H, TD1 - TD10 are independently controlled.

Writing 00000100 to 0741H would turn on TD7 - TD11.
(Bit 7, 6, 5, 4, 3, 2, 1, 0)</td></tr>
<tr><td>TD6 – TD11</td><td>00000010</td></tr>
<tr><td>TD7 – TD11</td><td>00000100</td></tr>
<tr><td>TD8 – TD11</td><td>00001000</td></tr>
<tr><td>TD9 – TD11</td><td>00010000</td></tr>
<tr><td>TD10 – TD11</td><td>00100000</td></tr>
<tr><td>TD1 – TD2</td><td>0100000</td></tr>
<tr><td>TD3 – TD4</td><td>1000000</td></tr>
</table>

Communication Option Cards

Settings for DP-RAM option cards.

Parameter Code	Display	Function	Range	Initial Value	Access Level
F6-01	Com Bus Flt Sel	Stopping method at communication error.	0-4	1	Adv
	0 Decel to Stop				
	1 Coast to Stop				
	2 Fast Stop				
	3 Use B3-03 Method				
	4 Alarm only				
F6-02	EFO Detection	Option External Fault	0-1	0	Adv
	0 Always Detected				
	1 Only During Run				
F6-03	EFO Fault Action	Option External Fault	0-4	1	Adv
	0 Decel to Stop				
	1 Coast to Stop				
	2 Fast Stop				
	3 Use B3-03				
	4 Alarm Only				
F6-05	Current Unit Sel	Current Unit	0-1	0	Adv
	0 A Display				
	1 100%/8192				

Terminal Parameters

- H1 Digital Inputs
- H2 Digital Outputs
- H3 Analog Inputs
- H4 Analog Outputs
- H5 Serial Communication Set-up
- H6 Pulse Input

Digital Inputs

The IMPULSE•G+ Series 3 has six multi-function contact inputs for the set-up of numerous functions. The following table lists the function selections for the multi-function contact inputs (terminals S3 to S8) and indicates the control modes during which each function can be enabled. An OPEO3 error will occur if a function is programmed in more than one terminal at the same time.

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Parameter Code	Display	Function	Reference Page Number	Range	Initial Value	Access Level
H1-01	Terminal S3 Sel	Selects the multi-function inputs. Setting for S3.	--	0-73	0	Adv
H1-02	Terminal S4 Sel	Setting for S4.	--	0-73	1	Adv
H1-03	Terminal S5 Sel	Setting for S5.	--	0-73	F	Adv
H1-04	Terminal S6 Sel	Setting for S6.	--	0-73	F	Adv
H1-05	Terminal S7 Sel	Setting for S7.	--	0-73	F	Adv
H1-06	Terminal S8 Sel	Setting for S8.		0-73	F	Adv
	0 Multi-Step Ref 2	*Multi-Step Speed 2 (Use w/ 3A to enable A2).*	*5-3*			
	1 Multi-Step Ref 3	*Multi-Step Speed 3 (Use w/ 3A to enable A3).*	*5-3*			
	2 Multi-Step Ref 4	*Multi-Step Speed 4.*	*5-3*			
	3 Multi-Step Ref 5	*Multi-Step Speed 5.*	*5-3*			
	4 Speed Hold 2	*Hold function (2nd step of Three-Step Infinitely Variable).*	*4-10*			
	5 Accel Command	*Acceleration function (2nd step of Two-Step Infinitely Variable or 3rd step of Three-Step Infinitely Variable).*	*4-10*			
	6 Upper Lmt 1 N.O.	*Upper Limit–SLOW DOWN; Normally Open. UL1 - blinking*	*5-20*			
	7 Upper Lmt 2 N.O.	*Upper Limit–STOP; Normally Open. UL2 - blinking*	*5-20*			
	8 Lower Lmt 1 N.O.	*Lower Limit–SLOW DOWN; Normally Open. LL1 - blinking*	*5-20*			
	9 Lower Lmt 2 N.O.	*Lower Limit–STOP; Normally Open. LL2 - blinking*	*5-20*			
	A Upper Lmt 1 N.C.	*Upper Limit–SLOW DOWN; Normally Closed. UL1 - blinking*	*5-20*			
	B Upper Lmt 2 N.C.	*Upper Limit–STOP; Normally Closed. UL2 - blinking*	*5-20*			

Parameter Code	Display	Function	Reference Page Number	Range	Initial Value	Access Level
	C Lower Lmt 1 N.C.	*Lower Limit–SLOW DOWN; Normally Closed. LL1 - blinking*	*5-20*			
	D Lower Limit 2 N.C.	*Lower Limit–STOP; Normally Closed. LL2 - blinking*	*5-20*			
	E M-Speed Gain 1	*Micro-Speed positioning control multiplier 1. Gain is set by parameter C2-01 (has priority over MS2)*	*5-19*			
	F Not used	*No function - terminal is disabled*	*--*			
	10 M-Speed Gain 2	*Micro-Speed positioning control multiplier 2. Gain is set by parameter C2-02.*	*5-19*			
	12 Weight Lmt N.C.	*Weighted Upper Limit (UL3); Stopping Method determined by C3-08.*	*5-20*			
	13 Ultra/Swift Lift	*Ultra/Swift Lift Enable (C6-01 = 2). Not available for Traverse Motion*	*5-24*			
	*14 Alt T-Lim Gain**	*Alternate Torque Limit Gain - C7-05. Use when load testing a hoist*	*5-26*			
	15 Forward Jog	*Uses B1-17 reference*	*5-3*			
	16 Reverse Jog	*Uses B1-17 reference*	*5-3*			
	17 Forward Inch	*Inch Control*	*5-35*			
	18 Reverse Inch	*Inch Control*	*5-35*			
	19 Inch Repeat	*Inch Control*	*5-35*			
	1A Acc/Dec 2	*Acceleration and Deceleration Time Changeover 2 using B5-03 and B5-04*	*5-12*			
	1B Acc/Dec 3	*Acceleration and Deceleration Time Changeover 3 using B5-12 and B5-13*	*5-13*			
	1C Acc/Dec 4	*Acceleration and Deceleration Time Changeover 4 using B5-14 and B5-15*	*5-13*			
	1D Digital Chngover	*Analog/Digital Reference Changeover B1-18=1* *Open=Analog* *Closed=Digital*	*5-3*			
	1F Opt/Inv Switch	*Option/Inverter Selection (Frequency and Run Reference from Option card. Closed = Option Card). Set B3-01, 02 = Terminals; set H1-0X = 1F*	*5-6*			
	20 thru 2F External Fault	*Desired setting is possible. Input mode: N.O./N.C., Detection mode: Always/ During Run*	*5-64*			
	30 Program Lockout	*Program Lockout* *Closed: Parameters enabled to write* *Open: Parameters disabled to write other than freq. reference (U1-01)*	*--*			
	31 Local/Remote Sw	*Closed = Local*	*--*			

Parameter Code	Display	Function	Reference Page Number	Range	Initial Value	Access Level
	32 Ext BB N.O.	*N.O.: Baseblock by ON.*	*--*			
	33 Ext BB N.C.	*N.C.: Baseblock by OFF.*	*--*			
	38 Speed Hold 1	*Acceleration and Deceleration is stopped by ON, and frequency is held.*	*--*			
	39 External OH2	*Inverter overheat prediction (OH2 is shown by ON). Alarm only.*	*--*			
	3A Trm A2/A3 Enable	*Multi-function analog input (A3) Enable/Disable. When programmed, analog input A2/ A3 is enabled by ON. A2 and A3 are enabled by Multi-Step Ref 1 and 2 respectively. H1-0x = 0 or 1.*	*--*			
	3D Fref UP Cmd	*Make sure to set with DOWN command. Used with B4-01*	*5-10*			
	3E Fref Down Cmd	*Make sure to set with UP command. Used with B4-01*	*5-10*			
	3F Fault Reset	*Reset by ON*	*--*			
	40 Fast Stop N.O.	*Deceleration to stop by fast stop time B5-08 at ON*	*5-13*			
	41 Motor 2 Switch	*Motor 2 changeover command (ON: Motor 2 selected)*	*5-49*			
	42 Fast Stop N.C.	*Deceleration to stop by fast time B5-08 at OFF*	*5-13*			
	43 Timer Enable	*Function settings by C12-03, C12-04. It is set with timer function output [Multi-Function Output]*	*5-33*			
	45 + Speed Cmd	*(ON: B4-02 frequency is added to analog frequency reference)*	*5-11*			
	46 — Speed Cmd	*(ON: B4-02 frequency is subtracted from analog frequency reference)*	*5-11*			
	47 Analog Hold	*Analog frequency reference Sample/Hold.*	*--*			
	4C DCInj Braking	*ON: DC injection braking command, once SFS reaches Zero Speed*	*5-36*			
	4D Ext Spd Search 1	*Max. output frequency (On: Speed Search 1)*	*--*			
	4E Ext Spd Search 2	*Set frequency reference (ON: Speed Search 2)*	*--*			
	50 Ext Spd Search 3	*OFF: Motor Base Blocked; ON: Speed Search*	*--*			
	53 Comm Test	*Communication test mode - Loopback test of Modbus RS-422/485 interface*	*--*			
	55 Drive Enable	*When Programmed, must be ON in order for Inverter Ready - Generates "Can't Run - Drive Not Ready" alarm. "RDY" is displayed in upper right hand corner of LCD when drive is ready.*	*--*			

Parameter Code	Display	Function	Reference Page Number	Range	Initial Value	Access Level
	56 Klixon N.O.	*When Closed, Reset run command, stop using method B3-03, display KLX - Klixon Alarm on Keypad*	*5-20*			
	57 Klixon N.C.	*When Open, Reset run command, use stopping method B3-03, display KLX - Klixon Alarm on Keypad*	*5-20*			
	58 Brake Answer back	*Generates BE1, BE4, BE5, BE7 alarm or fault conditions only when programmed to MFI (C8-04, C8-11)*	*5-27*			
	59 Alt F-Ref Up Lmt	*Use Alternate Upper Limit Frequency Reference B2-04*	*5-5*			
	5A Maintenance Reset	*Reset Maintenance Timer (C12-05 ~ 06, U1-52)*	*5-34*			
	5B BE6 Up Speed Lmt	*Limit Fref to C8-17 (BE6 Up Speed Limit)*	*--*			
	5F Phantom Fault N.C.	*Stops motion based C3-09 but does not change Keypad display. STOP L.E.D. on JVOP blinks.*	*5-20*			
	62 Weight Limit N.O.	*Weighted Upper Limit (UL3). Stopping method determined by C3-08.*	*5-20*			
	63 Phantom Fault N.O.	*Stops motion based C3-09 but does not change Keypad display. STOP L.E.D. on JVOP blinks.*	*5-20*			
	65 Dwell Enable	*Enables/Disables Dwell function. When H1-0x = 65H, OFF = Disabled*	*5-40*			
	70 Torque Det 0/1	*When H1-0x = 70H, Overtorque/Undertorque detection is enabled and disabled by MFDI. When the input is closed, Overtorque/ Undertorque detection is enabled.*	*5-80*			
	73 LL2/UL2 Bypass	*Bypasses Limit MFDIs*				

** = not available in V/F mode*

Digital Outputs

The IMPULSE•G+ Series 3 has three multi-function control outputs for indicating various conditions. The following table lists the function selections for the multi-function contact outputs and indicates the control modes during which each function can be enabled.

Parameter Code	Display	Function	Reference Page Number			
H2-01	Terminal M0 - M1	Digital Output 1 Function	--	0–40	0	Adv
H2-02	Terminal M2 - M3 - M4	Digital Output 2 Function	--	0–40	F	Adv
H2-03	Terminal M5 - M6	Digital Output 3 Function	--	0–40	F	Adv
	0 Brake Release	*Closed when voltage or frequency is output*	5-54			
	1 Zero Speed	*Closed when below B2-02 or D1-01*	--			
	2 Fref/Fout Agree 1	*Output when Frequency Reference and Frequency Output agree*	5-78			
	3 Fref/Set Agree 1	*Output when Output Frequency Reference equals L4-01.*	5-78			
	4 Freq Detect 1	*Closed when output frequency is < L4-01.*	5-78			
	5 Freq Detect 2	*Closed when output frequency is > L4-01.*	5-78			
	6 Inverter Ready	*Closed when an inverter is not in a fault state*	--			
	7 DC Bus Undervolt	*Closed when DC Bus voltage drops below UV trip point.*	--			
	8 BaseBlk N.O.	*Closed when the inverter is not outputting voltage.*	--			
	9 Operator Reference	*Closed when the frequency reference is input from the digital operator (02-01).*	5-87			
	A Local Operation	*Closed when the RUN command is input from the digital operator.*	5-87			
	B Trq Det 1 N.O.	*Output when torque > L6-02*	5-80			
	D DB Overheat	*Closed when inverter displays "RH" or "RR" fault.*	--			
	E Fault	*Closed during a major fault.*	6-3			
	F Not Used	*No function*	--			
	10 Minor Fault	*Closed during minor fault or alarm.*	6-3			
	11 Reset Cmd Active	*Closed when a reset command is present on the terminals*	--			
	12 Timer Output	*Timer function output*	5-34			
	13 Fref/Fout Agree 2	*Closed when output frequency = frequency reference*	5-78			
	14 Fref/Set Agree 2	*Closed when output frequency = L4-03*	5-78			

Parameter Code	Display	Function	Reference Page Number
	15 Freq Detect 3	*Closed when output frequency is ≤ L4-03*	5-78
	16 Freq Detect 4	*Closed when output frequency ≥ L4-03*	5-78
	17 Trq Det 1 N.C.	*Open when torque > L6-02*	5-80
	18 Trq Det 2 N.O.	*Closed when torque > L6-05*	5-81
	19 Trq Det 2 N.C.	*Open when torque > L6-05*	5-81
	1A Forward Dir	*Closed when running FWD/ UP*	--
	1B Reverse Dir	*Closed when running REV/ DOWN*	--
	1C Swift/Ultra mode	*Swift/Ultra Lift is active*	5-24
	1D BaseBlk N.C.	*During baseblock 2*	--
	1E Motor 2 Selected	*Closed when motor 2 changeover is input to terminals*	5-49
	20 Auto-Rst Attempt	*Auto-Reset Enabled*	5-83
	21 Overload OL1	*OL1 Overload fault code*	6-8
	22 OH Prealarm	*Closed when "OH" is displayed on keypad*	6-7
	23 Torque Limit	*Current Torque Limit*	5-26
	26 Run Cmd is input	*Fwd/Rev is ON*	--
	27 Load Check Det	*Load Check detected*	5-22
	29 Upper Limit	*Closed when Upper Limit– SLOW DOWN or Upper Limit STOP is input*	5-20
	2A During Run1	*Inverter Outputting Voltage*	--
	2B Upper Limit 1	*Output during Upper Limit 1*	5-20
	2C Upper Limit 2	*Output during Upper Limit 2*	5-20
	2D Lower Limit 1	*Output during Lower Limit 1*	5-20
	2E Lower Limit 2	*Output during Lower Limit 2*	5-20
	30 Lower Limit	*Closed when Lower Limit– SLOW DOWN or Lower Limit STOP is input*	5-20
	31 Up/Low Lmt	*Closed when Upper Limit– SLOW DOWN or Upper Limit STOP or Lower Limit– SLOW DOWN or Lower Limit STOP is input*	5-20
	33 Weight Limit	*Enabled by C10-08*	5-32
	35 Torq Proving OK	*Torque Proving successful, brake is released, drive ready for F-Ref.*	--
	37 Maintenance	*Timer reaches C12-05*	5-34
	39 Drive Enable	*Closed when drive enable is active*	--
	3F Klixon	*MFDI 56 or 57 is on - motor is overheating*	5-20
	40 ~ FF Fault Annunciate	*Closed on specified faults.*	5-62

Digital Outputs—Fault Annunciate (H2-01~03=40)

Digital Outputs—Fault Annunciate enables you to assign a set of six fault outputs to Relay Output M2/M3/M4 and/or Output M5/M6. In addition, you can select whether each fault output is enabled.

NOTE: Output M0/M1 can also be used for **Digital Outputs—Fault Annunciate***; however, it is normally assigned to a brake output.*

Before you start to program this feature, you may find it convenient to first photocopy the "Binary-to-Hexadecimal Conversion Worksheet" in this section. By being able to write in the worksheet's boxes, you will find it easier to program the feature.

Programming **Digital Outputs—Fault Annunciate** requires that you determine two 4-digit binary numbers and then convert these numbers to two 1-digit hexadecimal numbers. You enter the hexadecimal numbers when you program the drive.

To program **Digital Outputs—Fault Annunciate** (assuming you are in **Programming Mode**):

1. Press the **UP** button until | *Digital Outputs*
H2-01=0
TERM M0/M1 SEL | appears.
2. Determine the output terminal to which you want **Fault Annunciate** assigned; Terminals M0-M1, M2-M4 or M5-M6.
3. Press the **>** button. "01" blinks. Press the **UP** arrow button to select Relay Outputs 2 or 3.
4. Press the **DATA/ENTER** button.
5. Press the **UP** or **DOWN** button until | *H2-XX=40*
Fault Annunciate | appears.
6. Press the **DATA/ENTER** button. | *Fault Data Input*
OF | appears.
7. From the following worksheet, select one of three fault output sets. (Each row is a set.)
   Enter the one-zero combination that corresponds to the set (row) that you selected.

For example, if you selected Set 2, you would enter "1 0" in the first two columns from the left, which would represent the first two digits of the first binary number that you would convert later.

Table 5-12:Binary-to-Hexadecimal Conversion Worksheet

	First digit from the left				Second digit from the left			
	1 or 0	1 or 0	1 or 0	1 or 0	1 or 0	1 or 0	1 or 0	1 or 0
Set 1	0	1	BE8	BE6	BE5	BE3	BE2	BE1
Set 2	1	0	OT1	OT2	LL1	LL2	UL1	UL2
Set 3	1	1	SLC	BE4	BE3	BE2	BE1	BE0

8. Determine which fault outputs should be enabled. To enable a fault output, enter 1 in the box above the fault output; otherwise, enter 0. Do this for each fault output in the set.

   For example, if Set 2 is selected and LL1 and UL1=1, "1 0 0 0" and "1 0 1 0" would be the two 4-digit binary numbers.

9. Using the conversion table below, determine the 1-digit hexadecimal number for both 4-digit binary numbers.

Binary Number	Hexadecimal Number
0000	0
0001	1
0010	2
0011	3
0100	4
0101	5
0110	6
0111	7
1000	8
1001	9
1010	A
1011	B
1100	C
1101	D
1110	E
1111	F

   Continuing with the example, "1 0 0 0" and "1 0 1 0" converts to "8A."

10. Press the **UP** or **DOWN** and **>** button until the appropriate hexadecimal number appears for XX on *Fault Data Input XX*

External Fault Response Selection

It is sometimes desirable to have at least one external fault input to the drive. To properly program a multi-function input (H1-01 to H1-06) for this purpose an external fault response must be selected. The table below shows the possible selections for an external fault response.

Table 5-13:

External Fault Selection								MFI Setting Result
Input Level Selection		**Detection Method**		**External Fault Action**				
N.O.(1)	N.C.(1)	Always	During Run	Ramp to Stop	Coast to Stop	Fast-stop(3)	Alarm Only	
√		√		√				20
√		√			√			24(2)
√		√				√		28
√		√					√	2C
√			√	√				22
√			√		√			26
√			√			√		2A
√			√				√	2E
	√	√		√				21
	√	√			√			25
	√	√				√		29
	√	√					√	2D
	√		√	√				23
	√		√		√			27
	√		√			√		2B
	√		√				√	2F

(1) N.O. = normally open contact; N.C. = normally closed contact
(2) Setting 24 is the factory default
(3) Uses B5-08 timer

Analog Inputs

The IMPULSE•G+ Series 3 has three analog inputs (two multi-function and one reference) for the external input of numerous references and limits.

Parameter Code	Display	Function	Range	Initial Value	Access Level
H3-01	Term A1 LvL SeL	Voltage for Terminal A1 analog input signal	0-1	0	Adv
	0 OVDC to 10VDC				
	1 -10VDC to +10VDC				
H3-02	Terminal A1 Gain	Gain multiplier for Terminal A1 analog input signal	0.0-1000.0%	100.0	Adv
H3-03	Terminal A1 Bias	Bias multiplier for Terminal A1 analog input signal	-100.0–100.0%	0.0	Adv
H3-04	Term A3 Signal	Voltage for Terminal A3 analog input signal	0-1	0	Adv
	0 0VDC to 10VDC				
	1 -10VDC to +10VDC				
H3-05	Terminal A3 Sel	Assigns one of the following function analog input parameters to Terminal A3	0-3, 5-7, 9, A, E, 10-12, 15, 16, 1F	1F	Adv
	0 Add to Term A1	*Auxiliary Reference*			
	1 Frequency Gain	*Frequency Gain*			
	2 Aux Speed Ref 1				
	3 Aux Speed Ref 2				
	5 Acc/Dec T Reduct	*Acceleration/Deceleration Time Reduction*			
	6 DC Brake Current				
	7 OT/UT Det Level	*Overtorque Detection Level*			
	9 Ref Lower Limit	*Speed Reference Lower Limit*			
	A Jump Frequency	*Jump Frequency*			
	E Motor Temperature	*Used in conjunction with L1-03, L1-04 and L1-05*			
	10 Fwd Torque Limit				
	11 Rev Torque Limit				
	12 Regen Torque Limit				
	15 FWD/REV Torque Limit				
	16 Load Cell	*Weight input enable by C10-01=4*			
	1F Not Used	*Not Used*			
H3-06	Terminal A3 Gain	Gain multiplier for TerminalA3 analog input signal	0000.0–1000.0%	100.0	Adv
H3-07	Terminal A3 Bias	Bias multiplier for Terminal A3 analog input signal	-100.0–100.0%	0.0	Adv

Parameter Code	Display	Function	Range	Initial Value	Access Level
H3-08	Term A2 Signal	Terminal A2 Signal Level Selection	0-2	2	Adv
	*0 0 to +10VDC (Set S1-2 Dip Switch to Off) **				
	*1 -10 to +10VDC (Set S1-2 Dip Switch to Off) **				
	2 4 to 20mA				
H3-09	Terminal A2 Sel	Assigns one of the following function analog input parameters to Terminal A2.	0-3, 5-7, 9, A, E, 10-12, 15, 16, 1F	0	Adv
	0 Add to Term A1	*Auxiliary Reference*			
	1 Frequency Gain	*Frequency Gain*			
	2 Aux Speed Ref 1				
	3 Aux Speed Ref 2				
	5 Acc/Dec T Reduct	*Acceleration/Deceleration Time Reduction*			
	7 OT/UT Det Level	*Overtorque Detection Level*			
	9 Ref Lower Limit	*Speed Reference Lower Limit*			
	A Jump Frequency	*Jump Frequency*			
	E Motor Temperature	*Used in conjunction with L1-03, L1-04 and L1-05*			
	10 Fwd Torque Limit				
	11 Rev Torque Limit				
	12 Regen Torque Limit				
	15 FWD/REV Torque Limit				
	16 Load Cell	*Weight input enable by C10-01=4*			
	1F Not Used	*Not Used*			
H3-10	Terminal A2 Gain	Gain multiplier for terminal A2 analog input signal	0000.0–1000.0%	100.0	Adv
H3-11	Terminal A2 Bias	Bias multiplier for terminal A2 analog input signal	-100.0–100.0%	0.0	Adv
H3-12	Filter Avg Time	Analog input filter average time	0.00–2.00sec	0.00	Adv

* Damage may otherwise result.

** Time is doubled if a Bi-Polar analog input is used. (±10V)

Analog Outputs

The IMPULSE•G+ Series 3 has two analog outputs for the external monitoring of drive conditions.

Parameter Code	Display	Function	Range	Initial Value	Access Level
H4-01	Terminal FM Sel	Assigns one of the following function analog output parameters to Terminal FM	1-41	2	Adv
	1 Frequency Ref				
	2 Output Freq				
	3 Output Current				
	5 Motor Speed				
	6 Output Voltage				
	7 DC Bus Voltage				
	8 Output kWatts				
	9 Torque Reference				
	15 Term A1 Level				
	16 Term A2 Level				
	17 Term A3 Level				
	18 Mot SEC Current				
	19 Mot EXC Current				
	20 SFS Output				
	24 PID Feedback				
	26 Voltage Ref (Vq)				
	27 Voltage Ref (Vd)				
	31 Not used				
	32 ACR (q) Output				
	33 ACR (d) Output				
	36 PID Input				
	37 PID Output				
	38 PID Setpoint				
	41 Cooling Fin Temperature				
H4-02	Terminal FM Gain	Gain multiplier for Terminal FM analog output signal	0.00–1000.0%	100.0	Adv
H4-03	Terminal FM Bias	Bias multiplier for Terminal FM analog output signal	-110.0–110.0%	0.0	Adv

Parameter Code	Display	Function	Range	Initial Value	Access Level
H4-04	Terminal AM Sel	Assigns one of the above function analog output parameters to Terminal AM	(See H4-01)	3	Adv
H4-05	Terminal AM Gain	Gain multiplier for Terminal AM analog output signal	0.00–1000.0%	50.0	Adv
H4-06	Terminal AM Bias	Bias multiplier for Terminal AM analog output signal	-110.0–110.0%	0.0	Adv
H4-07	AO Level Select 1 *0 0 to +10VDC* *1 -10 to +10VDC* *2 4 to 20 mA*		0-2	0	Adv
H4-08	AO Level Select 2 *0 0 to +10VDC* *1 -10 to +10VDC* *2 4 to 20 mA*		0-2	0	Adv

Serial Communication Set-up

The IMPULSE•G+ Series 3 uses terminals R^+/R^-, S^+/S^- to communicate MODBUS RTU (RS-485/422) protocol.

Parameter Code	Display	Function	Range	Initial Value	Access Level
H5-01	Serial Com Adr	Serial communication address	0–20	1F	Adv
H5-02	Serial Baud Rate	Sets the baud rate	0–4	3	Adv
	0 1200 Baud				
	1 2400 Baud				
	2 4800 Baud				
	3 9600 Baud				
	4 19200 Baud				
H5-03	Serial Com Sel	Determines the parity	0–2	0	Adv
	0 No parity				
	1 Even parity				
	2 Odd parity				
H5-04	Serial Fault Set	Determines stopping method or fault at a serial fault occurrence	0–3	1	Adv
	0 Decel to Stop				
	1 Coast to Stop				
	2 Fast-Stop				
	3 Alarm Only				
H5-05	Serial Flt Dtct	Determines whether Serial Fault Detection is enabled	0–1	1	Adv
	0 Disabled				
	1 Enabled				
H5-06	Transmit Wait Tim	Send waiting time	5-65 ms	5	Adv
H5-07	RTS Control Sel	RTS Control enable/disable	0–1	1	Adv
	0 Disabled (RTS is always on)				
	1 Enabled (RTS is ON only when sending)				

NOTE: After changing any H5 parameter, power to the inverter must be cycled.

NOTE: After initial communication, if the inverter is not communicated with for 2 seconds, a communication fault will occur (CE Memobus ERR).

Pulse Input/Output

Parameter Code	Display	Function	Range	Initial Value	Access Level
H6-01	Pulse Input Sel *0 Frequency Reference* *1 PID Feedback* *2 PID Set Point*	Selects the function of Pulse Input Terminal RP	0–2	0	Adv
H6-02	Pulse In Scaling	Number of pulses equal to the maximum output frequency	1000-32000	1440 Hz	Adv
H6-03	Pulse Input Gain	Sets the output level when input is 100%	0.0-1000.0%	100.0	Adv
H6-04	Pulse Input Bias	Sets the output level when input is ONE	-100.0-100.0%	0.0	Adv
H6-05	Pulse In Filter	Sets the input filter time constant	0.00-2.00 sec	0.10 sec	Adv
H6-06	Pulse Moni Sel	Selects the function of pulse output terminal MP.	1, 2, 5, 20, 24, 31, 36	2	Adv
H6-07	Pulse Moni Scale	Item output by pulse monitor is selected by corresponding U1-□□ Value.	0-32000	1440 Hz	Adv

Protection Parameters

- L1 Motor Overload
- L2 Under Voltage Level
- L3 Stall Prevention
- L4 Ref Detection
- L6 Torque Detection
- L8 Hardware Protection
- L9 Automatic Reset

Motor Overload

The IMPULSE•G+ Series 3 has an electronic overload protection function (OL1) for protecting the motor from overheating. The Drive bases the protection on time, output current, and output frequency. The electronic thermal overload function is UL-recognized, so an external thermal overload relay is not required for single motor operation.

The parameter, L1-01, selects the motor overload curve used according to the type of motor applied.

Setting L1-01 = 1 selects a motor with limited cooling capability below rated (base) speed when running at 100% load. The OL1 function derates the motor any time it is running below base speed.

Setting L1-01 = 2 selects a motor capable of cooling itself over a 10:1 speed range when running at 100% load. The OL1 function derates the motor when it is running at 1/10 of its rated speed or less.

Setting L1-01 = 3 selects a motor capable of cooling itself at any speed when running at 100% load. This inlcudes zero speed. The OL1 function does not derate the motor at any speed.

If the drive is connected to a single motor, the motor overload protection should be enabled (L1-01 = 1, 2, or 3) unless another means of preventing motor thermal overload is provided. When the electronic thermal overload function is activated, an OL1 fault occurs, shutting OFF the Drive's output, thus preventing additional overheating of the motor. The motor temperature is continually calculated as long as the Drive is powered up.

When operating several motors with one Drive, install a thermal relay on each motor and disable the motor overload protection (L1-01 = 0).

Parameter Code	Display	Function	Range	Initial Value	Access Level
L1-01	MOL Fault Select	Enable/disable motor overload detection.	0-3	3	Adv
	0 Disabled				
	1 Std Fan Cooled				
	2 Std Blower Cooled				
	3 Vector Motor				
L1-02	MOL Time Const	Time for OL1 fault when motor current is ≥ 150% of the motor rated current.	0.1–20.0 min	8.0	Adv

Parameter Code	Display	Function	Range	Initial Value	Access Level
L1-03	Mtr OH Alarm Sel	Operation when the motor temperature analog input exceeds the OH3 alarm level. (1.17V) (H3-05 or 09 = E)	0-4	3	Adv
	0 Decel to Stop (Alarm)				
	1 Coast to Stop (Alarm)				
	2 Fast Stop by B5-08 (Alarm)				
	3 Alarm Only (OH3 Flashes)				
	4 Stop by B3-03 Method (Alarm)				
L1-04	Mtr OH Fault Sel	Operation when the motor temperature analog input exceeds the OH4 fault level. (2.34V) (H3-05 or 09 = E)	0-2	2	Adv
	0 Decel to Stop				
	1 Coast to Stop				
	2 Fast Stop by B5-08				
L1-05	Mtr Temp Filter	Motor temperature analog input filter time constant	0.00-10.00 sec	0.20	Adv

Power Loss Ride thru

Parameter Code	Display	Function	Range	Initial Value	Access Level
L2-01	PwrL Selection 0 Disabled 1 Enabled - drive will restart if power returns within L2-02 2 CPU Power Active - drive will restart if power returns before control supply shutdown	Enables/disables the Power Loss Ride thru function	0-2	0	Adv
L2-02	PwrL Ride thru t	Power Loss Ride thru time	0.0 - 25.5 sec	**	Adv
L2-03	PwrL BaseBlock t	Output turn on delay after power resumes	0.1 - 5.0 sec	**	Adv
L2-04	PwrL V/F Ramp t	Voltage recovery time after speed search is complete	0.0 - 5.0 sec	**	Adv
L2-05	PUV Det Level	Under voltage fault detection level	150 - 210 VDC 300 - 420 VDC	190/380**	Adv

** Initial value is dependent on drive size, which is determined by O2-04 (kVA Selection)

Stall Prevention

CAUTION

This function automatically adjusts the output frequency, acceleration and/or deceleration rates in order to continue operation without tripping or “stalling” the inverter.

Parameter Code	Display	Function	Range	Initial Value	V/F Access	Open Loop Vector Access
L3-01	StallP Accel Sel	Enable/disable stall prevention during acceleration.	0-2	1	Adv	Adv
	0 Disabled	See table below.				
	1 General Purpose	See table below.				
	2 Intelligent	See table below.				

Table 5.14

Setting	Description
0 Disabled	Stall prevention/current limit during acceleration is disabled. The inverter increases the output frequency at the set acceleration rate. If the acceleration rate is too fast for the load condition, the inverter may trip on overcurrent (OC) or overload (OL).
1 General Purpose	Stall prevention/current limit during acceleration is enabled (factory default). The acceleration rate is automatically extended according to motor current to prevent stalling during acceleration. The acceleration time may be longer than the set value (B5-01).
2 Intelligent	Stall prevention/current limit during acceleration is enabled with an intelligent acceleration mode. By monitoring motor current, the acceleration is the shortest amount of time, regardless of the set acceleration time.

Parameter Code	Display	Function	Range	Initial Value	V/F Access	Open Loop Vector Access
L3-02	StallP Accel Lvl	Stall prevention level during acceleration.	0–200%	150	Adv	Adv

The stall prevention/current limit level during acceleration is set as a percentage of inverter rated current. A setting of 200% disables current limit during acceleration. During acceleration, if the output current exceeds this current limit level (*L3-02*), acceleration stops and frequency is maintained. When the output current decreases below this current level (*L3-02*), acceleration restarts. See below, Figure 5-23.

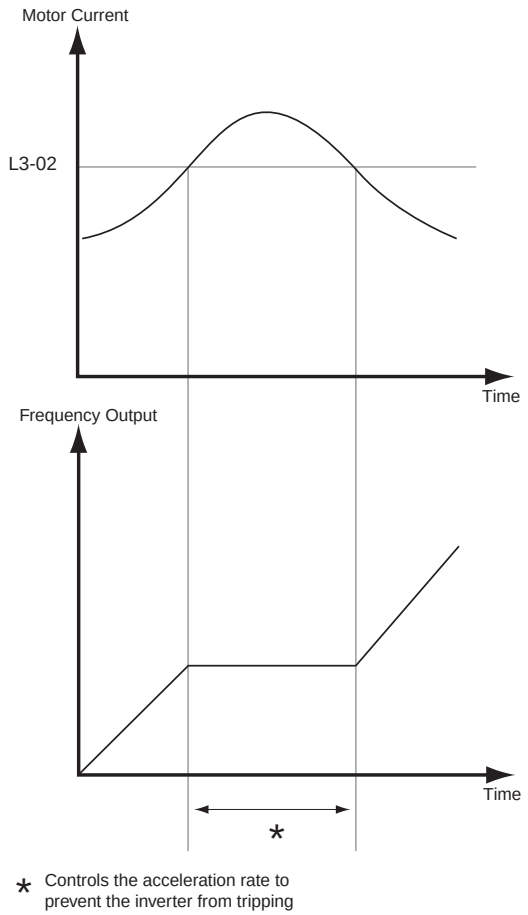


Figure 5-23: Stall Prevention/Current Limit During Acceleration

Parameter Code	Display	Function	Range	Initial Value	V/F Access	Open Loop Vector Access
L3-03	StallP CHP Lvl	Stall prevention limit	0–100%	50	Adv	Adv

When a motor is used above rated speed (E1-06), the output characteristics change from constant torque to constant HP (see Figure 5-XX). During acceleration above rated speed, the stall prevention current limit level is automatically reduced for smoother acceleration. The parameters (L3-02 and L3-03) limit the stall prevention current limit level in this region. The current limit during acceleration is changed according to the following equation:

$$\text{Current Limit Level During Accel in Constant Output Area} = \text{Current Limit Level During Acceleration (L3-02)} \times \frac{\text{Max Voltage Output Frequency (E1-06)}}{\text{Output Frequency}}$$

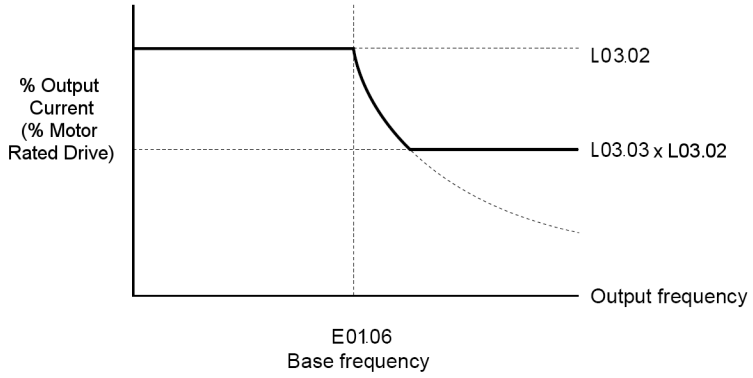


Figure 5-24: Stall Prevention Constant HP Limit

CAUTION

This function automatically adjusts the output frequency, acceleration and/or deceleration rates in order to continue operation without tripping or "stalling" the inverter.

Parameter Code	Display	Function	Range	Initial Value	V/F Access	Open Loop Vector Access
L3-05	StallP Run Sel	Enable/Disable stall prevention during running	0-2	1	Adv	–
	0 Disabled	See table below				
	1 Decel Time 1	See table below				
	2 Decel Time 2	See table below				

Sets a function to prevent stalling during an overload condition while running at constant speed.

Table 5.15

Setting	Description
0	Stall prevention/current limit during running is disabled.
1	Stall prevention/current limit during running is enabled (factory default). When the inverter output current exceeds the current limit level (L3-06) for more than 100ms during speed agree, the output frequency is decreased according to deceleration time 1 (B5-02). This can help prevent stalling. When the load condition is stabilized, the inverter accelerates to the previous frequency.
2	Stall prevention/current limit running is enabled as in setting “1”, however the output frequency is decreased according to deceleration time 2 (B5-04).

Parameter Code	Display	Function	Range	Initial Value	V/F Access	Open Loop Vector Access
L3-06	Stall Run Level	Stall prevention level during run.	30–200%	160	Adv	–

The stall prevention/current limit level during running is set as a percentage of inverter rated current. A setting of 200% disables current limit during running. During speed agree, if the output current exceeds this current limit level (*L3-06*) during running, deceleration starts. When the output current decreases below this current limit level (*L3-06*), acceleration starts, up to the set frequency. See Figure 5-25 below.

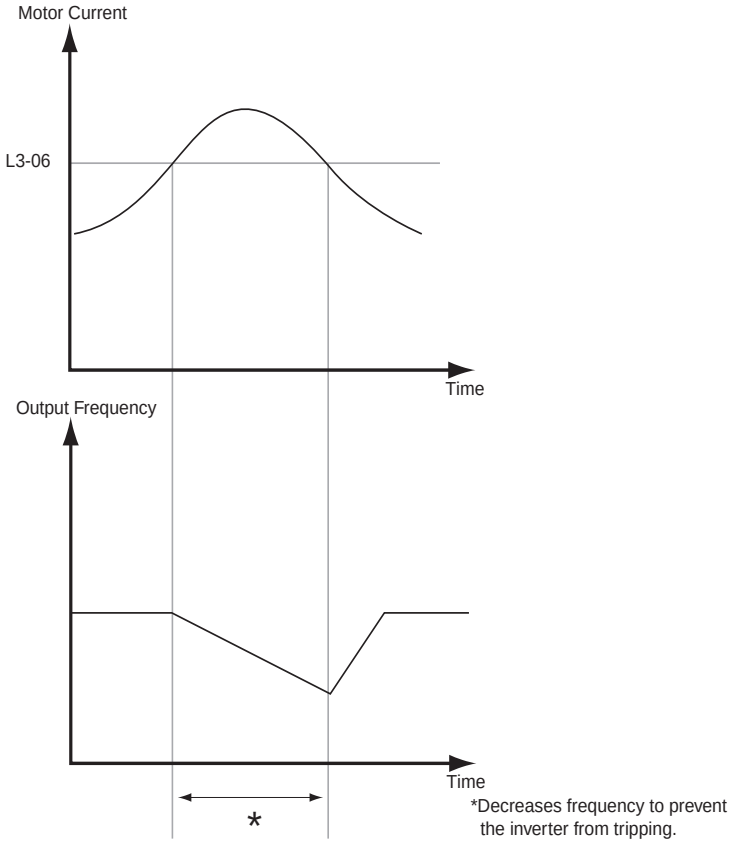


Figure 5-25: Stall Prevention/Current Limit During Running

Reference Detection

The IMPULSE•G+ Series 3 utilizes three different functions for detecting output frequency:

- *•When frequency agree is enabled using the multi-function contact outputs (H2-XX="2" or "13"), the contact closes whenever the output frequency "agrees" with the frequency reference, plus or minus the speed agree detection width.*
- *•When desired frequency agree is enabled using the multi-function contact outputs (H2-XX="3" or "14"), the contact closes whenever the output frequency "agrees" with the speed agree detection level, plus or minus the speed agree detection width.*
- *•When frequency detection is enabled using the multi-function contact outputs (H2-XX="4", "5", "15" or "16"), the contact closes whenever the output frequency is less than or more than the speed agree detection level, depending on which detection is selected.*

Parameter Code	Display	Function	Range	Initial Value	Access Level
L4-01	Spd Agree Level	Speed Agree Level	0.0–150.0 Hz	0.0	Adv

Sets the detection level for the desired frequency agree 1 and frequency detection 1 and 2 functions. The set detection level is effective during both FWD and REV operation.

Parameter Code	Display	Function	Range	Initial Value	Access Level
L4-02	Spd Agree Width	Speed Agree Width	0.0–20.0 Hz	2.0	Adv

Sets the detection width for frequency and desired frequency agree 1 and frequency detection 1 and 2 functions.

Parameter Code	Display	Function	Range	Initial Value	Access Level
L4-03	Speed Agree Lvl ±	Speed Agree Level ±	-150.0–150.0 Hz	0.0	Adv

Sets the detection level for the desired frequency agree 2 and frequency detection 3 and 4 functions. The set detection level is effective during either FWD or REV operation, depending on the set detection level (positive value for FWD operation, negative value for REV operation).

Parameter Code	Display	Function	Range	Initial Value	Access Level
L4-04	Speed Agree Width ±	Speed Agree Width ±	0.0–20.0 Hz	2.0	Adv

Sets the detection width for frequency and desired frequency agree 2 and frequency detection 3 and 4 functions.

Torque Detection

The overtorque detection circuit activates when the motor load causes the motor current to exceed the overtorque detection level (L6-02). When an overtorque condition is detected, alarm signals can be sent to a multi-function output. To output an overtorque detection signal, select torque detection 1 at either of the multi-function contact outputs (H2-XX=”B” or “17”).

Parameter Code	Display	Function	Range	Initial Value	Access Level
L6-01	Torque Det 1 Sel	Activates overtorque/ undertorque detection and selects whether detection generates an alarm or a fault	0-8	0	Adv
	0 Disable				
	1 OT At Speed Agree–Alarm				
	2 OT At Run–Alarm				
	3 OT At Speed Agree–Fault				
	4 OT At Run–Fault				
	5 UT At Speed Agree–Alarm				
	6 UT At Run–Alarm				
	7 UT At Speed Agree–Fault				
	8 UT At Run–Fault				

Table 5-16:

Setting	Description
0	Torque detection is disabled (*factory default*).
1	Overtorque detection is enabled whenever at the speed agree level (when inverter is not accelerating or decelerating). Continue running after detection (OT1 alarm).
2	Overtorque detection is enabled always. Continue running after detection (OT1 alarm).
3	Overtorque detection is enabled whenever at the speed agree level. Coast to a stop after detection (OT1 fault).
4	Overtorque detection is enabled always. Coast to a stop after detection (OT1 fault).
5	Undertorque detection is enabled whenever at the speed agree level (when inverter is not accelerating or decelerating). Continue running after detection (UT1 alarm).
6	Undertorque detection is enabled always. Continuing running after detection (UT1 alarm).
7	Undertorque detection is enabled whenever at the speed agree level. Coast to a stop after detection (UT1 fault).
8	Undertorque detection is enabled always. Coast to stop after detection (UT1 fault)

Note:
- *To detect overtorque/undertorque during acceleration or deceleration, set to “2” or “4” / “6” or “8”.*
- *To continue operation after overtorque/undertorque detection, set to “1” or “2” / “5” or “6”. During detection, the digital operator displays an “OL3” alarm (blinking).*
- *To stop the inverter after an overtorque/undertorque detection fault, set to “3” or “4” / “7” or “8”. During detection, the digital operator displays an “OL3/UL3” fault.*

Parameter Code	Display	Function	Range	Initial Value	Access Level
L6-02	Torq Det 1 Lvl	Sets the overtorque detection as a percentage of inverter rated current, during V/F control, and motor rated torque during vector control.	0–300%	150	Adv
L6-03	Torq Det 1 Time	The overtorque detection delay time inserts a delay, between the time motor current (or torque) exceeds the overtorque level (L6-02) and when the overtorque detection function is enabled. The digital operator then displays “OL3”.	0.0–10.0 sec	0.1	Adv

Parameter Code	Display	Function	Range	Initial Value	Access Level
L6-04	Torq Det 2 Sel	Activates overtorque/ undertorque detection, and selects whether detection generates an alarm or a fault.	0-8	0	Adv
	0 Disable				
	1 OT At Speed Agree–Alarm				
	2 OT At Run–Alarm				
	3 OT At Speed Agree–Fault				
	4 OT At Run–Fault				
	5 UT At Speed Agree–Alarm				
	6 UT At Run–Alarm				
	7 UT At Speed Agree–Fault				
	8 UT At Run–Fault				

Table 5-17:

Setting	Description
0	Overtorque/undertorque detection is disabled (*factory default*).
1	Overtorque detection is enabled whenever at the speed agree level (when inverter is not accelerating or decelerating). Continue running after detection (OT2 alarm).
2	Overtorque detection is enabled always. Continue running after detection (OT2 alarm).
3	Overtorque detection is enabled whenever at the speed agree level. Coast to a stop after detection (OT2 fault).
4	Overtorque detection is enabled always. Coast to a stop after detection (OT2 fault).
5	Undertorque detection is enabled whenever at the speed agree level (when inverter is not accelerating or decelerating). Continue running after detection (UT2 alarm).
6	Undertorque detection is enabled always. Continuing running after detection (UT2 alarm).
7	Undertorque detection is enabled whenever at the speed agree level. Coast to a stop after detection (UT2 fault).
8	Undertorque detection is enabled always. Coast to stop after detection (UT2 fault)

Overtorque detection 2 functions the same as overtorque/undertorque detection 1 (*L6-01*), except that “OT2/UT2” is displayed on the digital operator instead. This function is used when two types of detection are output to the multi-function output terminals.

Parameter Code	Display	Function	Range	Initial Value	Access Level
L6-05	Torq Det 2 Lvl	Torque Detection 2 Level	0–300%	150	Adv
L6-06	Torq Det 2 Time	Torque Detection 2 Time	0.0–10.0 sec	0.1	Adv

Hardware Protection

The IMPULSE•G+ Series 3 comes equipped with a number of built-in functions designed to protect the inverter and its components from damage.

Parameter Code	Display	Function	Range	Initial Value	Access Level
L8-02	OH Pre-Alarm Lvl	Sets the heatsink temperature level for protection against overheat (OH). Note: The inverter measures heatsink temperature by a negative temperature coefficient thermistor.	50–130°C	95**	Adv
L8-03	OH Pre-Alarm Sel	Selects the stopping method when heatsink overheat is detected.	0-4	4	Adv
	0 Decel to Stop	*(Decel to stop using B5-02)*			
	1 Coast to Stop	*(Immediate stop)*			
	2 Fast-Stop	*(Decel to stop using B5-08)*			
	3 Use B3-03 Method	*Uses programmed B3-03 Method*			
	4 Alarm Only	*(Operation continues and "OH Heatsink Overtemp" is displayed on keypad)*			
L8-05	PH Loss In Sel	Input phase loss detection	0-1	1	Adv
	0 Disabled				
	1 Enabled				
L8-07	PH Loss Out Sel	Output phase loss detection	0-2	2	Adv
	0 Disabled				
	1 1PH Loss Det				
	2 2/3PH Loss Det				
L8-09	Ground Fault Detect	Enables/disables ground fault detection	0-1	1	Adv
	0 Disabled				
	1 Enabled				
L8-10	Fan On/Off Sel	Cooling fan operation select	0-1	0	Adv
	0 Fan On-Run Mode				
	1 Fan Always On				
L8-11	Fan Delay Time	When L8-10 = 1, fan will operate L8-11 seconds after Run Command is removed	0-300 sec	60	Adv
L8-12	Ambient Temp	Adjusts Overload (OL2) Protection for high ambients	45-60°C	45	Adv
L8-15	OL2 Sel @ L-Spd	Enables/disables OL when output frequency ≤ 6 Hz	0-1	0	Adv
	0 Disabled				
	1 Enabled				
L8-18	Soft CLA Sel	Enables/disables the software current limit function. Limits output frequency when current exceeds 110% of rated.	0-1	1	Adv
	0 Disabled				
	1 Enabled				

** Initial value is dependent on drive size, which is determined by O2-04 (kVA Selection).

Automatic Reset

When a fault occurs during operation, the IMPULSE•G+ Series 3 can be programmed for an auto restart operation to automatically reset the fault.

Parameter Code	Display	Function	Range	Initial Value	Level Access
L9-01	Reset Select	Activates the fault auto-reset function.	0-1	1	Adv
	0 Disabled				
	1 Enabled				
L9-02	Reset Attempts	Sets the number of reset attempts. Reset attempt counter is returned to zero if no faults occur within a ten minute period.	0–10	3	Adv
L9-03	Reset Time	Sets the reset starting time	0.5–180.0 sec	0.5	Adv
L9-04*	Reset Flt Sel 1	Reset Fault Select 1.	0000–FFFF	0001	Adv
L9-05*	Reset Flt Sel 2	Reset Fault Select 2.	0000–FFFF	E000	Adv
L9-06	FLT Contact Sel	Fault contact operation during reset attempts	0-1	0	Adv
	0 No FLT Relay				
	1 FLT Relay active				

* To program constant L9-04 and L9-05, refer to the example on the following page and follow steps 1 through 4:

1. Sign 1 to each fault code that you wish to enable the auto reset.
2. Sign 0 to each fault code that you wish to disable the auto reset.
3. Convert all Digits (1 to 4) from binary to hex.
4. Program L9-04 and L9-05 by entering the hex number obtained from step 3.

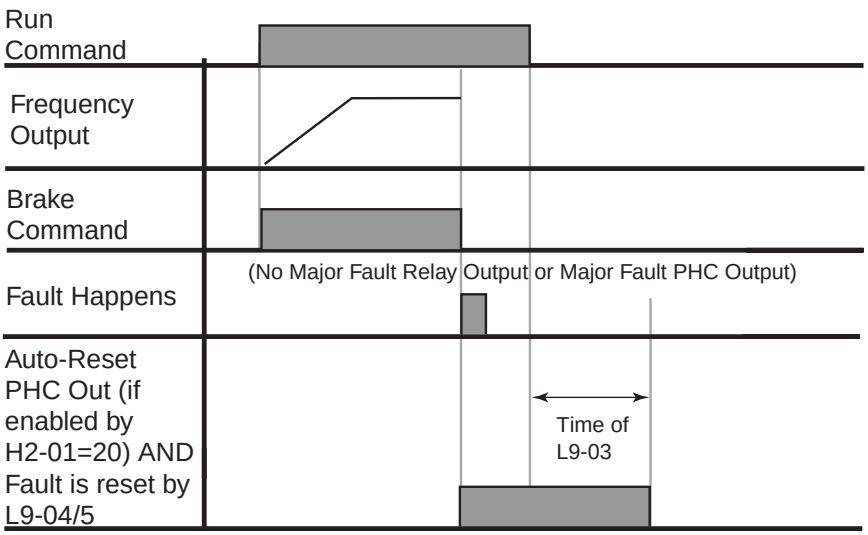


Figure 5-26: Automatic Fault Reset

Example:

Enable auto-reset for UV1, OS and CE faults.

Table 5-18:

	Digit 4				Digit 3				Digit 2				Digit 1			
HEX	2				0				0				1			
Binary	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
L9-04	EFO	---	---	---	LF	PF	UT1	UT2	OH1	SC	OV	GF	OC	UV3	UV2	UV1
HEX	0				0				8				0			
Binary	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
L9-05	BE1	BE2	BE3	FbL	OL1	OL2	Ot1	OT2	CE	CALL	EF8	EF7	EF6	EF5	EF4	EF3

Table 5-19:

L9-04	Binary	HEX
Digit 4	0010	2
Digit 3	0000	0
Digit 2	0000	0
Digit 1	0001	1

Table 5-20:

Binary Number	Hexadecimal Number
0000	0
0001	1
0010	2
0011	3
0100	4
0101	5
0110	6
0111	7
1000	8
1001	9
1010	A
1011	B
1100	C
1101	D
1110	E
1111	F

Operator Parameters

- O1 Monitor Selection
- O2 Keypad Key Selection
- O3 Clear History
- O4 Copy Parameters

Monitor Selection

The top level in the operation mode allows the viewing of four monitor variables. They are Fref, Fout, Iout, and User-Selected monitor. This user-selected monitor can be selected from the following table. See Monitor Parameters table on page 5-92 for available monitors by control method

Parameter Code	Display	Function	Range	Initial Value	Access Level
O1-01	User Monitor Sel	Assigns one of the following monitor parameter as user-selected monitor. Set O1-02 = 4 to use O1-01.	4-53	6	Adv
	4 Control Method				
	5 Motor Speed				
	6 Output Voltage				
	7 DC Bus Voltage				
	8 Output kWatts				
	9 Torque Reference				
	10 Input Term Sts				
	11 Output Term Sts				
	12 Int Ctl Sts 1				
	13 Elapsed Time				
	14 FLASH ID				
	15 Term A1 Level				
	16 Term A2 Level				
	17 Term A3 Level				
	18 Mot SEC Current				
	19 Mot EXC Current				
	20 SFS Output				
	21 ASR Input				
	22 ASR Output				
	23 PG-Z2 ch 2				
	24 PID Feedback				
	25 G5IN4 Reference				
	26 Voltage Ref (Vq)				
	27 Voltage Ref (Vd)				
	28 CPU ID				
	30 SS Delta Speed				
	32 ACR(q) Output				
	33 ACR(d) Output				
	34 OPE Detected				
	36 PID Input				

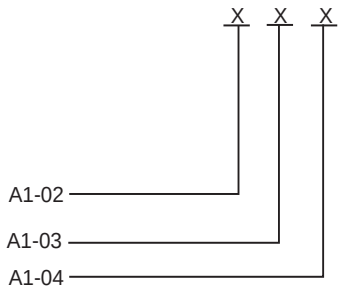
Parameter Code	Display	Function	Range	Initial Value	Access Level
	37 PID Output				
	38 PID Setpoint				
	39 Transmit Err				
	40 Fan Elapsed Time				
	41 Actual Fin Temp				
	50 Hook Height				
	51 Motor Revolution				
	52 Maintenance Timer				
	53 Index Count				
O1-02	Power-On Monitor	Selects the monitor to be displayed on the digital operator immediately after the power supply is turned on.	1-4	2	Adv
	1 Frequency Ref	(U1-01)			
	2 Output Freq	(U1-02)			
	3 Output Current	(U1-03)			
	4 User Monitor	(01-01)			
O1-03	Display Scaling	Units for parameters and monitor related to frequency reference and output frequency can be scaled as shown below.	0–39999	0	Adv

Table 5-21:

Setting (O1-03)	Description
00000	Unit: 0.01Hz (factory default)
00001	Unit: 0.01%
00002 to 00039	Unit: rpm (set O1-03 equal to the number of motor poles)
00040 to 39999 (user-selected units)	Digits: 5th 4th 3rd 2nd 1st 0 0 0 0 0 The first through fourth digits determine the set value at 100% output frequency. Decimal point position is set by the fifth digit as follows: 5th digit = 0: displayed as 0000 5th digit = 1: displayed as 000.0 5th digit = 2: displayed as 00.00 5th digit = 3: displayed as 0.000 Example 1 If 100% output frequency is equal to 200.0 units: Set O1-03=”12000”; 100% of this reference is displayed as 200.0 and 60% of this reference is displayed as 120.0. Example 2 If 100% output frequency is equal to 65.00: Set O1-03=”26500”; 60% of this reference is displayed as 39.00.

Parameter Code	Display	Function	Range	Initial Value	Access Level
O1-04	Display Units	Setting units for E1-04, E1-06, and E1-09	0-1	0	Adv
	0) Hertz				
	1) RPM				
O1-05	LCD Contrast	Adjusts brightness of the keypad display	0-5	3	Adv

Keypad Key Selection

Parameter Code	Display	Function	Range	Initial Value	Access Level
O2-01	Mode/Service Key	Pressing the Mode/Service Key once displays “Call ESI Service” 866-624-7378.	0-1	0	Adv
	0 Mode/Service	Pressing the Mode/Service Key a second time: 			
	1 Local/Remote	Local/remote key is enabled depressing the Mode/Service key switches operation command between the digital operator and the settings of B3-01 and B3-02.			
O2-02	Oper Stop Key	Selects the action when the digital stop key is pressed.	0-2	0	Adv
	0 Coast to Stop	(Immediate stop)			
	1 Decel to Stop				
	2 Use B3-03 Method				
O2-03	User Defaults		0-2	0	Adv
	0 No Change				
	1 Set Defaults	Memorizes up to 50 modified parameters. User defaults can be restored by setting A1 - 05= “1110”.			
	2 Clear all	Clear user defaults.			
O2-04	Inverter Model #	Determines the model number of the drive, which is based on the kVA rating. The following in this column are Magnetek model numbers.	0-F, 10, 20-37	kVA dependent	Adv
	0 20P4	Not used.			
	1 20P7	Not used.			
	2 21P5	2007-G+S3			
	3 22P2	2009-G+S3			
	4 23P7	2015-G+S3			
	5 25P5	2023-G+S3			
	6 27P5	2031-G+S3			
	7 2011	2045-G+S3			
	8 2015	2058-G+S3			
	9 2018	2071-G+S3			
	A 2022	2085-G+S3			
	B 2030	Not Used.			
	C 2037	2145-G+S3			
	D 2045	Not Used			

Parameter Code	Display	Function	Range	Initial Value	Access Level
	E 2055	2215-G+S3			
	F 2075	2283-G+S3			
	10 2090	2346-G+S3			
	20 40P4	4001-G+S3			
	21 40P7	4002-G+S3			
	22 41P5	4003-G+S3			
	23 42P2	4005-G+S3			
	24 43P7	Not Used			
	25 44P0	4008-G+S3.			
	26 45P5	4012-G+S3			
	27 47P5	4017-G+S3			
	28 4011	4024-G+S3			
	29 4015	4031-G+S3			
	2A 4018	4039-G+S3			
	2B 4022	4045-G+S3			
	2C 4030	4060-G+S3			
	2D 4037	4075-G+S3			
	2E 4045	4091-G+S3			
	2F 4055	4112-G+S3			
	30 4075	4150-G+S3			
	31) 4090	4180-G+S3			
	32 4110	Not Used.			
	33) 4132	4260-G+S3			
	34 4160	4304-G+S3			
	35 4185	4370-G+S3			
	36 4220	4477-G+S3			
	37 4300	4590-G+S3			
O2-05	Operator M.O.P	Selects whether the ENTER key is used when the frequency reference is set by the digital operator. The digital operator can simulate a motor operated potentiometer (M.O.P.) by setting this parameter.	0-1	0	Adv
	0 Disabled	ENTER Key Required	*Note: This feature cannot be used in conjunction with infinitely variable speed control.*		
	1 Enabled	ENTER Key Not Required			
O2-06	Oper Detection	If the digital operator is disconnected from the inverter. This parameter selects whether the inverter detects this condition. The operator is only detected when the inverter is being commanded locally.	0-1	1	Adv
	0 Disabled				
	1 Enabled				
O2-07	Elapsed Time Set	Viewable by U1-13	0–65535	0	Adv
O2-08	Elapsed Time Run	Defines the operation time that accumulates in the timer.	0-1	1	Adv
	0 Power-On Time				
	1 Running Time				
O2-10	Fan ON Time Set	Sets the initial fan operation timer value displayed in U1-40	0-65535	0	Adv

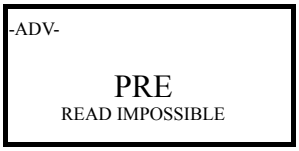
Clear History

Parameter Code	Display	Function	Range	Initial Value	Access Level
O3-01	Flt Trace Clear	Clears fault history	0 to 1	0	Adv
	0 Not Clear				
	1 Clear U2/U3				
O3-02	Count Hist Clear	Clears count history.	0 to 3	0	Adv
	0 Not Clear				
	1 AC Count Clr	Clears AC operations (U3-09).			
	2 OL/LC Count Clr	Clears OL/LC (U3-10).			
	3 Both Count Clr	Clears Both (U3-09 and U3-10).			

Copy Function

Parameter Code	Display	Function	Range	Initial Value	Access Level
O4-01	Copy Function Sel	Copy parameters to/from keypad	0-3	0	Adv
	0 Copy Select				
	1 Inv –> OP Read				
	2 OP –> Inv Write				
	3 OP <–> Inv Verify				
O4-02	Read Allowable	Enables/disables copy function	0-1	1	Adv
	0 Disabled				
	1 Enabled				

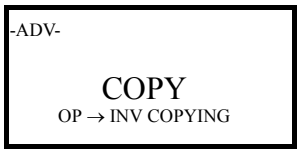
The digital operator has parameter COPY capabilities via built-in non-volatile memory. The digital operator can READ all of the parameters in the Drive and store them for later, and then WRITE back to the Drive or into a Drive with the same product code and software number. In order to read the parameter values and store them into the digital operator, select O4-02 = "1: Enabled". If you attempt to READ the data, which overwrites any previously stored data, without first setting O4-02 = "1: Enabled," you will get the following error:



After setting O4-02 = "1: Enabled," it is possible to store parameter values in the digital operator by setting O4-01 = 1 (INV → OP READ).

A successful READ of the parameter values will display:

An error may occur while saving the parameter values to the digital operator's memory. If an error is displayed, press any key to cancel the error display and return to parameter O4-01. Error displays and their meanings are covered in Chapter 6: Troubleshooting of the IMPULSE•G+ Series 3 Users Manual. To COPY the parameter values into a Drive, set O4-01 = 2 (OP → INV WRITE). During the writing of the parameter values into the Drive, the digital operator will display:



A successful COPY of the parameter values will display:

An error may occur while writing the parameter values to the Drive. If an error is displayed, press any key to cancel the error display and return to parameter O4-01. Error displays and their meanings are covered in Chapter 6: Troubleshooting of the IMPULSE•G+ Series 3.

It is possible to compare the parameter values stored in the digital operator with the parameter values currently in the Drive by using the VERIFY function. This VERIFY function should not be confused with the "-VERIFY-" that is displayed on the digital operator when viewing the "Modified Constants" menu. To VERIFY the parameter values in the Drive as compared with those stored in the digital operator, set O4-01 = 3 (OP ↔ INV VERIFY). During the comparing of the parameter values into the drive the digital operator will display:

A successful VERIFY of the parameter values will display:

If all the parameters stored in the digital operator do not match those programmed in the Drive, the digital operator displays the following:

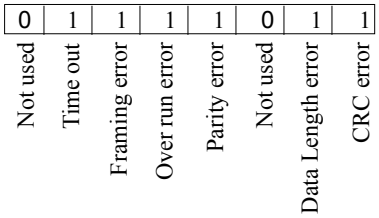
The digital operator will not display which parameters did not match, only that the verification found discrepancies in some parameter values.

NOTE: In order to properly use the COPY or VERIFY functions, the following Drive specifications must be identical between the Drive that the parameters were read from and the Drive that the parameters are written to:

Model Number (e.g. 4001-G+S3)
Software Number (e.g. 8001.x as known as FLASH ID)

Monitor Parameters

Parameter Code	Display	Function	Units
Monitor			
U1-01	Frequency Ref	Frequency Reference	Hz
U1-02	Output Frequency	Inverter Output Frequency	Hz
U1-03	Output Current	Inverter Output Current	A
U1-04	Control Method	Displays the value of A1-02	n/a
U1-05	Motor Speed	Motor Speed	Hz
U1-06	Output Voltage	Inverter Output Voltage (Reference)	V
U1-07	DC Bus Voltage	DC Bus Voltage (Measured)	V
U1-08	Output Hp	Inverter Output Power (Calculated)	HP
U1-09	Torque Reference	Torque Reference (Internal)	%
U1-10	Input Term Sts	Input Terminal Status (See figure 5-27 for a detailed description.)	--
U1-11	Output Term Sts	Output Terminal Status (See figure 5-27 for a detailed description.)	--
U1-12	Int Ctl Sts 1	Operation Status (See figure 5-27 for a detailed description.)	--
U1-13	Elapsed Time	Elapsed Time. See O2-07 and O2-08.	hrs
U1-14	Flash ID	Flash ROM software ID number	--
U1-15	Terminal A1 Level	External Terminal input level	V
U1-16	Terminal A2 Level	External Terminal input level	V/mA
U1-17	Terminal A3 Level	External Terminal input level	V
U1-18	Mot SEC Current	Motor secondary current (lq).	A
U1-19	Mot EXC Current	Motor excitation current (ld).	A
U1-20	SFS Output	Primary freq. after the SFS	Hz
U1-21	ASR Input	Monitors the input to the speed regulator. 100%=FMAX	%
U1-22	ASR Output	Monitors the output from the speed regulator. The motor's secondary current corresponds to 100%.	%
U1-23	PG-Z2 ch 2	Monitors the speed feedback from option card PG-Z2, channel 2 (when used)	Hz
U1-24	PID Feedback	PID feedback signal level	%
U1-25	G5IN4 Reference	See page 5-28.	Hex
U1-26	Voltage Reference (Vq)	Motor secondary voltage reference	V
U1-27	Voltage Reference (Vd)	Motor excitation voltage reference	V
U1-28	CPU ID	CPU software ID number	--
U1-30	SS Delta Speed	Snap Shaft Delta Speed between Ch1 and Ch 2 after gear ratio	Hz
U1-32	ACR (q) Output		%
U1-33	ACR (d) Output		%
U1-34	OPE Detected		const #
U1-35	Zero Servo Pulse	4 times pulses of movement during zero servo	--
U1-36	PID Input		%
U1-37	PID Output		%
U1-38	PID Set Point		%

Parameter Code	Display	Function	Units
U1-39	Transmit Error		--
U1-40	Fan Elapsed Time		hr
U1-41	Actual Fin Temp		°C
U1-49	Occupation Rate	CPU Utilization	%
U1-52	Maintenance Timer	Hours since last timer reset	hr
U1-60	PG CH1 Count	Displays the raw pulse count for PG Channel 1	pulses
U1-61	PG CH2 Count	Displays the raw pulse count for PG Channel 2	pulses
U1-66	BE6 Pulse Count	Displays the amount of shaft movement during the BE6 detection time	pulses

Fault Trace

U2-01	Current Fault	Displays the most current fault detected before being reset	--
U2-02	Last Fault	Displays most recent fault after being reset (same as U3-01)	--
U2-03	Frequency Reference	Freq ref when fault was detected	Hz
U2-04	Output Frequency	Output freq when fault was detected	Hz
U2-05	Output Current	Output current when fault was detected	A
U2-06	Motor Speed	Motor Speed when the “Last Fault” occurred	RPM
U2-07	Output Voltage	Output voltage when fault was detected	V
U2-08	DC Bus Voltage	DC Bus voltage when fault was detected	V
U2-09	Output kWatts	Output power when fault was detected	kW
U2-10	Torque Reference	Torque Reference when the “Last Fault” occurred	--
U2-11	Input Terminal Sts	Input terminal status when fault was detected	--
U2-12	Output Terminal Sts	Output terminal status when fault was detected	--
U2-13	Inverter Status	Inverter status before fault was detected	--
U2-14	Elapsed Time	Elapsed time when fault was detected	hrs

Fault History

U3-01	Last Fault	Displays most recent fault detected	--
U3-02	Fault Message 2	2nd most recent fault	--
U3-03	Fault Message 3	3rd most recent fault	--
U3-04	Fault Message 4	4th most recent fault	--
U3-05	Elapsed Time 1	Elapsed time of most recent fault	hrs
U3-06	Elapsed Time 2	Elapsed time of 2nd most recent fault	hrs
U3-07	Elapsed Time 3	Elapsed time of 3rd most recent fault	hrs
U3-08	Elapsed Time 4	Elapsed time of 4th most recent fault	hrs
U3-09	Fault Message 5	5th most recent fault	--
U3-10	Fault Message 6	6th most recent fault	--
U3-11	Fault Message 7	7th most recent fault	--
U3-12	Fault Message 8	8th most recent fault	--
U3-13	Fault Message 9	9th most recent fault	--
U3-14	Fault Message 10	10th most recent fault	--
U3-15	Elapsed Time 5	Elapsed time of 5th most recent fault	hrs

Parameter Code	Display	Function	Units
U3-16	Elapsed Time 6	Elapsed time of 6th most recent fault	hrs
U3-17	Elapsed Time 7	Elapsed time of 7th most recent fault	hrs
U3-18	Elapsed Time 8	Elapsed time of 8th most recent fault	hrs
U3-19	Elapsed Time 9	Elapsed time of 9th most recent fault	hrs
U3-20	Elapsed Time 10	Elapsed time of 10th most recent fault	hrs
U3-21	Accumulated Operations	Counts Fwd or Rev Run commands	--
U3-22	U3-21 Rollovers	Increments when U3-21 reaches 65535, U3-21 is then set to zero	--
U3-23	OL/LC Count	Counts OL1, OL2 and LC faults	--

Note: Faults such as CPF00, CPF01, CPF02, CPF03, UV1 and UV2 are not stored in fault history.

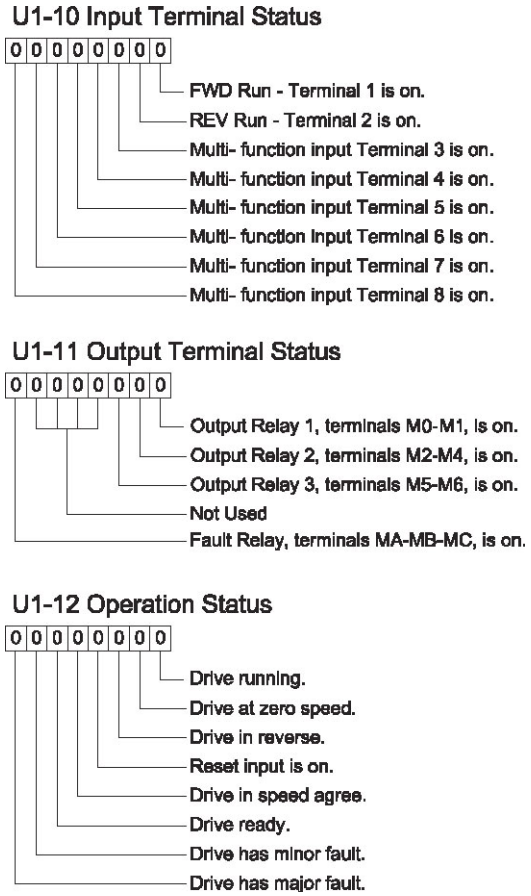


Figure 5-27: Status

c h a p t e r *6*

Troubleshooting IMPULSE•G+ Series 3

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Troubleshooting the Drive

In this troubleshooting section, "*check,"* means *investigating whether an item is functioning and in an acceptable physical condition, and then taking corrective action (adjusting, fixing, replacing, etc.) as necessary.* In the Corrective Action column, you may not have to perform all of the steps to correct the problem.

Maintenance and Inspection

This section describes basic maintenance and inspection procedures for the IMPULSE•G+Series 3.

Component	Check	Corrective Action
External terminals, connectors, mounting screws, etc.	Loose screws or connectors	Securely tighten.
Heatsink	Build-up of dust and dirt	Blow with dry, compressed air (57-86 psi).
Printed Circuit Board (PCB)	Accumulation of conductive dust or oil	Blow with dry, compressed air (57-86 psi). If dust and oil cannot be removed, replace the board.
Cooling Fan	Abnormal noise and vibration	Clean or replace the fan.
Power Components	Accumulation of dust or dirt	Blow with dry, compressed air (57-86 psi).

Alarm and Fault classes are described as follows:

- Major Fault: Brake is set, operation indicator lights flash, fault is displayed on keypad and fault contact output (terminals MA, MB, & MC) are activated. The reset key must be pressed, a multi-function input set for fault reset or power must be cycled in order to continue operation.
- Fault (minor): Brake is set, RUN Led flashes until run command is removed, fault is displayed on keypad, fault contact output (terminals MA, MB, & MC) are not activated. The reset key does not need to be pressed. The drive will attempt to run again at the next run command.
- Alarm (Warning): Operation continues, fault is displayed on the keypad, fault contact output (terminals MA, MB and MC) are not activated.

Motor Faults and Corrective Actions

Symptom	Corrective Action
Analog frequency reference is not stable. (drifting)	1. Stabilize the analog source. 2. Increase B2-02. 3. Increase B5-01, -02.
No motor rotation.	1. Verify that power is on (Charge LED). 2. Verify that the keypad display is not showing a fault. 3. Verify that the run command is input to the drive (U1-10). 4. Motor stalled due to excessive load.
Motor rotation is in the wrong direction.	1. Verify FWD/REV or UP/DN is correct at the interface card. 2. Match wiring to the phase order of the motor leads T1, T2, T3.

Symptom	Corrective Action
Motor rotates, but at minimum speed only.	1. Check wiring of speed inputs. 2. Verify speed reference setting (A1-04). 3. Verify reference and run source settings are correct (B3-01, -02). 4. Verify reference priority setting (B1-18).
Motor RPM too high or too low.	1. Compare motor nameplate specifications with E1 parameter. 2. Check maximum frequency setting (E1-04). 3. Check minimum frequency setting (E1-09).

Drive Faults, Alarms and Indicators

Fault Code	Fault or Indicator Name/Description	Corrective Action
BB (flashing) Base Block	**External Base Block Indicator.** The flashing base block signal is the result of a multi-function input in the terminal strip. The base block indicates that the drive's IGBTs have been disabled. The motor will begin coasting when the base block input is received. If a RUN command is still present when the BB signal is removed, the output voltage will be restored to the previous operating level and operation will continue at the previously commanded frequency.	1. Check constants H1-01 through H1-06 for proper programming. 2. Check terminal status. (U1-10)
BE0 (flashing) Brake Ans Lost	**Brake answer back signal is lost during run.** While running, the multi-function input brake answer back is lost.	1. Check brake answer back circuit. 2. Check terminal status. (U1-10)
BE4 (flashing) Brake Answer 1	**Brake Answer-Back, Brake not Released.** At Start, Brake Answer-back is not input within predetermined time (C8-04) after electric brake release command is output–Electric brake not released.	1. Check brake answer back circuit. 2. Increase the value of C8-04. 3. Check terminal status (U1-10).
BE5 (flashing) Brake Answer 2	**Brake Answer-Back At Stop.** At Stop, Brake Answer-back signal is not removed within predetermined time (C8-11) after electric brake release command is removed–Electric brake not closed.	1. Check brake answer back circuitries 2. Increase the value of C8-11 time.
BE7 Brake Welded	**Brake Answer-Back Major Fault.** At Power Up, Brake Answer-Back is on - Electric brake not closed.	1. Check if brake is closed. 2. Check brake answer back circuitry.
BUS Option Com Err	**Option Card Communication Error.** Communication to the option card was lost.	1. Check all connections.
CALL (flashing) SI-F/G Com Call	**Serial Communication Transmission Error.** Control data is not received correctly after power supply is turned ON for 2 sec.	1. Check serial device connections. 2. Ensure drive is properly programmed for serial communication.
Can't Run Drive not ready	**User is trying to give a run command without first Enable Drive Enable Multi-Function input or Fwd or Rev input are present at power up.**	1. Turn on Drive Enable Multi-function input 2. Check H1-01 to H1-06 programming 3. Change B3-10 to allow run at power up.
CE Memobus Com Err	**Communication Error.** Serial communications disruption.	1. Check serial connections (6 CN). 2. Check H5-01 through H5-05 for proper programming.
CF Control Fault	**Control Fault.** A torque limit was reached for 3 seconds or longer during deceleration while in open Loop Vector.	1. Perform auto tune. 2. Check motor parameters.

Fault Code	Fault or Indicator Name/Description	Corrective Action
CPF00 Com-Err (OP&INV)	**Control Circuit Fault 1— Keypad Transmission.** Because of external noise, excessive vibration or shock, or component failure (including RAM and PROM), one or both of the following occurs: • Transmission between the inverter and keypad cannot be established 5 sec after power-up. • External RAM of CPU is defective.	1. Check the keypad connection. 2. Replace keypad. 3. Replace Control board.
CPF01 Com-Err (OP&INV)	**Control Circuit Fault 2—Keypad Transmission.** After initial power-up, communication between the inverter and keypad was interrupted for more than 2 seconds.	1. Check keypad connection. 2. Cycle Power 3. Replace keypad 4. Replace Control board.
CPF02 BB Circuit Err	**Base Block Circuit Fault.** Base block circuit fault at power-up.	1. Cycle power. 2. Ensure that the control board terminals are shielded from electrical noise. 3. Replace Control board.
CPF03 EEPROM Err	**EEPROM Fault.** Invalid data found in the EEPROM.	1. Cycle power. 2. Ensure that the control board terminals are shielded from electrical noise. 3. Replace Control board.
CPF04 Internal A/D Err	**Internal A/D Converter Fault.** CPU internal analog-digital converter fault.	1. Cycle power. 2. Ensure that the control board terminals are shielded from electrical noise. 3. Replace Control board.
CPF05 External A/D Err	**External A/D Converter Fault.** CPU external analog-digital converter fault.	1. Cycle power. 2. Ensure that the control board terminals are shielded from electrical noise. 3. Replace Control board.
CPF06 Option Error	**Option Card Fault.** Optional card has disconnected or failed.	1. Power down. 2. Verify proper installation of all option cards.
CPF10 ASIC-ERR	**ASIC Version Fault 10.** .	1. Cycle power. 2. Replace the drive.
CPF20 Option A/D Error	**Control Circuit Fault 20 — AI-14.** Analog-to-digital converter fails or analog speed reference error.	1. Power down. 2. Verify proper installation of AI-14B. 3. Replace AI-14B card.
CPF21 Option CPU Down	**Control Circuit Fault 21 — CPU on Optional Card.** CPU on an installed optional card fails.	1. Power down. 2. Verify proper installation of Option card. 3. Replace card.
CPF22 Option Type Err	**Control Circuit Fault 22 — Optional Card Code.** Optional card code is not compatible with the inverter.	1. Power down. 2. Verify proper card. 3. Verify proper installation of Option card. 4. Replace card.
CPF23 Option DPRAM Err	**Control Circuit Fault 23 — DP-RAM.** DP-RAM on an installed optional card failed.	1. Power down. 2. Remove any inputs to card. 3. Verify proper installation of Option card. 4. Replace card.

Fault Code	Fault or Indicator Name/Description	Corrective Action
EF *(flashing)* External Fault	Both FORWARD/UP and REVERSE/DOWN commands are input at same time for 500 msec or longer.	1. Check control input wiring. 2. Check the sequence of operation.
EF0 Optional External Fault	External fault input from communication option card.	1. Check communication option card connection and signals.
EF3 External Fault 3	External fault occurs on Terminal S3.	1. Check constant H1-01 for proper programming. 2. Check the condition of the input terminal S3.
EF4 External Fault 4	External fault occurs on Terminal S4.	1. Check constant H1-02 for proper programming. 2. Check the condition of the input terminal S4.
EF5 External Fault 5	External fault occurs on Terminal S5 external control circuit.	1. Check constant H1-03 for proper programming. 2. Check the condition of the input terminal S5.
EF6 External Fault 6	External fault occurs on Terminal S6 external control circuit	1. Check constant H1-04 for proper programming. 2. Check the condition of the input terminal S6.
EF7 External Fault 7	External fault occurs on Terminal S7 external control circuit.	1. Check constant H1-05 for proper programming. 2. Check the condition of the input terminal S7.
EF8 External Fault 8	External fault occurs on Terminal S8 external control circuit.	1. Check constant H1-06 for proper programming. 2. Check the condition of the input terminal S8.
ERR EEPROM R/W Err	**EEPROM Read/Write Fault.** EEPROM internal data did not match when initializing the parameter.	1. Cycle Power. 2. User initialize (A1-05=1110). 3. Replace Control board.
KLX Klixon	Motor Thermal Overload Switch has opened.	1. Check motor for Overtemp. 2. Check Klixon Circuit.
GF Ground Fault	During operation, the inverter sums the currents of all three motor phases. Ideally, the sum should always equal zero. If the sum is greater than 50% of the inverter rated output current, a GF occurs.	1. Disconnect motor from drive and check it for shorts using a megger. 2. Ensure that R/C Surge Suppressors are used across all brake contactor coils to prevent disturbance by electrical transients.
LC Load Check Err	**Load Check Fault.** Load is greater than specified amount.	1. Reduce Load. 2. Check Load Check sequence set-up. (C5-XX).
LF Output Phase Loss	An open phase occurred at the inverter output.	1. Check for broken wires in output cable. 2. Check for open winding in the motor. 3. Check for loose terminals
LL1 *(flashing)* Lower Limit 1 Err	**Lower Limit 1—SLOW DOWN Indicator.** Lower Limit 1—SLOW DOWN is input (switch status is changed).	1. May not require corrective action. 2. Check the Limit Switches position. 3. Check the Limit Switches condition.
LL2 *(flashing)* Lower Limit 2 Err	**Lower Limit 2—STOP Indicator.** Lower Limit 2—STOP is input (switch status is changed).	1. May not require corrective action. 2. Check the Limit Switches position. 3. Check the Limit Switches condition.

Fault Code	Fault or Indicator Name/Description	Corrective Action
MNT Maintenance Reqd	**Maintenance Required Alert.** Running time has exceeded C12-05	1. Reset timer by MFI=5A or depress Mode/ Service key three times and enter within 2 seconds.
OC Over Current	Output current exceeds 200% of inverter rated output current.	1. Check for a phase-to-phase short in the motor or wiring using a megger. 2. Extend the acceleration/deceleration time. 3. Check torque limit setting.
OH (flashing) Heatsnk Over temp	**Overheat Pre-Alarm.** Heatsink is overheating. The temperature of the inverters heatsink exceeded the setting in L8-02.	1. The inverter cooling fan has stopped. 2. Reduce the ambient temperature.
OH1 Heatsink MaxTemp	**Overheat Fault.** There are two situations that result in an overheat fault. The first occurs when the measured heat sink exceeded 105°C. The second is a result of a fault in the internal 24VDC cooling fan.	1. Ensure that the heat sink cooling fans are functioning. 2. Ensure that the heat sink is free from dirt and debris. 3. Ensure that the inverter's ambient temperature is within specification. 4. Replace the 24VDC fan 5. Replace the heat sink thermistor(s)
OH2 (flashing) Overheat 2	**Overheat Alarm.** Signal is input by external terminal. H1-XX=39	
OH3 Motor Overheat 1	**Motor Overheating 1.** Thermistor analog input detected motor overheating. See L1-03	1. Check the motor rated current value, E2-01. 2. Increase cycle time or reduce the load.
OH4 Motor Overheat 2	**Motor Overheating 2.** Thermistor analog input detected motor overheating. See L1-04	
OL1 Motor Overloaded	**Motor Overload Fault.** Inverter output exceeded the motor overload level.	1. Ensure drive is programmed with proper motor full load Amps (E2-01). 2. Reduce the load.
OL2 INV Overload	**Inverter Overload Fault.** Inverter output exceeded the inverter overload level.	1. Reduce the load. 2. Extend the acceleration time.
OT1 Overtorque Det 1	**Overtorque Detection Level 1 Fault.** Defined by L6-02. Alarm defined by L6-01.	1. Check for proper programming for L6-XX constant.
OT2 Overtorque Det 2	**Overtorque Detection Level 2 Fault.** Defined by L6-05. Alarm defined by L6-04.	1. .Check for proper programming for L6-XX constant.
OPE01 kVA Selection	**kVA Setting Fault.** Inverter kVA setting range is incorrect.	1. Check 02-04 constant for proper kVA.
OPE02 Limit	**Setting Out of Range .** Parameter setting is out of range.	1. With the fault displayed on the keypad, press the DATA/ENTER key to reveal the "Out of Range" parameter via the U1-34 monitor. 2. Verify that E2-03 is < E2-01. 3. Verify E1-05 is within range. 4. Compare Modified constants with defaults. 5. Cycle Power.
OPE03 Terminal	**Multi-Function Input Setting Fault.** Set values other than "F" and "FF" are duplicated.	1. Check the settings for H1-01 to H1-06, verify that the same input is not used twice.
OPE05 Sequence Select	**Sequence Select Setting Fault.** B3-01=3 and no option is plugged in.	1. Check the function selection or plug in optional card.

Fault Code	Fault or Indicator Name/Description	Corrective Action
OPE07 Analog Selection	**Multi-Function Analog Input Setting Fault.** H3-05 and H3-09 multi-Function analog input settings are set to the same value.	1. Check the function selections.
OPE08 Terminal	**Selection Parameter error.** A parameter has been changed that is not available in the present control method.	1. Undo the last parameter change (if known) 2. Scroll through modified constants for obvious setting errors. 3. Perform a user initialize (A1-05=1110) **CAUTION: All settings will be restored to the factory defaults.**
OPE10 V/F Ptrn Setting	**V/F Parameter Setting Error.**	1. Check Parameters E1-04 to E1-11.
OPE11 Carrier Frq/On-Delay	**Carrier Frequency Parameter Error.**	1. Check Parameters D10-01 to D10-05.
OPE17 Pwr Sel (L2-01)	**Stopping Method is not Ramp to Stop When L2-01>0.**	1. Satisfy condition
OPE19 Stp-Mthd & Ctrl	**Incompatible Setting of Stopping Method and Control Method.**	1. Satisfy B3-03 $\geq$ 6 and A1-02 $\leq$ 1.
OPE22 Ctrl & Motion	**Incompatible Setting of Motion and Control Mode.**	1. Satisfy A1-02 $\leq$ 1 and A1-03 $\geq$ 2.
OPE23 Load Check	**Check C5-04 $\leq$ C5-07 $\leq$ C5-09.**	1. Load Check setting error.
OPR Oper Disconnect	**Keypad Disconnected.** The keypad is removed while the inverter is running, and the run command was initiated via the keypad RUN key.	1. Secure the keypad. 2. Verify O2-06 setting.
OV DC Bus Overvolt	**Overvoltage Fault.** The main circuit direct current voltage exceeded the overvoltage level. Detection level: 230V class—approx. 400VDC 460V class—approx. 800VDC	1. Extend the deceleration time. 2. Check for proper DBU operation. 3. Check the resistor. 4. Check the line voltage.
OV (flashing) DC Bus Overvolt	**Overvoltage Fault.** Overvoltage occurs during stop. Main circuit DC voltage rises above the detection level while the drive output is off. Detection level: 410V or more for 230V, 820V or more for 460V.	1. Check the line voltage.
PF Input Pha Loss	**Input Phase Loss Fault.** Inverter input power supply has open phase.	1. Check the line voltage. 2. Remove power. 3. Retighten the input terminal screws. 4. Check line fuses.

Fault Code	Fault or Indicator Name/Description	Corrective Action
PUF DC Bus Fuse Open	**DC Bus Fuse Open Fault.** The DC fuse is open.	1. Check for damaged transistor. 2. Check load-side short circuit. 3. Check grounding. *Do not replace an open DC bus fuse until the cause of failure has been corrected; non-warranty, damage to the drive may result. Refer to the "Power Section Check".*
RR DynBrk Transistr	**Braking Transistor Fault.** Internal Braking transistor failed.	1. Verify that the external braking resistor is connected to the proper terminals. 2. Confirm that the proper resistor is installed. 3. Check for a short circuit across the braking resistor.
SC Short Circuit	**Short Circuit Fault.** The inverter has detected an output short circuit condition.	1. Disconnect the motor from the inverter. 2. Check for a short circuit in the motor or wiring using a megger.
SVE Zero Servo Fault	**Zero-Servo Fault.**	1. Check Zero-Servo sequence set-up.
UL1 Upper Limit 1 Err	**Upper Limit 1—SLOW DOWN Indicator.** Upper Limit 1—SLOW DOWN switch status is changed.	1. May not require corrective action. 2. Check the limit switches location. 3. Check the limit switches condition.
UL2 Upper Limit 2 Err	**Upper Limit 2—STOP Indicator.** Upper Limit 2—STOP switch status is changed.	1. May not require corrective action. 2. Check the limit switches location. 3. Check the limit switches condition.
UL3 Upper Limit 3 Err	**Upper Limit 3—Weighted STOP Indicator.** Upper Limit 3—Weighted STOP switch status is changed**.**	1. Check Upper Geared Limit Stop for failure. 2. Check Weighted Limit Switch Circuit. 3. Check Limit switch position and condition.
UT1 Undertorque Det 1	**Undertorque Detection 1.** The current is less than L6-02 for more than L6-03**.**	1. Check settings. 2. Check motor coupling.
UT2 Undertorque Det 2	**Undertorque Detection 2.** The current is less than L6-05 for more than L6-06**.**	1. Check settings. 2. Check motor coupling.
UV DC Bus Undervolt	**Undervoltage Fault.** Undervoltage status occurs for more than 2 sec during STOP. Input voltage drops below 190V DC or less for 230V AC class, 380V DC or less for 460V AC class.	1. Check the power source wiring. 2. Replace any bad branch fuses. 3. Check collector system.
UV1 DC Bus Undervolt	**Undervoltage 1 Fault.** Undervoltage status occurs for more than 2 sec during RUN command. Input voltage drops below 190V DC or less for 230V AC class, 380V DC or less for 460V AC class.	1. Check power supply wiring. 2. Correct the line voltage. 3. Check collector system.
UV2 CTL PS Undervolt	**Undervoltage 2 Fault.** The inverter detected a loss of the 24V logic power supply voltage.	1. Check power supply wiring. 2. Correct the line voltage. 3. Check collector system.
UV3 MC Answerback	**MC Fault.** The pre-charge contactor opened during operation.	1. Check power supply wiring. 2. Correct the line voltage. 3. Check collector system. 4. Wait 30-45 seconds before restarting drive after auto shut down.

Fault Display and Corrective Actions at Auto-tuning

The following are fault displays and corrective actions at auto-tuning. If any of the following faults are found, the digital operator displays that fault contents; the motor coasts to stop if it is under operation. Fault contact output or minor fault contact output does not operate.

Fault Display	Fault or Indicator Name/Description	Corrective Action
Er-01 Fault	**Motor Data Fault**. Motor data input fault for auto-tuning. Relationship between motor output and motor rated current fault. Relationship between input motor rated current and set no-load current fault (at vector control mode and line-to-line resistance tuning.)	• Check input data. • Check inverter and motor capacity • Check motor rated current and no-load current.
Er-02 Minor Fault	**Alarm**. The minor fault is detected during auto-tuning.	• Check input data. • Check wirings • Check load.
Er-03 STOP Key	**STOP Key Input**. The stop key is pressed during auto-tuning.	•
Er-04 Resistance	**Line to Line Resistance Fault**. Auto-tuning is not completed within the expected time. The auto-tuning is outside the parameter setting.	• Check input data. • Check motor wiring. • If a motor and a load are connected, disconnect the motor from machinery system.
Er-05 No-Load Current	**No-load Current Fault.** Auto-tuning is not completed within the expected time. The auto-tuning is outside the parameter setting.	
Er-08 Rated Slip	**Rated Slip Faul**t. Auto-tuning is not completed within the expected time. The auto-tuning is outside the parameter setting.	
Er-09 Accelerate	**Acceleration Fault**. The motor did not accelerate at the expected time.	• Increase B5-01 (acceleration time). • If C7-01 and C7-02 (torque limit value) are decreased, increase values. • If a motor and a load are connected, separate the motor from the load.
Er-11 Motor Speed	**Motor Speed Fault (Rotation type tuning only).** The motor speed was over 100% at auto-tuning (vector control without PG only).	• Increase B5-01 (acceleration time). • If a motor and a load are connected, separate the motor from the load.
Er-12 I.det.Circuit	**Current Detection Fault.** Current exceeded the motor rated current.	• Release brake. • Check for open motor lead.
Er-13 Leakage Inductance	**Leakage Inductance Fault**. Auto-tuning did not finish within the set time.	• Check the T1 parameters. • Check motor wiring.
End 1 V/F Oversetting	**Excess V/F setting * (Rotation type tuning only).** The torque reference exceeded 100% and no load current exceeded 70%.	• Check the T1 parameters. • Disconnect the motor from the load.
End 2 Saturation	**Motor Iron Core Saturation Coefficient Fault (Rotation type tuning only)** Since the motor iron core saturation coefficient could not be auto-tuned within the set time, tentative value is set in the iron core saturation coefficient**.**	• Check the T1 parameters. • Check motor wiring. • Disconnect the motor from the load
End 3 Rated FLA Alm	**Rated Current Set Alarm**. Motor current during tuning was greater than the set value.	• Check E2-01.

*NOTE: * Excessive V/F set value, motor iron core saturation coefficient fault, and rated current set alarm are displayed after the auto tuning is completed.*

Power Section Check

WARNING

Do NOT touch any circuit components while AC main power is on or immediately after the main AC power is disconnected from the unit. You must wait until the red "CHARGE" lamp is extinguished. It may take as long as 10 minutes for the charge on the main DC bus capacitors to drop to a safe level. Failure to adhere to this warning could result in serious injury.

Power Off Checks

To perform a power section check, remove the drives main and control wiring from the terminal strips. Obtain reading as specified in the table on the next page, and ensure that the reading falls within the normal reading range.

Test equipment - Analog Ohmmeter set R x 1 scale or digital multimeter set to the diode check.

Device	VOM (on RX1 Scale)		Normal Reading (Analog Meter)	Normal Reading (Digital Meter)
	Positive Lead	Negative Lead		
Input Rectifier Bridge *1	L1	+	7–100Ω	Approximately 0.5 V
	L2	+		
	L3	+		
	–	L1		
	–	L2		
	–	L3		
	L1	–	Infinite Ω	OL Displayed
	L2	–		
	L3	–		
	+	L1		
	+	L2		
	+	L3		
Bus Capacitors	+	–	Observe gradually increasing resistance	Observe gradually increasing voltage to OL
Pre-charge Resistor	–	Across the Resistors	100 Ω or less	–
Output Transistors *2 *3	T1	+	7-100 Ω	Approximately 0.5V
	T2	+		
	T3	+		
	–	T1		
	–	T2		
	–	T3		
	T1	–	Infinite Ω	OL Displayed
	T2	–		
	T3	–		
	+	T1		
	+	T2		
	+	T3		
Braking Diode (2006–2033) (4001–4039)	B2	B1	10 Ω	0.5 V
	B1	B2	Infinite Ω	OL Displayed
	B2	–	Infinite Ω	OL Displayed
	–	B2	Infinite Ω	OL Displayed

1. "+" could be any one of three (+) terminals which are labeled as ⊕1, ⊕2, and ⊕3.
2. If the bus fuse is blown you must install a jumper across the fuse terminals to get accurate resistance measurements.
3. If the pre-charge resistor is open, you will read infinite Ω between + and any output terminal unless you install a temporary jumper across the resistor.

Braking Circuit

Test Equipment - Analog Ohmmeter set to R X 1 scale or digital multimeter set to the diode check.

Step No.	Ohmmeter Positive Lead	Ohmmeter Negative Lead	Expected Reading (Analog Meter)	Expected Reading (Digital Meter)
1	Connect to B2	Connect to B1	10 Ohms	0.5 Volts
2	Connect to B1	Connect to B2	Infinite Ohms	0L displayed
3	Connect to B2	–	Infinite Ohms	0L displayed
4	–	Connect to B2	Infinite Ohms	0L displayed

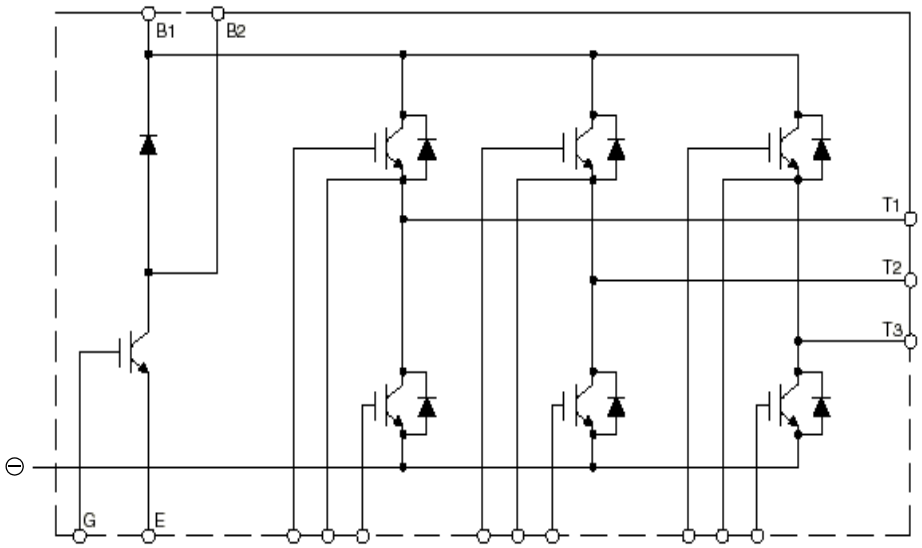

Figure 6-1

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appendix A

IMPULSE•G+ Series 3
Parameter Listing

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IMPULSE•G+ Series 3 Parameter Listing

No.	Parameter Name.	Factory	Ref Page#.
A1-01	Access Level	2	4-9
A1-02	Control Method	2	4-9
A1-03	Motion	1	4-10
A1-04	Speed Ref	1	4-10
A1-05	Initialize Parameters	0	4-13
A1-06	Password 1	0	4-13
A1-07	Select Password 1	0	4-13
A2-01 to A2-32	User Parameters	--	4-13
B1-01	Reference 1	15.00*	5-3
B1-02	Reference 2	30.00*	5-3
B1-03	Reference 3	60.00*	5-3
B1-04	Reference 4	0.00*	5-3
B1-05	Reference 5	0.00*	5-3
B1-06	Reference 6	0.00*	5-3
B1-07	Reference 7	0.00*	5-3
B1-08	Reference 8	0.00*	5-3
B1-09	Reference 9	0.00*	5-3
B1-10	Reference 10	0.00*	5-3
B1-11	Reference 11	0.00*	5-3
B1-12	Reference 12	0.00*	5-3
B1-13	Reference 13	0.00*	5-3
B1-14	Reference 14	0.00*	5-3
B1-15	Reference 15	0.00*	5-3
B1-16	Reference 16	0.00*	5-3
B1-17	Jog Reference	6.00*	5-3
B1-18	Ref Priority	0*	5-3
B2-01	Ref Upper Limit	100.0*	5-5
B2-02	Ref Lower Limit	0.0	5-5
B2-03	Ref 1 Lower Limit	2.0*	5-5
B2-04	Alt Upper Limit	100.0	5-5
B3-01	Reference Source	1	5-6
B3-02	Run Source	1	5-6
B3-03	Stopping Method	1*	5-7
B3-04	Reverse Motor Direction	0	5-9
B3-06	Control Input Scans	1	5-10
B3-07	Local/Remote Run Select	0	5-10
B3-08	Run Command at Program	0	5-10
B3-10	Allow Run at Power Up	0	5-10
B4-01	MOP Ref Memory	0	5-10

* Initial value is determined by X-Press Programming.

** Initial value is dependent on drive size, which is determined by O2-04 (kVA Selection).

*** Value is automatically set during auto-tuning

No.	Parameter Name.	Factory	Ref Page#.
B4-02	Trim Control Level	10	5-11
B5-01	Acceleration Time 1	5.0*	5-12
B5-02	Deceleration Time 1	3.0*	5-12
B5-03	Acceleration Time 2	2.0	5-12
B5-04	Deceleration Time 2	2.0	5-12
B5-05	Acceleration Time N Change	2.0	5-13
B5-06	Deceleration Time N Change	2.0	5-13
B5-08	Fault Stop Time	0.5	5-13
B5-09	Accel/Decel Units	1	5-13
B5-10	Accel/Decel Switch Freq	120.0	5-13
B5-11	Switch Freq Compare	1	5-13
B5-12	Accel Time 3	3.0	5-13
B5-13	Decel Time 3	3.0	5-13
B5-14	Accel Time 4	3.0	5-13
B5-15	Decel Time 4	3.0	5-13
B6-01	Speed Search Enable/Disable	2	5-14
B6-02	Speed Search Current	120	5-14
B6-03	Speed Search Decel Time	2.0	5-14
B6-05	Speed Search delay	0.2	5-14
B6-10	Search Detection Gain	1.10	5-14
B6-14	Bidirectional Search	1	5-14
B8-01	Jump Frequency 1	0.0	5-15
B8-02	Jump Frequency 2	0.0	5-15
B8-03	Jump Frequency 3	0.0	5-15
B8-04	Jump Bandwidth	1.0	5-15
C1-01	Quick Stop Enable/Disable	0*	5-17
C1-02	Quick Stop Time	1.0	5-17
C1-03	Reverse Plug Enable/Disable	0	5-18
C1-04	Reverse Plug Decel Time	2.0	5-18
C1-05	Reverse Plug Accel Time	2.0	5-18
C2-01	Micro Speed Gain 1	1.00	5-19
C2-02	Micro Speed Gain 2	1.00	5-19
C3-01	Upper Limit 1 Speed	6.00	5-20
C3-02	Upper Limit 1 Decel Time	1.0	5-20
C3-03	Upper Limit 2 Decel Time	1.0	5-20
C3-04	Lower Limit 1 Speed	6.00	5-20
C3-05	Lower Limit 1 Decel Time	1.0	5-20
C3-06	Lower Limit 2 Decel Time	1.0	5-20
C3-07	Stopping Method @ LL2/UL2	2*	5-20
C3-08	UL3 Stopping Method	4	5-20
C3-09	Phantom Stopping Method	1	5-20
C3-11	Klixon Action	0	5-20

* Initial value is determined by X-Press Programming.

** Initial value is dependent on drive size, which is determined by O2-04 (kVA Selection).

*** Value is automatically set during auto-tuning

No.	Parameter Name.	Factory	Ref Page#.
C5-01	Load Check Enable/Disable	0	5-22
C5-02	Load Check Alarm Action	4	5-22
C5-03	Min Torque Reference	60%	5-22
C5-04	Look Speed 1	6	5-22
C5-05	Current/Torque Reference for Look Speed 1	160	5-22
C5-07	Look Speed 2	20	5-22
C5-08	Current/Torque Reference for Look Speed 2	160	5-22
C5-09	Look Speed 3	40	5-22
C5-10	Current/Torque Reference for Look Speed 3	160	5-22
C5-11	Current Ref for > Look Speed 3	160	5-22
C5-12	Load Check Setting Time	1.00	5-22
C5-13	Load Check Test Time	0.25	5-23
C5-14	Load Check Fault Speed	6.0	5-23
C6-01	Ultra Lift Enable/Disable	0	5-24
C6-02	Ultra Lift Forward Speed	60	5-24
C6-03	Ultra Lift Reverse Speed	60	5-24
C6-04	Ultra Lift Forward Torque	50	5-24
C6-05	Ultra Lift Reverse Torque	30	5-24
C6-06	Ultra Lift Enabling Speed	59.0	5-24
C6-07	Ultra Lift Delay Time	2.0	5-24
C6-08	SFS Acceleration Gain	1.0	5-24
C7-01	Forward Torque Limit	150	5-26
C7-02	Reverse Torque Limit	150	5-26
C7-03	Forward Regen Torque Limit	180	5-26
C7-04	Reverse Regen Torque Limit	180	5-26
C7-05	Torque Limit Gain by MFI	1.25	5-26
C8-04	Roll Back/BE4 Timer	0.30	5-27
C8-11	Brake Delay Time/BE5 Timer	0.7	5-27
C9-01	G5IN4 Enable/Disable	0	5-28
C9-02	G5IN4 Setup	0	5-28
C9-03	DIO Terminal 1	0F	5-28
C9-04	DIO Terminal 2	0F	5-28
C9-05	DIO Terminal 3	0F	5-28
C9-06	DIO Terminal 4	0F	5-28
C9-07	DIO Terminal 5	0F	5-28
C9-08	DIO Terminal 6	0F	5-28
C9-09	DIO Terminal 7	0F	5-28
C9-10	DIO Terminal 8	0F	5-28
C9-11	DIO Terminal 9	0F	5-28
C9-12	DIO Terminal 10	0F	5-28
C10-01	Load Weight Enable/Disable	0	5-32
C10-03	Load Weight Display Hold	0	5-32

* Initial value is determined by X-Press Programming.

** Initial value is dependent on drive size, which is determined by O2-04 (kVA Selection).

*** Value is automatically set during auto-tuning

No.	Parameter Name.	Factory	Ref Page#.
C10-08	Weight Limit Output	125	5-32
C12-01	Brake Jog Delay	0.0	5-33
C12-02	Brake Run Delay	0.0	5-33
C12-03	Delay-ON Timer	0.0	5-33
C12-04	Delay-OFF Timer	0.0	5-33
C12-05	Maintenance Timer	0	5-34
C12-06	Maintenance Speed Gain	0.5	5-34
C13-01	Inch Run Time	1.00	5-35
C13-02	Repeat Delay Timer	1.00	5-35
D1-01	DC Injection Start Frequency	0.5	5-36
D1-02	DC Injection Current	50	5-36
D1-03	DC Injection Time @ Start	0.00	5-36
D1-04	DC Injection Time @ Stop	0.05	5-36
D2-01	Slip Compensation Gain	1.0/0	5-37
D2-02	Slip Compensation Time	200/2000	5-37
D2-03	Slip Compensation Limit	200	5-37
D2-04	Slip Compensation during regen	0	5-37
D2-05	Slip Compensation at V/F Setting	0	5-37
D3-01	Torque Compensation Gain	1.00	5-38
D3-02	Torque Compensation Time	20/200	5-38
D3-03	FWD Compensation at Start	0.0	5-38
D3-04	REV Compensation at Start	0.0	5-38
D3-05	Torque Compensation Delay	10	5-38
D4-01	ASR P Gain 1	30	--
D4-02	ASR I Time 1	0.500	--
D4-03	ASR P Gain 2	30	--
D4-04	ASR I Time 2	0.100	--
D4-05	ASR Limit	5.0	--
D8-01	Dwell Reference @ Start	0.0	5-39
D8-02	Dwell Time @ Start	0.0	5-39
D8-03	Dwell Reference @ Stop	0.0	5-39
D8-04	Dwell Time @ Stop	0.0	5-39
D9-01	S-Curve Accel @ Start	0.5*	5-40
D9-02	S-Curve Accel @ End	0.5*	5-40
D9-03	S-Curve Decel @ Start	0.5*	5-40
D9-04	S-Curve Decel @ Stop	0.20	5-40
D11-01	Hunt Prevention Select	1	5-41
D11-02	Hunt Prevention Gain	1.00	5-41
E1-01	Input Voltage	230/460**	5-42
E1-03	V/F Selection	0A	5-46
E1-04	Max Frequency	60.0	5-46
E1-05	Max Voltage	460	5-46

* Initial value is determined by X-Press Programming.

** Initial value is dependent on drive size, which is determined by O2-04 (kVA Selection).

*** Value is automatically set during auto-tuning

No.	Parameter Name.	Factory	Ref Page#.
E1-06	Base Frequency	60	5-46
E1-07	Mid Frequency A	3.0	5-46
E1-08	Mid Voltage A	30.0	5-46
E1-09	Min Frequency	1.5	5-46
E1-10	Min Voltage	20.6	5-46
E1-11	Mid Frequency B	0.0	5-46
E1-12	Mid Voltage B	0.0	5-46
E1-13	Base Voltage	0.0	5-46
E2-01	Motor Rated Full Load Amps	**	5-47
E2-02	Motor Rated Slip	**	5-47
E2-03	No load current	**	5-47
E2-04	Number of Poles	4	5-47
E2-05	Terminal Resistance	**	5-47
E2-06	Leakage Inductance	**	5-47
E2-07	Saturation Compensation 1	**	5-47
E2-08	Saturation Compensation 2	**	5-47
E2-09	Mechanical Loss	0.0	5-47
E2-11	Motor Rated Power	**	5-47
E3-01	Motor 2 Control Method	0	5-48
E3-02	Motion 2	1	5-48
E3-03	Motor 2 Max Frequency	60.0	5-48
E3-04	Motor 2 Max Voltage	230.0	5-48
E3-05	Motor 2 Base Frequency	60.0	5-48
E3-06	Motor 2 Mid Frequency	3.0	5-48
E3-07	Motor 2 Mid Voltage	17.2	5-48
E3-08	Motor 2 Min Frequency	1.5	5-48
E3-09	Motor 2 Min Voltage	10.3	5-48
E4-01	Motor 2 FLA	**	5-49
E4-02	Motor 2 Slip	**	5-49
E4-03	Motor 2 NLA	**	5-49
E4-04	Motor 2 Poles	4	5-49
E4-05	Motor 2 Term Resistance	**	5-49
E4-06	Motor 2 Leak Inductance	**	5-49
E4-07	Motor 2 Rated Power	**	5-49
F2-01	AI-14 Input Select	0	5-51
F3-01	Digital Input Setup	7	5-51
F4-01	Analog Out Channel 1 Select	2	5-52
F4-02	Analog Out Channel 1 Gain	100	5-52
F4-03	Analog Out Channel 2 Select	3	5-52
F4-04	Analog Out Channel 2 Gain	50	5-52
F4-05	Analog Out Channel 1 bias	0.0	5-52
F4-06	Analog Out Channel 2 bias	0.0	5-52

* Initial value is determined by X-Press Programming.

** Initial value is dependent on drive size, which is determined by O2-04 (kVA Selection).

*** Value is automatically set during auto-tuning

No.	Parameter Name.	Factory	Ref Page#.
F4-07	Channel 1 output signal	0	5-53
F4-08	Channel 2 output signal	0	5-53
F5-01	Digital Out Channel 1 Select	F	5-53
F5-02	Digital Out Channel 2 Select	F	5-53
F5-03	Digital Out Channel 3 Select	F	5-53
F5-04	Digital Out Channel 4 Select	F	5-53
F5-05	Digital Out Channel 5 Select	F	5-53
F5-06	Digital Out Channel 6 Select	F	5-53
F5-07	Digital Out Channel 7 Select	F	5-53
F5-08	Digital Out Channel 8 Select	F	5-53
F5-09	Do Output Mode	2	5-53
F6-01	Com Fault Stop Method	1	5-55
F6-02	Option External Fault (EFO) Detection	0	5-55
F6-03	Option External Fault (EFO) Action	1	5-55
F6-05	Current Unit Selection	0	5-55
H1-01	Terminal 3 Select	0*	5-56
H1-02	Terminal 4 Select	1*	5-56
H1-03	Terminal 5 Select	F*	5-56
H1-04	Terminal 6 Select	F*	5-56
H1-05	Terminal 7 Select	F*	5-56
H1-06	Terminal 8 Select	F*	5-56
H2-01	Terminal M0/M1 Select	0*	5-60
H2-02	Terminal M2/M3/M4 Select	F*	5-60
H2-03	Terminal M5/M6 Select	F*	5-60
H3-01	Terminal A1 Signal	0*	5-65
H3-02	Terminal A1 Gain	100.0	5-65
H3-03	Terminal A1 Bias	0.0	5-65
H3-04	Terminal A3 Signal	0	5-65
H3-05	Terminal A3 Select	1F*	5-65
H3-06	Terminal A3 Gain	100.0	5-65
H3-07	Terminal A3 Bias	0.0	5-65
H3-08	Terminal A2 Signal	2	5-66
H3-09	Terminal A2 Select	0	5-66
H3-10	Terminal A2 Gain	100.0	5-66
H3-11	Terminal A2 Bias	0.0	5-66
H3-12	Filter Average Time	0.00	5-66
H4-01	Terminal FM Select	2	5-67
H4-02	Terminal FM Gain	100.0	5-67
H4-03	Terminal FM Bias	0.0	5-67
H4-04	Terminal AM Select	3	5-68
H4-05	Terminal AM Gain	50.0	5-68
H4-06	Terminal AM Bias	0.0	5-68

* Initial value is determined by X-Press Programming.

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*** Value is automatically set during auto-tuning

No.	Parameter Name.	Factory	Ref Page#.
H4-07	Analog Out Level Select 1	0	5-68
H4-08	Analog Out Level Select 2	0	5-68
H5-01	Serial Comm Address	1F	5-69
H5-02	Serial Baud Rate	3	5-69
H5-03	Serial Communication Parity	0	5-69
H5-04	Action @ Serial Fault Select	1	5-69
H5-05	Serial Fault Enable/Disable	1	5-69
H5-06	Transmit Wait Time	5	5-69
H5-07	RTS Control Select	1	5-69
H6-01	Pulse Input Select	0	5-70
H6-02	Pulse Input Scaling	1440	5-70
H6-03	Pulse Input Gain	100.0	5-70
H6-04	Pulse Input Bias	0.0	5-70
H6-05	Pulse Input Filter	0.10	5-70
H6-06	Pulse Input Select	2	5-70
H6-07	Pulse Input Scale	1440	5-70
L1-01	Motor Overload Fault Select	3	5-71
L1-02	Motor Overload Time Constant	8.0	5-71
L1-03	Motor Overheat Alarm Select	3	5-72
L1-04	Motor Overheat Fault Select	2	5-72
L1-05	Motor Temperature Input Filter	0.20	5-72
L2-01	Power Loss Ride Thru Enable/Disable	0	5-72
L2-02	Power Loss Ride Thru Time	**	5-72
L2-03	Power Loss Base Block Time	**	5-72
L2-04	Power Loss Voltage Recovery Time	**	5-72
L2-05	Under Voltage Fault Level	190/380**	5-72
L3-01	Stall Prevention - Accel Enable/Disable	1	5-73
L3-02	Stall Level During Accel	150	5-73
L3-03	Stall Prevention Limit	50	5-75
L3-05	Stall Prevention - Run Enable/Disable	1	5-76
L3-06	Stall Level During Run	160	5-77
L4-01	Speed Agree Level	0.0	5-78
L4-02	Speed Agree Width	2.0	5-78
L4-03	Speed Agree Level +/-	0.0	5-78
L4-04	Speed Agree Width +/-	2.0	5-78
L6-01	Torque Detection 1 Select	0	5-79
L6-02	Torque Detection 1 Level	150	5-80
L6-03	Torque Detection1 Time	0.1	5-80
L6-04	Torque Detection 2 Select	0	5-81
L6-05	Torque Detection 2 Level	150	5-81
L6-06	Torque Detection 2 Time	0.1	5-81
L8-02	Over Heat Pre-Alarm Level	95**	5-82
L8-03	Over Heat Pre-Alarm Select	4	5-82

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*** Value is automatically set during auto-tuning

No.	Parameter Name.	Factory	Ref Page#.
L8-05	Input Phase Loss Detection	1	5-82
L8-07	Output Phase Loss Detection	2	5-82
L8-09	Ground Fault Detection	1	5-82
L8-10	Fan on/off Selection	0	5-82
L8-11	Fan Delay Time	60	5-82
L8-12	Ambient Temperature	45	5-82
L8-15	OL2 Selection at Low Speed	0	5-82
L8-18	Software Current Limit	1	5-82
L9-01	Auto Reset Enable/Disable	1	5-83
L9-02	Reset Attempts	3	5-83
L9-03	Reset Time	0.5	5-83
L9-04	Reset Fault Select 1	0001	5-83
L9-05	Reset Fault Select 2	E000	5-83
L9-06	Fault Contact Operation at Reset	0	5-83
O1-01	User Monitor Select	6	5-85
O1-02	Power On Monitor	2	5-86
O1-03	Display Scaling	0	5-86
O1-04	Display Units	0	5-86
O1-05	LCD Contrast	3	5-86
O2-01	Mode/Service Key	0	5-87
O2-02	Operator Stop Key	0	5-87
O2-03	User Defaults	0	5-87
O2-04	Drive Model #	**	5-87
O2-05	Operator MOP	0	5-88
O2-06	Operator Detection	1	5-88
O2-07	Elapsed Time Set	0	5-88
O2-08	Elapsed Time Run	1	5-88
O2-10	Fan on Time Setting	0	5-88
O3-01	Fault Trace Clear	0	5-89
O3-02	Count History Clear	0	5-89
O4-01	Copy Function Select	0	5-89
O4-02	Copy Function enable/disable	1	5-89
T1-00	Select Motor	1	4-14
T1-01	Tuning Mode Sel	0	4-14
T1-02	Mtr Rated Power	--	4-14
T1-03	Rated Voltage	--	4-14
T1-04	Rated Current	--	4-14
T1-05	Rated Frequency	60.0	4-14
T1-06	Number of Poles	4	4-14
T1-07	Rated Speed	1750	4-14
T1-08	PG Pulses/Rev	1024	4-14
U1-01	Frequency Reference	--	5-92

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*** Value is automatically set during auto-tuning

No.	Parameter Name.	Factory	Ref Page#.
U1-02	Output Frequency	--	5-92
U1-03	Output Current	--	5-92
U1-04	Control Method	--	5-92
U1-05	Motor Speed	--	5-92
U1-06	Output Voltage	--	5-92
U1-07	DC Bus Voltage	--	5-92
U1-08	Output Hp	--	5-92
U1-09	Torque Reference	--	5-92
U1-10	Input Terminal Status	--	5-92
U1-11	Output Terminal Status	--	5-92
U1-12	Inverter Control Status 1	--	5-92
U1-13	Elapsed Time	--	5-92
U1-14	Flash ROM Software ID Number and Revision	--	5-92
U1-15	Terminal A1 Level	--	5-92
U1-16	Terminal A2 Level	--	5-92
U1-17	Terminal A3 Level	--	5-92
U1-18	Motor Secondary Current	--	5-92
U1-19	Motor Excitation Current	--	5-92
U1-20	SFS Output	--	5-92
U1-21	ASR Input	--	5-92
U1-22	ASR Output	--	5-92
U1-23	PG Channel 2 Speed	--	5-92
U1-24	PID Feedback	--	5-92
U1-25	G5IN4 Monitor	--	5-92
U1-26	Voltage Reference (Vq)	--	5-92
U1-27	Voltage Reference (Vd)	--	5-92
U1-28	CPU ID	--	5-92
U1-29	Load Weight	--	--
U1-30	Snap Shaft Delta Speed	--	5-92
U1-32	ACR (q) Output	--	5-92
U1-33	ACR (d) Output	--	5-92
U1-34	OPE Detected	--	5-92
U1-35	Zero Servo Pulses	--	5-92
U1-36	PID Input	--	5-92
U1-37	PID Output	--	5-92
U1-38	PID Setpoint	--	5-92
U1-39	Communication Transmit Error	--	5-93
U1-40	Fan Elapsed Time	--	5-93
U1-41	Actual Heat Sink Temperature	--	5-93
U1-44	ASR out w/o Filter	--	--
U1-49	CPU Utilization Rate	--	5-93
U1-50	Hook Height	--	--

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*** Value is automatically set during auto-tuning

No.	Parameter Name.	Factory	Ref Page#.
U1-51	Motor Revolutions after UL2	--	--
U1-52	Maintenance Timer Elapsed Time	--	5-93
U1-53	Index Counts (Counts DIV BY SIGN F1-01 = # of Rev's)	--	--
U1-60	PG CH1 Count	--	5-93
U1-61	PG CH2 Count	--	5-93
U1-66	BE6 Pulse Count	--	5-93
U2-01	Current Fault	--	5-93
U2-02	Last Fault	--	5-93
U2-03	Frequency Reference	--	5-93
U2-04	Output Frequency	--	5-93
U2-05	Output Current	--	5-93
U2-06	Motor Speed	--	5-93
U2-07	Output Voltage	--	5-93
U2-08	DC Bus Voltage	--	5-93
U2-09	Output kWatts	--	5-93
U2-10	Torque Reference	--	5-93
U2-11	Input Terminal Status	--	5-93
U2-12	Output Terminal Status	--	5-93
U2-13	Inverter Status	--	5-93
U2-14	Elapsed Time	--	5-93
U3-01	Last Fault	--	5-93
U3-02	Fault Message 2	--	5-93
U3-03	Fault Message 3	--	5-93
U3-04	Fault Message 4	--	5-93
U3-05	Elapsed Time 1	--	5-93
U3-06	Elapsed Time 2	--	5-93
U3-07	Elapsed Time 3	--	5-93
U3-08	Elapsed Time 4	--	5-93
U3-09	Fault Message 5	--	5-93
U3-10	Fault Message 6	--	5-93
U3-11	Fault Message 7	--	5-93
U3-12	Fault Message 8	--	5-93
U3-13	Fault Message 9	--	5-93
U3-14	Fault Message 10	--	5-93
U3-15	Elapsed Time 5	--	5-93
U3-16	Elapsed Time 6	--	5-94
U3-17	Elapsed Time 7	--	5-94
U3-18	Elapsed Time 8	--	5-94
U3-19	Elapsed Time 9	--	5-94
U3-20	Elapsed Time 10	--	5-94
U3-21	AC Operations	--	5-94
U3-22	U3-21 Rollovers	--	5-94
U3-23	OL/LC Count	--	5-94

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*** Value is automatically set during auto-tuning