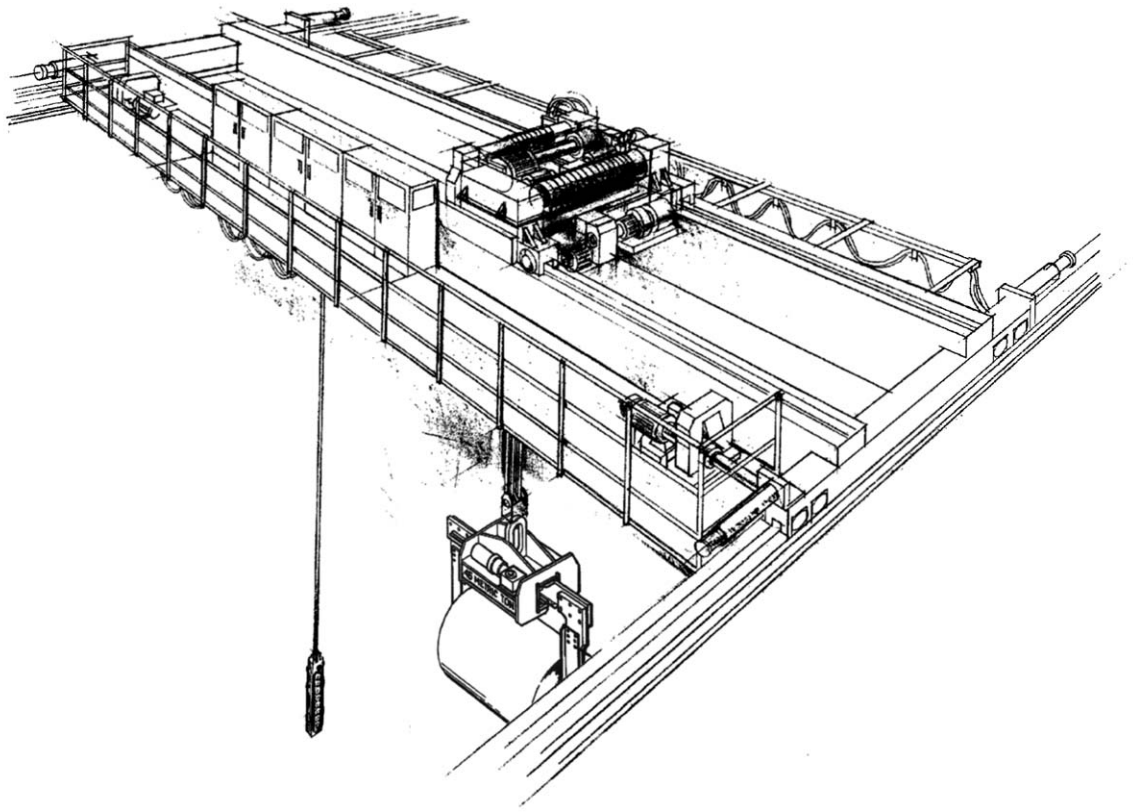

IMPULSE® • G+ Mini

Adjustable Frequency Crane Controls

Basic Instruction Manual

MAGNETEK
MATERIAL HANDLING

Software # 505X April 2009
Part Number: 144-25084-R1

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.

Product Warranty Information

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 5 : Programming Features

Chapter 6: Troubleshooting

Appendix A: Parameter Listing

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Chapter **1**

Introduction

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WARNING

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 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 inside the left side of the Drive.) 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 set (locked) closed to ensure the load does not move. If the electric brake cannot be released, you must ensure that the brake is disengaged for the entire tuning process.

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 ten 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 30,000 RMS symmetrical Amperes, 240VAC maximum (230V Class) and 480VAC maximum (460V 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.

Introduction

The IMPULSE•G+ Mini drive is the next generation of Magnetek, Inc. drives, providing compact and economical crane control. The drive maintains a similar footprint size and feature set of previous generation drives, while offering expanded capabilities in both Basic and Advanced modes. The drive is configured by default as BASIC with features that include:

- Volts/Hertz Control
- X-Press Programming™
- Swift-Lift™
- Reverse Plug Simulation™
- Quick Stop™
- End-of-Travel Limits
- RS485 Communications

Switching the IMPULSE•G+ Mini to ADVANCED mode enables many additional control features, including:

- Open-Loop Vector Control
- Micro-Positioning Control™
- Up to 15 Discrete Speed References
- Load Check™
- Maintenance Timers
- Braketronic™
- Expanded Programmable Input/Output Capabilities

This manual will provide support for the basic operating features of IMPULSE•G+ Mini. For information on the additional control features, please consult the IMPULSE•G+ Mini Advanced Instructions Manual (144-25085) found at www.magnetekmh.com/manuals.htm.

IMPULSE•G+ Mini General Specifications

230V Class

Specification	Specification Values and Information for Each 230V-Class Model									
	2001	2003	2005	2008	2011	2017	2025	2033	2047	2060
Rated current (A)	1.6	3.0	5.0	8.0	11.0	17.5	25.0	33.0	47.0	60.0
Capacity (kVA)	0.6	1.1	1.9	3.0	4.2	6.7	9.5	12.6	17.9	22.9

460V Class

Specification	Specification Values and Information for Each 460V-Class Model								
	4001	4002	4003	4004	4009	4014	4018	4024	4031
Rated current (A)	1.2	1.8	3.4	4.8	9.2	14.8	18.0	24.0	31.0
Capacity (kVA)	0.9	1.4	2.6	3.7	7.0	11.3	13.7	18.3	23.6

230V and 460V Classes

Specification	Specification Value and Information for All Models
Certification	UL, cUL, CE, TüV, RoHS
Rated input power supply volts & freq	3-phase 200 ~ 240V or 380 ~ 480V; 50/60 Hz
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 ~ 240V; 380 ~ 480V (proportional to input voltage).
Rated frequency (Hz)	Up to twice motor nameplate RPM (Swift-Lift) 60 Hz standard (150 Hz, consult factory)
Output speed control range	40:1 - V/f
Output frequency accuracy	0.01%—with digital reference command 0.1%—with analog reference command; 10 bits/10V
Frequency reference resolution	Digital: 0.01 Hz; analog: 0.03 Hz (at 60 Hz)
Output frequency resolution	0.01 Hz
Overload capacity	150% of rated output current of the drive for 1 minute
Remote frequency reference sources	0–10VDC (2kΩ); 4–20mA (250Ω); ±10VDC serial (RS-485)
Accel/decel times	0.0 to 25.5 seconds - 1 set; 0.0 to 6000.0 - 3 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 drive rated current
Circuit protection	Ground fault and blown-fuse protection
Overvoltage protection level	Approximately 410VDC (230V Class), 820VDC (460V Class)
Undervoltage protection level	Approximately 190VDC (230V Class), 380VDC (460V Class)
Heatsink overtemperature	Thermostat trips at 184° - 249°F (90° - 121°C), dependent on drive capacity
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.

Specification	Specification Value and Information for All Models
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 122°F (-10° to 50°C) for open chassis
Storage temperature	-4° to 140°F (-20° to 60°C)
Humidity	95% relative; noncondensing
Vibration	1 G less than 20 Hz; 0.2 G for 20–55 Hz
Elevation	3300 Ft. (1000M) or less
Memobus	RS485/422 Max 115.2 Kbps

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:

- Install an input reactor if the power source is greater than 500kVA.
- Ensure that the drive-to-motor wiring distance is less than 150 ft. unless appropriate reactors, filters and/or Inverter Duty motor is used.
- 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
2001-G+M	REA230-1	4
2003-G+M	REA230-1	4
2005-G+M	REA230-1	4
2008-G+M	REA230-2	8
2011-G+M	REA230-3	12
2017-G+M	REA230-5	18
2025-G+M	REA230-7.5	25
2033-G+M	REA230-10	35
2047-G+M	REA230-15	45
2060-G+M	REA230-20	55

460V Class

Model Number	460 V Part Number	Maximum Amps of Reactor
4001-G+M	REA460-1	2
4002-G+M	REA460-1	2
4003-G+M	REA460-2	4
4004-G+M	REA460-3	4
4009-G+M	REA460-5	8
4014-G+M	REA460-7.5	12
4018-G+M	REA460-10	18
4024-G+M	REA460-15	25
4031-G+M	REA460-20	35

IMPULSE•G+ Mini External Resistor Specifications

If Magnetek resistors are not used, this table should be used to determine the minimum resistance values.

		Traverse				Hoist w/ Mechanical Brake Load	
	IMPULSE•G+ Mini	Resistor Part No.	Resistance	Resistor Part No.	Resistance	Resistor Part No.	Resistance
	Model Number	CMAA Class A, B, C	Ω	CMAA Class D	Ω	CMAA Class A, B, C, D	Ω
230 Volts	2001-G+M	EDB2001CT	220	EDB2001DTP	220	EDB2001CT	220
	2003-G+M	EDB2001CT	220	EDB2001DTP	220	EDB2001CT	220
	2005-G+M	EDB2003CT	110	EDB2004DTP*	100	EDB2003CT	110
	2008-G+M	EDB2006CT	58	EDB2006DTP*	44	EDB2003CT	110
	2011-G+M	EDB2009CT	58	EDB2011DTP*	31	EDB2006CT	58
	2017-G+M	EDB2015CT	37	EDB2015DTP*	25	EDB2009CT	37
	2025-G+M	EDB2022CT*	14	EDB2022DT*	14	EDB2015CT	25
	2033-G+M	EDB2028CT*	13	EDB2028DT*	12	EDB2015CT	25
	2047-G+M	EDB2042CT*	7.8	EDB2042DT*	6.5	EDB2022CT*	14
	2060-G+M	EDB2054CT*	6	--	4.8	EDB2028CT*	13
460 Volts	4001-G+M	EDB4001CT	440	EDB4001DTP	440	EDB4001CT	440
	4002-G+M	EDB4001CT	440	EDB4002DTP*	354	EDB4001CT	440
	4003-G+M	EDB4003CT	230	EDB4003DTP*	187	EDB4001CT	440
	4004-G+M	EDB4004CT	150	EDB4004DTP*	133	EDB4003CT	230
	4009-G+M	EDB4007CT	100	EDB4007DTP*	84	EDB4004CT	150
	4014-G+M	EDB4011CT*	59	EDB4011DT*	47	EDB4007CT	100
	4018-G+M	EDB4014CT*	46	EDB4014DT*	37	EDB4007CT	100
	4024-G+M	EDB4021CT*	31.1	EDB4021DT*	24.9	EDB4011CT*	59
	4031-G+M	EDB4027CT*	24.2	EDB4027DT*	22	EDB4014CT*	46

* Resistors are supplies in vented indoor enclosure.

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Chapter 2

Installation

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Assessing The System Requirements

WARNING

- When preparing to mount the IMPULSE•G+ Mini drive, lift it by its base. Never lift it by the front cover.
- Mount the drive on nonflammable material.
- The IMPULSE•G+ Mini drive generates heat. For the most effective cooling possible, mount it vertically. For more details, refer to the "IMPULSE•G+ Mini 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 122°F (50°C).

Failure to observe these Warnings may result in equipment damage.

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

- Motion (traverse or hoist)
- Motor HP, RPM, and FLA
- Speed control method (2-speed, 3-speed, multistep, etc.)
- Stopping method (Decelerate or Coast to Stop)
- Wire size
- Grounding location and method

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:
  Open Chassis: +14° to 122°F (-10° to 50°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.)

IMPULSE•G+ Mini System Components And External Devices

Optional Drive Components

- 120 VAC Interface Card (Part Number 144-25077)
- 24 VAC Interface Card (Part Number 144-25078)
- P3S2OUT2 Card (Part Number 144-44000)
- Copy Stick (Part Number 144-25090)
- Advanced Instruction Manual (Part Number 144-25085)
- Quick Start Guide (Part Number 144-25086)

As-Required Drive Components

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

Required External Devices

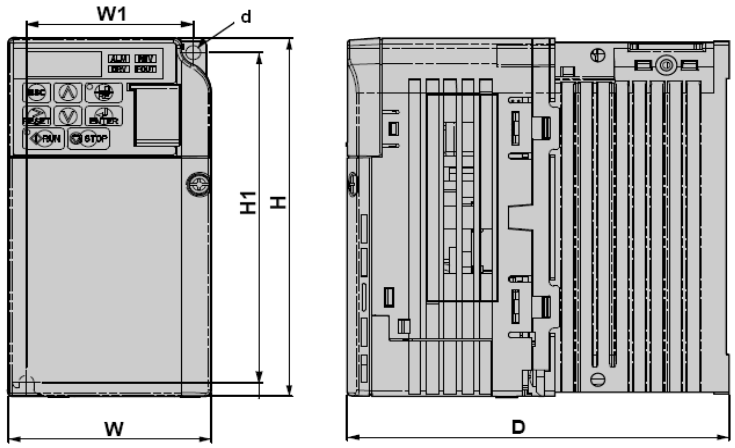
- Motor
- User input device (pendant, joystick, PC, PLC, radio, or infrared control)
- External circuit protection devices (fuses or circuit breakers) (See “Suggested Circuit Protection Specifications and Wire Size” in Chapter 3.)
- R-C surge suppressors on contactor coils

Impulse G+ Mini Ratings and Dimensions*

Voltage	Model	W	H	D	W1	H1	d	Wt. Lbs.	Total Heat Loss (W)**
				Dimensions in Inches					
230V	2001-G+M	2.68	5.04	2.99	2.20	4.65	M4	1.3	14.7
	2003-G+M	2.68	5.04	4.25	2.20	4.65	M4	2.0	24.0
	2005-G+M	2.68	5.04	5.04	2.20	4.65	M4	2.4	36.7
	2008-G+M	4.25	5.04	5.08	3.78	4.65	M4	3.7	61.9
	2011-G+M	4.25	5.04	5.41	3.78	4.65	M4	3.7	81.3
	2017-G+M	5.51	5.04	5.63	5.04	4.65	M4	5.3	122.7
	2025-G+M	5.51	10.00	5.51	4.80	9.76	M5	8.4	248.5
	2033-G+M	5.51	10.00	5.51	4.80	9.76	M5	8.4	282.6
	2047-G+M	7.09	11.42	6.42	6.30	11.18	M5	12.1	389.7
	2060-G+M	8.66	13.78	7.36	7.56	13.23	M5	20.3	563.8
460V	4001-G+M	4.25	5.04	3.19	3.78	4.65	M4	2.2	19.1
	4002-G+M	4.25	5.04	3.90	3.78	4.65	M4	2.6	27.1
	4003-G+M	4.25	5.04	5.41	3.78	4.65	M4	3.7	38.3
	4004-G+M	4.25	5.04	6.06	3.78	4.65	M4	3.7	57.4
	4009-G+M	5.51	5.04	5.63	5.04	4.65	M4	5.3	97.1
	4014-G+M	5.51	10.00	5.51	4.80	9.76	M5	8.4	173.4
	4018-G+M	5.51	10.00	5.51	4.80	9.76	M5	8.4	219.4
	4024-G+M	7.09	11.42	5.63	6.30	11.18	M5	11.5	283.8
	4031-G+M	7.09	11.42	6.42	6.30	11.18	M5	12.1	344.3

**NOTE: Applications such as high duty cycles in conjunction with high ambient temperatures or other unique environmental conditions can impact drive ratings. Please consult factory. Due to ongoing improvements, data is subject to change without notice.*

** Heat loss for carrier frequency of 2.0 kHz (heavy duty).



Installing the Drive

The following two figures show the minimum clearances when mounting the drive in standard or side-by-side installations.

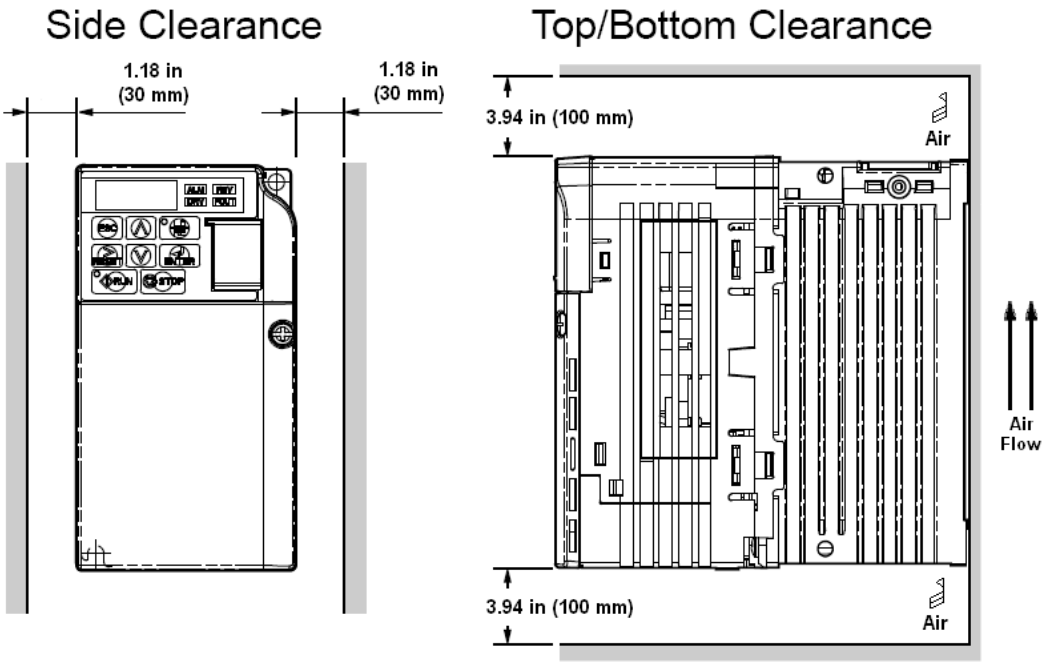


Figure 2-1: Standard Installation

Installing the Drive (Side-by-Side)

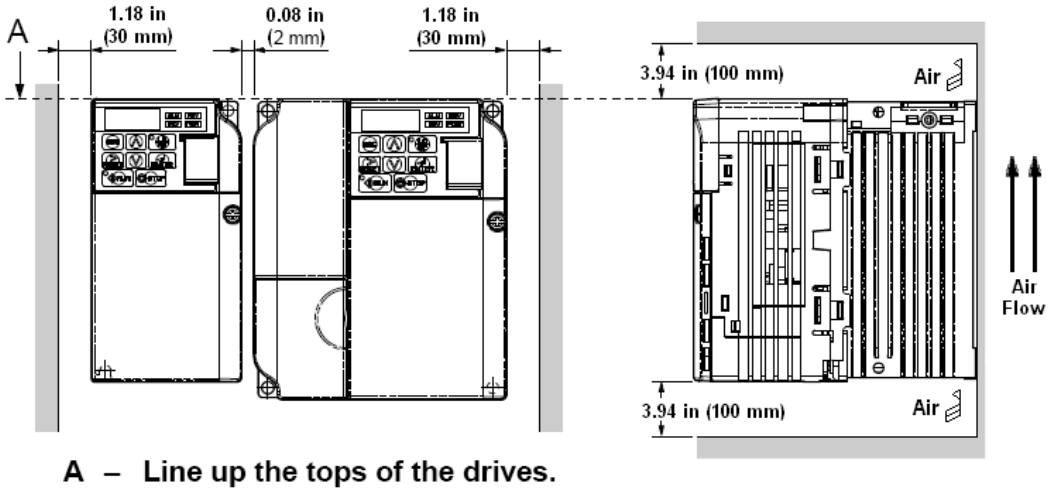


Figure 2-2: Side-by-Side Installation

Chapter 3

Wiring

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IMPULSE•G+ Mini Wiring Practices

WARNING

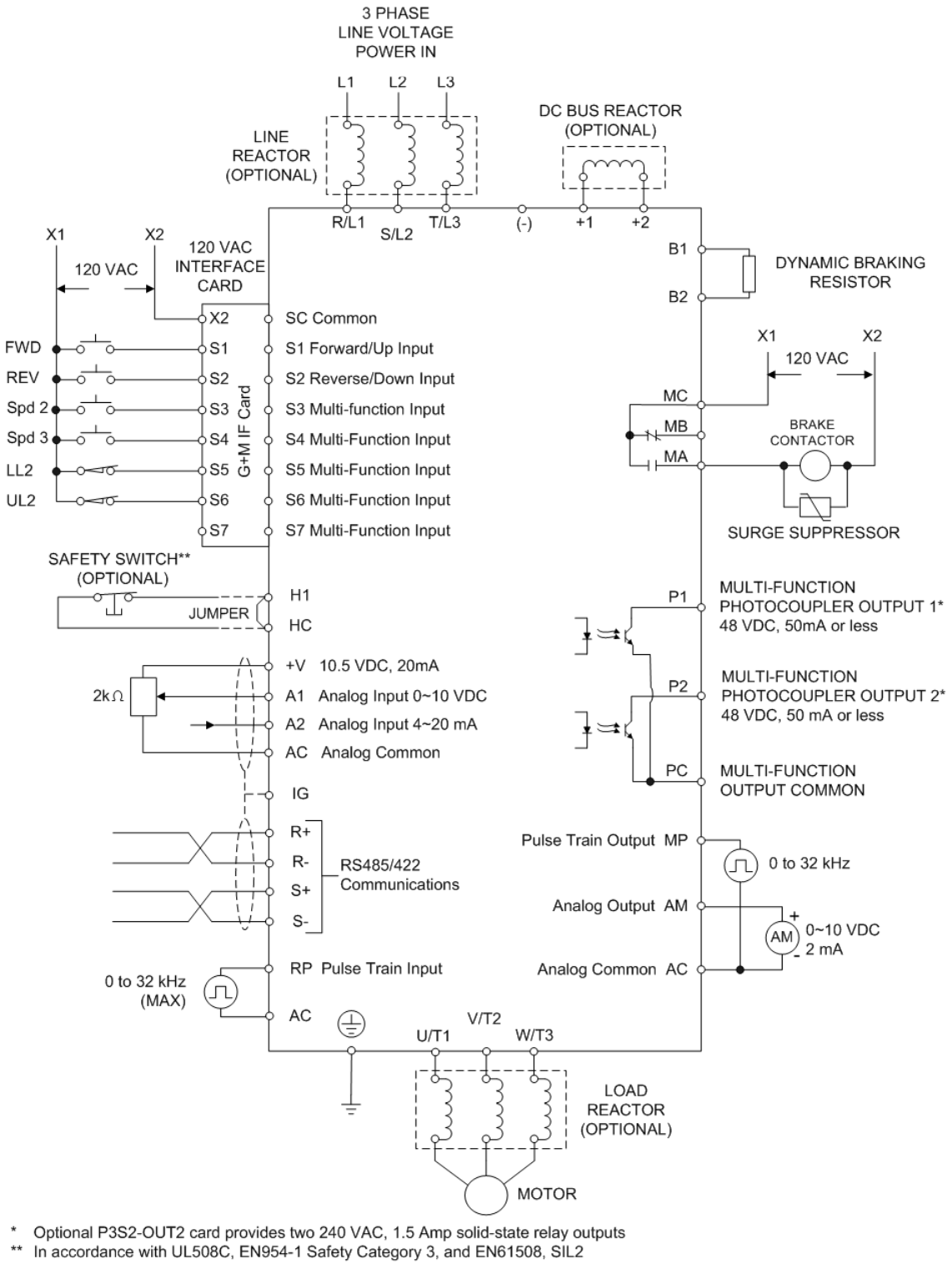
Before you wire the drive, review the following practices to help ensure that your system is wired properly.

- 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 and/or filters are 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-KΩ, 5-W resistor between the signal and L2 (X2).
- Comply with "Suggested Circuit Protection Specifications and Wire Size" on page 3-7.
- 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.
- If you have a user input device or interface board that 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 (U/T1, V/T2 and W/T3) for possible short circuits and ground faults.
- Increase the wire size by one size 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, 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 to 10VDC, 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+ Mini Typical Connection Diagram



* Optional P3S2-OUT2 card provides two 240 VAC, 1.5 Amp solid-state relay outputs
** In accordance with UL508C, EN954-1 Safety Category 3, and EN61508, SIL2

Figure 3-1: IMPULSE•G+ Mini Typical Connection Diagram

Terminal Description

Type		Terminal		Name	Function (Signal Level)		
Main Circuit		R/L1, S/L2, T/L3		AC power supply input	AC power supply input		
		U/T1, V/T2, W/T3		Inverter output	Inverter output		
		B1, B2		Braking resistor connection	Braking resistor connection		
		+2, +1		DC reactor connection	When connecting optional DC reactor, remove the main circuit short-circuit bar between +2 and +1.		
		+1, (–)		DC power supply input	DC power supply input [+1: positive; (–): negative]		
		⏚		Grounding	Ground to local grounding codes		
Control Circuit	Input	Sequence	S1	Multi-function input selection 1	FWD run when closed, stop when open	H01.01 ~ H01.07	120VAC ±10%
			S2	Multi-function input selection 2	REV run when closed, stop when open		
			S3	Multi-function input selection 3	Inputs are programmable		
			S4	Multi-function input selection 4			
			S5	Multi-function input selection 5			
			S6	Multi-function input selection 6			
			S7	Multi-function input selection 7			
			X2 (SC)	Multi-function input selection common	Common for control signal		
		Analog Input Signal	+V	+10.5V DC Power supply output	For analog command +10V power supply		+10V (Allowable current 20 mA max)
			A1	Master frequency reference	0 to +10V/0 to 100%		0 to +10V/(2K Ohm)
			A2	Multi-function analog reference	4 to 20 mA/0 to 100% 0 to 10V/0 to 100% 0 to 20 mA/0 to 100%	H03.09	4 to 20 mA (250 Ohm), 0 to +10V/(2k Ohm)
			AC	Frequency reference common	0V	0 to ±10V. Max ±5% 2mA or less	
		Safe Disable Input	HC	Power Supply for safe disable input	+24 VDC (max 10 mA allowed)		
			H1	Safe disable input	Open: Output disabled Closed: Normal Operation *NOTE: Disconnect wire jumper between HC and H1 when using the safe disable input. See Safe Disable Function on page 3-7.*		
			RP	Pulse Input	Pulse Input frequency reference	H06.01	0 to 32kHz (3k Ω impedance) ±5% High level voltages 3.5 to 13.2 Low level voltages 0.0 to 0.8 Duty Cycle (on/off) 30% to 70%
	Output	Multi-function contact output	MP	Pulse Monitor	Pulse output frequency	H06.06	0 to 32kHz ±5% output (load: 1.5k Ω)
			MA	NO contact output	Factory setting: brake output	H02.01	Dry contact capability: 250VAC 1A or less, 30VDC 1A or less
			MB	NC contact output			
			MC	Contact output common			
			P1	Photo coupler output 1	Outputs are programmable	H02.02 ~ H02.03	Photo-coupler output +48VDC, 50mA or less
			P2	Photo coupler output 2			
			PC	Photo coupler output common	0V		
			AM	Analog monitor output	Factory setting: output frequency 0 to +10V	H04.01	+10VDC, 2mA or less, 8-bit resolution
			AC	Analog monitor common	0V		
Communication Circuit Terminal		MEMOBUS communications	R+	Communications input (+)	MEMOBUS communication Run through RS-485 or RS-422.	H05.01 ~ H05.08	RS-485/422 MEMOBUS protocol, 115.2 kbps max.
			R-	Communications input (-)			
			S+	Communications output (+)			
			S-	Communications output (-)			
			I(G)	Signal Common	Connection to shield sheath of signal lead		0V

Safe Disable Function

The Safe Disable function can be utilized to perform a safe stop according to the EN60204-1, stop category 0 (Uncontrolled stop by power removal). It is designed to meet the requirements of the EN954-1, Safety Category 3 and EN61508, SIL2.

Removing the voltage from terminal H1 disables the drive output, i.e. the power supply to the motor is cut by stopping the switching of the output transistors in a safe way. "Hbb" is shown on the display. Safe Disable is applicable for induction and permanent magnet motors.

Installation

If the Safe Disable function is utilized, the wire link between the terminals HC and H1 that is installed at shipment must be removed entirely.

Connect the drive to an EN954-1, Safety Category 3 interrupting device so that in case of a Safe Disable request the connection between the terminals HC and H1 is opened.

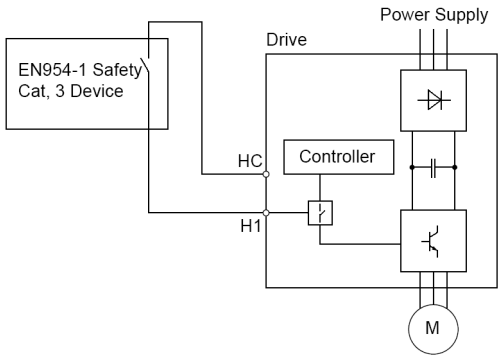


Figure 3-2: Safe Disable Wiring Example

Installation Precautions:

- To ensure the Safe Disable function appropriately fulfills the safety requirements of the application, a thorough risk assessment for the safety system must be carried out.
- The drive must be installed in an enclosure with a protection degree of at least IP54 in order to maintain EN954-1, safety category 3 compliance.
- If the safety device and the drive are installed in separate cabinets, install the Safe Disable wires in a manner preventing short circuits.
- The Safe Disable function does not cut the power supply to the drive and does not provide electrical isolation. Before any installation or maintenance work is done, the power supply of the drive must be switched off.
- The wiring distance for the Safe Disable inputs should not exceed 30 m.
- The time from opening the Safe Disable input until the drive output is switched off is less than 1 ms.
- When utilizing the Safe Disable function use the recommended filters manufactured by Schaffner only.

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+ Mini. 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.

				Wiring Size (AWG/KCMIL)					
				Power Circuit Wiring [1]		Control Circuit Wiring			
Model #	Rated Current (A) Input Fuse	Time Delay Input Fuse Class	Inverse Time Molded/Case Circuit Breaker	Applicable Gauge (AWG)	Recommended Gauge (AWG)	Control Wiring (AWG)	Relay (AWG)	Recommended Gauge (AWG)	Ground Copper [2] (AWG)
230VClass									
2001-G+M	3	CC	10	18 to 14	14	18 to 16	18 to 16	18/16	14
2003-G+M	5	CC	10	18 to 14	14	18 to 16	18 to 16	18/16	14
2005-G+M	8	CC	10	18 to 14	14	18 to 16	18 to 16	18/16	14
2008-G+M	15	CC	15	14 to 10	12	18 to 16	18 to 16	18/16	12
2011-G+M	20	CC	20	14 to 10	12	18 to 16	18 to 16	18/16	12
2017-G+M	30	CC	35	14 to 10	12	18 to 16	18 to 16	18/16	10
2025-G+M	40	J	50	10 to 6	10	18 to 16	18 to 16	18/16	8
2033-G+M	50	J	70	10 to 6	8	18 to 16	18 to 16	18/16	8
2047-G+M	60	J	90	6 to 4	6	18 to 16	18 to 16	18/16	4
2060-G+M	80	J	110	8 to 2	4	18 to 16	18 to 16	18/16	4
460VClass									
4001-G+M	2	CC	10	14 to 10	12	18 to 16	18 to 16	18/16	14
4002-G+M	3	CC	10	14 to 10	12	18 to 16	18 to 16	18/16	14
4003-G+M	6	CC	10	14 to 10	12	18 to 16	18 to 16	18/16	14
4004-G+M	8	CC	10	14 to 10	12	18 to 16	18 to 16	18/16	14
4009-G+M	15	CC	15	14 to 10	12	18 to 16	18 to 16	18/16	12
4014-G+M	25	CC	30	14 to 10	12	18 to 16	18 to 16	18/16	10
4018-G+M	30	CC	40	12 to 6	12	18 to 16	18 to 16	18/16	10
4024-G+M	35	J	50	10 to 6	10	18 to 16	18 to 16	18/16	8
4031-G+M	45	J	60	10 to 6	8	18 to 16	18 to 16	18/16	8

References:
1. NFPA 70 National Electrical Code 2008 Table 610.14(a) 90°C, 60-minute, copper, 50°C ambient.
2. NFPA 70 National Electrical Code 2008. Table 250-122.

Grounding

1. Connect terminal ⏚ to the common panel ground. Use ground wiring as specified in "Suggested Circuit Protection and Wire Size" on page 3-7, and keep the length as short as possible.
   - Ground Resistance: 230V class; 100Ω or less, 460V or greater class; 10Ω or less.
   - Never run the IMPULSE•G+ Mini 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 drive directly, or daisy-chain to the ground pole. Do not loop the ground wires.

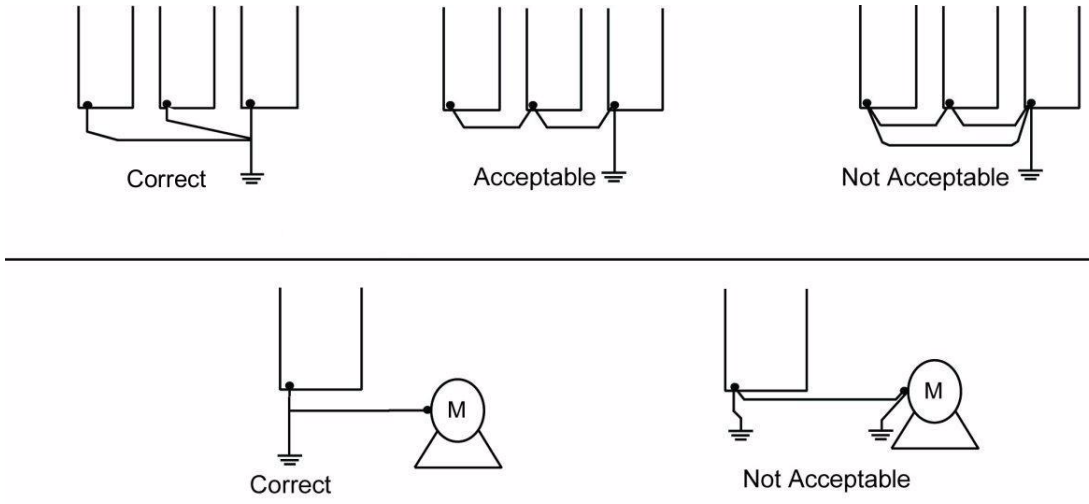


Figure 3-3: Grounding

Wiring the Control Circuit

Control Circuit Terminals

The IMPULSE•G+ Mini is shipped with a 120V interface card, allowing direct connection of 120V user input devices. The interface card connects to drive terminals S1-S7 and SC. The user input device then connects to terminals S1-S7 and X2 on the interface card. Terminals S1 and S2 are factory set for the forward (up) and reverse (down) run commands; however, they can be programmed for speed control and other functions like the remaining terminals. The figure below shows the control terminal arrangement for the IMPULSE•G+ Mini along with the 120V interface card (G+M IF 120VAC).

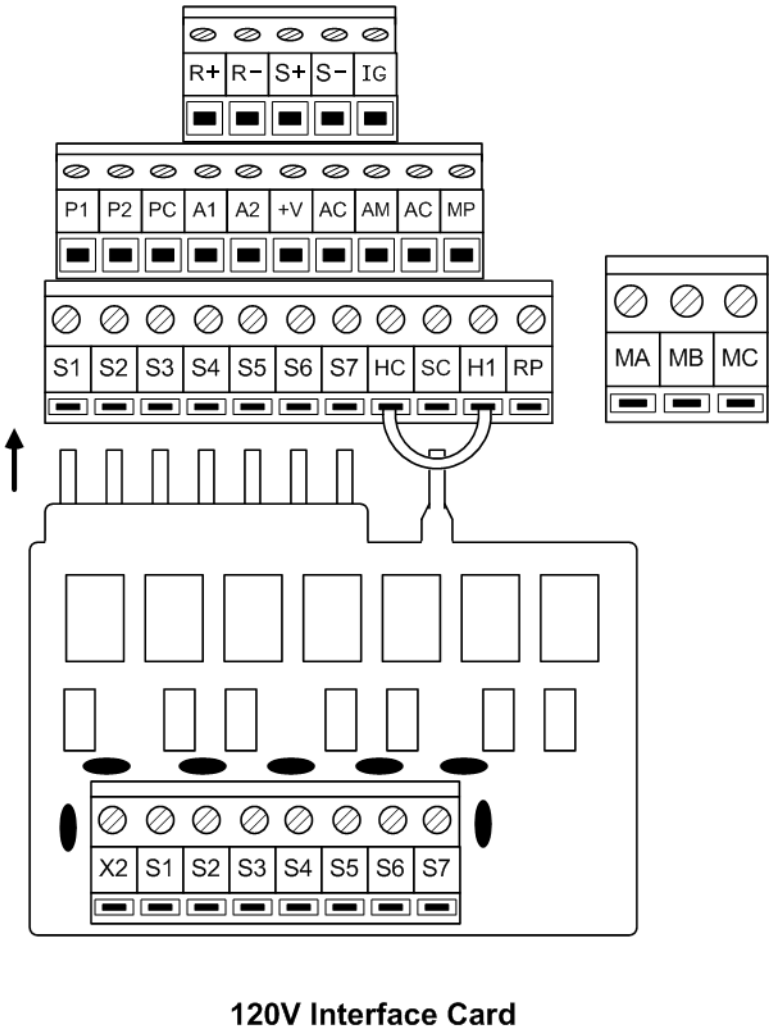


Figure 3-4: IMPULSE•G+ Mini 120V Interface Card

Control Board DIP Switches

There are three switch settings on the controller board that are used for controller input (S1 - S7) polarity, analog input signal control method, and RS485 termination. The figure below shows the location of these switches and their function along with the default settings.

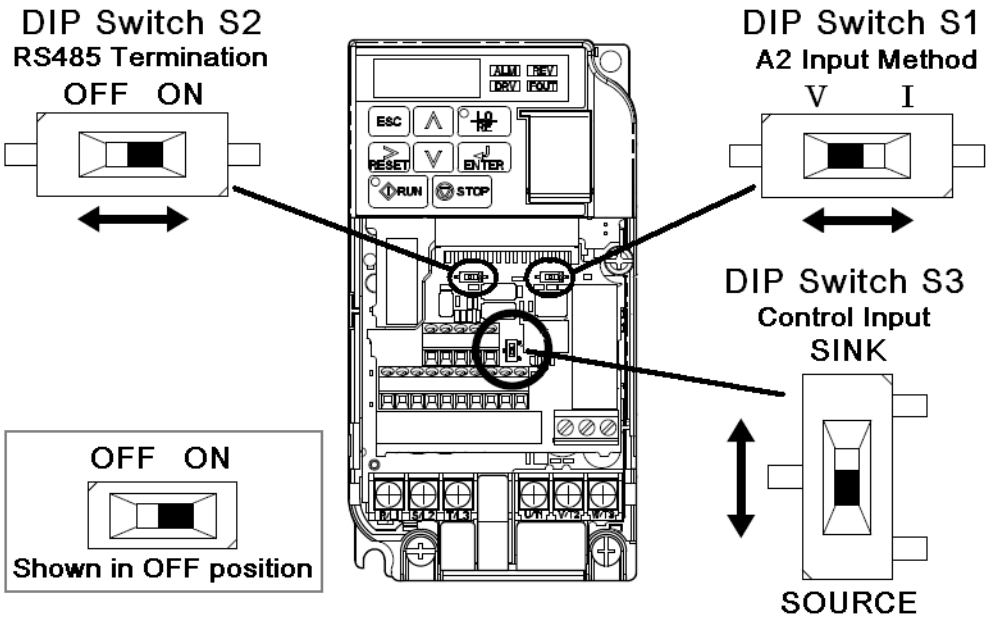


Figure 3-5: DIP Switches

Name	Function	Settings
DIP Switch 1	Input method for analog input A2	**V:** 0~10VDC input (internal resistance: 20K Ohm) **I**: 4~20 mA input (internal resistance 250 Ohm) (**Default**)
DIP Switch 2	RS485 Termination	**OFF**: No terminating resistance (**Default**) **ON**: Terminating resistance of 110 Ohm
DIP Switch 3	Controller input signal polarity (S1-S7) on the controller board	**SINK**: Must remain in this position for use with the 120VAC and 24VAC interface cards (**Default**) **SOURCE**: Consult Factory

IMPULSE•G+ Mini Optional Relay Outputs

Interface card P3S2-OUT2 provides two 240 VAC, 1.5 Amp rated solid-state relay outputs. Each relay is independently programmable. Constants H02.02 and H02.03 will configure these digital outputs.

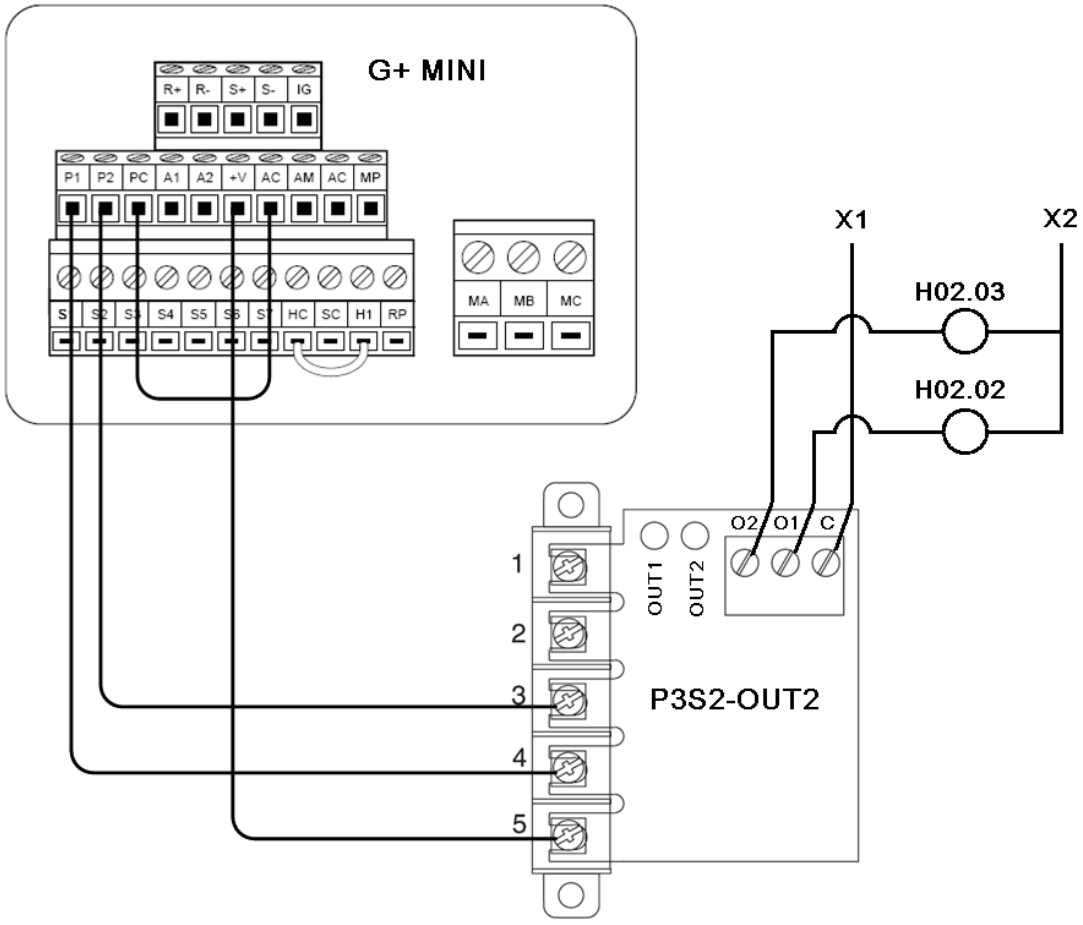


Figure 3-6: IMPULSE•G+ Mini Output Card

IMPULSE•G+ Mini Power Terminal Arrangement

230V	Arrangement	460V	Arrangement
2001-G+M	1	4001-G+M	2
2003-G+M	1	4002-G+M	2
2005-G+M	1	4003-G+M	2
2008-G+M	2	4004-G+M	2
2011-G+M	2	4009-G+M	2
2017-G+M	2	4014-G+M	3
2025-G+M	3	4018-G+M	3
2033-G+M	3	4024-G+M	4
2047-G+M	4	4031-G+M	4
2060-G+M	5	--	--

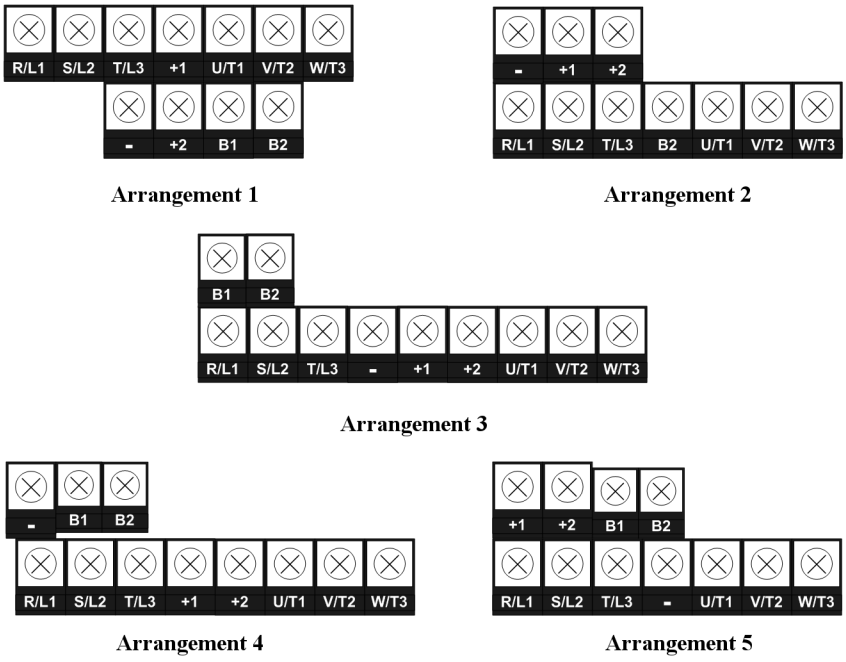


Figure 3-7: IMPULSE•G+ Mini Power Terminal Arrangement

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Chapter **4**

Getting Started

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Overview

With its easy-to-use keypad and X-Press Programming, IMPULSE•G+ Mini makes it easy to get up and running right away. This chapter explains how to navigate through the Drive's menus along with the function and meaning of each button and indicator. The keypad will make it possible to view fault codes and change parameter settings. The keypad enables you to:

- Program the various drive parameters.
- Monitor the functions of the drive.
- Read 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.

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.) If unsure of the source transformer, use a line reactor.

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

All functions of the drive are accessed using the keypad. The operator can enter information using the keypad to configure the drive for their application. This information will be stored into the drive's memory.

Keypad Functions

The keypad has a 5-digit LED display. Both numeric and alpha-numeric data can appear on the display.

Indicators and keys on the keypad are described in Figure 4-1.

NOTE: The STOP key is always active and will cause any run command to come to an immediate stop following the B03.03 Stopping Method.

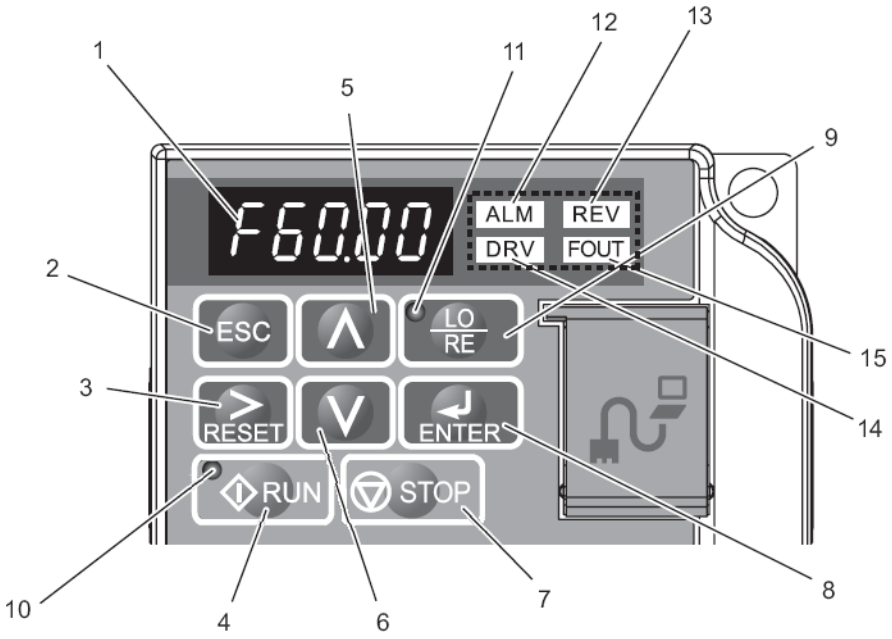


Figure 4.1: Keypad Display

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.

Keys and Displays on the LED Operator

No.	Display	Name	Function
1		Data Display Area	Displays the frequency reference, parameter number, etc.
2		ESC Key	Returns to the previous menu (before ENTER Key is pressed), or cursor position
3		RESET Key	Moves the cursor to the right. Resets the drive to clear a fault situation.
4		RUN Key	Pressing the key initiates the RUN command when LOCAL mode operation is selected. Starts the auto-tuning process.
5		Up Arrow Key	Scrolls up to select next parameter group or parameter settings. It also increases the value of the blinking digit of a parameter setting.
6		Down Arrow Key	Scrolls down to select next parameter group or parameter settings. It also decreases the value of the blinking digit of a parameter setting.
7		STOP Key	Stops the drive by initiating a base block STOP command. *NOTE: Stop priority circuit.*
8		ENTER Key	Selects modes or parameters. Displays each parameter's set value. By pressing this key again, the set value is stored.
9		LO/RE Selection Key	Pressing the key once displays support phone number 866-624-7378. Pressing the key again shows control method, motion, and reference speed. Pressing the key again will show RESET. Pressing the ENTER Key afterwards will reset the maintenance timers.

LO/RE LED and RUN LED Indications

No.	LED	Lit	Flashing	Flashing Quickly	Off
10		During run.	During deceleration to stop. When a run command is input and frequency reference is 0.	During deceleration at a fast-stop. During stop by interlock operation.	During stop.
11		When run command is selected from LED operator (LOCAL).	--	--	Run command is selected from device other than LED operator (REMOTE).

Function LEDs

No.	Display	Lit	Flashing	Off
12		When the drive detects an alarm or error	When an alarm occurs OPE detected When a fault or error occurs during Auto-Tuning	Normal state (no fault or alarm)
13		When the REVERSE command is given	--	When the FORWARD command is given
14		Drive Ready Auto-Tuning	--	Programming Mode
15		Displays output frequency (Hz)	--	--

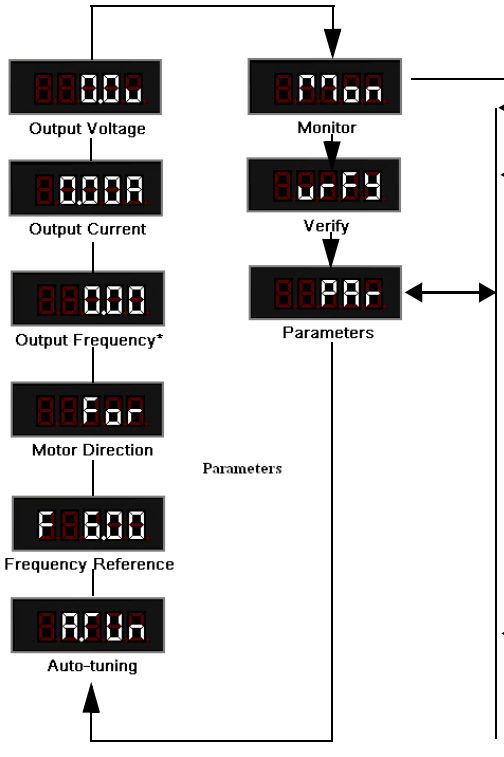
Parameters

There are hundreds of parameters, organized by function group, 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.

By default, the IMPULSE•G+ Mini is configured for a common crane system. If you find it necessary to change the intial settigs, it is recommended that you only allow qualified crane system technicians to program the drive. This can be accomplished by using the Password and Access Level features. For more information on these security features, see "User Parameters (A02.XX)," in the IMPULSE•G+ Mini Advanced Instruction Manual (P/N 144-25085).

IMPULSE•G+ Mini Structure of Parameters



Group		Function
Monitor	U1	Monitor
	U2	Fault Trace
Initialize	A1	Initialization Parameters
Application	B1	Preset References
	B2	Reference Limits
	B3	Sequence/Reference Source
	B5	Acceleration/Deceleration
Special Function	C1	Quick Stop/Reverse Plug Simulation
	C3	Travel Limits
	C6	Swift-Lift
	C8	Brake Answerback
Tuning	D1	Braking
	D3	Torque Compensation
	D9	S-Curve Acceleration/Deceleration
Motor	E1	V/f Pattern 1
	E2	Motor Set-up
Terminal	H1	Digital Inputs
	H2	Digital Outputs
	H3	Analog Inputs
	H5	Serial Communication Set-up
Protection	L1	Motor Overload Protection
	L3	Stall Prevention
	L4	Reference Detection
	L6	Torque Detection
	L8	Hardware Protection
	L9	Automatic Reset
Operator	O2	Keypad Key Selection

**View after power-up*

Parameter Modes

All parameters are organized under four modes:

Operation Mode

Drive operation is enabled. Drive status LED lights.

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 V/f control method.

Verify Constants Mode

Only parameters that have been changed from the factory settings are shown here. They can be set/read.

Initialization Set-up

Parameter Access Level (A01.01)

This parameter controls the level of access for all the parameters in the drive. Using this parameter controls the "masking" of parameters according to the access level selected. There are two access levels available, BASIC and USER. When the access level is set to BASIC (A01.01 = 0001), it will allow access to all parameters outlined in this manual.

Changing the access level to USER (A01.01 = 0000) limits access to only parameters stored in the A02.xx table (up to 32). To set up the A02.xx group, refer to the G+ Mini Advanced Instruction manual.

Setting	Description
0000	User Program - Allows read/write capabilities for parameters selected by OEM (A02.01 to A02.32).
0001	Basic Level - Access to parameters for general crane applications

Control Method Selection (A01.02)

Select the control method best suited for your application.

Setting	Description
00	V/f Control—For general purpose and multiple motor applications.

Select Motion (A01.03)

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

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

Speed Reference (A01.04)

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
00	2-SPD Multi-step — Defines Terminal S3 = 2nd speed.
01	3-SPD multi-step — Defines Terminals S3 and S4 as speeds 2 and 3 respectively.
02	5-SPD Multi-step — Defines Terminals S3-6 as speeds 2-5.
03	2-Step infinitely variable — Terminals S1 and S2 = B01.01 (Reference 1) and speed hold. Terminal S3 = Accelerate.
04	3-Step infinitely variable — Terminals S1 and S2 = B01.01 (Reference 1). Terminal S3 = Speed Hold. Terminal S4 =Accelerate.
05	Uni-polar analog — Terminals S1 and S2 = A directional input. Terminal A1 = 0-10V. Terminal A2 = 4-20mA for speed reference.

Parameters Changed by X-Press Programming

Table 4-1: Traverse (A01.03= 00)

A01.04	Description	B01.01	B01.02	B01.03	B01.04	B01.05	B01.18	B02.03	B03.03	B05.01	B05.02	C01.01	D09.01	D09.02	D09.03
		Speed 1	Speed 2	Speed 3	Speed 4	Speed 5	Ref Priority	Ref. Lower Limit	Stopping Method	Accel Time 1	Decel Time 1	Quick Stop	S-Curve Accel at Start	S-Curve Accel at End	S-Curve Decel at Start
00	2-Speed Multi-Step	6.00	60.00	0.00	0.00	0.00	00	2.0	00	10.0	10.0	00	1.50	1.50	1.50
01	3-Speed Multi-Step	6.00	30.00	60.00	0.00	0.00	00	2.0	00	10.0	10.0	00	1.50	1.50	1.50
02	5-Speed Multi-Step	6.00	15.00	30.00	45.00	60.00	00	2.0	00	10.0	10.0	00	1.50	1.50	1.50
03	2-Step Infinitely Variable	6.00	0.00	0.00	0.00	60.00	00	2.0	00	10.0	10.0	00	1.50	1.50	1.50
04	3-Step Infinitely Variable	6.00	0.00	0.00	0.00	60.00	00	2.0	00	10.0	10.0	00	1.50	1.50	1.50
05	Uni-Polar Analog	0.00	0.00	0.00	0.00	0.00	01	2.0	00	10.0	10.0	00	1.50	1.50	1.50

A01.04	Description	E01.03	H01.01	H01.02	H01.03	H01.04	H01.05	H01.06	H01.07	H02.01	H02.02	H02.03	H03.01
		V/f Selection	Terminal S1 Select	Terminal S2 Select	Terminal S3 Select	Terminal S4 Select	Terminal S5 Select	Terminal S6 Select	Terminal S7 Select	Terminal MA/MB/MC Select	Terminal P1 Select	Terminal P2 Select	Terminal A1 Signal
00	2-Speed Multi-Step	01	80	81	00	0F	0F	0F	0F	00	0F	0F	00
01	3-Speed Multi-Step	01	80	81	00	01	0F	0F	0F	00	0F	0F	00
02	5-Speed Multi-Step	01	80	81	00	01	02	03	0F	00	0F	0F	00
03	2-Step Infinitely Variable	01	80	81	05	0F	0F	0F	0F	00	0F	0F	00
04	3-Step Infinitely Variable	01	80	81	04	05	0F	0F	0F	00	0F	0F	00
05	Uni-Polar Analog	01	80	81	0F	0F	0F	0F	0F	00	0F	0F	00

Parameters Changed by X-Press Programming

Table 4-2: Standard Hoist (A01.03 = 01)

A01.04	Description	B01.01	B01.02	B01.03	B01.04	B01.05	B01.18	B02.03	B03.03	B05.01	B05.02	C01.01	D09.01	D09.02	D09.03
		Speed 1	Speed 2	Speed 3	Speed 4	Speed 5	Ref Priority	Ref. Lower Limit	Stopping Method	Accel Time 1	Decel Time 1	Quick Stop	S-Curve Accel at Start	S-Curve Accel at End	S-Curve Decel at Start
00	2-Speed Multi-Step	6.00	60.00	0.00	0.00	0.00	00	2.0	01	5.0	3.0	00	0.50	0.50	0.50
01	3-Speed Multi-Step	6.00	30.00	60.00	0.00	0.00	00	2.0	01	5.0	3.0	00	0.50	0.50	0.50
02	5-Speed Multi-Step	6.00	15.00	30.00	45.00	60.00	00	2.0	01	5.0	3.0	00	0.50	0.50	0.50
03	2-Step Infinitely Variable	6.00	0.00	0.00	0.00	60.00	00	2.0	01	5.0	3.0	00	0.50	0.50	0.50
04	3-Step Infinitely Variable	6.00	0.00	0.00	0.00	60.00	00	2.0	01	5.0	3.0	00	0.50	0.50	0.50
05	Uni-Polar Analog	0.00	0.00	0.00	0.00	0.00	01	2.0	01	5.0	3.0	00	0.50	0.50	0.50

A01.04	Description	E01.03	H01.01	H01.02	H01.03	H01.04	H01.05	H01.06	H01.07	H02.01	H02.02	H02.03	H03.01
		V/f Selection	Terminal S1 Select	Terminal S2 Select	Terminal S3 Select	Terminal S4 Select	Terminal S5 Select	Terminal S6 Select	Terminal S7 Select	Terminal MA/MB/MC Select	Terminal P1 Select	Terminal P2 Select	Terminal A1 Signal
00	2-Speed Multi-Step	04	80	81	00	0F	0F	0F	0F	00	0F	0F	00
01	3-Speed Multi-Step	04	80	81	00	01	0F	0F	0F	00	0F	0F	00
02	5-Speed Multi-Step	04	80	81	00	01	02	03	0F	00	0F	0F	00
03	2-Step Infinitely Variable	04	80	81	05	0F	0F	0F	0F	00	0F	0F	00
04	3-Step Infinitely Variable	04	80	81	04	05	0F	0F	0F	00	0F	0F	00
05	Uni-Polar Analog	04	80	81	0F	0F	0F	0F	0F	00	0F	0F	00

Initialize Parameters (A01.05)

Use this parameter to reset the drive to user-specified initial values or to clear an oPE04 fault.

Setting	Description
0000	No Initialize (no action)
1110	User Initialize - Restores the drive to user-specified initial values.
5550	Copies saved parameters back from the terminal board to the drive's memory.

User Initialize (A01.05 = 1110)

Once the drive is configured and the system is running, set parameter O02.03 = 01 to save all modified parameters to the User Initialized memory. Once this has been done, the setting of 1110 "User Initialize" will be visible for A01.05. Changing A01.05 = 1110 will recall all modified parameters back to what they were the last time they were saved using O02.03.

oPE04 Fault (A01.05 = 5550)

The oPE04 fault indicates that the paremeters in the terminal board do not match the parameters of the control board. To reset the oPE04 fault, set A01.05 = 5550. This will copy the parameters from the terminal board to the control board. Check and verify your kVA setting (O02.04) before operating the drive. Please contact Magnetek support for assistance.

Password Entry 1 (A01.06)

This parameter enables the user to set a password that inhibits the programming of parameters A01.01 to A01.03. This function is useful when used in conjunction with the Access Level parameter A01.01. To set the password, access the parameters menu, PAR, and navigate to parameter A01.06. Press the STOP and UP arrow keys at the same time to change the display from A01.06 to A01.07. Program in a password number, so when A01.06 is not the same as A01.07 the parameters of A01.01 to A01.03 cannot be modified. When A01.06 is the same as A01.07, then A01.01 to A01.07 can be modified.

User Parameters (A02.01 through A02.32)

The user can select up to 32 parameters for quick-access programming when the access level is set to User Program (A01.01 = 0001). Only parameters selected in the A02 function group can be accessed. To assign a parameter as a user parameter, change the Access Level to Advanced (A01.01 = 0002). Go to the A02 function group, enter a parameter for quick-access into one of the parameters (A02.01 ~ A02.31). Change the Access Level to User Program (A01.01 = 0001).

Password Entry 2 (A01.08)

Used to access OEM specific crane and hoist functions.

Auto-Tuning

The IMPULSE•G+ Mini can adapt to all motors manufactured worldwide with its automatic tuning function. The Drive asks the user for minimal motor information, and then guides the user through a quick simple tuning process. The IMPULSE•G+ Mini can perform a stationary Auto-Tune in the Basic Mode using the V/f control method to obtain the motor lead resistance for better performance.

NOTE: Contact Magnetek Inc. Service Department if an auto-tune can not be performed.

CAUTION

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

Parameter Code	Name	Description	Range	Initial Value	Access Level
T01.01	Tuning Mode Select 02: Stationary Auto-Tuning for Line-to-Line resistance	Selects Tuning Method	02	02	Basic
T01.02	Motor Output Power	Sets the motor size in HP (note: KW = HP x 0.746)	KVA Dependent	--	Basic
T01.04	Motor Rated Current	Sets motor rated current in Amps	KVA Dependent	--	Basic

Using Auto-Tuning

With the keypad, use the UP or DOWN arrow keys to show the auto-tuning menu  . Depress the ENTER key and scroll through the tuning parameters using the UP Arrow key and enter each of the required parameter settings. Depress the RUN key when the RUN12 message is shown. The display will flash the RUN12 message during the tuning process. When complete, the drive will display END, indicating the tuning was successful. Press the ESC key twice to exit. If there is a fault during the tuning process, the drive will dsiplay an error message. Refer to the "Faults display and Corrective Actions at Auto-Tuning" in Chapter 6.

NOTE: If the STOP key is depressed during tuning or the auto-tuning is interrupted, the motor will coast to stop and the inverter display will show ER-03. The data changed during tuning returns to its original values.

Chapter **5**

Programming Features

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Application

The application parameters control the acceleration and deceleration characteristics, as well as any preset frequencies the system will require for operation. Application parameters included in this section are listed below.

- B1 Preset References
- B2 Reference Limits
- B3 Sequence/Reference Source
- B5 Acceleration/Deceleration

Preset Reference

Parameter Code	Name	Function	Range	Initial Value	Access Level
B01.01*	Frequency Reference 1	Sets the frequency of Minimum Speed/Speed 1.	0.00–150.00 Hz**	15.00	Basic
B01.02*	Frequency Reference 2	Sets the Speed 2 frequency.	0.00–150.00 Hz**	30.00	Basic
B01.03*	Frequency Reference 3	Sets the Speed 3 frequency.	0.00–150.00 Hz**	60.00	Basic
B01.04*	Frequency Reference 4	Sets the Speed 4 frequency.	0.00–150.00 Hz**	45.00	Basic
B01.05*	Frequency Reference 5	Sets the Speed 5 frequency.	0.00–150.00 Hz**	60.00	Basic
B01.18*	Reference Priority *00 Digital Ref Only* *01 Analog Ref Only* *02 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 A01.04. The two functions are not intended to work in conjunction.*		00	Basic

** 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 (B01.01 ~ B01.05)

Speed Reference	Forward/Reverse H01.01 = 80 H01.02 = 81	Multi-Step Speed 2 H01.01 ~ .06 = 00	Multi-Step Speed 3 H01.01 ~ .06 = 01	Multi-Step Speed 4 H01.01 ~ .06 = 02	Multi-Step Speed 5 H01.01 ~ .06 = 03
STOP	Off	--	--	--	--
B01.01 Speed Ref 1	On	Off	Off	Off	Off
B01.02 Speed Ref 2	On	On	Off	Off	Off
B01.03 Speed Ref 3	On	On	On	Off	Off
B01.04 Speed Ref 4	On	On	On	On	Off
B01.05 Speed Ref 5	On	On	On	On	On

Reference Limits

These parameters will limit the frequency range as a percentage of maximum output frequency (E01.04).

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 = (B02.04) % x (E01.04).

Parameter Code	Name	Function	Range	Initial Value	Access Level
B02.01	Frequency Reference Upper Limit	Sets as a percentage of the maximum output frequency (E01.04), which determines the maximum frequency at which the drive is able to run.	0.0–110%	100.0	Basic
B02.02	Frequency Reference Lower Limit	Sets as a percentage of the maximum output frequency (E01.04), which determines the minimum master frequency reference only.	0.0–110%	0.0	Basic
B02.03	Reference 1 Lower limit	Sets as a percentage of the maximum output frequency (E01.04), and determines the minimum frequency at which the drive is able to run when an analog signal is below this level.	0.0–110%	2.0*	Basic
B02.04	Alt Upper Limit	Alternate of B02.01 set by MFI=59.	0-110%	100.0	Basic

*Initial value set by X-Press programming.

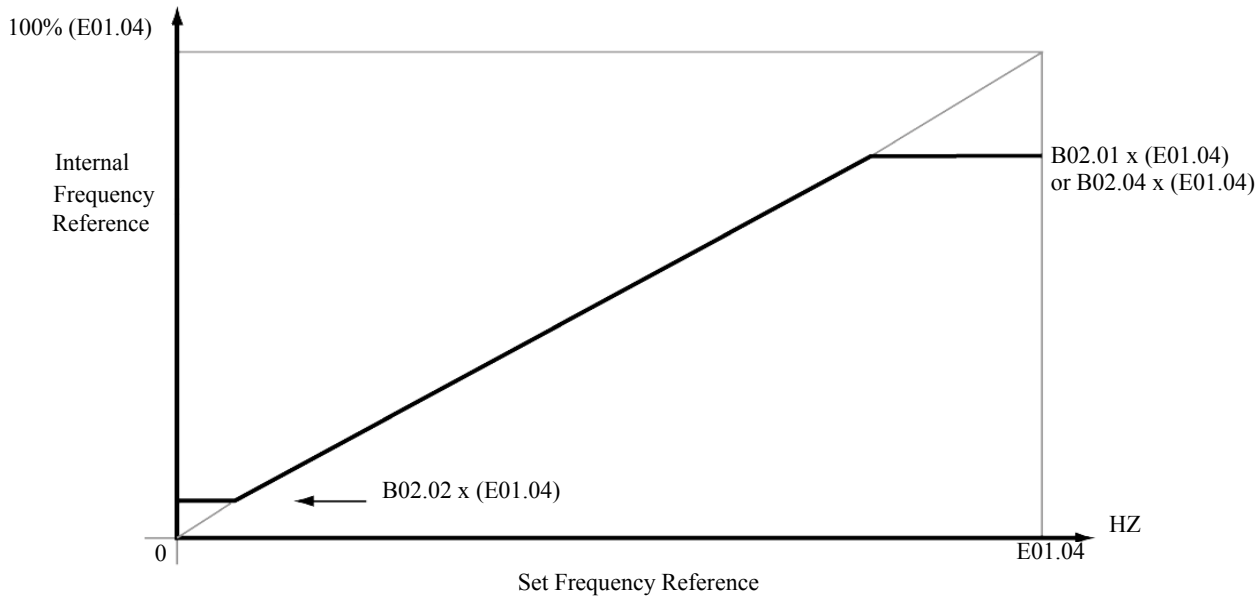


Figure 5-1: Setting Frequency Upper and Lower Limits

Sequence/Reference Source

B03.01 and B03.02 determine the source from where the frequency reference and RUN command are generated.

Parameter Code	Name	Function	Range	Initial Value	Access Level
B03.01	Reference Source	Source from where the frequency reference is generated.	00-01	01	Basic
	00 Digital Operator	Digital operator (Keypad).			
	01 Terminal	Control circuit terminal			
B03.02	Run Source	Source from where the RUN command is generated.	00-01	01	Basic
	00 Digital Operator	Digital operator (Keypad).			
	01 Terminals	Control circuit terminal.			

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.

Stopping Method

B03.03 selects the stopping method suitable for the particular application.

Parameter Code	Name	Function	Range	Initial Value	Access Level
B03.03	Stop Method	Determines stop method.	00-01	*	Basic
	00 Decel to Stop (A1-03=0)	Used to stop when motion is traverse (Fig 5-2)			
	01 Coast to Stop (A1-03=1)	Used to stop when motion is hoist (Fig 5-3)			

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

Decel to Stop (B03.03 = 00)

Upon removal of the FWD or REV run command, the motor decelerates at a rate determined by the time set in deceleration time 1 (B05.02) and DC injection braking is applied after the DC injection start frequency, D01.01, 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.

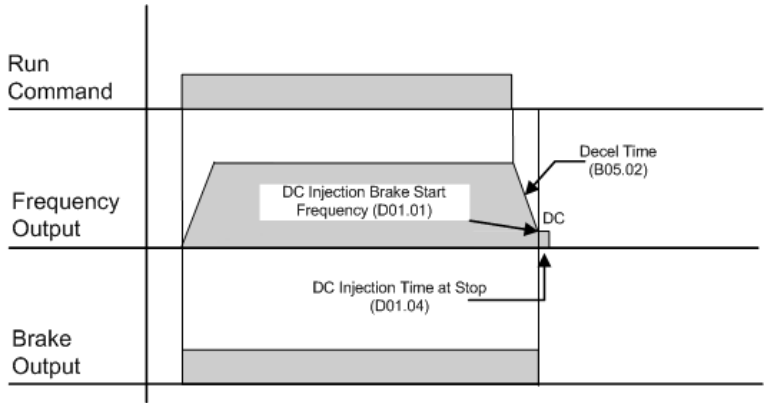


Figure 5-2: B03.03 = 00 (Decel to Stop) without DC Injection

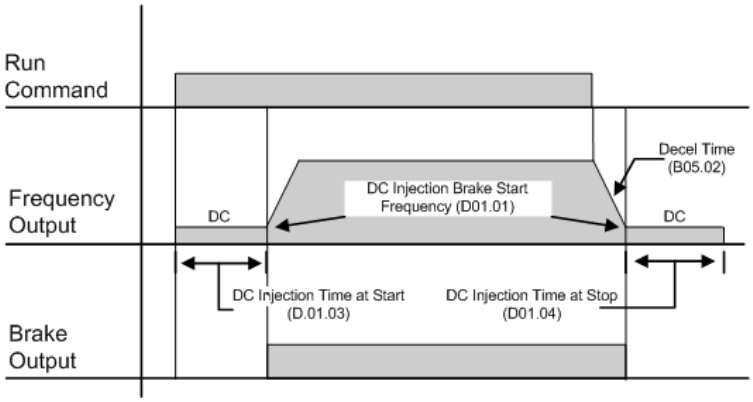


Figure 5-3: B03.03 = 00 (Decel to Stop) with DC Injection

Coast to Stop (B03.03 = 01)

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

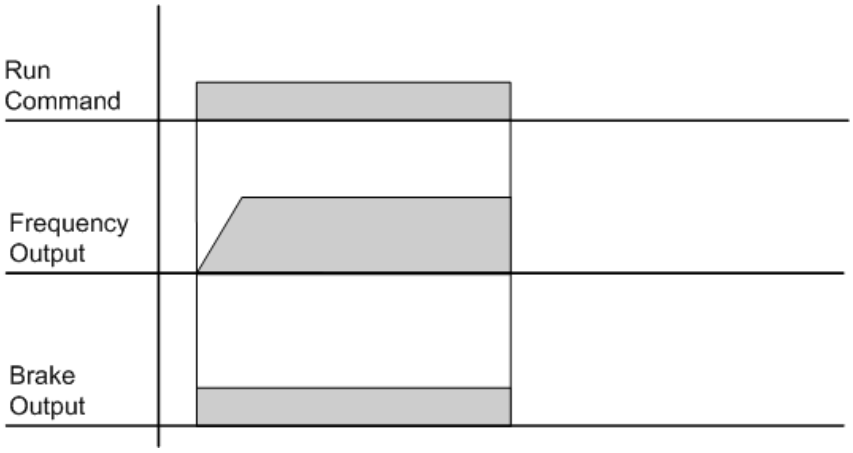


Figure 5-4: B03.03 = 01 (Coast to Stop) without DC Injection

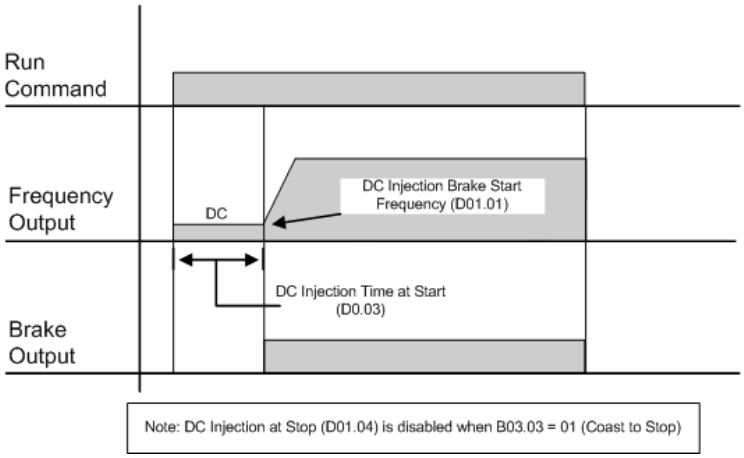


Figure 5-5: B03.03 = 01 (Coast to Stop) with DC Injection

DC Injection Braking (B03.03 = 02)

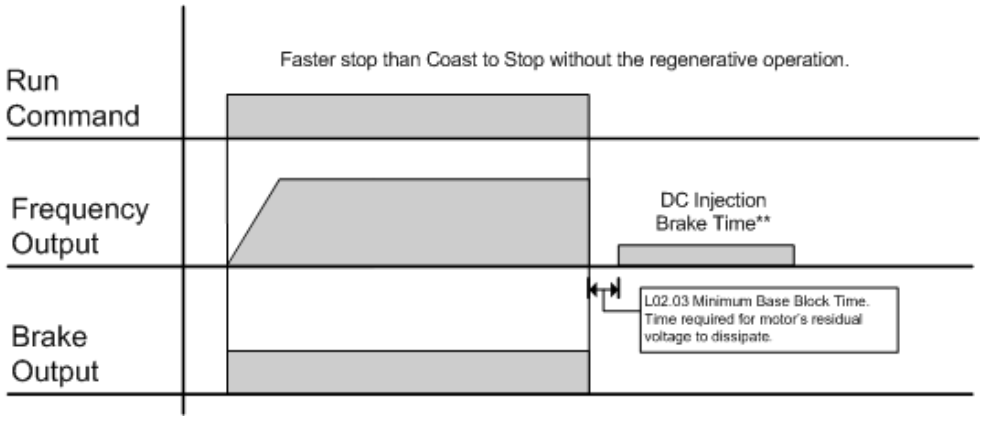


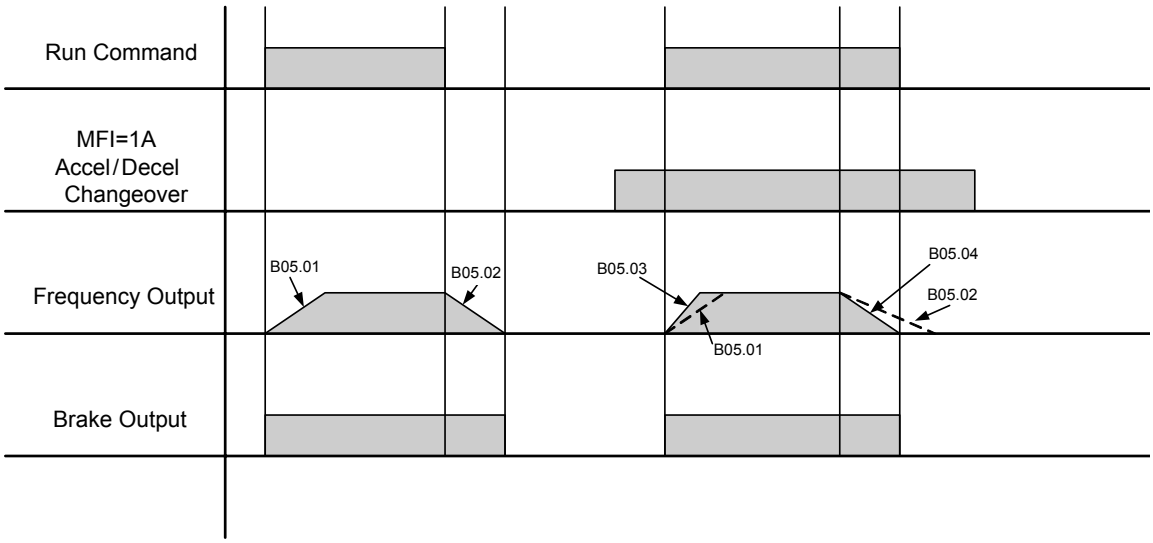
Figure 5-6: B03.03 = 02 (DC Injection at Stop) without DC Injection at Start

Acceleration/Deceleration

Acceleration time sets the time necessary for the output frequency to accelerate from 0Hz to maximum output frequency (E01.04). Deceleration time sets the time necessary for the output frequency to decelerate from the maximum output frequency (E01.04) to 0Hz.

Parameter Code	Name	Function	Range	Initial Value	Access Level
B05.01	Accel Time 1	Sets acceleration time.	0.0–25.5 sec	5.0*	Basic
B05.02	Decel Time 1	Sets deceleration time.	0.0–25.5 sec	3.0*	Basic
B05.03	Accel Time 2	Sets alternate accel. time. Enabled by multi-function input=1A.	0.0–6000.0 sec	2.0	Basic
B05.04	Decel Time 2	Sets alternate decel. time. Enabled by multi-function input=1A.	0.0–6000.0 sec	2.0	Basic

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



NOTE: Assume the constant B03.03 is set to "00" (Decel to Stop).

Figure 5-7: Normal Accel/Decel Time and Multiple Accel/Decel Changeover

Special Functions

The special function parameters are special crane and hoist specific functions used to control how the system will operate the application. These include Quick Stop™ and Reverse Plug Simulation™. Listed below are the special function parameters covered in this section.

- C1 Quick Stop
- C1 Reverse Plug Simulation
- C3 End of Travel Limit
- C6 Swift-Lift

Special Function	Motion (A01.03)	
	Traverse (A01.03=0)	Standard Hoist (A01.03=1)
C1: Quick Stop	○	○
C1: Reverse Plug Simulation	○	×
C3: End of Travel Limits	○	○
C6: Swift-Lift	×	○

○: Available for the Motion selected

×: Not available for the Motion selected

Quick Stop

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	Name	Function	Range	Initial Value	Access Level
C01.01	Quick Stop 0/1	Determines whether Quick Stop is enabled *00 Disabled* *01 Enabled*	00-01	00*	Basic
C01.02	Quick Stop Time	Deceleration time during Quick Stop function.	0.0–25.5 sec	1.0	Basic

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

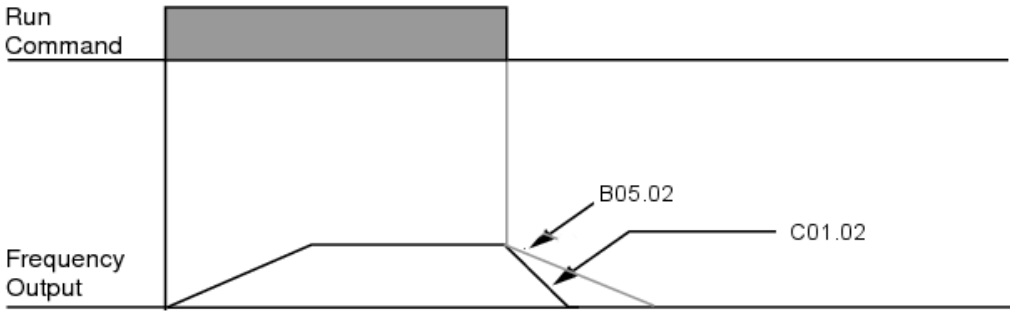


Figure 5-8: Quick Stop

Reverse Plug Simulation™

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

Parameter Code	Name	Function	Range	Initial Value	Access Level
C01.03	Reverse Plug	Determines whether Reverse Plug Simulation is enabled. *00 Disabled* *01 Enabled*	00-01	00	Basic
C01.04	Reverse Plug Decel Time	Deceleration time during Reverse Plug Simulation.	0.0–25.5 sec	2.0	Basic
C01.05	Reverse Plug Accel Time	Acceleration time during Reverse Plug Simulation	0.0–25.5 sec	2.0	Basic

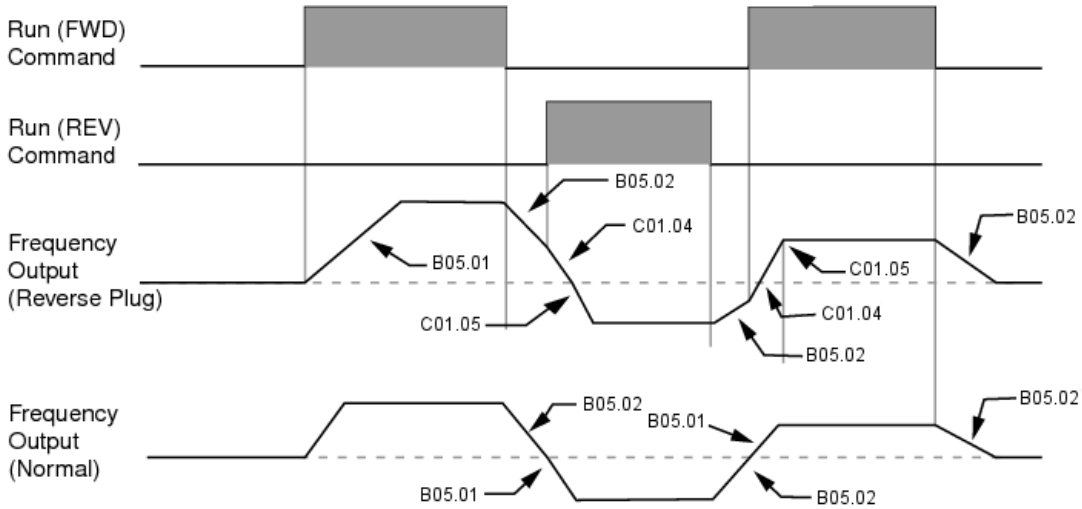


Figure 5-9: Reverse Plug Simulation

Travel Limits

This function can automatically slow and stop a crane or hoist when it reaches the end of the travel limits. Two types of limit inputs (slow and stop) are available in both travel directions. Inputs can be programmed through H01.01 ~ H01.07.

When the crane reaches either the Upper Limit 1 (UL1) or Lower Limit 1 (LL1), the drive will decelerate to the Upper and Lower Limit speeds (C03.01 and C03.04) respectively. When the crane reaches either the Upper Limit 2 (UL2) or Lower Limit 2 (LL2), the drive will come to a stop based on the Limit Stopping Method (C03.07). If C03.07 is set to 00, then the deceleration time will use Upper Limit 2 Stop Time (C03.03) or Lower Limit 2 Stop Time (C03.06).

Parameter Code	Name	Function	Range	Initial Value	Access Level
C03.01	Upper Limit 1 Speed	Speed at Upper Limit input.	0–150 Hz	6.00	Basic
C03.02	Upper Limit 1 Decel Time	Decel time to Upper Limit Speed.	0.0–25.5 sec	1.0	Basic
C03.03	Upper Limit 2 (UL2) Stop Time	Decel time to STOP when Upper Limit is Input.	0.0–25.5 sec	1.0	Basic
C03.04	Lower Limit 1 Speed	Speed at Lower Limit input.	0–150 Hz	6.00	Basic
C03.05	Lower Limit 1 Decel Time	Decel time to Lower Limit Speed	0.0–25.5 sec	1.0	Basic
C03.06	Lower Limit 2 (LL2) Stop Time	Decel time to STOP when Lower Limit is input.	0.0–25.5 sec	1.0	Basic
C03.07	Limit Action @ LL2/UL2	Determine the stop method at Upper Limit 2 and Lower Limit 2 Input. 00 Decel to Stop 01 Coast to Stop 02 Use B03.03 Method	00-02	02*	Basic

* Initial value is determined by X-Press Programming

Swift-Lift™

Swift-Lift provides additional productivity by allowing a hoist to quickly move into position by increasing speeds under light or no load conditions. 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 of the Swift-Lift Forward Speed (C06.02) or Swift-Lift Reverse Speed (C06.03) and the Max Output Frequency (E01.04). See the Swift-Lift timing diagram on page 5-16.

NOTE: Swift-Lift is disabled when in traverse applications.
The maximum frequency (E01.04) ≥ C06.02 and C06.03.

There are two methods that may be utilized to enable Swift-Lift:

1) Automatic: Swift-Lift can be enabled to automatically occur whenever the load is less than the maximum percentage of motor current (C06.04 or C06.05) and the output frequency is greater than the Swift Lift Enabling Speed (C06.06).

2) Manual: Swift-Lift may be enabled manually through the Multi-Functional Digital Inputs by setting H01.01 ~ H01.07 = 13.

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.

Parameter Code	Name	Function	Range	Initial Value	Access Level
C06.01	Swift-Lift	Determines whether Swift-Lift is enabled. *00 Disabled* *01 Enabled Automatic* *02 Enabled by MFI = 13*	00-02	00	Basic
C06.02	Swift-Lift Forward Speed	Maximum Output Frequency during Swift-Lift—FORWARD.	0–150 Hz	60	Basic
C06.03	Swift-Lift Reverse Speed	Maximum Output Frequency during Swift-Lift—REVERSE.	0–150 Hz	60	Basic
C06.04	Swift-Lift Forward Torque	Maximum output current below which Swift-Lift—FORWARD is enabled.	0–100%	50	Basic
C06.05	Swift-Lift Reverse Torque	Maximum output current below which Swift-Lift REVERSE is enabled.	0–100%	30	Basic
C06.06	Swift-Lift Enabling Spd	Threshold frequency at which Swift-Lift is enabled.	0–150 Hz	59.0	Basic
C06.07	Swift-Lift Delay Time	Delay time at enabling speed prior to torque-compare function.	0.0–25.5 sec	2.0	Basic

Enable Swift-Lift Function:

Using Multi-Step 2, 3, 5 (A01.04 = 00, 01, or 02):

If the system is using **Multi-Step** as the **Speed Control Method**, use the following instructions to set up Swift-Lift.

1. Set **V/f Selection (E01.03) = 0F** to allow for a custom V/f pattern.

   *NOTE: If you choose a **Custom V/f pattern** you will need to change all the values for E01.05 ~ E01.13 parameters from your current settings. You may also choose a V/f pattern that is similar to the one you are using from the other V/f selections.*

2. Ensure that the **Maximum Frequency (E01.04)** is increased from 60 Hz and will be equal to or slightly greater than the maximum Swift-Lift Forward or Reverse speeds you want to run at.

   Maximum frequency (E01.04) ≥ C06.02 and C06.03.

3. Set C06.01 = 01 or 02 to enable the **Swift-Lift Function**.
   a. 01 = Enable Automatic
   b. 02 = Enable by Multi-Function Input (MFI).
4. Set C06.02 and C06.03 to determine **Swift-Lift** maximum FWD/REV output frequency.
5. Set C06.04 and C06.05 to determine **Swift-Lift** maximum enable output current.
6. Set the **Swift-Lift Enabling Speed (C06.06)** one or two hertz below the maximum normal running speed reference.
   a. For example: If the maximum normal running speed is at 60 Hz, set C06.06 to 58 or 59 Hz as the **Swift-Lift Enabling Speed**.

Using Infinitely Variable 2, 3 Step (A01.04 = 03 or 04):

If the system is using **2-Step** or **3-Step Infinitely Variable** as the **Speed Control Method**, use the following formula to adjust the constant **B02.01 (Reference Upper Limit)**:

B02.01 = (60 Hz x 100) / E01.04

1. Set **V/f Selection (E01.03) = 0F** to allow for setting a custom V/f pattern.

   *NOTE: If you choose a **Custom V/f pattern**, you will need to change all the values for E01.05 ~ E01.13 parameters from your current settings. You may also choose a V/f pattern that is similar to the one you are using from the other V/f selections.*

2. Ensure that the **Maximum Frequency (E01.04)** is increased from 60 Hz and will be equal to or slightly greater than the maximum Swift-Lift Forward or Reverse speeds you want to run at.
   a. Maximum frequency (E01.04) ≥ C06.02 and C06.03.
3. Set the Frequency Upper Limit (B02.01). This is done so that the *maximum normal running speed* will be 60 Hz with the new E01.04 setting.
   a. For example, if E01.04 is set to 75.0 Hz, then B02.01 = 80%
      B02.01 = (60.0 Hz x 100%) / (75.0 Hz) = 80%
4. Set C06.01 = 01 or 02 to enable the **Swift-Lift Function**:
   a. 01 = Enable Automatic.
   b. 02 = Enable by Multi-Function Input (MFI).
5. Set C06.02 and C06.03 to determine **Swift-Lift** maximum FWD/REV output frequency.

6. Set C06.04 and C06.05 to determine **Swift-Lift** maximum enable output current.
7. Set the **Swift-Lift Enabling Speed (C06.06)** one or two hertz below the *maximum normal running speed* reference (see step 3).
   a. For example: if the *maximum normal running speed* is at 60 Hz, set C06.06 to 58 or 59 Hz as the **Swift-Lift Enabling Speed**.

Using Uni-Polar Analog (A01.04 = 5):

If the system is using **Uni-Polar Analog** as the **Speed Control Method**, use the following formula to adjust the constants **H03.03 (Gain Multiplier for Terminal A1 analog input signal)** or **H03.11 (Gain Multiplier for Terminal A2 analog input signal)**:

Gain Terminal A1: H03.03 = (60 Hz x 100) / E01.04

or

Gain Terminal A2: H03.11 = (60 Hz x 100) / E01.04

1. Set **V/f Selection (E01.03) = 0F** to allow for setting a custom V/f pattern.
2. Ensure that the **Maximum Frequency (E01.04)** is increased from 60 Hz and will be equal to or slightly greater than the maximum Swift-Lift Forward or Reverse speeds you want to run at.
   a. Maximum frequency (E01.04) ≥ C06.02 and C06.03.
3. Set the terminal gain multiplier for H03.03 or H03.11. This is done so that the *maximum normal running speed* will be 60 Hz with the new E01.04 setting. Use one of the above equations to determine the correct multiplier.
   a. For example, to set the gain for Terminal A1 if if E01.04 is set to 80.0 Hz, then H03.03 = 75%
      H03.03 = (60.0 Hz x 100%) / (80.0 Hz) = 75%
4. Set C06.01 = 01 or 02 to enable the **Swift-Lift Function**:
   a. 01 = Enable Automatic.
   b. 02 = Enable by Multi-Function Input (MFI).
5. Set C06.02 and C06.03 to determine **Swift-Lift** maximum FWD/REV output frequency.
6. Set C06.04 and C06.05 to determine **Swift-Lift** maximum enable output current.
7. Set the **Swift-Lift Enabling Speed (C06.06)** one or two hertz below the *maximum normal running speed* reference (see step 3).
   a. For example: if the *maximum normal running speed* is at 60 Hz, set C06.06 to 58 or 59 Hz as the **Swift-Lift Enabling Speed**.

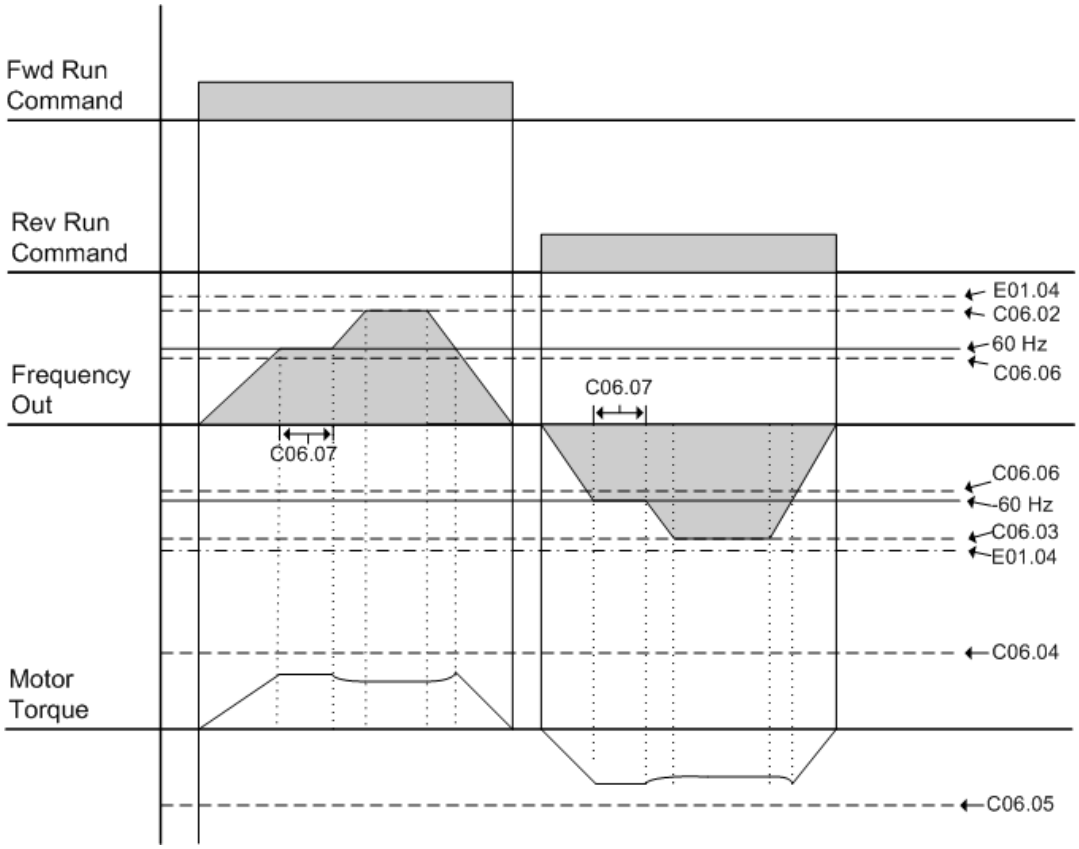


Figure 5-10: Swift Lift Timing Diagram

Tuning

These parameters help tune the motor for your application, which include Torque Compensation and S-Curve characteristics for smoother transition during machine acceleration and deceleration. Below are the parameters included in this section.

- D1 DC Injection
- D3 Torque Compensation
- D9 S-Curve Acceleration/Deceleration

DC Injection

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

With Decel to Stop enabled (B03.03 = 00), upon removal of the run command the IMPULSE•G+ Mini drive controls motor deceleration according to the Decel Time setting, until output frequency reaches the DC Injection Braking Start Frequency (D01.01 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	Name	Function	Range	Initial Value	Access Level
D01.01	DC Injection Start Frequency	DC Injection braking frequency start.	0.0–10 Hz	0.5	Basic
D01.02	DC Injection Current	% of Inverter rated current	0-75%	50	Basic
D01.03	DC Injection Time @ Start	DC Injection braking time.	0.00–10.00 sec	0.00	Basic
D01.04	DC Injection Time @ Stop	DC Injection braking time at stop.	0.00–10.00 sec	0.05	Basic

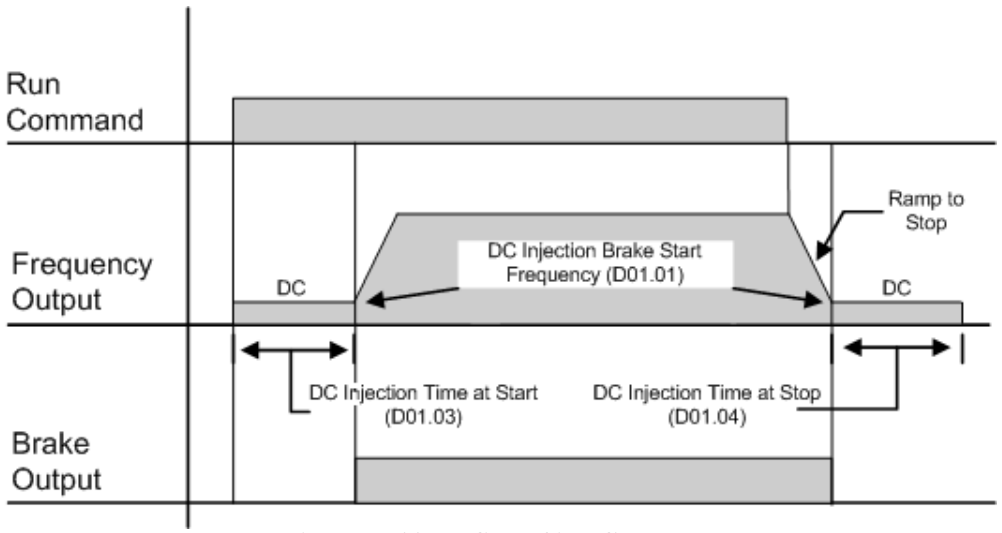


Figure 5-11: DC Braking Sequence

Torque Compensation

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

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

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

Parameter Code	Name	Function	Range	Initial Value	Access Level
D03.01	Torque Compensation Gain	Torque compensation multiplier.	0.00-2.50	1.00	Basic

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	Name	Function	Range	Initial Value	Access Level
D09.01	S-Curve Accel @ Start	Sets S-Curve time at Accel start	0.00–10.0 sec	0.50*	Basic
D09.02	S-Curve Accel @ End	Sets S-Curve time at Accel end	0.00–10.0 sec	0.50*	Basic
D09.03	S-Curve Decel @ Start	Sets S-Curve time at Decel start	0.00–10.0 sec	0.50*	Basic
D09.04	S-Curve Decel @ End	Sets S-Curve time at Decel end	0.00–10.0 sec	0.20	Basic

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

Figure 5-9 shows FWD/REV run switching during deceleration to stop. The S-Curve function will add time to the acceleration and deceleration.

Total time to acceleration from minimum frequency to maximum frequency (total acceleration) is:

$$TotalAccerationTime(s) = B05.01 + \left(\frac{(D09.01 + D09.02)}{2} \right)$$

Total time to deceleration from maximum frequency to minimum frequency (total deceleration) is:

$$TotalDecelerationTime(s) = B05.02 + \left(\frac{(D09.03 + D09.04)}{2} \right)$$

CAUTION

CAUTION: Accel/Decel times will be extended.

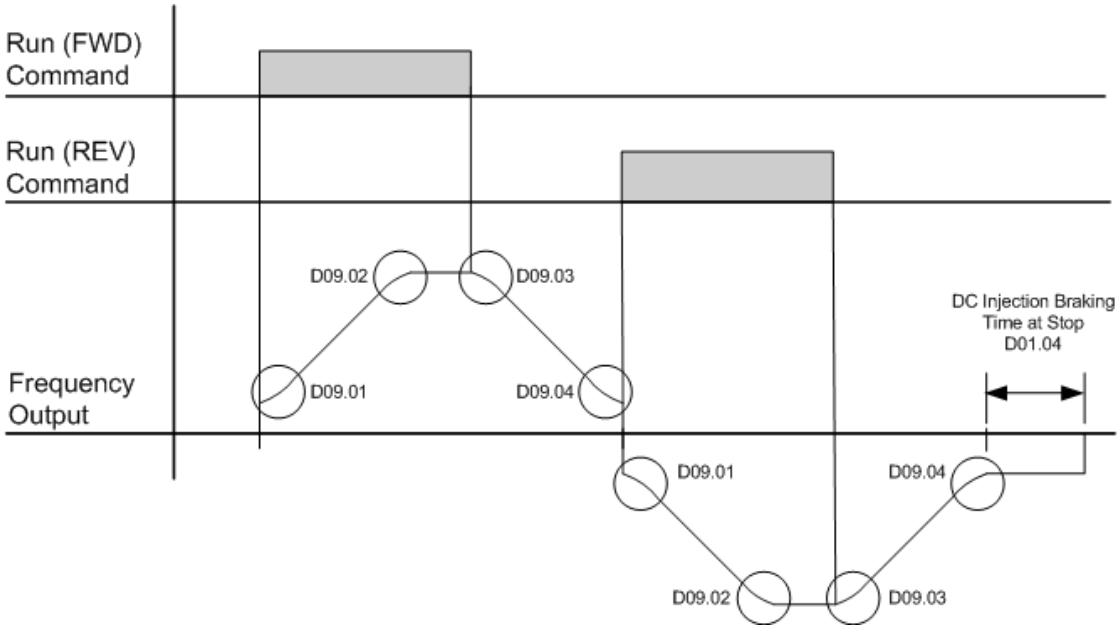


Figure 5-12: S-Curve Characteristics–FWD/REV Operation

Motor Parameters

Motor data such as full load amps and V/f pattern are selected with the following parameters. These parameters include the ability to select and set up custom V/f patterns for the type of motor used.

- E1 V/f Pattern 1
- E2 Motor Set-up

Voltage/Frequency Pattern

Parameter Code	Name	Function	Range	Initial(1) Value	Access Level
E01.01	Input Voltage	Sets input voltage	155-255/ 310-510	230 460	Basic

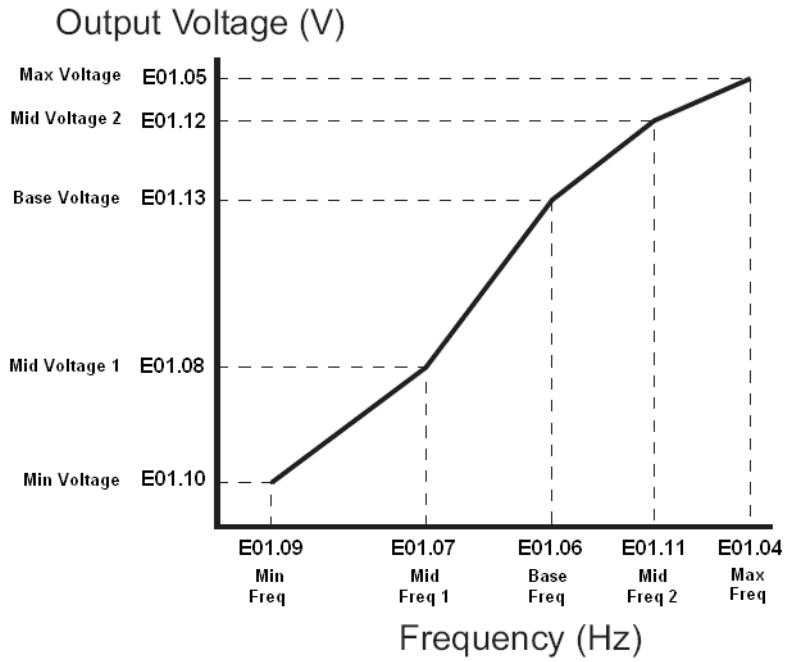


Figure 5-13: E01.01 Input Voltage

- *Factory setting is 230 (230V units) or 460 (460V units).*
- *When E01.11 = 0, then the value of E01.11 is not used,*
- *When E01.12 = 0, then the value of E01.12 is not used.*
- *When E01.13 = 0, then the value of E01.13 is not used.*

An OPE10 error will occur if the following conditions are not met:

$$E01.05 \geq E01.12 \geq E01.13 \geq E01.08 \geq E01.10$$

$$E01.04 \geq E01.11 \geq E01.06 \geq E01.07 \geq E01.09$$

The setting E01.01 adjusts the overvoltage level, braking transistor turn on level, and the stall prevention level during deceleration.

Table 5-2:

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

Table 5-3:V/f Parameters

Parameter Code	Name	Function	Range	Initial Value	Access Level
E01.03	V/f Selection	Selection V/f Pattern	00-FF	04*	Basic
E01.04(3)	Max Frequency	Maximum Frequency	40.0–150.0 Hz	60.0**	Basic
E01.05(2)	Max Voltage	Maximum Voltage	0.0–510.0 V	460**	Basic
E01.06	Base Frequency	Motor Base Frequency	0.0–150.0 Hz	60**	Basic
E01.07	Mid Frequency A	Midpoint Output Frequency A	0.0-150.0 Hz	3.0**	Basic
E01.08(2)	Mid Voltage A	Midpoint Frequency Voltage A	0.0-510.0 V	30.0**	Basic
E01.09	Min Frequency	Minimum Frequency	0.0–150.0 Hz	1.5**	Basic
E01.10(2)	Min Voltage	Minimum Voltage	0.0-510.0 V	20.6**	Basic
E01.11	Mid Frequency B	Midpoint Output Frequency B	0.0–150.0 Hz	0.0**	Basic
E01.12(2)	Mid Voltage B	Midpoint Output Voltage B	0.0–510.0 V	0.0**	Basic
E01.13(2)	Base Voltage	Motor Base Voltage	0.0–510.0 V	0.0**	Basic

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

** Initial value is determined by voltage class and setting of E01.03; see Tables 5.4 and 5.5.

(1) The initial value displayed here is for 460V class drives.

(2) For 230V class units, the voltage range is half that of 460V class units (0.0 ~ 255.0V).

(3) To change E01.04 "Max Frequency," E01.03 must first be set to "0F", or pick a V/f pattern from Table 5-4 or 5-5.

Parameter Code	Name	Function	Range	Initial Value	Access Level
E02.01	Motor Rated FLA	Motor-rated current	...	***	Basic

*** Initial value is determined by O02.04 (kVA Selection). This valule is set automatically during auto tuning.

Table 5-4: Voltage/Frequency Pattern Options for 230 V Class

	E01.04	E01.05	E01.06	E01.07	E01.08	E01.09	E01.10	E01.11	E01.12	E01.13
E01.03	**Hz**	**V**	**Hz**	**Hz**	**V**	**Hz**	**V**	**Hz**	**V**	**V**
00[4]	60.0	230.0	60.0	3.0	15.0	1.3	8.1	0.0	0.0	0.0
01	60.0	230.0	60.0	3.0	16.1	1.3	9.2	0.0	0.0	0.0
02	60.0	230.0	60.0	3.0	17.3	1.3	10.4	0.0	0.0	0.0
03	60.0	230.0	60.0	3.0	18.4	1.3	11.5	0.0	0.0	0.0
04[5]	60.0	230.0	60.0	3.0	19.6	1.3	12.7	0.0	0.0	0.0
05	60.0	230.0	60.0	3.0	20.7	1.3	13.8	0.0	0.0	0.0
06	60.0	230.0	60.0	3.0	21.9	1.3	15.0	0.0	0.0	0.0
07	60.0	230.0	60.0	3.0	23.0	1.3	16.1	0.0	0.0	0.0
08	60.0	230.0	60.0	3.0	24.2	1.3	17.3	0.0	0.0	0.0
09	72.0	230.0	60.0	3.0	16.1	1.3	9.2	0.0	0.0	0.0
0A	72.0	230.0	60.0	3.0	17.8	1.3	10.9	0.0	0.0	0.0
0B	72.0	230.0	60.0	3.0	19.6	1.3	12.7	0.0	0.0	0.0
0C	90.0	230.0	60.0	3.0	16.1	1.3	9.2	0.0	0.0	0.0
0D	90.0	230.0	60.0	3.0	17.8	1.3	10.9	0.0	0.0	0.0
0E	90.0	230.0	60.0	3.0	19.6	1.3	12.7	0.0	0.0	0.0
0F	60.0	230.0	60.0	3.0	17.3	1.3	10.4	0.0	0.0	0.0

Table 5-5: Voltage/Frequency Pattern Options for 460 V Class

	E01.04	E01.05	E01.06	E01.07	E01.08	E01.09	E01.10	E01.11	E01.12	E01.13
E01.03	**Hz**	**V**	**Hz**	**Hz**	**V**	**Hz**	**V**	**Hz**	**V**	**V**
00[4]	60.0	460.0	60.0	3.0	29.9	1.3	16.1	0.0	0.0	0.0
01	60.0	460.0	60.0	3.0	32.2	1.3	18.4	0.0	0.0	0.0
02	60.0	460.0	60.0	3.0	34.5	1.3	20.7	0.0	0.0	0.0
03	60.0	460.0	60.0	3.0	36.8	1.3	23.0	0.0	0.0	0.0
04[5]	60.0	460.0	60.0	3.0	39.1	1.3	25.3	0.0	0.0	0.0
05	60.0	460.0	60.0	3.0	41.4	1.3	27.6	0.0	0.0	0.0
06	60.0	460.0	60.0	3.0	43.7	1.3	29.9	0.0	0.0	0.0
07	60.0	460.0	60.0	3.0	46.0	1.3	32.2	0.0	0.0	0.0
08	60.0	460.0	60.0	3.0	48.3	1.3	34.5	0.0	0.0	0.0
09	72.0	460.0	60.0	3.0	32.2	1.3	18.4	0.0	0.0	0.0
0A	72.0	460.0	60.0	3.0	35.6	1.3	21.8	0.0	0.0	0.0
0B	72.0	460.0	60.0	3.0	39.1	1.3	25.3	0.0	0.0	0.0
0C	90.0	460.0	60.0	3.0	32.2	1.3	18.4	0.0	0.0	0.0
0D	90.0	460.0	60.0	3.0	35.6	1.3	21.8	0.0	0.0	0.0
0E	90.0	460.0	60.0	3.0	39.1	1.3	25.3	0.0	0.0	0.0
0F	60.0	460.0	60.0	3.0	34.5	1.3	20.7	0.0	0.0	0.0

[4] Default for Traverse Motion (A01.03 = 00).

[5] Default for Hoist Motion (A01.03 = 01)

Terminal Parameters

There are both digital and analog inputs and outputs that can be programmed for customized operation and sequencing. These include input and output terminal selection along with serial communication. Listed below are the parameters in this section that are customizable for your system.

- H1 Digital Inputs
- H2 Digital Outputs
- H3 Analog Inputs
- H5 Serial Communication Set-up

Digital Inputs

The IMPULSE•G+ Mini has seven 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 S1 to S7) 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.

.

Parameter Code	Name	Function	Reference Page Number	Range	Initial Value	Access Level
H01.01	Terminal S1 Select	Selects the multi-function inputs. Setting for S1.	--	00~81	80*	Basic
H01.02	Terminal S2 Select	Setting for S2.	--	00~81	81*	Basic
H01.03	Terminal S3 Select	Setting for S3.	--	00~81	00*	Basic
H01.04	Terminal S4 Select	Setting for S4.	--	00~81	01*	Basic
H01.05	Terminal S5 Select	Setting for S5.	--	00~81	0F*	Basic
H01.06	Terminal S6 Select	Setting for S6.	--	00~81	0F*	Basic
H01.07	Terminal S7 Select	Setting for S7.	--	00~81	0F*	Basic
	00 Multi-Step Ref 2	*Multi-Step Speed 2.*	*5-3*			
	01 Multi-Step Ref 3	*Multi-Step Speed 3.*	*5-3*			
	02 Multi-Step Ref 4	*Multi-Step Speed 4.*	*5-3*			
	03 Multi-Step Ref 5	*Multi-Step Speed 5.*	*5-3*			
	04 Speed Hold 2	*Hold function (2nd step of Three-Step Infinitely Variable).*	--			
	05 Accel Command	*Acceleration function (2nd step of Two-Step Infinitely Variable or 3rd step of Three-Step Infinitely Variable).*	*5-3*			
	06 Upper Limit 1 N.O.	*Upper Limit - SLOW DOWN; Normally Open. UL1 - blinking*	*5-12*			
	07 Upper Limit 2 N.O.	*Upper Limit - STOP; Normally Open. UL2 - blinking*	*5-12*			
	08 Lower Limit 1 N.O.	*Lower Limit - SLOW DOWN; Normally Open. LL1 - blinking*	*5-12*			
	09 Lower Limit 2 N.O.	*Lower Limit - STOP; Normally Open. LL2 - blinking*	*5-12*			
	0A Upper Limit 1 N.C.	*Upper Limit - SLOW DOWN; Normally Closed. UL1 - blinking*	*5-12*			

** = Parameter defaults changed by X-Press Programming*

Parameter Code	Name	Function	Reference Page Number	Range	Initial Value	Access Level
	0B Upper Limit 2 N.C.	*Upper Limit - STOP; Normally Closed. UL2 - blinking*	*5-12*			
	0C Lower Limit 1 N.C.	*Lower Limit - SLOW DOWN; Normally Closed. LL1 - blinkinng*	*5-12*			
	0D Lower Limit 2 N.C.	*Lower Limit - STOP; Normally Closed. LL2 - blinking*	*5-12*			
	0F Not Used	*Not Used*	*--*			
	13 Swift-Lift	*Swift-Lift Enable (C06.01 = 2). Not available for Traverse Motion*	*5-13*			
	1A Acc/Dec 2	*Acceleration and Deceleration Time Changeover 2 using B05.03 and B05.04*	*5-9*			
	20 thru 2F External Fault	*Desired setting is possible. Input mode: N.O./N.C., Detection mode: Always/ During Run (See external fault response selection table)*	*5-26*			
	32 Ext BB N.O.	*N.O.: Baseblock by ON. Immediate stop at STOP command; normally open*	*--*			
	33 Ext BB N.C.	*N.C.: Baseblock by OFF. Immediate stop at STOP command; normally closed*	*--*			
	3A Trm A1/A2 Enable	*Multi-function analog input (A1/A2) Enable/Disable. When programmed, analog input A1/ A3 is enabled by ON.*	*--*			
	3F Fault Reset	*Reset by ON*	*--*			
	59 Alternate Upper Frequency	*Alternate Reference Upper Limit Frequency*	*5-4*			
	80 Forward Run.	*Forward Run Command*	*5-3*			
	81 Reverse Run	*Reverse Run Command*	*5-3*			

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 (H01.01 to H01.06) for this purpose an external fault response must be selected. The table below shows the possible selections for an external fault response.

Table 5-6:

External Fault Selection							MFI Setting Result
Input Level Selection		**Detection Method**		**External Fault Action**			
N.O.	N.C.	Always	During Run	Ramp to Stop	Coast to Stop	Alarm Only	
√		√		√			20
√		√			√		24
√		√					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

Digital Outputs

The IMPULSE•G+ Mini has three multi-function control outputs (one relay, two open collector) 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	Name	Function	Reference Page Number	Range	Initial Value	Access Level
H02.01	Output Contactor (MC-MB-MA) select	Digital Output 1 Function	--	000–117	000	Basic
H02.02	Output Terminal P1 Select	Digital Output 2 Function	--	000–117	000	Basic
H02.03	Output Terminal P2 Select	Digital Output 3 Function	--	000–117	00F	Basic
	000 Brake Release	*Closed when voltage or frequency is output*	--			
	001 Zero Speed	*Closed when below B02.02 or D01.01*	5-4			
	004 Freq Detect 1	*Closed when output frequency is < L04.01.*	5-36			
	005 Freq Detect 2	*Closed when output frequency is > L04.01.*	5-36			
	00B Trq Det 1 N.O.	*Output when torque > L06.02*	5-37			
	00E Fault	*Closed during a major fault.*	--			
	00F Not Used	*No function*	--			
	017 Trq Det 1 N.C.	*Open when torque > L06.02 for longer than L06.03 time*	5-37			
	101 Inverse Zero Speed	*Open when below B02.02 or D01.01*	5-4			
	104 Inverse Freq Detect 1	*Open when output frequency is < L04.01.*	5-36			
	105 Inverse Freq Detect 2	*Open when output frequency is > L04.01.*	5-36			
	10B Inverse Trq Det 1 N.O.	*Output when torque > L06.02*	--			
	10E Inverse Fault	*Open during a major fault*	--			
	117Inverse Trq Det 1 N.C.	*Closed when torque > L06.02 for longer than L06.03 time*	--			

Analog Inputs

The IMPULSE•G+ Mini has two analog inputs for the external input of frequency references.

Parameter Code	Name	Function	Range	Initial Value	Access Level
H03.01	Terminal A1 Signal Select	Voltage for Terminal A1 analog input signal	00	00	Basic
	00 0VDC to 10VDC				
H03.02	Terminal A1 Select	Assigns one of the following function analog input parameters to Terminal A1.	00, 0F	00	Basic
	00 Frequency Bias				
	0F Not used				
H03.03	Terminal A1 Gain	Gain multiplier for Terminal A1 analog input signal	-999.9 - 999.9%	100.0	Basic
H03.04	Terminal A1 Bias	Bias multiplier for Terminal A1 analog input signal	-999.9 - 999.9%	0.0	Basic
H03.09	Terminal A2 Signal Select	Selects the signal level of Terminal A2	00-03	02	Basic
	00 0VDC ~ 10VDC (switch S1 must be in the "V" position)				
	02 4 to 20mA (switch S1 must be in the "I" position)				
	03 0 to 20mA (switch S1 must be in the "I" position)				
	NOTE: Switch between current or voltage inputs by using (S1) switch on the main board				
H03.10	Terminal A2 Select	Assigns one of the following function analog input parameters to Terminal A2.	00, 0F	00	Basic
	00 Frequency Bias				
	0F Not used				
H03.11	Terminal A2 Gain	Gain multiplier for terminal A2 analog input signal	-999.9 - 999.9%	100.0	Basic
H03.12	Terminal A2 Bias	Bias multiplier for terminal A2 analog input signal	-999.9 - 999.9%	0.0	Basic
H03.13	Analog Input Filter Time Constant	Analog input filter average time; analog delay time constant between Terminals A1 and A2	0.00-2.00sec	0.03	Basic

Serial Communication Set-up

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

Parameter Code	Name	Function	Range	Initial Value	Access Level
H05.01	Serial Drive Address	Serial communication address (hexadecimal)	00–20	1F	Basic
H05.02	Serial Baud Rate	Sets the baud rate (bits per second)	00~08	03	Basic
	00 1200 BPS				
	01 2400 BPS				
	02 4800 BPS				
	03 9600 BPS				
	04 19200 BPS				
	05 38400 BPS				
	06 57600 BPS				
	07 76800 BPS				
	08 115200 BPS				
H05.03	Communication - Parity	Determines the parity	00–02	00	Basic
	00 No parity				
	01 Even parity				
	02 Odd parity				

NOTE: After changing any H05.xx parameter, power to the inverter must be cycled for changes to take effect.

Protection Parameters

The IMPULSE•G+ Mini has the ability to protect both the drive's hardware and motor by allowing various means to detect and take corrective action when a condition occurs. These include motor overload detection, torque detection, and the ability to perform a self-diagnostic check, and then resume operation after a fault is cleared.

- L1 Motor Overload
- L3 Stall Prevention
- L4 Reference Detection
- L6 Torque Detection
- L8 Hardware Protection
- L9 Automatic Reset

Motor Overload

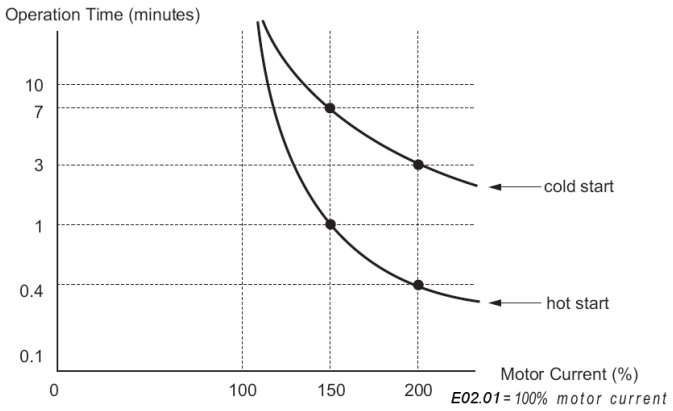
The IMPULSE•G+ Mini protects against motor overload with a UL-recognized, built-in electronic thermal overload function.

The electronic thermal overload function estimates motor temperature, based on inverter output current, frequency and time to protect the motor from overheating. This time is based on a "hot start" for the motor (see Figure 5-11 Motor Protection Operation Time). When the thermal overload fault is activated, an "OL1" trip occurs, shutting OFF the inverter output and preventing excessive overheating in the motor. As long as the inverter is powered up, it continues to calculate the motor temperature.

When operating with one inverter connected to one motor, an external thermal relay is not needed. When operating several motors with one inverter, use the internal thermal protection from the motor in accordance with NEC 430.126 (6) or install an external thermal overload relay on each motor. In this case, set parameter *L01.01* to "00."

Parameter Code	Name	Function	Range	Initial Value	Access Level
L01.01	Motor Overload Fault Select	Enable/disable motor overload detection. *00 Disabled* *01 Standard Fan Cooled* *02 Standard Blower Cooled* *03 Vector Motor*	00-03	01	Basic
L01.02	Motor Overload Time Const	Time for OL1 fault when motor current is ≥ 150% of the motor rated current. Hot start	0.1–5.0 min	1.0	Basic

Figure 5-14:



Motor Protection Operation Time

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	Name	Function	Range	Initial Value	Access Level
L03.01	Stall Prevention Accel Select	Enable/disable stall prevention during acceleration.	00–02	01	Basic
	00 Disabled	See Table 5.7 below.			
	01 General Purpose	See Table 5.7 below.			
	02 Intelligent	See Table 5.7 below.			

Table 5-7:

Setting	Description
00 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).
01 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 (B05.01).
02 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	Name	Function	Range	Initial Value	Access Level
L03.02	Stall Prevention Accel Level	Stall prevention level during acceleration.	0–150%	150	Basic

The stall prevention/current limit level during acceleration is set as a percentage of inverter rated current. Setting L03.01 = 00 disables current limit during acceleration. During acceleration, if the output current exceeds this current limit level (*L03.02*), acceleration stops and frequency is maintained. When the output current decreases below this current level (*L03.02*), acceleration restarts. See below, Figure 5-12.

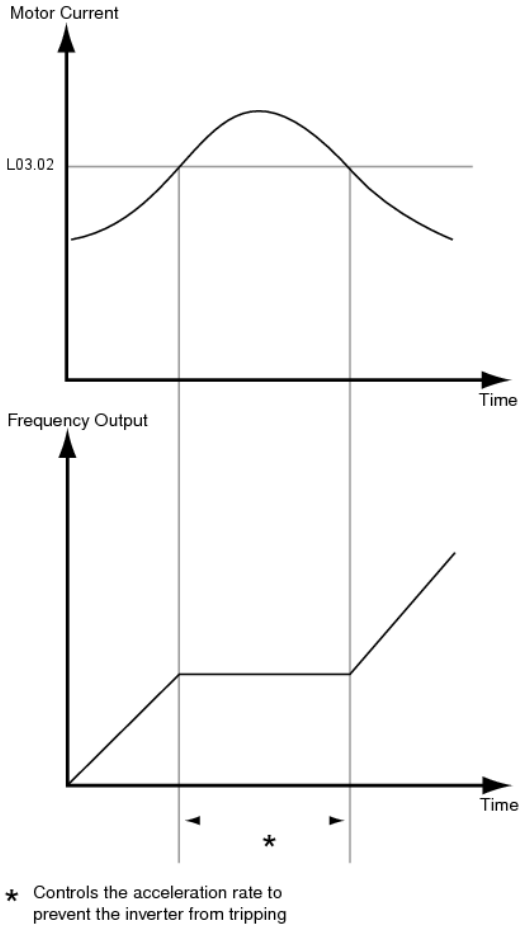


Figure 5-15: Stall Prevention/Current Limit During Acceleration

Parameter Code	Name	Function	Range	Initial Value	Access Level
L03.03	Stall Prevention Constant HP Limit	Stall prevention limit	0–100%	50	Basic

When a motor is used above rated speed (E01.06), the output characteristics change from constant torque to constant HP (see figure 5-16). During acceleration above rated speed, the stall prevention current limit level is automatically reduced for smoother acceleration. The parameters (L03.02 and L03.03) limit the stall prevention current limit level in this region. The current limit during acceleration is changed according to the following equation:

$$\text{Current Limit Level During Accel in Constant Output Area} = \text{Current Limit Level During Acceleration (L03.02)} \times \frac{\text{Max Voltage Output Frequency (E01.06)}}{\text{Output Frequency}}$$

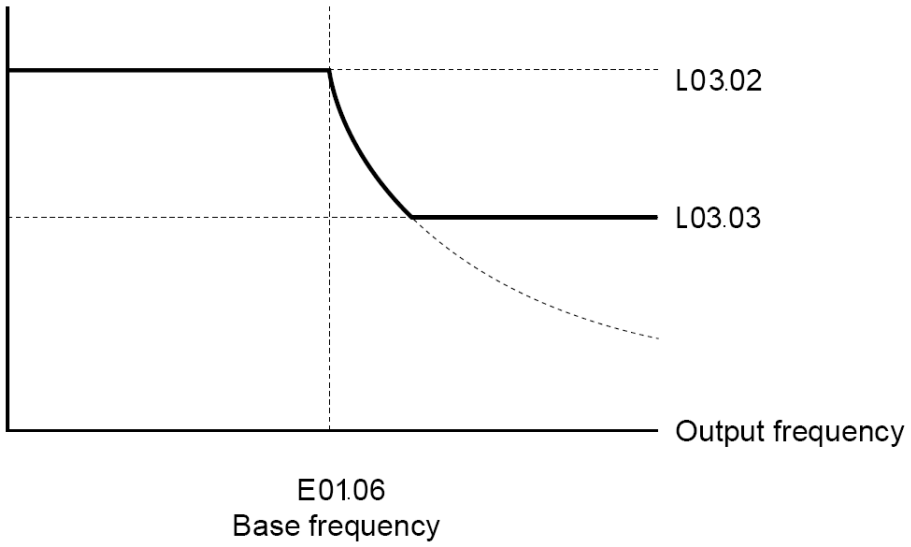


Figure 5-16: Stall Prevention Constant HP Limit

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	Name	Function	Range	Initial Value	Access Level
L03.05	Stall Prevention Run Select	Enable/Disable stall prevention during running	00~02	01	Basic
	00 Disabled	See Table 5.8 below			
	01 Decel Time 1	See Table 5.8 below			
	02 Decel Time 2	See Table 5.8 below			

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

Table 5-8:

Setting	Description
00	Stall prevention/current limit during running is disabled.
01	Stall prevention/current limit during running is enabled (factory default). When the inverter output current exceeds the current limit level (L03.06) for more than 100ms during speed agree, the output frequency is decreased according to deceleration time 1 (B05.02). This can help prevent stalling. When the load condition is stabilized, the inverter accelerates to the previous frequency.
02	Stall prevention/current limit running is enabled as in setting “01”, however the output frequency is decreased according to deceleration time 2 (B05.04).

Parameter Code	Name	Function	Range	Initial Value	Access Level
L03.06	Stall Prevention Run Level	Stall prevention level during run.	30–150%	150	Basic

The stall prevention/current limit level during running is set as a percentage of inverter rated current. A setting of L03.05 = 00 disables current limit during running. During speed agree, if the output current exceeds this current limit level (*L03.06*) during running, deceleration starts. When the output current decreases below this current limit level (*L03.06*), acceleration starts, up to the set frequency. See Figure 5-14 below.

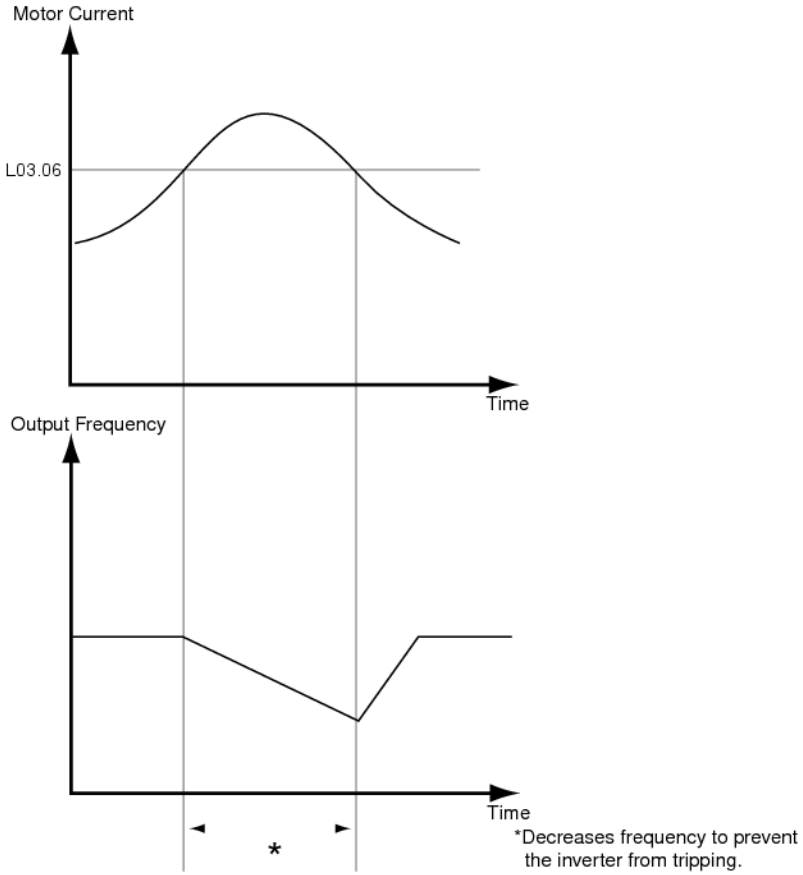


Figure 5-17: Stall Prevention/Current Limit During Running

Reference Detection

The IMPULSE•G+ Mini has the ability to detect output frequencies.

Parameter Code	Name	Function	Range	Initial Value	Access Level
L04.01	Spd Agree Level	Speed Agree Level	0.0~150.0 Hz	0.0	Basic

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.

When frequency detection is enabled using the multi-function contact outputs (H02.XX = “004,” “005,” “104,” or “105”), the contact opens or closes whenever the output frequency is less than or more than the speed agree detection level, depending on which detection is selected.

Torque Detection

The overtorque detection circuit activates when the motor load causes the motor current to exceed the overtorque detection level (L06.02). When an overtorque condition is detected, alarm signals will be shown on the keypad as well, and 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 (H02.XX = “00B” or “017”).

Parameter Code	Name	Function	Range	Initial Value	Access Level
L06.01	Torque Detect 1 Select	Activates overtorque detection and selects whether detection generates an alarm or a fault	00~04	00	Basic
	00 Disable				
	01 Overtorque At Speed Agree (Alarm)				
	02 Overtorque At Run (Alarm)				
	03 Overtorque At Speed Agree (Fault)				
	04 Overtorque At Run (Fault)				

Table 5-9:

Setting	Description
00	Torque detection is disabled (*factory default*).
01	Overtorque detection is enabled whenever at the speed agree level (when inverter is not accelerating or decelerating). Continue running after detection (OT1 alarm).
02	Overtorque detection is enabled always. Continue running after detection (OT1 alarm).
03	Overtorque detection is enabled whenever at the speed agree level. Coast to a stop after detection (OT1 fault).
04	Overtorque detection is enabled always. Coast to a stop after detection (OT1 fault).

NOTE:
- *To detect overtorque during acceleration or deceleration, set to “02” or “04”.*
- *To continue operation after overtorque detection, set to “01” or “02”. During detection, the digital operator displays an “OT1” alarm (blinking).*
- *To stop the inverter after an overtorque detection fault, set to “03” or “04”. During detection, the digital operator displays an “OT1” fault.*

Parameter Code	Name	Function	Range	Initial Value	Access Level
L06.02	Torque Detection 1 Level	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	Basic
L06.03	Torque Detection 1 Time	The overtorque detection delay time inserts a delay, between the time motor current (or torque) exceeds the overtorque level (L06.02) and when the overtorque detection function is enabled. The digital operator then displays “OT1”.	0.0–10.0 sec	0.1	Basic

Hardware Protection

Parameter Code	Name	Function	Range	Initial Value	Access Level
L08.09	Ground Fault Detection *00 Disable* *01 Enable*	Enables/disables ground fault detection	00~01	01*	Basic

** Value depends on drive model*

Automatic Reset

When a fault occurs during operation, the IMPULSE•G+ Mini can be programmed to automatically restart operation and reset the fault.

Parameter Code	Name	Function	Range	Initial Value	Level Access
L09.01	Auto Reset Select *00 Disabled* *01 Enabled*	Activates the fault auto-reset function.	00-01	01	Basic
L09.02	Auto Reset Attempts	Sets the number of reset attempts. Reset attempt counter is returned to zero if no faults occur within a ten minute period.	00–10	03	Basic
L09.03	Auto Reset Time	Sets the reset starting time	0.5–180.0 sec	0.5	Basic
L09.04*	Auto Reset Flt Sel 1	Reset Fault Select 1.	0000–FFFF	0001	Basic
L09.05*	Auto Reset Flt Sel 2	Reset Fault Select 2.	0000–FFFF	E000	Basic
L09.06	Output Contact (MC-MB-MA) Select *00 No Fault Relay* *01 Fault Relay active*	Fault contact operation during reset attempts	00-01	00	Basic

* To program constant L09.04 and L09.05, refer to the example on the following page and follow steps 1 through 4:

1. Assign a “1” to each fault code that you wish to enable using the auto reset.
2. Assign a “0” to each fault code that you wish to disable using the auto reset.
3. Convert all Digits (1 to 4) from binary to hex.
4. Program L09.04 and L09.05 by entering the hex number obtained from step 3.

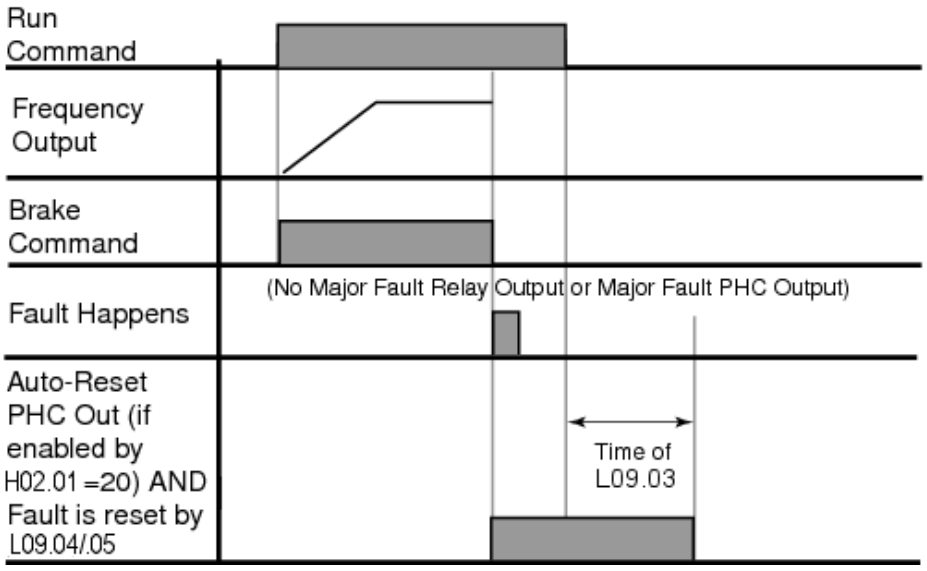


Figure 5-18: Automatic Fault Reset

Example:

Enable auto-reset for UV2 and CE faults.

Table 5-10: Auto Reset Table (default)

	Digit 4				Digit 3				Digit 2				Digit 1			
HEX	0				0				0				1			
Binary	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
L09.04	EF0	---	---	---	LF	PF	UT1	---	OH1	SC	OV	GF	OC	UV3	UV2	UV1
HEX	E				0				0				0			
Binary	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
L09.05	BE1	BE2	COF	FBL	OL1	OL2	OT1	OT2	CE	CALL	---	EF7	EF6	EF5	EF4	EF3

Table 5-11: Auto Reset Table with UV2 and CE Faults (modified)

	Digit 4				Digit 3				Digit 2				Digit 1			
HEX	0				0				0				3			
Binary	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
L09.04	EF0	---	---	---	LF	PF	UT1	---	OH1	SC	OV	GF	OC	UV3	UV2	UV1
HEX	E				0				8				0			
Binary	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0
L09.05	BE1	BE2	COF	FBL	OL1	OL2	OT1	OT2	CE	CALL	---	EF7	EF6	EF5	EF4	EF3

1. Place a “1” above UV2 and CE faults
2. Convert binary to hexadecimal using Table 5-14 for each digit
3. Program L09.04 to 0003 to enable UV2 and UV1 from Table 5-12
4. Program L09.05 to E080 to enable BE1, BE2, CoF, and CE from Table 5-13

Table 5-12: UV2 Example

L09.04	Binary	HEX
Digit 4	0000	0
Digit 3	0000	0
Digit 2	0000	0
Digit 1	0011	3

Table 5-13: CE Example

L09.05	Binary	HEX
Digit 4	1110	E
Digit 3	0000	0
Digit 2	1000	8
Digit 1	0000	0

Table 5-14:

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

The keypad parameters give the ability to show a variety of informati such as frequency reference, motor current, input and output terminal status, along with fault trace information. Information displayed can be customized to meet your crane and hoist application. Below is a list of parameters covered in this section.

- O2 Keypad Key Selection
- U1 Monitor
- U2 Fault Trace

Keypad Key Selection

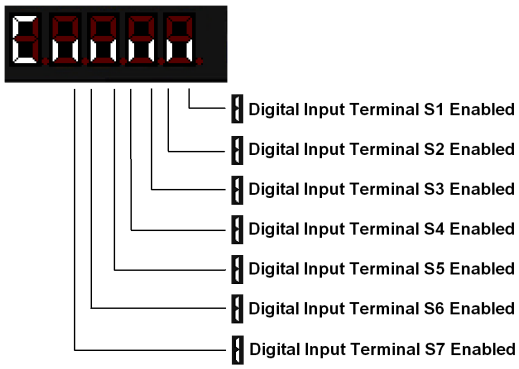
Parameter Code	Name	Function	Range	Initial Value	Access Level
O02.04	kVa selection	Determines the model number of the drive, which is based on the kVA rating. The following in this column are Magnetek model numbers.	00-FF	*	Basic
	60 2A0001	Not used.			
	61 2A0002	2001-G+M			
	62 2A0004	2003-G+M			
	63 2A0006	2005-G+M			
	64 Not used	Not used			
	65 2A0010	2008-G+M			
	66 2A0012	2011-G+M			
	67 2A0018	Not used			
	68 2A0020	2017-G+M			
	69 Not used	Not used			
	6A 2A0030	2025-G+M			
	6B 2A0040	2033-G+M			
	6C Not used	Not used			
	6D 2A0056	2047-G+M			
	6E 2A0069	2060-G+M			
	91 4A0001	4001-G+M			
	92 4A0002	4002-G+M			
	93 4A0004	4003-G+M			
	94 4A0005	4004-G+M			
	95 4A0007	4005-G+MF (OEM only)			
	96 4A0009	4007-G+MG (OEM only)			
	97 4A0011	4009-G+M			
	98 Not used	Not used			
	99 4A0018	4014-G+M			
	9A 4A0023	4018-G+M			
	9B Not used	Not used			
	9C 4A0031	4024-G+M			
	9D 4A0038	4031-G+M			

** Initial value determined by Inverter model*

Monitor Parameters

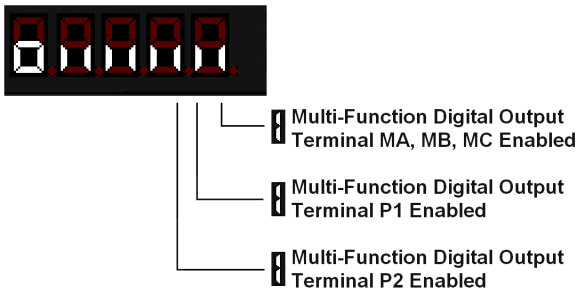
Parameter Code	Name	Function	Units
Monitor			
U01.01	Frequency Reference	Frequency Reference	Hz
U01.02	Output Frequency	Inverter Output Frequency	Hz
U01.03	Output Current	Inverter Output Current	A
U01.04	Control Method	Displays the value of A01.02	--
U01.06	Output Voltage	Inverter Output Voltage (Reference)	V
U01.07	DC Bus Voltage	DC Bus Voltage (Measured)	V
U01.08	Output Power	Inverter Output Power (Calculated)	HP
U01.10	Input Terminal Status	Input Terminal Status	--

Figure 5-19:



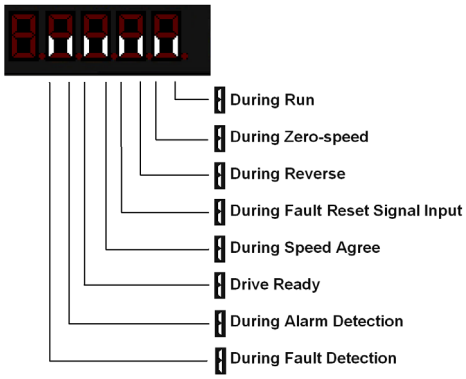
U01.11	Output Terminal Status	Output Terminal Status	--

Figure 5-20:



Parameter Code	Name	Function	Units
U01.12	Inverter Control Status	Operation Status	--

Figure 5-21:



U01.13	Elapsed Time	Elapsed Time.	hours
U01.14	Flash ID	Flash ROM software ID number	--
U01.15	Terminal A1 Level	External Terminal input level	V
U01.16	Terminal A2 Level	External Terminal input level	V/mA
U01.34	OPE Detection Parameter	Parameter OPE Detected	const #

Fault Trace

U02.01	Current Fault	Displays current fault	--
U02.02	Last Fault	Displays last fault detected	--
U02.03	Frequency Reference @ Fault	Freq ref when fault was detected	Hz
U02.04	Output Frequency @ Fault	Output freq when fault was detected	Hz
U02.05	Output Current @ Fault	Output current when fault was detected	A
U02.07	Output Voltage @ Fault	Output voltage when fault was detected	V
U02.08	DC Bus Voltage @ Fault	DC Bus voltage when fault was detected	V
U02.09	Output Power @ Fault	Output power when fault was detected	kW
U02.11	Input Terminal Status @ Fault	Input terminal status when fault was detected	--
U02.12	Output Terminal Status @ Fault	Output terminal status when fault was detected	--
U02.13	Operation Status @ Fault	Inverter status before fault was detected	--
U02.14	Elapsed Time @ Fault	Elapsed time when fault was detected	hr
U02.15	Speed Reference During Soft Start @ Fault	Speed reference during soft start at previous fault	%

Chapter **6**

Troubleshooting IMPULSE•G+ Mini

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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+ Mini.

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, ALM indicator LED remains lit, fault is displayed on keypad and brake contact output (terminals MA, MB, & MC) is deactivated. 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, ALM/indicator LED flashes, fault code flashes in the keypad, brake contact output (terminals MA, MB, & MC) is deactivated. 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, ALM/indicator LED flashes, fault code flashes, brake contact output (terminals MA, MB and MC) stay activated.

Motor Faults and Corrective Actions

Symptom	Corrective Action
Analog frequency reference is not stable. (drifting)	1. Stabilize the analog source. 2. Increase B02.02. 3. Increase B05.01, B05.02.
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 (U01.10). 4. Check if motor stalled due to excessive current (U01.03).
Motor rotation is in the wrong direction.	1. Verify FWD/REV or UP/DN is wired correctly at the interface card. 2. Switch any two leads on U/T1, V/T2, or W/T3 going to the motor.

Symptom	Corrective Action
Motor rotates, but at minimum speed only.	1. Check wiring of speed inputs and verify inputs (U01.10). 2. Verify speed reference setting (A01.04). 3. Verify reference and run source settings are correct (B03.01, B03.02). 4. Verify reference priority setting (B01.18). 5. Check if motor stalled due to excessive current (U01.03)
Motor RPM too high or too low.	1. Compare motor nameplate specifications with E2 parameters. 2. Check maximum frequency setting (E01.04). 3. Check minimum frequency setting (E01.09).

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 H01.01 through H01.07 for proper programming. 2. Check terminal status. (U01.10)
CALL (flashing)	**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.
CE Memobus Com Err	**MEMOBUS/Modbus Communication Error.** Serial communications data corrupted.	1. Check serial connections (R+, R-, S+, & S-). 2. Check H05.01 through H05.03 for proper programming.
COF	**Current Offset Fault.** The drive automatically adjusts the current offset, the calculated value exceeded the allowable setting range	1. Press reset. 2. Check brake. 3. Check brake contact.
CPF02	**A/D Conversion Error.** An A/D conversion error occurred.	1. Cycle power to the drive. 2. Ensure that the control board terminals and wiring are shielded from electrical noise. 3. Check resistance of potentiometer. 4. Replace the drive.
CPF03	**PWM Data Error.** There is a problem with the PWM data.	1. Cycle power to the drive. 2. Replace the control board.
CPF06	**EEPROM Data Error.** There is an error in the data saved to EEPROM.	1. Cycle power to the drive. 2. If the problem continues, replace the drive.
CPF07	**Terminal Board Communications Error.** A communication error occurred at the terminal board.	1. Cycle power to the drive. 2. Check connections on the control board.
CPF08	**EEPROM Serial Communications Fault.** EEPROM communications are not functioning properly.	1. Cycle power to the drive. 2. If the problem continues, replace the drive.

Fault Code	Fault or Indicator Name/Description	Corrective Action
CPF11	**RAM Fault.**	1. Cycle power to the drive. 2. Replace the drive.
CPF12	**FLASH Memory Fault.** Problem with the ROM (FLASH memory).	1. Cycle power to the drive. 2. Replace the drive.
CPF13	**Watchdog Circuit Exception.** Control circuit damage.	1. Cycle power to the drive. 2. Replace the drive.
CPF14	**Control Circuit Fault.** CPU Error (CPU operates incorrectly due to noise, etc.)	1. Cycle power to the drive. 2. Replace the drive.
CPF16	**Clock Fault.** Standard clock error.	1. Cycle power to the drive. 2. Replace the drive.
CPF17	**Timing Fault.** A timing error occurred during an internal process.	1. Cycle power to the drive. 2. Replace the drive.
CPF18 and CPF19	**Control Circuit Fault.** CPU error (CPU operates incorrectly due to noise, etc).	1. Cycle power to the drive. 2. Ensure that the control board terminals and wiring are shielded from electrical noise. 3. Replace the drive.
CPF20 and CPF21	**RAM fault, FLASH memory error, watchdog circuit exception.**	1. Cycle power to the drive. 2. Replace the drive.
CPF22	**A/D Conversion Fault.** A/D conversion error.	1. Cycle power to the drive. 2. Ensure that the control board terminals and wiring are shielded from electrical noise. 3. Check resistance of potentiometer.
CPF23	**PWM Feedback Fault.** PWM feedback error.	1. Cycle power to the drive. 2. Replace the drive.
CPF24	**Drive Capacity Signal Fault.** Entered a capacity that does not exist (checked when the drive is powered up).	1. Cycle power to the drive. 2. Replace the drive.
CRST	Cannot reset. External fault occurred and reset button was pressed before motor was completely stopped. Fault reset was being executed when a RUN command is executed during a fault.	1. Wait for motor to come to complete stop. 2. Reset fault before issuing a RUN command.
DNE Drive not ready	**User is trying to give a run command while a FWD or REV is present at Power Up.**	1. Check input terminals. 2. Check H01.01 to H01.07 programming.
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. 2. Check external device for any fault(s)
EF1 External Fault 1	External fault occurs on Terminal S1.	1. Check constant H01.01 for proper programming. 2. Check the conditions for input terminal S1 (U01.10).
EF2 External Fault 2	External fault occurs on Terminal S2.	1. Check constant H01.02 for proper programming. 2. Check the conditions for input terminal S2 (U01.10).

Fault Code	Fault or Indicator Name/Description	Corrective Action
EF3 External Fault 3	External fault occurs on Terminal S3.	1. Check constant H01.03 for proper programming. 2. Check the condition for input terminal S3 (U01.10).
EF4 External Fault 4	External fault occurs on Terminal S4.	1. Check constant H01.04 for proper programming. 2. Check the condition for input terminal S4 (U01.10).
EF5 External Fault 5	External fault occurs on Terminal S5.	1. Check constant H01.05 for proper programming. 2. Check the condition for input terminal S5 (U01.10).
EF6 External Fault 6	External fault occurs on Terminal S6.	1. Check constant H01.06 for proper programming. 2. Check the condition for input terminal S6 (U01.10).
EF7 External Fault 7	External fault occurs on Terminal S7.	1. Check constant H01.07 for proper programming. 2. Check the condition for input terminal S7 (U01.10).
GF Ground Fault	**Ground Fault.** Current shorted to ground exceeded 50% of rated current on output side of the drive. Setting L08.09 to 1 enable ground fault detection in models 2025 and 4014 or larger.	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.
HBB	**Safe Disable Signal Input.** The Safe Disable Input channel is open.	1. Check if external safety circuit tripped and disabled the drive. 2. If the Safe Disable function is not utilized, check if the terminals HC and H1 are linked.
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 position of the Limit Switch. 3. Check the condition of the Limit Switch. 4. Check the conditions of/for input terminal H01.XX (U01.10).
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 position of the Limit Switch. 3. Check the condition of the Limit Switch. 4. Check the conditions of/for input terminal H01.XX (U01.10).
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 L08.02.	1. The inverter cooling fan has stopped. 2. Reduce the ambient temperature.

Fault Code	Fault or Indicator Name/Description	Corrective Action
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. H01.XX=39	
OH3 Motor Overheat 1	**Motor Overheating 1.** Thermistor analog input detected motor overheating. See L01.03	1. Check the motor rated current value, E02.01. 2. Increase cycle time or reduce the load.
OH4 Motor Overheat 2	**Motor Overheating 2.** Thermistor analog input detected motor overheating. See L01.04	
OL1 Motor Overloaded	**Motor Overload Fault.** Inverter output exceeded the motor overload level.	1. Ensure drive is programmed with proper motor full load Amps (E02.01). 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.
OPE01 kVA Selection	**kVA Setting Fault.** Inverter kVA setting range is incorrect.	1. Check O02.04 constant for proper kVA.
OPE02	**Parameter Range Setting Error.** Parameter settings are set outside the parameter range.	1. Press enter to view parameter. 2. Change parameter to appropriate setting.
OPE03 Terminal	**Multi-Function Input Setting Fault.** Set values other than "F" and "FF" are duplicated.	1. Check the settings for H01.01 to H01.07, verify that the same input is not used twice.
OPE04 Terminal	**Parameters do not match.** The drive, control board, or terminal board has been replaced, and the parameter settings between the controller board or terminal board do not match.	1. Press ENTER to view the parameter. 2. Change parameter(s) to appropriate settings. 3. Set A01.05 = 5550.
OPE07 Analog Selection	**Multi-Function Analog Input Setting Fault.** Set values other than 00 and 0F are duplicated.	1. Check setting for H03.02 and H03.10. Verify that the same value is not used twice.
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 (A01.05=1110) **CAUTION: All settings will be restored to the factory defaults.**
OPE10 V/f Ptrn Setting	**V/f Parameter Setting Error.**	1. Check Parameters E01.04 to E01.11.
OT1 Overtorque Det 1	**Overtorque Detection Level 1 Fault.** Current is higher than set value (L06.02) for more than set time (L06.03).	1. Check for proper programming of L06.02 and L06.03.
OV DC Bus Overvolt	**Overvoltage Fault.** The DC bus voltage exceeded the overvoltage level. Detection level: 230V class—approx. 410V 460V class—approx. 820V	1. Extend the deceleration time. 2. Check for proper DBU operation. 3. Check the resistor. 4. Check the line voltage. 5. If on a load break hoist, check the gear box.

Fault Code	Fault or Indicator Name/Description	Corrective Action
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.
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.
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 position of the Limit Switch. 3. Check the condition of the Limit Switch. 4. Check the conditions of/for terminal H01.XX (U01.10).
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 position of the Limit Switch. 3. Check the condition of the Limit Switch. 4. Check the conditions of/for terminal H01.XX (U01.10)
UV (Flashing) 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 was entered incorrectly for auto-tuning. Relationship between motor HP and motor rated current fault. Input motor rated current and motor no-load current fault don't match.	• Check the T1 parameters. • 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 the T1 parameters. • Check wirings • Disconnect motor from 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.	
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.	• Check the T1 parameters. • Check motor wiring. • Disconnect motor from load.
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 (rotating auto-tuning only)**. The motor did not accelerate at the expected time.	• Increase B05.01 (acceleration time). • If C07.01 and C07.02 (torque limit value) are decreased, increase values. • Disconnect motor from load.
Er-11 Motor Speed	**Motor Speed Fault (rotating auto-tuning only)**. The motor speed was over 100% at auto-tuning (vector control without PG only).	• Increase B05.01 (acceleration time). • Disconnect motor from load.
Er-12 I.det.Circuit	**Current Detection Fault.** Current exceeded the motor rated current.	• Release brake. • Check for open motor lead.
End 1 V/f Oversetting	**Excess V/f setting * (rotating auto-tuning only).** The torque reference exceeded 20% and no load current exceeded 80%.	• Check the T1 parameters. • Disconnect the motor from the load.
End 2 Saturation	**Motor Iron Core Saturation Coefficient Fault (rotating auto-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 E02.01. • Check T01.04.

*NOTE: * Excessive V/f set value, motor iron core saturation coefficient fault, and rated current set alarm are all 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	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

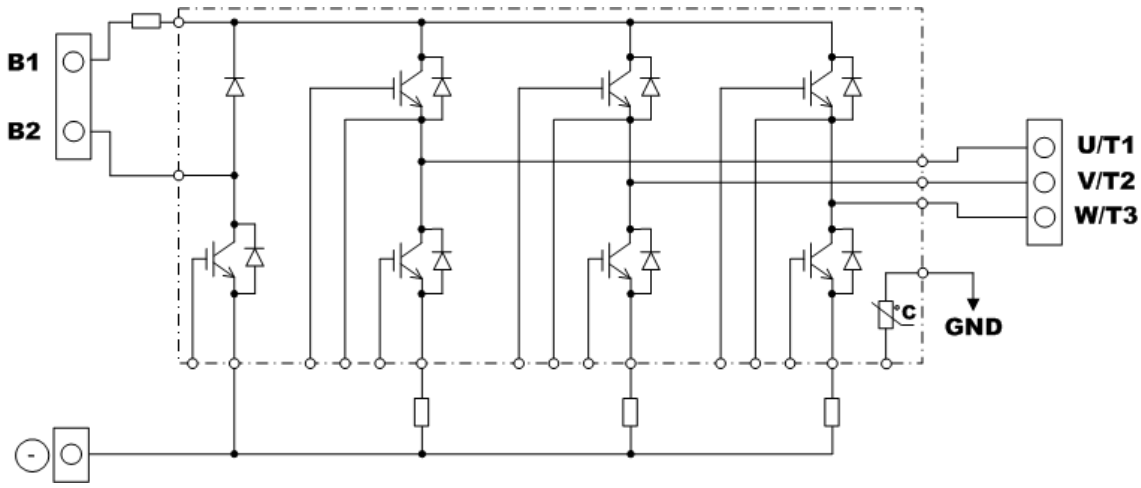

Figure 6-1

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Appendix A

IMPULSE•G+ Mini Basic Parameter Listing

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IMPULSE•G+ Mini Parameter Listing

Parameter	Parameter Name	Default	Range	Units	Reference Page
A01.01	Access Level 0000: User 0001: Basic	0001	0000~0001	--	4-9
A01.02	Control Method 00: V/f	00	00	--	4-9
A01.03	Motion 00: Traverse 01: Hoist	01	00~01	--	4-10
A01.04	Speed Reference 00: 2 Speed Multi-Step 01: 3 Speed Multi-Step 02: 5 Speed Multi-Step 03: 2 Speed Infinitely Variable 04: 3 Speed Infinitely Variable 05: Analog	01	00~05	--	4-10
A01.05	Initialize 0000: No Initialize 1110: User Initialize 5550: Moves modified parameters from terminal board to control board	0000	0000~5550	--	4-13
A01.06	Password 1	0000	0000~9999	--	4-13
A01.08	Password 2	0000	0000~9999	--	4-13
B01.01	Frequency Reference 1	15.00*	0.00~150.00	Hz	5-3
B01.02	Frequency Reference 2	30.00*	0.00~150.00	Hz	5-3
B01.03	Frequency Reference 3	60.00*	0.00~150.00	Hz	5-3
B01.04	Frequency Reference 4	0.00*	0.00~150.00	Hz	5-3
B01.05	Frequency Reference 5	0.00	0.00~150.00	Hz	5-3
B01.18	Reference Priority 00: Digital Reference Only 01: Analog Reference Only 02: Higher Reference Select	00*	00~02	--	5-3
B02.01	Frequency Reference Upper Limit	100.0	0.0~110.0	%	5-4
B02.02	Frequency Reference Lower Limit	0.00	0.0~110.0	%	5-4
B02.03	Reference 1 Lower Limit	2.0*	0.0~110.0	%	5-4
B02.04	Alt Upper Limit	100.0	0.0~110.0	%	5-4
B03.01	Reference Source 00: Digital Operator 01: Terminal	01	00~01	--	5-5
B03.02	Run Source 00: Digital Operator 01: Terminal	01	00~01	--	5-5
B03.03	Stop Method 00: Decel to Stop 01: Coast to Stop	01*	00~01	--	5-5
B05.01	Accel Time 1	5.0*	0.0~25.5	sec	5-9
B05.02	DecelTime 1	2.0*	0.0~25.5	sec	5-9

* Parameters defaults changed by X-Press Programming

** Parameters changed by E01.03

*** Value depends on drive model

Parameter	Parameter Name	Default	Range	Units	Reference Page
B05.03	Accel Time 2	2.0	0.0~6000.0	sec	5-9
B05.04	Decel Time 2	2.0	0.0~6000.0	sec	5-9
C01.01	Quick Stop 00: Disabled 01: Enabled	00*	00~01	--	5-10
C01.02	Quick Stop Time	1.0	0.0~25.5	sec	5-10
C01.03	Reverse Plug 00: Disabled 01: Enabled	00	00~01	--	5-11
C01.04	Reverse Plug Decel Time	2.0	0.0~25.5	sec	5-11
C01.05	Reverse Plug Accel Time	2.0	0.0~25.5	sec	5-11
C03.01	Upper Limit 1 Speed	6.00	0.00~150.00	Hz	5-12
C03.02	Upper Limit 1 Decel Time	1.0	0.0~25.5	sec	5-12
C03.03	Upper Limit 2 (UL2) Decel Time	1.0	0.0~25.5	sec	5-12
C03.04	Lower Limit 1 Speed	6.00	0.00~150.00	Hz	5-12
C03.05	Lower Limit 1 Decel Time	1.0	0.0~25.5	sec	5-12
C03.06	Lower Limit 2 (LL2) Decel Time	1.0	0.0~25.5	sec	5-12
C03.07	Limit Action @ LL2/UL2 00: Decel to Stop 01: Coast to Stop 02: Use B03.03 Stopping Method	02*	00~02	--	5-12
C06.01	Swift-Lift 00: Disabled 01: Enabled Automatic 02: Enabled by MFI 13	00	00~02	--	5-13
C06.02	Swift-Lift Forward Speed	60.00	0.00~150.00	Hz	5-13
C06.03	Swift-Lift Reverse Speed	60.00	0.00~150.00	Hz	5-13
C06.04	Swift-Lift Forward Torque	50	0~100	%	5-13
C06.05	Swift-Lift Reverse Torque	30	0~100	%	5-13
C06.06	Swift-Lift Enabling Speed	59.00	0.00~150.00	Hz	5-13
C06.07	Swift-Lift Delay Time	2.0	0.0~25.5	sec	5-13
D01.01	DC Injection Start Frequency	0.5	0.0~10.0	Hz	5-17
D01.02	DC Injection Current	50	0~75	%	5-17
D01.03	DC Injection Time @ Start	0.00	0.00~10.00	sec	5-17
D01.04	DC Injection Time @ Stop	0.05	0.00~10.00	sec	5-17
D03.01	Torque Compensation Gain	1.00	0.00~2.50	--	5-18
D09.01	S-Curve Accel @ Start	0.50*	0.00~10.00	sec	5-19
D09.02	S-Curve Accel @ End	0.50*	0.00~10.00	sec	5-19
D09.03	S-Curve Decel @ Start	0.50*	0.00~10.00	sec	5-19
D09.04	S-Curve Decel @ Stop	0.20	0.00~10.00	sec	5-19
E01.01	Input Voltage	230 (230V)*** 460 (460V)	155~255 310~510	V	5-21
E01.03	V/f selection	04*	00~FF	--	5-22
E01.04	Max Frequency	60.0**	0.00~150.00	Hz	5-22

* Parameters defaults changed by X-Press Programming

** Parameters changed by E01.03

*** Value depends on drive model

Parameter	Parameter Name	Default	Range	Units	Reference Page
E01.05	Max Voltage	230 (230V)*** 460 (460V)	0.0~255.0 0.0~510.0	V	5-22
E01.06	Base Frequency	60.0**	0.00~150.00	Hz	5-22
E01.07	Mid Frequency A	3.0**	0.00~150.00	Hz	5-22
E01.08	Mid Voltage A	19.6 (230V)** 39.1 (460V)	0.0~255.0 0.0~510.0	V	5-22
E01.09	Min Frequency	1.3**	0.00~150.00	Hz	5-22
E01.10	Min Voltage	12.7 (230V)** 25.3 (460V)	0.0~255.0 0.0~510.0	V	5-22
E01.11	Mid Frequency B	0.0	0.00~150.00	Hz	5-22
E01.12	Mid Voltage B	0.0 (230V) 0.0 (460V)	0.0~255.0 0.0~510.0	V	5-22
E01.13	Base Voltage	230 (230V) 460 (460V)	0.0~255.0 0.0~510.0	V	5-22
E02.01	Motor Rated Full Load Amps	--	--	A	5-22
H01.01	Input Terminal 1 Select (See reference page for further details)	80*	00~81	--	5-24
H01.02	Terminal 2 Select (See reference page for further details)	81*	00~81	--	5-24
H01.03	Terminal 3 Select (See reference page for further details)	00*	00~81	--	5-24
H01.04	Terminal 4 Select (See reference page for further details)	01*	00~81	--	5-24
H01.05	Terminal 5 Select (See reference page for further details)	0F*	00~81	--	5-24
H01.06	Terminal 6 Select (See reference page for further details)	0F*	00~81	--	5-24
H01.07	Terminal 7 Select (See reference page for further details)	0F*	00~81	--	5-24
H02.01	Output Contact (MC-MB-MA) Select 000: Brake Release 001: Zero Speed 004: Frequency Detect 1 005: Frequency Detect 2 00B: Torque Detect 1 N.O. 00E: Fault 00F: Not used 017: Torque Detect 2 N.C. 101: (Inverse) Zero Speed 104: (Inverse) Frequency Detect 1 105: (Inverse) Frequency Detect 2 10B: (Inverse) Torque Detect 1 N.O. 10E: (Inverse) Fault 117: (Inverse) Torque Detect N.C.	000*	000~117	--	5-27
H02.02	Output Terminal P1 Select (See H02.01 for selections)	00F*	000~117	--	5-27
H02.03	Output Terminal P2 Select (See H02.01 for selections)	00F*	000~117	--	5-27
H03.01	Terminal A1 Select Signal 00: 10 VDC	00*	00	--	5-28

* Parameters defaults changed by X-Press Programming

** Parameters changed by E01.03

*** Value depends on drive model

Parameter	Parameter Name	Default	Range	Units	Reference Page
H03.02	Terminal A1 Select 00: Frequency Bias 0F: Not Used	00	00~FF	--	5-28
H03.03	Terminal A1 Gain	100.0	-999.9~999.9	%	5-28
H03.04	Terminal A1 Bias	0.0	-999.9~999.9	%	5-28
H03.09	Terminal A2 Signal Select 00: 0~10 VDC 02: 4 to 20 mA 03: 0 to 20 mA	02	00~03	--	5-28
H03.10	Terminal A2 Select 00: Frequency Bias 0F: Not Used	00	00~0F	--	5-28
H03.11	Terminal A2 Gain	100.0	-999.9~999.9	%	5-28
H03.12	Terminal A2 Bias	0.00	-999.9~999.9	%	5-28
H03.13	Analog Input Filter Time Constant	0.03	0.00~2.00	sec	5-28
H05.01	Serial Drive Address	1F	00~20	--	5-29
H05.02	Series Baud Rate 00: 1200 BPS 01: 2400 BPS 02: 4800 BPS 03: 9600 BPS 04: 19200 BPS 05: 38400 BPS 06: 57600 BPS 07: 76800 BPS 08: 115200 BPS	03	00~08	--	5-29
H05.03	Communications - Parity 00: No Parity 01: Even Parity 02: Odd Parity	00	00~02	--	5-29
L01.01	Motor Overload Fault Select 00: Disabled 01: Standard Fan Cooled 02: Standard Blower Cooled 03: Vector Motor	01	00~03	--	5-30
L01.02	Motor Overload Time Constant	1.0	0.1~5.0	min	5-30
L03.01	Stall Prevention Accel Select 00: Disabled 01: General Purpose 02: Intelligent	01	00~02	--	5-31
L03.02	Stall Prevention Accel Level	150	0~150	%	5-31
L03.03	Stall Prevention Constant HP Limit	50	0~100	%	5-33
L03.05	Stall Prevention Run Select 00: Disabled 01: Decel Time 1 02: Decel Time 2	01	00~02	--	5-34
L03.06	Stall Prevention Run Level	150	30~150	%	5-35
L04.01	Reference Detection	0.0	0.0~150.0	Hz	5-36
L06.01	Torque Detection 1 Level Select 00: Disabled 01: Overtorque @ Speed Agree (Alarm) 02: Overtorque @ Run (Alarm) 03: Overtorque @ Speed Agree (Fault) 04: Overtorque @ Run (Fault)	00	00~04	--	5-37

* Parameters defaults changed by X-Press Programming

** Parameters changed by E01.03

*** Value depends on drive model

Parameter	Parameter Name	Default	Range	Units	Reference Page
L06.02	Torque Detection 1 Level	150	0~300	%	5-38
L06.03	Torque Detection 1 Time	0.1	0.0~10.0	sec	5-38
L08.09	Ground Fault 00: Disable 01: Enable	01***	00~01	--	5-38
L09.01	Auto Reset Select 00: Disable 01: Enable	01	00~01	--	5-39
L09.02	Auto Reset Attempts	03	00~10	--	5-39
L09.03	Auto Reset Time	0.5	0.5~180.0	sec	5-39
L09.04	Auto Reset Fault Select 1	0001	0000~FFFF	--	5-39
L09.05	Auto Reset Fault Select 2	E000	0000~FFFF	--	5-39
L09.06	Fault Contact Select 00: Disabled (No Fault Relay) 01: Enabled (Fault Relay Active)	01	00~01	--	5-39
O02.04	kVA Selection	--	00~FF	--	5-42
T01.01	Tuning Mode Select 02: Stationary Auto-Tune 03: Rotating Auto-Tune	02	02~03	--	4-14
T01.02	Motor Output Power	--	--	HP	4-14
T01.04	Motor Rated Current	--	--	A	4-14
U01.01	Frequency Reference	--	--	Hz	5-43
U01.02	Output Frequency	--	--	Hz	5-43
U01.03	Output Current	--	--	A	5-43
U01.04	Control Method	--	--	--	5-43
U01.06	Output Voltage	--	--	V	5-43
U01.07	DC Bus Voltage	--	--	V	5-43
U01.08	Output Power	--	--	HP	5-43
U01.10	Input Terminal Status	--	--	--	5-43
U01.11	Output Terminal Status	--	--	--	5-43
U01.12	Inverter Control Status	--	--	--	5-44
U01.13	Elapsed Time	--	--	Hours	5-44
U01.14	Flash ID	--	--	--	5-44
U01.15	Terminal A1 Level	--	--	%	5-44
U01.16	Terminal A2 Level	--	--	%	5-44
U01.34	OPE Detection Parameter	--	--	Const #	5-44
U02.01	Current Fault	--	--	--	5-44
U02.02	Last Fault	--	--	--	5-44
U02.03	Frequency Reference @ Fault	--	--	Hz	5-44
U02.04	Output Frequency @ Fault	--	--	Hz	5-44
U02.05	Output Current @ Fault	--	--	A	5-44
U02.07	Output Voltage @ Fault	--	--	V	5-44
U02.08	DC Bus Voltage @ Fault	--	--	V	5-44

* Parameters defaults changed by X-Press Programming

** Parameters changed by E01.03

*** Value depends on drive model

Parameter	Parameter Name	Default	Range	Units	Reference Page
U02.09	Output Power @ Fault	--	--	kW	5-44
U02.11	Input Terminal Status @ Fault	--	--	--	5-44
U02.12	Output Terminal Status @ Fault	--	--	--	5-44
U02.13	Operation Status @ Fault	--	--	--	5-44
U02.14	Elapsed Operation Time @ Fault	--	--	Hours	5-44
U02.15	Speed Reference During Soft Start	--	--	--	5-44

* Parameters defaults changed by X-Press Programming

** Parameters changed by E01.03

*** Value depends on drive model