

IMPULSE·G+ & VG+ *Series 4*

Adjustable Frequency/Vector Crane Controls

Drive Communication Instruction Manual



MAGNETEK
MATERIAL HANDLING

March 2012
Part Number: 144-27025
© Copyright 2012 Magnetek

Table of Contents

1. Preface and Safety	3
Applicable Documentation	3
Terms	4
Registered Trademarks	4
Supplemental Safety Instructions	4
General Safety	5
2. IMPULSE® G+/VG+ Series 4 Drive and Serial Communication	6
Introduction to IMPULSE® Series 4 Drive Modbus RTU Communication	6
IMPULSE® Series 4 Drive/Modbus RTU Specifications	6
3. Wiring	7
Connection of Multiple IMPULSE® Series 4 Drives	7
Wiring Instructions	7
Terminating Resistor	8
4. Setting IMPULSE® Series 4 Drive Parameters for Communication	10
Run/Stop and Frequency Selection	10
Serial Communication Set up Parameters	10
5. The Message Format	14
Message Functions	14
Read Multiple Registers - 03h	14
Loop-back Test - 08h	16
Write Multiple Registers - 10h	18
No Response Message	20
CRC-16	20
6. Registers	24
Command Registers	24
Monitor Registers	25
Drive Parameter Registers	32
Special Registers	68
7. Error Codes and Troubleshooting	69
Communication Error	69
Modbus Error Codes	69
IMPULSE® Series 4 Drive Fault Codes	70

1. Preface and Safety

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

Applicable Documentation

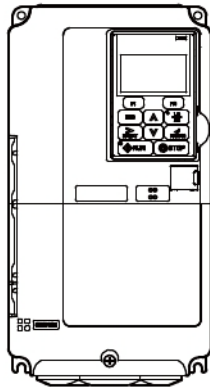
The following manuals are available for the option:

Modbus Protocol Reference

Refer to the following Modicon publication for technical information on Modbus RTU protocol:

Modicon Modbus Protocol Reference Guide: http://modbus.org/docs/PI_MBUS_300.pdf

IMPULSE®•G+/VG+ Series 4 Drive



IMPULSE®•G+/VG+ Series 4 Instruction Manual

The drive manuals cover basic installation, wiring, operation procedures, functions, troubleshooting, and maintenance information. The manuals also include important information about parameter settings and drive tuning.

Access <http://www.magnetekmh.com> to obtain Magnetek instruction manuals.

Terms

Drive: IMPULSE®•G+/VG+ Series 4

Registered Trademarks

Trademarks are the property of their respective owners.

Supplemental Safety Instructions

Read and understand this manual before installing, operating, or servicing this option. Install the option according to this manual and local codes.

The following conventions indicate safety messages in this manual. Failure to heed these messages could cause fatal injury or damage products and related equipment and systems.



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.

NOTICE

NOTICE indicates an equipment damage message.

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

General Safety

General Precautions

- The diagrams in this book may include options and drives without covers or safety shields to illustrate details. Be sure to reinstall covers or shields before operating any devices. Use the option according to the instructions described in this manual.
- Any illustrations, photographs, or examples used in this manual are provided as examples only and may not apply to all products to which this manual is applicable.
- The products and specifications described in this manual or the content and presentation of the manual may be changed without notice to improve the product and/or the manual.
- When ordering new copies of the manual, contact a Magnetek representative and provide the manual number shown on the front cover.



DANGER

Heed the safety messages in this manual.

Failure to comply will result in death or serious injury.

The operating company is responsible for any injuries or equipment damage resulting from failure to heed the warnings in this manual.

NOTICE

Do not modify the drive circuitry.

Failure to comply could result in damage to the drive or option and will void warranty.

Magnetek is not responsible for any modification of the product made by the user. This product must not be modified.

Do not expose the drive to halogen group disinfectants.

Failure to comply may cause damage to the electrical components.

Do not pack the drive in wooden materials that have been fumigated or sterilized.

Do not sterilize the entire package after the product is packed.

2. IMPULSE[®] G+/VG+ Series 4 Drive and Serial Communication

Introduction to IMPULSE[®] Series 4 Drive Modbus RTU Communication

This manual describes the set-up and protocol for Modbus Communication. The IMPULSE[®] Series 4 drive offers RS-485 serial communication as a standard.

The Modbus RTU protocol requires that the controller communicates using a master-slave technique, in which only one device (the master) can initiate transactions. The other devices (the slaves) respond by supplying the requested data to the master, or by taking the action requested. The IMPULSE[®] Series 4 drive must act in the slave mode.

A complete understanding of drive programming and operation is required before attempting serial communication operation. A full discussion of programming and operation is covered in the IMPULSE[®] G+/VG+ Series 4 drive instruction manuals.

IMPULSE[®] Series 4 Drive / Modbus RTU Specifications

The data that may be sent or received from the drive consists of:

- Run Command
- Frequency Reference
- Fault Contents
- Drive Status
- Drive Parameter Settings

The following table illustrates whether the serial communication specifications are fixed or user selectable. If the specification is fixed, the fixed value is shown in the last column. If the specification is selectable, the range of allowed values is shown in the last column.

Communication Specification	Fixed or Selectable	Range
Baud Rate	Selectable	1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, or 115200 bps
Data Bit	Fixed	8
Parity	Selectable	None, Even, or Odd
Stop Bit	Fixed	1
Nodes	Selectable for RS-485	Maximum of 31 nodes

Standard RS-485 Serial Communication

The IMPULSE[®] Series 4 drive offers RS-485 serial communications as a standard feature of the drive. RS-485 allows multi-drop (multiple devices) communication, over a maximum transmission distance of 4,000 feet. The master performs serial communication with one slave at a time. A slave receives a command from the master, performs the specified function, and sends a response back to the master.

3. Wiring

Connection of Multiple IMPULSE® Series 4 Drives

With the RS-485/RS-422 multiple drives may be connected together for a multiple drive communication system. Figure 1 illustrates the connection between a master and multiple slaves.

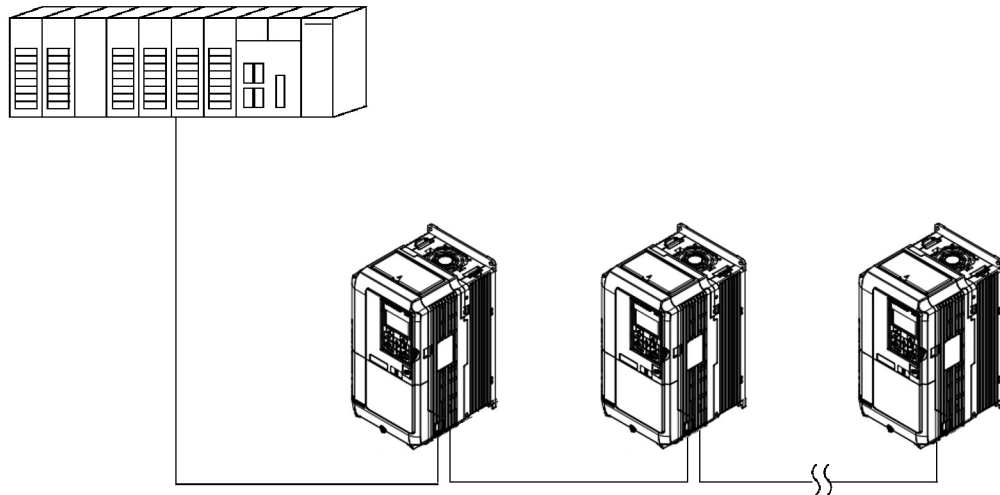


Figure 1: Example of Connections between Master and Drive

Wiring Instructions

1. Locate terminals: R+, R-, S+, S- on the control board, as shown in Figure 2.

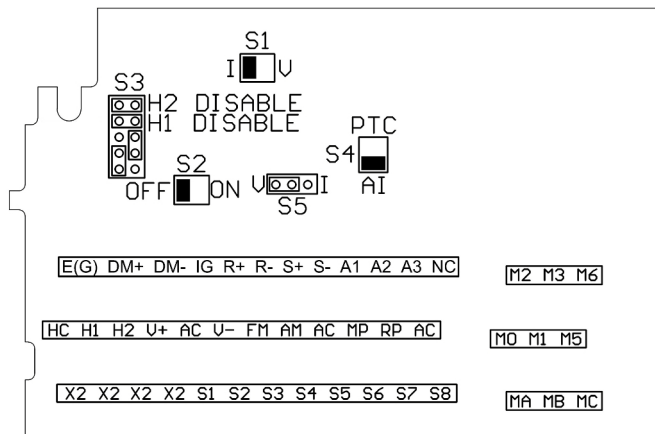


Figure 2: Control Board

2. A twisted shielded wire should be used for connection to these terminals. The shielded wire should be separated and connected per the drawing below to eliminate interference due to noise.

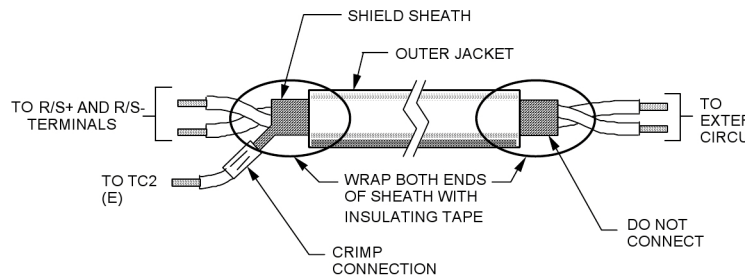


Figure 3: Shielded Wire Termination

3. The function of the terminals is described in Table 1.

Table 1: Functions of Terminals

Classification	Terminal	Signal Function	Description	Signal Level
RS-485/422	R+	Modbus communication input	For 2-wire RS-485, jumper R+ and S+ and jumper R- and S-	Differential input, PHC isolation
	R-	Modbus communication input		
	S+	Modbus communication output	Differential output, PHC isolation	
	S-	Modbus communication output		
	IG	Signal Common		

4. It is important that an appropriate wire size is selected. The suggested wire size is 16/14 (AWG/KCMIL).

NOTE: Avoid sources of electric interference capable of inducing noise into the cable. Communication and signal wiring should be kept separate from power wiring. If communication or signal wiring must cross power wiring, it must cross at a right angle.

Terminating Resistor

Dip Switch S2 is located on the control board (see Figure 2). When S2 is on, a termination resistor (110 Ohms) is connected between S/R (+) and S/R (-).



Figure 4: S2 Dip Switch

For one-to-one connections of the drive and a master device, set S2 to ON as shown in Figure 5.

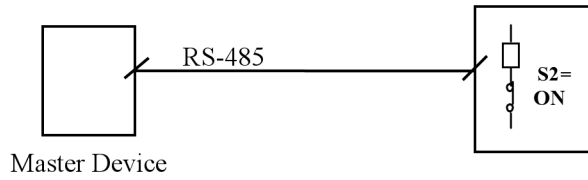


Figure 5: One-to-one connection

If multiple drives are connected to a master device, set S2 on the last drive to ON as shown in Figure 6.

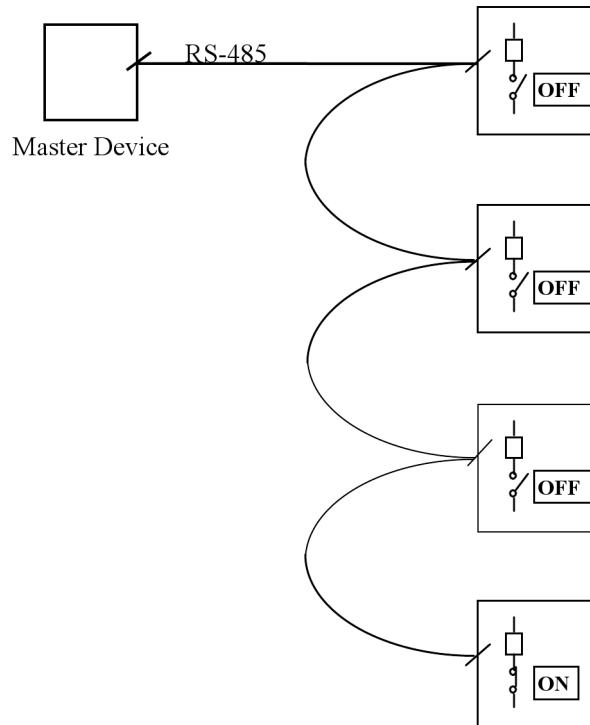


Figure 6: Multiple Connections to Master Device

4. Setting IMPULSE[®] Series 4 Drive Parameters for Communication

Run/Stop and Frequency Selection

The run/stop commands and frequency reference command can originate from serial communication, the digital operator, the external terminals, or an option board. The origin of the run/stop command does not have to be the same as the origin for the frequency reference command. Parameter B03-01 (Reference Source) allows you to set up the origin of the frequency reference, and parameter B03-02 (Run Source) sets the origin of the run/stop commands. The charts shown below illustrate the possible frequency reference and run/stop selections.

Table 2: Parameter B03-01 Settings

Parameter B03-01 (180h) Setting	Frequency Reference Selection
0	Digital Operator
1	External Terminals
2	Serial Communication
3	Option Board
4	Pulse Input (H06-01)

The default setting of parameter B03-01 is '1' (determined by X-Press Programming).

Table 3: Parameter B3-02 Settings

Parameter B03-02 (181h) Setting	Operation Method Selection (Run/Stop)
0	Digital Operator
1	External Terminals
2	Serial Communication
3	Option Board

The default setting of parameter B03-02 is '1' (determined by X-Press Programming).

NOTE: "CALL COMCALL" will be displayed on the keypad, along with an alarm condition, when B03-01 and B03-02 are set up for serial communications. This will clear automatically once communication has been initiated to the drive.

Serial Communication Set up Parameters

The IMPULSE[®] Series 4 drive has parameters used for the set up of serial communication. These communication set up parameters are H05-01 through H05-07.

Parameter H05-01 - Serial Communication Address

Parameter H05-01 (or Modbus Register 425h) is used to set the Modbus slave address of the IMPULSE[®] Series 4 drive. The slave address can be any number from 1 to 1F in hexadecimal (or 1 to 31 decimal). Two nodes may not have the same address. The default setting for parameter H05-01 is 1F.

Parameter H05-02 - Serial Communication Baud Rate Selection

Parameter H05-02 (or Modbus Register 426h) is used to select the baud rate. The table below indicates the baud rates that may be selected.

Table 4: Serial Communication Baud Rate Selection

Setting Value (in hex)	Baud Rate Selection
0	1200 bps
1	2400 bps
2	4800 bps
3	9600 bps
4	19.2 kbps
5	38.4 kbps
6	57.6 kbps
7	76.8 kbps
8	115.2 kbps

The default setting of parameter H05-02 is '3'.

Parameter H05-03 - Serial Communication Parity Selection

Parameter H05-03 (or Modbus Register 427h) is used to select the parity. The table below indicates the parity that may be selected.

Table 5: Serial Communication Parity Selection

Setting Value (in hex)	Parity Selection
0	No parity
1	Even parity
2	Odd parity

The default setting of parameter H05-03 is '0'.

Communication Error (CE)

A communication error can occur only after communication has been established between the master and the IMPULSE® Series 4 drive. The drive waits for the master to initiate communication.

The message data is always checked for CRC, parity, overrun, framing, and overflow. If the data has discrepancies in any of these areas a communication error will occur. If the IMPULSE® Series 4 drive does not receive a message (addressed to its appropriate slave address set up in H05-01) within a period of two seconds, a time-out occurs. A time-out can also cause a communication error if it is enabled (see parameter H05-05).

Parameters H05-04 and H05-05 are the set up parameters that determine how the IMPULSE® Series 4 drive will respond to a communication error.

Parameter H05-04 - Stopping Method after Serial Communication Error

Parameter H05-04 (or Modbus Register 428h) is used to determine the method of stopping the motor if there is a communication error. The table below indicates the stopping methods that can be used when a communication error occurs.

Table 6: Stopping Method after Serial Communication Error

Setting Value (in hex)	Stopping Method
0	Decelerate to stop
1	Coast to stop
2	Fast Stop
3	Alarm Only/Continue Operation

The default setting of parameter H05-04 is '1'.

Parameter H05-05 - Serial Fault Detection Selection

Parameter H05-05 (or Modbus Register 429h) is used to enable or disable the Time-out detection. The table below indicates how to enable or disable the communication error.

Table 7: Setting Value for Time-Out Detection Selection

Setting Value (in hex)	Time-out Detection Selection
0	Disabled
1	Enabled

The default setting of parameter H05-05 is '1'.

Parameter H05-06 – Transit Wait Time

Parameter H05-06 (or Modbus Register 42Ah) is used to set the wait time in between the drive receiving data and transmitting data, and is settable from 5-65 MS.

The default setting of parameter H05-06 is '5'.

Parameter H05-07 – RTS (Request to Send) Control Selection

Parameter H05-07 (or Modbus Register 42Bh) enables or disables RTS control

Table 8: RTS Settings

Setting	RTS Control
0	Disabled (RTS is always ON)
1	Enabled (RTS turns ON with sending)

The default setting of H05-07 is '1'.

NOTE: After changing any of the serial communication set-up parameters, power to the IMPULSE® Series 4 drive must be cycled for the changes to be effective.

“ENTER” Command

The IMPULSE® Series 4 drive has two types of memory: 'Volatile' and 'Non-Volatile'. Data held in the Volatile memory will be lost when power is removed from the drive. Data held in Non-Volatile memory will be retained when power is removed from the drive. Different types of registers are stored in different areas of memory.

Command Data:

The command registers (000h to 00Fh) are stored in Volatile memory. When writing to a command register the new data becomes active immediately. In the case of a power loss all data stored in these registers will not be retained.

Monitor Data:

The monitor registers (010h to 03Fh) are stored in Volatile memory. These registers cannot be written to; they are read-only registers. Any data read from the monitor registers will not be retained during a power loss situation.

Parameter Data:

The parameter registers (40h to 708h) are stored in Non-Volatile memory. When writing new data to parameter registers, an 'ENTER' command must be given for the new data to become active.

There are two different types of 'ENTER' commands, 'ACCEPT' and 'ENTER'. For an 'ACCEPT' command, write the value '0' to Modbus register FFDDh. This causes data to become "active". If a power loss occurs, the data will not be retained. For an 'ENTER' command, write the value '0' to Modbus register FFFDh. This causes data to become "active" and saves the data to Non-Volatile memory. If a power loss occurs, the data will be retained.

Some parameter data registers may be written to while the drive is running. These parameters are called run operative parameters. For a list of these parameters, refer to Table 30: Run Operative Parameters.

All other parameter data registers may only be written to when the drive is stopped. These are called non-run operative parameters.

If new data is written to any parameter serially, and is not followed by an 'ENTER' command, a "Busy Write Protected" message will flash on the digital operator display if an attempt is then made to change a parameter using the digital operator.

The same message will be displayed if an attempt is made to change a parameter via the digital operator while the contents of the 'ENTER' command register is any value other than '0'.

NOTE: Use the 'ENTER' (FFFDh) command only when necessary!

The life of the EEPROM (Non-Volatile memory) on the IMPULSE® Series 4 drive will support a finite number of operations. This means that the 'ENTER' command, value '0' written to register FFFDh, can only be used a maximum of a 100,000 times to store data in the EEPROM. After the specified number of operations, the EEPROM may fault (ERR) requiring the IMPULSE® Series 4 drive control board to be replaced.

5. The Message Format

Message Functions

In communicating to the IMPULSE® Series 4 drive via Modbus RTU, there are three message functions available. The master specifies the function to be executed by the slave according to the function code. The following table shows the types of function codes available, and the length (quantity) and contents of the message according to the function.

Table 9: Message Functions

Function Code (hex)	Function	Command Message		Response Message (Normal)	
		min. (bytes)	max. (bytes)	min. (bytes)	max. (bytes)
3	Read Multiple Registers	8	8	7	37
8	Loop-back test	8	8	8	8
10	Write Multiple Registers	11	41	8	8

The message format varies depending upon the function of the message. For each function, there is a command message from the master and a response message initiated from the slave. The following sections review the format of the command message and the response message for each function.

Read Multiple Registers - 03h

The multiple register read function (03h) allows the master to request information from the slave. The command message of a multiple register read is structured as shown below.

Table 10: Command Message

SLAVE ADDRESS		02h
FUNCTION CODE		03h
STARTING REGISTER NO.	UPPER	00h
	LOWER	40h
QTY.	UPPER	00h
	LOWER	04h
CRC-16	UPPER	2Fh
	LOWER	F3h

Each IMPULSE® Series 4's slave address is set in advance by the drive parameter H05-01. Valid slave addresses must be in the range of 1 to 31 decimal (1 to 1F hex). No two slaves may have the same address. The master addresses the slave by placing the slave address in the address field of the message. In the command message above, the slave is addressed at 2.

The function code of this message is 03h (read multiple registers).

The starting number is the first register to be read. In the command message above the starting register is 20h, indicating that the first register is the Frequency Reference. A listing of the IMPULSE® Series 4 drive registers is shown in Chapter 6, Registers.

The quantity indicates how many consecutive registers are to be read. The quantity may range from

1 to 16 registers. If the quantity is greater than 16, an error code of '3' is returned in the fault response message. In this command message there are four consecutive registers to be read: 40h-Frequency Reference, 41h-Output Frequency, 42h-Output Current, and 43h-Control Method.

A CRC-16 value is generated from a calculation using the values of the address, function code, and data sections of the message. The procedure for calculating a CRC-16 is described at the end of this chapter. When the slave receives the command message it calculates a CRC-16 value and compares it to the one in CRC-16 field of the command message. If these two CRC-16 values are the same the slave has received the proper command message. If the two CRC-16 values are not the same the slave will not respond.

If the command message has a valid slave address, function code, starting register, and quantity value, the slave will respond with a normal response message. If the command message has an invalid slave address, function code, starting register, and/or quantity the slave will respond with a fault response message.

Table 11: Normal Response Message

SLAVE ADDRESS		02h	
FUNCTION CODE		03h	
NO. OF DATA BYTES		08h	
STARTING REGISTER NO.	UPPER	17h	The starting register, 40h (Frequency Reference), has a value of 1770h or 6000 dec. (60.00 Hz)
	LOWER	70h	
NEXT REGISTER CONTENTS	UPPER	17h	The next register, 41h (Output Frequency), has a value of 1770h or 6000 dec. (60.00 Hz).
	LOWER	70h	
NEXT REGISTER CONTENTS	UPPER	01h	The next register, 42h (Output Current), has a value of 109h or 265 dec. (drive rating /8192).
	LOWER	90h	
NEXT REGISTER CONTENTS	UPPER	00h	The next register, 43h (Control Method), has a value of 00h or 0 dec. (V/f Control).
	LOWER	00h	
CRC-16	UPPER	ADh	
	LOWER	D2h	

The normal response message contains the same slave address and function code as the command message, indicating to the master which slave is responding and to what type of function it is responding.

The number of data bytes is the number of data bytes returned in the response message. The number of data bytes is actually the quantity (in the command message) times 2, since there are two bytes of data in each register.

The data section of the response message contains 8 upper and 8 lower bits of data for each register that has been read from the drive.

A CRC-16 value is generated from a calculation using the values of the address, function code, number of data bytes, and register data sections of the message. The procedure for calculating a CRC-16 value is described at the end of this chapter. How the response message is handled by the master depends on what master is used. When the master receives the response message it should calculate a CRC-16 value and compare it to the one in the CRC-16 field of the response message. If these two CRC-16 values are the same, the master has received the proper response message.

Table 12: Fault Response Message

SLAVE ADDRESS		02h
80h + FUNCTION CODE		83h
ERROR CODE		02h
CRC-16	LOWER	30h
	UPPER	F1h

The fault response message contains the same slave address as the command message, indicating to the master which slave is responding.

The function code of a fault response message is actually a value of 80h plus the original function code of 03h. This indicates to the master that the message is a fault response message, instead of a normal response message.

The error code indicates where the error occurred in the command message. The value of 2h in the error code field of this fault response message indicates that the command message requested data be read from an invalid register. A complete listing of the error codes is shown in Chapter 7, Troubleshooting and Error Codes.

A CRC-16 value is generated from a calculation using the values of the address, function code, and error code sections of the message. The procedure for calculating a CRC-16 value is described at the end of this chapter. How the response message is handled by the master depends on what master is used. When the master receives the fault response message it should calculate a CRC-16 value and compare it to the one in the CRC-16 field of the fault response message. If these two CRC-16 values are the same, the master has received the proper fault response message.

Loop-back Test - 08h

The loop-back test function (08h) is used for checking signal transmission between master and slaves. The command message format is shown below.

Table 13: Command Message

SLAVE ADDRESS		01h
FUNCTION CODE		08h
TEST CODE	UPPER	00h
	LOWER	00h
DATA	UPPER	A5h
	LOWER	37h
CRC-16	LOWER	DAh
	UPPER	8Dh

Each IMPULSE® Series 4 drive's slave address is set in advance by the drive parameter H05-01. Valid slave addresses must be in the range of 1 to 31 decimal (1 to 1F hex). No two slaves may have the same address. The master addresses the slave by placing the slave address in the address field of the message. In the command message above, the slave is addressed at 1.

The function code of this message is 08h (loop-back test).

The test code must be set to '0000'. This function specifies that the data passed in the command message be returned (looped back) in the response message.

The data section contains arbitrary data values. These data values are used to verify that the slave

receives the correct data.

A CRC-16 value is generated from a calculation using the values of the address, function code, test code, and data sections of the message. The procedure for calculating a CRC-16 is described at the end of this chapter. When the slave receives the command message it calculates a CRC-16 value and compares it to the one in CRC-16 field of the command message. If these two CRC-16 values are the same, the slave has received the proper command message. If these two CRC-16 values are not the same, the slave does not respond.

If the command message has a valid slave address, function code, test code, and data value, the slave will respond with a normal response message. If the command message has an invalid slave address, function code, test code, and/or data value, the slave will respond with a fault response message.

Table 14: Normal Response Message

SLAVE ADDRESS		01h
FUNCTION CODE		08h
TEST CODE	UPPER	00h
	LOWER	00h
DATA	UPPER	A5h
	LOWER	37h
CRC-16	LOWER	DAh
	UPPER	8Dh

A normal response message for the loop-back test should be identical to the command message.

Table 15: Fault Response Message

SLAVE ADDRESS		01h
FUNCTION CODE		88h
ERROR CODE		01h
TEST CODE	UPPER	00h
	LOWER	00h
CRC-16	LOWER	80h
	UPPER	62h

The fault response message contains the same slave address as the command message, indicating to the master which slave is responding.

The function code of a fault response message is actually a value of 80h plus the original function code of 08h. This indicates to the master that the message is a fault response message instead of a normal response message.

The error code indicates where the error occurred in the command message. A complete listing of the error codes is shown in Chapter 7, Troubleshooting and Error Codes.

A CRC-16 value is generated from a calculation using the values of the address, function code, and data sections of the message. The procedure for calculating a CRC-16 value is described at the end of this chapter. How the response message is handled by the master depends on what master is used. When the master receives the fault response message it should calculate a CRC-16 value and compare it to the one in the CRC-16 field of the fault response message. If these two CRC-16 values are the same, the master has received the proper fault response message.

Write Multiple Registers - 10h

The multiple register write function (10h) allows the master to write data to the IMPULSE® Series 4 drive's registers. The multiple register write message format is shown below.

Table 16: Command Message

SLAVE ADDRESS		01h	
FUNCTION CODE		10h	
STARTING REGISTER NO.	UPPER	00h	
	LOWER	01h	
QTY.	UPPER	00h	
	LOWER	02h	
NO. OF DATA BYTES		04h	
DATA TO FIRST REGISTER	UPPER	00h	The first register, 01h (Operation Command) has a value of 01h or 1 dec. (forward run command)
	LOWER	01h	
DATA TO NEXT REGISTER	UPPER	17h	The next register, 02h (Frequency Reference) has a value of 1770h or 6000 dec. (60.00 Hz)
	LOWER	70h	
CRC-16	LOWER	6Dh	
	UPPER	B7h	

Each Series 4 drive's slave address is set in advance by the drive parameter H05-01. Valid slave addresses must be in the range of 1 to 31 decimal (1 to 1F hex). No two slaves may have the same address. The master addresses the slave by placing the slave address in the address field of the message. In the command message above, the slave is addressed at 1.

By setting the slave address to zero (0) in the address section of the message, the master can send operation signals (register 1h) and frequency reference (register 2h) to all slaves on the network. The master can send a single transmission to all the slaves simultaneously. This is called simultaneous broadcasting. In a simultaneous broadcast message all of the slaves on the network act upon one message.

The function code of this message is 10h (write multiple registers).

The starting register number is the first register to be written to. In the command message above the starting number is 01h, indicating that the first register is the Run command. A listing of the IMPULSE® Series 4 drive registers is shown in Chapter 6, Registers.

The quantity indicates how many consecutive registers are to be written to. The quantity may range from 1 to 16 registers. If the quantity is greater than 16, an error code of '3' is returned in the fault response message. In this command message there are two consecutive registers to be written to: 01h-Operation Command and 02h- Frequency Reference.

The number of data bytes is the number of bytes of data to be written to the drive. The number of data bytes is actually the quantity times 2, since there are two bytes of data in each register.

The data section of the response message contains 8 upper and 8 lower bits of data for each register that is being written to.

A CRC-16 value is generated from a calculation using the values of the address, function code, starting register number, quantity, number of data bytes, and data sections of the message. The

procedure for calculating a CRC-16 is described at the end of this chapter. When the slave receives the command message it calculates a CRC-16 value and compares it to the one in CRC-16 field of the command message. If these two CRC-16 values are the same, the slave has received the proper command message. If these two CRC-16 values are not the same, the slave does not respond.

If the command message has a valid slave address, function code, starting register number, quantity, number of data bytes, and data values, the slave will respond with a normal response message. If the command message has an invalid slave address, function code, starting register number, quantity, number of data bytes, and/or data values the slave will respond with a fault response message.

Table 17: Normal Response Message

SLAVE ADDRESS		01h
FUNCTION CODE		10h
STARTING REGISTER NO.	UPPER	00h
	LOWER	01h
QTY.	UPPER	00h
	LOWER	02h
CRC-16	LOWER	09h
	UPPER	CCh

The normal response message contains the same slave address and function code as the command message, indicating to the master which slave is responding and to what type of function it is responding.

The starting number is the first register that was written to. In the response message above the starting number is 01h, indicating that the first register is the operation command.

The quantity indicates how many consecutive registers were written to.

A CRC-16 value is generated from a calculation using the values of the address, function code, starting register number, and quantity value of the message. The procedure for calculating a CRC-16 value is described at the end of this chapter. How the response message is handled by the master depends on what master is used. When the master receives the response message it should calculate a CRC-16 value and compare it to the one in the CRC-16 field of the response message. If these two CRC-16 values are the same the master has received the proper response message.

Table 18: Fault Response Message

SLAVE ADDRESS		01h
80h + FUNCTION CODE		90h
ERROR CODE		02h
CRC-16	LOWER	00h
	UPPER	95h

The fault response message contains the same slave address as the command message, indicating to the master which slave is responding.

The function code of a fault response message is actually a value of 80h plus the original function code of 10h. This indicates to the master that the message is a fault response message, instead of a normal response message.

The error code indicates where the error occurred in the command message. The value of 2h in the error code field of this fault response message, indicates that the command message requested data to be written to an invalid register. A complete listing of the error codes is shown in Chapter 7, Troubleshooting and Error Codes.

A CRC-16 value is generated from a calculation using the values of the address, function code, and error code sections of the message. The procedure for calculating a CRC-16 value is described at the end of this chapter. How the response message is handled by the master depends on what master is used. When the master receives the fault response message it should calculate a CRC-16 value and compare it to the one in the CRC-16 field of the response message. If these two CRC-16 values are the same the master has received the proper response message.

No Response Message

The slave disregards the command message and does not return the respond message in the following cases:

1. In simultaneous broadcasting of data (slave address field is 0), all slaves execute but do not respond.
2. When a communication error (overrun, framing, parity, or CRC-16) is detected in the command message.
3. When the slave address in the command message does not coincide with the address set in the slave.
4. When the command message data length is not proper.

CRC-16

At the end of the message, the data for CRC error checking is sent in order to detect errors in signal transmission. In Modbus RTU, the error check is conducted in the form of a CRC-16 (Cyclical Redundancy Check). The CRC field checks the contents of the entire message. It is applied regardless of any parity check method used for the individual characters of the message.

The CRC field is two bytes, containing 16-bit binary value. The CRC value is calculated by the transmitting device, which appends the CRC to the message. The receiving device recalculates a CRC during receipt of the message, and compares the calculated value to the actual value it received in the CRC field. If the two values are not equal, an error results.

The CRC is started by first preloading a 16-bit register to all 1s. Then a process begins of applying successive 8-bit bytes of the message to the current contents of the register. Only the eight bits of data in each character are used for generating the CRC. Start and stop bits, and the parity bit (if one is used) do not apply to the CRC.

During generation of the CRC, each 8-bit character is exclusive 'OR'ed with the register contents. Then the result is shifted in the direction of the least significant bit (LSB), with a zero filled into the most significant bit (MSB) position. The LSB is extracted and examined. If the LSB is a 1, the register is then exclusive 'OR'ed with a preset, fixed value (A001h). If the LSB is a 0, no exclusive OR takes place.

This process is repeated until eight shifts have been performed. After the last (eighth) shift, the next 8-bit byte is exclusive 'OR'ed with the register's current value, and the process repeats for eight more shifts as described above. The final contents of the register, after all the bytes of the message have been applied, is the CRC value.

For applications using a host computer, a detailed example of a CRC generation using Quick Basic is shown on the following page.

Typical CRC-16 Calculation Program in Quick Basic:

```
crcsum# = &HFFFF&
crcshift# = &H0&
crconst# = &HA001&

CLS
PRINT "*****"
PRINT
PRINT "          CRC-16 calculator"
PRINT
PRINT "*****"
PRINT "If entering data in hex, precede the data with '&H'"
PRINT "  Example: 32decimal = 20hex = &H20"
PRINT "*****"
PRINT

INPUT "Enter the number of bytes in the message: ", maxbyte

FOR bytenum = 1 TO maxbyte STEP 1
  PRINT "Enter byte "; bytenum; ":"
  INPUT byte&
  byte& = byte& AND &HFF&
  crcsum# = (crcsum# XOR byte&) AND &HFFFF&
  FOR shift = 1 TO 8 STEP 1
    crcshift# = (INT(crcsum# / 2)) AND &H7FFF&
    IF crcsum# AND &H1& THEN
      crcsum# = crcshift# XOR crconst#
    ELSE
      crcsum# = crcshift#
    END IF
  NEXT shift
NEXT bytenum

lower& = crcsum# AND &HFF&
upper& = (INT(crcsum# / 256)) AND &HFF&

PRINT "Lower byte (1st) = ", HEX$(lower&)
PRINT "Upper byte (2nd) = ", HEX$(upper&)
```

CRC-16 Calculation Example:

A two byte message for a read-out of a specified coil status is as follows.

0000 0010	Slave Address = 2
0000 0111	Function Code = 7

0100 1001 0000 0100	0	Shift#6
0010 0100 1000 0010	0	Shift #7
0001 0010 0100 0001	0	Shift #8
1 2 4 1		
CRC-16 (Upper 8)	CRC-16 (Lower 8)	

The actual CRC calculation would look like this:

CRCTMP	FLAG	
1111 1111 1111 1111		Initial Value
0000 0010		Slave Address
1111 1111 1111 1101		Result of EX
OR		
0111 1111 1111 1110	1	Shift #1
1010 0000 0000 0001		CRC-16
constant A001h		
1101 1111 1111 1111		Result of EX
OR		
0110 1111 1111 1111	1	Shift #2
1010 0000 0000 0001		CRC-16
constant A001h		
1100 1111 1111 1110		Result of EX
OR		
0110 0111 1111 1111	0	Shift #3
0011 0011 1111 1111	1	Shift #4
1010 0000 0000 0001		CRC-16
constant A001h		
1001 0011 1111 1110		Result of EX
OR		
0100 1001 1111 1111	0	Shift #5
0010 0100 1111 1111	1	Shift #6
1010 0000 0000 0001		CRC-16
constant A001h		
1000 0100 1111 1110		Result of EX
OR		
0100 0100 0111 1111	0	Shift #7
0010 0001 0011 1111	1	Shift #8
1010 0000 0000 0001		CRC-16
1000 0001 0011 1110		Result of EX
OR		
0000 0111		Function Code
1000 0001 0011 1001		Result of EX
OR		
0100 0000 1001 1100	1	Shift #1
1010 0000 0000 0001		CRC-16
constant A001h		
1110 0000 1001 1101		Result of EX
OR		
0111 0000 0100 1110	1	Shift #2
1010 0000 0000 0001		CRC-16
constant A001h		
1101 0000 0100 1111		Result of EX
OR		
0110 1000 0010 0111	1	Shift #3
1010 0000 0000 0001		CRC-16
constant A001h		
1100 1000 0010 0110		Result of EX
OR		
0110 0100 0001 0011	0	Shift #4
0011 0010 0000 1001	1	Shift #5
1010 0000 0000 0001		CRC-16
constant A001h		
1001 0010 0000 1000		Result of EX
OR		

After calculating the CRC-16 upper and lower values, they are inserted into the message format as shown below.

0000 0010	Slave Address = 2
0000 0111	Function Code = 7
0100 0001	CRC-16 Lower = 41h
0001 0010	CRC-16 Upper = 12h

6. Registers

Command Registers

Table 19: Command Registers (Read/Write)

Register No.	Contents	
0000H	Reserved	
0001H	Operation Commands and Multi-function Inputs	
	bit 0	H05-12 = 0: Forward Run Command (0 = Stop, 1 = Forward Run) H05-12 = 1: Run Command (0 = Stop, 1 = Run)
	bit 1	H05-12 = 0: Reverse Run Command (0 = Stop, 1 = Reverse Run) H05-12 = 1: Forward/Reverse (0 = Forward, 1 = Reverse)
	bit 2	External Fault (EF0)
	bit 3	Fault Reset
	bit 4	Multi-Function Input 1 Function is ComRef when H01-03 = 40 (Forward/Stop).
	bit 5	Multi-Function Input 2 Function is ComCtrl when H01-04 = 41 (Reverse/Stop).
	bit 6	Multi-Function Input 3
	bit 7	Multi-Function Input 4
	bit 8	Multi-Function Input 5
	bit 9	Multi-Function Input 6
	bit A	Multi-Function Input 7
	bit B	Multi-Function Input 8
	bit C to F	Reserved
0002H	Frequency Reference	Units are determined by parameter O01-03.
0003H	V/f Gain	
0004H	Torque Reference/Torque Limit, 0.1% units, signed (Usable only if Torque Control is enabled)	
0005H	Torque Compensation, 0.1% units, signed (Usable only if Torque Control is enabled)	
0006H	PID Target, 0.01% units, signed	
0007H	Analog Output Terminal FM Setting (10 V/4000 H)	
0008H	Analog Output Terminal AM Setting (10 V/4000 H)	
0009H	Settings for Multi-Function Digital Outputs	
	bit 0	Multi-Function Contact Output (terminal M1-M2)
	bit 1	Multi-Function Contact (terminal M3-M4)
	bit 2	Multi-Function Contact (terminal M5-M6)
	bit 3 to 5	Reserved
	bit 6	Enables the function in bit 7
	bit 7	Fault Contact Output (terminal MA/MB-MC)
	bit 8 to F	Reserved
000AH	Pulse Output Terminal MP Setting, 1 Hz units, Setting Range: 0 to 32000	
000BH to 000EH	Reserved	

Register No.	Contents	
000FH	Control Selection Setting	
	bit 0	Reserved
	bit 1	PID Setpoint Input
	bit 2	Torque reference/ torque limit input (enables the setting from MEMOBUS/Modbus)
	bit 3	Torque compensation input (enables the setting from MEMOBUS/Modbus)
	bit 4 to B	Reserved
	bit C	Enable Terminal S5 Input for Broadcast Data
	bit D	Enable Terminal S6 Input for Broadcast Data
	bit E	Enable Terminal S7 Input for Broadcast Data
bit F	Enable Terminal S8 Input for Broadcast Data	

Monitor Registers

Table 20: Monitor Registers (Read Only)

Register No.	Contents	
0010H	Drive Status	
	bit 0	Run
	bit 1	Zero Speed
	bit 2	Reverse Run
	bit 3	Reset Signal Output
	bit 4	Speed Agree
	bit 5	Drive Operation Ready
	bit 6	Minor Fault (Alarm)
	bit 7	Major Fault (Fault)
	bit 8 to 10	Not Used
	bit E	Com Ref Status
	bit F	Com Ctrl Status
0011H	Operator Status	
	bit 0	OPE has occurred
	bit 1	ERR has occurred
	bit 2	Program Mode
	bit 3	0: Operator 1: PC
bit 4 to F	Not Used	
0012H	OPE Description Number	
0013H	Inverter Code	G5: 0000h V7: 2040h F7: 2040h

Register No.	Contents	
0014H or 0730h	Existing Fault Code 1	
	bit 0	PUF - Fuse Blown
	bit 1	UV1 - DCBus Undervoltage
	bit 2	UV2 - CTL PS Undervoltage
	bit 3	UV3 - MC Answerback
	bit 4	Not Used
	bit 5	GF - Ground Fault
	bit 6	OC - Over Current
	bit 7	OV - Overvoltage
	bit 8	OH - Heatsink Overtemperature
	bit 9	OH1 - Drive Overheat
	bit A	OL1 - Motor Overload
	bit B	OL2 - Drive Overload
	bit C	OT1 - Overtorque 1
	bit D	OT2 - Overtorque 2
bit E	RR - Dynamic Braking Resistor	
bit F	RH - Dynamic Braking Resistor Overheat	
0015h or 0731h	Existing Fault Code 2	
	bit 0	EF3 - External Fault 3
	bit 1	EF4 - External Fault 4
	bit 2	EF5 - External Fault 5
	bit 3	EF6 - External Fault 6
	bit 4	EF7 - External Fault 7
	bit 5	EF8 - External Fault 8
	bit 6	PGO-1-h - PG CH 1 Open (Hardware Detection)
	bit 7	OS-1 - CH 1 Overspeed
	bit 8	DEV-1 - Speed Deviation
	bit 9	PGO-1-S - PG CH 1 Open (Software Detection)
	bit A	PF - Input Phase Loss
	bit B	LF - Output Phase Loss
	bit C	OH3 - Motor Overheat
	bit D	OPR - Operator Disconnect
	bit E	ERR - EEPROM R/W Error
	bit F	OH4 - Motor Overheat 2

Register No.	Contents	
0016h or 0732h	Existing Fault 3	
	bit 0	CE - Modbus Com Error
	bit 1	BUS - Option Communication Error
	bit 2	E15 - Serial Communication Error
	bit 3	E10 - Option CPU Down
	bit 4	CF - Out of Control
	bit 5	SVE - Zero Servo Fault
	bit 6	EFO - Communication Option External Fault
	bit 7	FBL - PID Feedback Loss
	bit 8	UT1 - Undertorque 1
	bit 9	UT2 - Undertorque 2
	bit A	OL7 - High Speed Slip Braking Overload
	bit B	PGO-2-H - PG CH2 Open (Hardware Detection)
	bit C	OS-2 - CH2 Overspeed
	bit D	DEV-2 - CH2 Speed Deviation
bit E	PGO-S-S - PG CH2 Open (Software Detection)	
bit F	Not Used	
0733h	Existing Fault 4	
	bit 0	Not Used
	bit 1	Not Used
	bit 2	SNAP - Snapped Shaft
	bit 3	LC - Load Check Error
	bit 4	BE1 - Rollback Detected
	bit 5	BE2 - No Current
	bit 6	BE3 - Brake Release No Good
	bit 7	BE7 - Brake Welded
	bit 8	UL3 - Upper Limit 3
	bit 9 to F	Not Used
0017h	CPF Description 1	
	bit 0 and 1	Not Used
	bit 2	CPF02 - Baseblock Circuit
	bit 3	CPF03 - EEPROM Fault
	bit 4	CPF04 - CPU Internal A/D Converter
	bit 5	CPF05 - External A/D Converter
	bit 6	CPF06 - Option Board Connection Error
	bit 7	CPF07 - ASIC Internal RAM Error
	bit 8	CPF08 - Watchdog Timer Fault
	bit 9	CPF09 - CPU-ASIC Mutual Diagnosis Fault
	bit A	CPF10 - ASIC Version Fault
bit B to F	Not Used	

Register No.	Contents	
0018h	CPF Description 2	
	bit 0	CPF20 - Option A/D Error
	bit 1	CPF21 - Option CPU Down
	bit 2	CPF22 - Option Type Error
	bit 3	CPF23 - Option Board Interconnection Fault
	bit 4 to F	Not Used
0019h or 734h	Minor Fault Content 1 (Alarm)	
	bit 0	UV - DC Bus Undervoltage (No run command)
	bit 1	OV - DC Bus Overvoltage (No run command)
	bit 2	OH - Inverter Overheat
	bit 3	OH2 - Inverter Overheat Warning by MFDI '39H'
	bit 4	OT1 - Overtorque 1
	bit 5	OT2 - Overtorque 2
	bit 6	EF - External Fault (F/R simultaneously)
	bit 7	BB - External Baseblock
	bit 8	EF3 - External Fault Terminal 3
	bit 9	EF4 - External Fault Terminal 4
	bit A	EF5 - External Fault Terminal 5
	bit B	EF6 - External Fault Terminal 6
	bit C	EF7 - External Fault Terminal 7
	bit D	EF8 - External Fault Terminal 8
	bit E	SNAP - Snapped Shaft
bit F	OS-1 - CH1 Overspeed	
001Ah or 735h	Minor Fault Content 2 (Alarm)	
	bit 0	DEV-1 - CH1 Speed Deviation
	bit 1	PGO-1-S - PG CH1 Open (Software Detection)
	bit 2	PGO-1-H - PG CH1 Open (Hardware Detection)
	bit 3	CE - Memobus Communication Error
	bit 4	BUS - Communication Option Error
	bit 5	CALL - Serial Comm has not been established (Communication Option)
	bit 6	LC - Load Check Error
	bit 7	BE0 - Brake Answerback Lost durring run
	bit 8	DEV-2 - CH2 Speed Bias Exceeded
	bit 9	EF0 - Communication Option External Fault
	bit A	Can't SW - Motor Switch During Run
	bit B	FBL - PID Feedback Loss
	bit C	CALL - Serial Comm has not been established (Memobus)
	bit D	UT1 - Undertorque 1
	bit E	UT2 - Undertorque 2
bit F	Communication TEST Error	

Register No.	Contents	
001Bh or 736h	Minor Fault Content 3 (Alarm)	
	bit 0	OS-2 - CH2 Overspeed
	bit 1	OH3 - Motor Overheat 1
	bit 2	DNE - Drive not Ready
	bit 3	PGO-2-S - PG CH2 Disconnect (Software Detection)
	bit 4	PGO-2-H - PG CH2 Disconnct (Hardware Detection)
	bit 5	BE4 - Brake Answer 1 (Start of Run)
	bit 6	BE5 - Brake Answer 2 (End of Run)
	bit 7	BE6 - Brake Slipping
	bit 8	UL2 - Upper Limit 2
	bit 9	LL2 - Lower Limit 2
	bit A	UL1 - Upper Limit 1
	bit B	LL1 - Lower Limit 1
	bit C	SLC - Slack Cable Detect
	bit D	MNT - Maintenance Required
737h	Minor Fault Content 4 (Alarm)	
	bit 0	BE8 – Brake Slipping (Load Catch)
	bit 1 to F	Not Used
0020h	Drive Status	
	bit 0	Running
	bit 1	Reverse Run
	bit 2	Drive Operation Ready
	bit 3	Drive Fault
	bit 4	Data Setting Error
	bit 5	Multi-Function Digital Output (Terminal M0 – M1)
	bit 6	Multi-Function Digital Output (Terminal M2 – M3)
	bit 7	Multi-Function Digital Output (Terminal M5 – M6)
bit 8 to F	Not Used	

Register No.	Contents	
0021h	Major Fault Content	
	bit 0	OC -Overcurrent, GF - Ground Fault
	bit 1	OV - DC Bus Overvoltage
	bit 2	OL2 - Inverter Overload
	bit 3	OH1, OH2 Inverter Overheat
	bit 4	RR - Braking Transistor Fault, RH - Internal Braking Resister Overheat
	bit 5	PUF - Fuse Blown
	bit 6	FbL - PID Feedback Loss
	bit 7	External Fault (EF, EF0)
	bit 8	CPF Hardware Fault
	bit 9	OL1, OT1, OT2
	bit A	PGO-1-S, OS-1, DEV-1
	bit B	UV - DC Bus Undervoltage (No run command)
	bit C	UV1, UV2, UV3 Power Loss while running
	bit D	SPO - Output Phase, SPI - Input Phase
bit E	CE - Memobus Communication Error	
bit F	OPR - Operator Connection Fault while running from operator	
0022h	Data Link Status	
	bit 0	Writing Data
	bit 1 to 2	Not Used
	bit 3	Parameter Upper/Lower Limit Fault
	bit 4	Parameter Data Inconsistency Fault
	bit 5 to F	Not Used
0023h	Frequency Reference	U01-01
0024h	Output Frequency	U01-02
0025h	OutputVoltage	U01-06
0026h	Output Current	U01-03
0027h	Output Power	U01-08
0028h	Torque Reference	U01-09
002Bh	Digital Input Status	
	bit 0	Terminal 1 (Closed)
	bit 1	Terminal 2 (Closed)
	bit 2	Terminal 3 (Closed)
	bit 3	Terminal 4 (Closed)
	bit 4	Terminal 5 (Closed)
	bit 5	Terminal 6 (Closed)
	bit 6	Terminal 7 (Closed)
bit 7	Terminal 8 (Closed)	

Register No.	Contents	
002Ch	Drive Status	
	bit 0	During Run
	bit 1	During Zero Speed
	bit 2	During Speed Agree (Fixed: (Fref = Fout) or (Fref = Motor Speed)) (Width by L04-02)
	bit 3	During Speed Agree (Programmable by L04-01, L04-02)
	bit 4	Frequency Detection 1
	bit 5	Frequency Detection 2
	bit 6	Inverter Ready
	bit 7	Undervoltage During Detection
	bit 8	During Baseblock
	bit 9	Frequency Reference Mode 1: Not from Comm.
	bit A	Run Command Mode 1: Not from Comm.
	bit B	Overtorque During Detection
	bit C	During Frequency Reference Loss
	bit D	During Fault Restart (Auto Reset)
	bit E	During Fault
bit F	Memobus Timed Out	
002Dh	Multi-Function Output Status	
	bit 0	Multi-Function Output (Terminal M0, M1)
	bit 1	Multi-Function Output (Terminal M2, M3)
	bit 2	Multi-Function Output (Terminal M5, M6)
	bit 3 to F	Not Used
0031h	DC Bus Voltage	U01-07
0032h	Torque Reference	U01-09
0033h	Output Power	U01-08
0038h	PID Setpoint	U01-24
0039h	PID Input	U01-36
003Ah	PID Output	U01-37
003Bh	CPU Software Number	U01-28
003Ch	Flash Software Number	U01-114
003Dh	Comm. Error Description	
	bit 0	CRC Error
	bit 1	Data Length Error
	bit 2	Not Used
	bit 3	Parity Error
	bit 4	Overrun Error
	bit 5	Framing Error
	bit 6	Timed Out
	bi 7 to F	Not Used
003Eh	KVA Setting	Drive KW Rating
003Fh	Control Mode	Control Method

Drive Parameter Registers

Table 21: Drive Parameter Registers (U01-xx/Monitor Only)

Register No.	Parameter	Parameter Function	Parameter Setting	Bit No.	Limits/Description
040h	U01-01	Frequency Reference	--	--	Monitors the frequency reference of drive (0.1 Hz)*
041h	U01-02	Output Frequency	--	--	Displays the output frequency of drive (0.1 Hz)*
042h	U01-03	Output Current	--	--	Displays the output current.
043h	U01-04	Control Method	0	--	V/fControl
			1		V/f with PG Feedback
			2		Open Loop Vector Control
			3		Closed Loop Vector Control
044h	U01-05	Motor Speed	--	--	Displays the motor speed feedback*
045h	U01-06	Output Voltage	--	--	Displays the output voltage (in 0.1 VAC)
046h	U01-07	DC Bus Voltage	--	--	Displays the DC bus voltage (in 1 VDC)
047h	U01-08	Output Power	--	--	Displays the output power (in 0.1 HP)
048h	U01-09	Torque Reference	--	--	Displays the internal torque reference (in 0.1%)
049h	U01-10	Input Terminal Status	--	0	Digital Input 1 closed
			--	1	Digital Input 2 closed
			--	2	Digital Input 3 closed
			--	3	Digital Input 4 closed
			--	4	Digital Input 5 closed
			--	5	Digital Input 6 closed
			--	6	Digital Input 7 closed
			--	7	Digital Input 8 closed
04Ah	U01-11	Output Terminal Status	--	0	Multi-Function Digital Output (terminal M0–M1): “Closed”
			--	1	Multi-Function Digital Output (terminal M2–M3): “Closed”
			--	2	Multi-Function Digital Output (terminal M5–M6): “Closed”
			--	3–6	Not Used
			--	7	Fault Relay (terminal MA–MC): “Closed”
04Bh	U01-12	Operating Status	--	0	During Run
			--	1	During zero-speed
			--	2	During REV
			--	3	During fault reset signal input
			--	4	During speed agree
			--	5	Drive Ready
			--	6	During alarm detection
			--	7	During fault detection
04Dh	U01-14	Software No. (Flash)	--	--	Flash ID

Register No.	Parameter	Parameter Function	Parameter Setting	Bit No.	Limits/Description
050h	U01-15	Terminal A1 Input Level	--	--	Displays the signal level to analog input terminal A1 (+10V/ +100.0% – -10V/-100.0%)
053h	U01-16	Terminal A2 Input Level	--	--	Displays the signal level to analog input terminal A2 (+10V/+100.0% – -10V/-100.0%) or (4mA/0.0% – 20mA/100.0%)
17A0	U01-17	Terminal A3 Input Level	--	--	Displays the signal level to analog input terminal A3 (+10V/+100.0% – -10V/-100.0%)
17A1	U01-20	Output Frequency after Soft Starter	--	--	Displays output frequency with decel time and S-curves*
077h	U01-21	AI-A3 Terminal V1 Input Voltage Monitor	--	--	Displays the input voltage to terminal V1 on analog input card AI-A3 (0.01%)
072Ah	U01-22	AI-A3 Terminal V2 Input Voltage Monitor	--	--	Displays the input voltage to terminal V2 on analog input card AI-A3 (0.01%)
072Bh	U01-23	AI-A3 Terminal V3 Input Voltage Monitor	--	--	Displays the input voltage to terminal V3 on analog input card AI-A3 (0.01%)
058h	U01-25	DI-A3 Input Status (Opt In Low)	--	--	Displays the reference value input from the DI-A3 option card
063h	U01-26	DI-A3 Input Status (Opt In High)	--	--	Displays the upper 8 bits from the DI-A3 option card.
17A2h	U01-28	Software No. (ROM)	--	--	ROM ID
17C5h	U01-29	Load Weight	--	--	Displays the measured load weight from C10 group calculation
17C8h	U01-30	SS Delta Speed	--	--	Snap Shaft Delta Speed between Ch1 and Ch2 after gear ratio
061h	U01-34	oPE Error Code	--	--	Displays the parameter number that caused the OPExx or Err (EEPROM write error) error.
066h	U01-39	MEMOBUS/ Modbus Error Code	--	--	Displays the contents of a MEMOBUS/ Modbus error
06Bh	U01-44	Feedback Control Output	--	--	Output monitor from Speed Control loop. (Primary Delay filter input value). 100 % is displayed at motor rated secondary current
17A3h	U01-50	Hook Height	--	--	Percentage of Hook height is displayed (0.01%)
17A4h	U01-51	Motor Revolution	--	--	Number of Motor Revolutions since Upper Limit (UL2)

Register No.	Parameter	Parameter Function	Parameter Setting	Bit No.	Limits/Description
17A5h	U01-52	Maintenance Timer	--	--	Number of Hours Remaining Before Maintenance is Required
17A6h	U01-53	Index Count	--	--	The Number of Pulses the Encoder has moved since the beginning of a new Inch 2 command
17A7h	U01-30	PG CH1 Count	--	--	Displays the raw PG Channel 1 pulse count 4 pulses = 1 ppr of F01-01
17A8h	U01-61	PG CH2 Count	--	--	Displays the raw PG Channel 2 pulse count 4 pulses = 1 ppr of F01-01
17AAh	U01-63	PG CH1 Freq	--	--	Displays the current input frequency on PG Channel 1
17ABh	U01-64	PG CH2 Freq	--	--	Displays the current input frequency on PG Channel 2
17ACh	U01-65	PG Output Freq	--	--	Displays the current output frequency on the PG Output channel
17ADh	U01-66	BE6 Pulse Count	--	--	Displays the amount of shaft movement during the BE6 detection time 4 pulses = 1 ppr of F01-01
17AFh	U01-68	LC Zone	--	--	Displays the LC Zone the driver is currently running in. If an LC fault occurs, the value displayed will be which LC zone the LC fault occurred in
17B0h	U01-69	LC Margin	--	--	Displays how close the current/torque levels are to the target value for each of the LC zones. Values less than zero will cause an LC detection or an LC fault to occur. If the LC fault occurs, the value displayed is the amount the level was below the LC zone setting.
17B5h	U01-84	NLB State	--	--	Displays the current NLB State Machine sequence
17C6h	U01-85	NLB Rel Trq	--	--	Torque level for next BE2 check. Is set to 100% after BE2 is passed, and set to torque output level at end of Load Float. No signal output available
17C7h	U01-86	Brk Test Trq	--	--	Brake breakaway torque; FLV only; MFDI needs to be programmed with "Brake Test"

Table 22: Drive Parameter Registers (U2-xx/Fault Trace and U3-xx/Fault History)

Register No.	Parameter	Parameter Function	Parameter Setting	Bit No.	Limits/Description
080h	U02-01	Current Fault	--	--	Displays the current fault
081h	U02-02	Last Fault	--	--	Displays the last fault
082h	U02-03	Frequency Reference at Previous Fault	--	--	Displays the frequency reference at the previous fault (U02-02)

Register No.	Parameter	Parameter Function	Parameter Setting	Bit No.	Limits/Description
083h	U02-04	Output Frequency at Previous Fault	--	--	Displays the output frequency at the previous fault (U02-02)
084h	U02-05	Output Current at Previous Fault	--	--	Displays the output current at the previous fault (U02-02)
085h	U02-06	Motor Speed at Previous Fault	--	--	Displays the motor speed at the previous fault (U02-02)
086h	U02-07	Output Voltage at Previous Fault	--	--	Displays the output voltage at the previous fault (U02-02)
087h	U02-08	DC Bus Voltage at Previous Fault	--	--	Displays the DC bus voltage at the previous fault (U02-02)
088h	U02-09	Output Power at Previous Fault	--	--	Displays the output power at the previous fault (U02-02)
089h	U02-10	Torque Reference at Previous Fault	--	--	Displays the torque reference at the previous fault (U02-02)
08Ah	U02-11	Input Terminal Status at Previous Fault	--	0-7	Displays the output status at the previous fault (U02-02). Displays the same status displayed in U01-10
08Bh	U02-12	Output Terminal Status at Previous Fault	--	0-7	Displays the output status at the previous fault (U02-02). Displays the same status displayed in U01-11
08Ch	U02-13	Drive Operation Status at Previous Fault	--	0-7	Displays the operation status of the drive at the previous fault (U02-02). Displays the same status displayed in U01-12
08Dh	U02-14	Cumulative Operation Time at Previous Fault	--	--	Displays the cumulative operation time at the previous fault (U02-02)
07E0h	U02-15	SFS Speed Ref	--	--	Displays the speed reference for the soft starter at the previous fault (U02-02)
07E1h	U02-16	Motor Iq Current	--	--	Displays the q-axis current for the motor at the previous fault (U02-02)
07E2h	U02-17	Motor Id Current	--	--	Displays the d-axis current for the motor at the previous fault (U02-02)
08Eh	U02-20	Actual Fin Temp	--	--	Displays the temperature of the heatsink when the most recent fault occurred
090h	U03-01	Last Fault	--	--	Displays the first most recent fault
091h	U03-02	Fault Message 2	--	--	Displays the second most recent fault
092h	U03-03	Fault Message 3	--	--	Displays the third most recent fault
093h	U03-04	Fault Message 4	--	--	Displays the fourth most recent fault

Register No.	Parameter	Parameter Function	Parameter Setting	Bit No.	Limits/Description
804h	U03-05	Fault Message 5	--	--	Displays the fifth most recent fault
805h	U03-06	Fault Message 6	--	--	Displays the sixth most recent fault
806h	U03-07	Fault Message 7	--	--	Displays the seventh most recent fault
807h	U03-08	Fault Message 8	--	--	Displays the eighth most recent fault
808h	U03-09	Fault Message 9	--	--	Displays the ninth most recent fault
809h	U03-10	Fault Message 10	--	--	Displays the tenth most recent fault
094h	U03-11	Elapsed Time 1	--	--	Elapsed Time at the most recent fault occurrence
095h	U03-12	Elapsed Time 2	--	--	Elapsed Time at the second to most recent fault occurrence
096h	U03-13	Elapsed Time 3	--	--	Elapsed Time at the third to most recent fault occurrence
097h	U03-14	Elapsed Time 4	--	--	Elapsed Time at the fourth to most recent fault occurrence
80Eh	U03-15	Elapsed Time 5	--	--	Elapsed Time at the fifth to most recent fault occurrence
80Fh	U03-16	Elapsed Time 6	--	--	Elapsed Time at the sixth to most recent fault occurrence
810h	U03-17	Elapsed Time 7	--	--	Elapsed Time at the seventh to most recent fault occurrence
811h	U03-18	Elapsed Time 8	--	--	Elapsed Time at the eighth to most recent fault occurrence
812h	U03-19	Elapsed Time 9	--	--	Elapsed Time at the ninth to most recent fault occurrence
813h	U03-20	Elapsed Time 10	--	--	Elapsed Time at the tenth to most recent fault occurrence
075h	U03-21	Number of Run Commands	--	--	Displays the number of times the Forward or Reverse Run command is toggled. This value will reset to 0 and start counting again after reaching 65535. Counter cleared by O03-14.
71B9	U03-22	U03-21 Rollovers	--	--	Increments when U03-21 reaches 65535. U03-21 is set to 0. Counter cleared by O03-14.
17BA	U03-23	OL/LC Check Count	--	--	Increments a counter after every occurrence of an OL1, OL2, LC faults. Counter cleared by O03-14.

Table 23: Drive Parameter Registers (U04-xx/Maintenance and U06-xx/Control Monitor)

Register No.	Parameter	Parameter Function	Parameter Setting	Bit No.	Limits/Description
004Eh	U04-01	Drv Elapsed Time	--	--	Displays the cumulative operation time of the drive. The value for the cumulative operation time counter can be reset in parameter O03-01. Use parameter O03-02 to determine if the operation time should start as soon as the power is switched on or only while the Run command is present. The maximum number displayed is 99999, after which the value is reset to 0.
067h	U04-03	Fan Elapsed Time	--	--	Displays the cumulative operation time of the cooling fan. The default value for the fan operation time is reset in parameter O03-03. After the count reaches 99999, the value will reset to 0 and start counting again.
07Eh	U04-04	Fan Life Mon	--	--	Displays main cooling fan usage time in as a percentage of its expected performance life. Parameter O03-03 can be used to reset this monitor.
07Ch	U04-05	Cap Life Mon	--	--	Displays main circuit capacitor usage time in as a percentage of their expected performance life. Parameter O03-05 can be used to reset this monitor.
07D6h	U04-06	ChgCirc Life Mon	--	--	Displays the soft charge bypass relay maintenance time as a percentage of its estimated performance life. Parameter O03-07 can be used to reset this monitor.
07D7h	U04-07	IGBT Life Mon	--	--	Displays IGBT usage time as a percentage of the expected performance life. Parameter O03-09 can be used to reset this monitor.
068h	U04-08	Heatsink Temp	--	--	Displays the heatsink temperature.
05Eh	U04-09	LED Oper Check	--	--	Lights all segments of the LED to verify that the display is working properly.
05Ch	U04-10	kWh Lower 4 dig	--	--	Monitors the drive output power. The value is shown as a 9 digit number displayed across two monitor parameters, U04-10 and U04-11.
05Dh	U04-11	kWh Upper 5 dig	--	--	--
070h	U04-12	CPU Occup Rate	--	--	Displays the amount of space being used in the CPU.
07CFh	U04-13	Current PeakHold	--	--	Displays the highest current value that occurred during run.
07D0h	U04-14	Freq@ I PeakHold	--	--	Displays the output frequency when the current value shown in U04-13 occurred.
07D8h	U04-16	Motor OL1 Level	--	--	Shows the value of the motor overload detection accumulator. 100% is equal to the OL1 detection level. Accumulator is reset when drive power is cycled.

Register No.	Parameter	Parameter Function	Parameter Setting	Bit No.	Limits/Description
07D9h	U04-17	Drive OL2 Level	--	--	100% = OL2 detection level
07DAh	U04-18	Reference Source	--	--	Displays the source for the frequency reference as XY-nn.
07DBh	U04-19	MEMOBUS Freq Ref	--	--	Displays the frequency reference provided by MEMOBUS/Modbus (decimal).
07DCh	U04-20	Option Freq Ref	--	--	Displays the frequency reference input by an option card (decimal).
07DDh	U04-21	Run Cmd Source	--	--	Displays the source for the Run command as XY-nn.
07DEh	U04-22	MEMOBUS Ref Reg	--	--	Displays the drive control data set by MEMOBUS/Modbus communications register no. 0001H as a four-digit hexadecimal number.
07DFh	U04-23	Option Ref Reg	--	--	Displays drive control data set by an option card as a four-digit hexadecimal number.
17C1h	U06-01	Mot SEC Current	--	--	Displays the value of the motor secondary current (Iq). Motor rated secondary current is 100%.
17C2h	U06-02	Mot EXC Current	--	--	Displays the value calculated for the motor excitation current (Id). Motor rated secondary current is 100%.
054h	U06-03	ASR Input	--	--	Displays the input value when using ASR control.
055h	U06-04	ASR Output	--	--	Displays the output value when using ASR control.
05Bh	U06-05	Voltage Ref (Vq)	--	--	Output voltage reference (Vq) for the q-axis.
05Ah	U06-06	Voltage Ref (Vd)	--	--	Output voltage reference (Vd) for the d-axis.
05Fh	U06-07	ACR(q) Output	--	--	Displays the output value for current control relative to motor secondary current (q-axis).
060h	U06-08	ACR(d) Output	--	--	Displays the output value for current control relative to motor secondary current (d-axis).
07CDh	U06-18	PG1 CounterValue	--	--	Monitors the number of pulses for speed detection.
07E5h	U06-19	PG2 CounterValue	--	--	Monitors the number of pulses for speed detection.
062h	U06-22	Zero Servo Pulse	--	--	Displays how far the rotor has moved from its last position in PG pulses (multiplied by 4).
06Ch	U06-26	FF Cont Output	--	--	Output monitor for Feed Forward control.

Table 24: Drive Parameter Registers (Read/Write)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
100h	A01-00	Language Selection	0	English	0
			1	French	
			2	Spanish	
101h	A01-01	Access Level	0	Operation Only	2
			1	User Parameters	
			2	Advanced Level	
102h	A01-02	Control Method	0	V/fControl	2
			2	Open Loop Vector	
			3	Flux Vector	
1600h	A01-03	Motion Select	0	Traverse	1
			1	Standard Hoist	
			2	Hoist NLB	
			4	Braketronic	
1601h	A01-04	Speed Reference	0	2-Spd Multi-Step	1
			1	3-Spd Multi-Step	
			2	5-Spd Multi-Step	
			3	2-Step Infinitely Variable	
			4	3-Step Infinitely Variable	
			5	Uni-Polar Analog	
			6	Bi-Polar Analog	
			7	Digital Option Card	
8	Serial Opt Card				
103h	A01-05	Initialize Parameters	0000	No Initialize	0000
			1110	User Default	
			2220	2-wire Initial	
			5550	oPE04 Reset	
			7770	Swap Setup	
			8880	Swap Exe	
			9990	EEPROM Initial	
104h	A01-06	Enter Password 1	--	0000–9999	0
105h	A01-07	Select Pass. 1	--	0000–9999	0
1602h	A01-08	Enter Password 2	--	0000–9999	0
106h through 125h	A02-01 – A02-32	User Selected Parameter 1 through User Selected Parameter 32	--	Setting B01-01–O02-08	0
280h	B01-01	Reference 1	--	Sets the frequency reference for the drive*	15.00**

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
281h	B01-02	Reference 2	--	Sets the frequency reference for the drive. 0.00 to (E1-04 x B2-01)*	30.00**
282h	B01-03	Reference 3	--	Sets the frequency reference for the drive. 0.00 to (E1-04 x B2-01)*	60.00**
283h	B01-04	Reference 4	--	Sets the frequency reference for the drive. 0.00 to (E1-04 x B2-01)*	0.00**
284h	B01-05	Reference 5	--	Sets the frequency reference for the drive. 0.00 to (E1-04 x B2-01)*	0.00**
285h	B01-06	Reference 6	--	Sets the frequency reference for the drive. 0.00 to (E1-04 x B2-01)*	0.00**
286h	B01-07	Reference 7	--	Sets the frequency reference for the drive. 0.00 to (E1-04 x B2-01)*	0.00**
287h	B01-08	Reference 8	--	Sets the frequency reference for the drive. 0.00 to (E1-04 x B2-01)*	0.00**
288h	B01-09	Reference 9	--	Sets the frequency reference for the drive. 0.00 to (E1-04 x B2-01)*	0.00**
28Bh	B01-10	Reference 10	--	Sets the frequency reference for the drive. 0.00 to (E1-04 x B2-01)*	0.00**
28Ch	B01-11	Reference 11	--	Sets the frequency reference for the drive. 0.00 to (E1-04 x B2-01)*	0.00**
28Dh	B01-12	Reference 12	--	Sets the frequency reference for the drive. 0.00 to (E1-04 x B2-01)*	0.00**
28Eh	B01-13	Reference 13	--	Sets the frequency reference for the drive. 0.00 to (E1-04 x B2-01)*	0.00**
28Fh	B01-14	Reference 14	--	Sets the frequency reference for the drive. 0.00 to (E1-04 x B2-01)*	0.00**
290h	B01-15	Reference 15	--	Sets the frequency reference for the drive. 0.00 to (E1-04 x B2-01)*	0.00**
291h	B01-16	Reference 16	--	Sets the frequency reference for the drive. 0.00 to (E1-04 x B2-01)*	0.00**
292h	B01-17	Jog Frequency Reference	--	Sets the Jog frequency reference. 0.00 to (E1-04 x B2-01)*	6.00

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
1606h	B01-18	Reference Priority	0	Digital Ref Only	0**
			1	B03-01 Ref Only	
			2	Higher Ref Select	
289h	B02-01	Frequency Reference Upper Limit	--	0.0 to 110.0%	100.0
28Ah	B02-02	Frequency Reference Lower Limit	--	0.0 to 110.0%	0.0
293h	B02-03	Master Speed Ref Lower Limit	--	0.0 to 110.0%	2.0
1607h	B02-04	Alternate Upper Limit	--	0.0 to 110.0%	0.0.
180h	B03-01	Frequency Reference Selection 1	0	Operator	1**
			1	Terminals	
			2	Communication	
			3	Option PCB	
				Pulse Input (Terminal RP)	
181h	B03-02	Run Command Selection 1	0	Operator	1*
			1	Terminals	
			2	Communication	
			3	Option PCB	
182h	B03-03	Stopping Method Selection	0	Decel to Stop	**
			1	Coast to Stop	
			4	Decel w/ Timer (Traverse Only)	
			6	No Load Brake (FLV Only)	
1C3h	B03-04	Change Rotation	0	Standard	0
			1	Switch Phase Order	
184h	B03-05	Zero Speed Operation	0	RUN at Freq Ref	0
			1	STOP	
			2	RUN at Min Freq	
			3	RUN at Zero RPM	
185h	B03-06	Cntl Input Scans	0	1 ms - 1 scan	1
			1	2 ms - 2 scans	
186h	B03-07	Local/Remote Run Selection	0	Cycle External Run	0
			1	Accept External Run	
187h	B03-08	Run Command Selection in Programming Mode	0	Run disabled@PRG	0
			1	Run enabled@PRG	
			2	PRG only @ Stop	
1C6h	B03-10	Allow Run @ Power Up	0	Cycle Ext Run	0
			1	Accept Ext Run	

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
1C4h	B03-15	Ref Source 2	0	Operator	0
			1	Terminals	
			2	Communication	
			3	Option PCB	
			4	Pulse Input	
1C5h	B03-16	Run Source 2	0	Operator	0
			1	Terminals	
			2	Communication	
			3	Option PCB	
200h	B05-01	Acceleration Time 1	--	0.0 to 25.5 seconds***	5.0**
201h	B05-02	Deceleration Time 2	--	0.0 to 25.5 seconds***	3.0**
202h	B05-03	Acceleration Time 2	--	0.0 to 25.5 seconds***	10.0
203h	B05-04	Deceleration Time 2	--	0.0 to 25.5 seconds***	10.0
160Ah	B05-05	Acceleration Time N Chg	--	0.0 to 25.5 seconds	2.0
160Bh	B05-06	Deceleration Time N Chg	--	0.0 to 25.5 seconds	2.0
208h	B05-08	Fast Stop Time	--	0.0 to 25.5 seconds	0.5
209h	B05-09	Accel/Decel Time Setting Unit	0	0.01 seconds	1
			1	0.1 seconds	
20Ah	B05-10	Accel/Decel Time Switching Freq.	--	0.0 to 150.0 Hz	0.00
160Ch	B05-11	SW Freq Compare	0	Lower SW Freq: B5-05 ~ B5-06 enabled, Fout < B5-10	1
			1	Upper SW Freq: B5-05 ~ B5-06 enabled, Fout > B5-10	
204h	B05-12	Acceleration Time 3	--	0.0 to 25.5 seconds***	3.0
205h	B05-13	Deceleration Time 3	--	0.0 to 25.5 seconds***	3.0
206h	B05-14	Acceleration Time 4	--	0.0 to 25.5 seconds***	3.0
207h	B05-15	Deceleration Time 4	--	0.0 to 25.5 seconds***s	3.0
160Dh	B05-16	Acc/Dec Ext Rang	0	Disabled (Range = 0.0 to 25.5)	0
			1	Enabled (Range = 0.0 to 6000.0)	
294h	B08-01	Jump Frequency 1	--	0.0 to 150.0 Hz	0.0

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
295h	B08-02	Jump Frequency 2	--	0.0 to 150.0 Hz	0.0
296h	B08-03	Jump Frequency 3	--	0.0 to 150.0 Hz	0.0
297h	B08-04	Jump Bandwidth	--	0.0 to 20.0 Hz	1.0
161Bh	C01-01	Quick Stop 0/1	0	Disabled	0**
			1	Enabled	
161Ch	C01-02	Quick Stop Time	--	0.0 to 25.5 seconds	1.0
161Dh	C01-03	Reverse Plug 0/1	0	Disabled	0
			1	Enabled	
161Eh	C01-04	Reverse Plug Decel Time	--	0.0 to 25.5 seconds	2.0
161Fh	C01-05	Reverse Plug Accel Time	--	0.0 to 25.5 seconds	2.0
1620h	C02-01	Micro Speed Gain 1	--	0.01 to 1.00	1.0
1621h	C02-02	Micro Speed Gain 2	--	0.01 to 1.00	1.0
1623h	C03-01	Upper Limit 1 Speed	--	0.00 to E01-04 Hz	6.00
1624h	C03-02	Upper Limit 1 Decel Time	--	0.0 to 25.5 sec***	1.0
1625h	C03-03	Upper Limit 2 Stop Time	--	0.0 to 25.5 sec***	1.0
1626h	C03-04	Lower Limit 1 Speed	--	0.00 to E01-04 Hz	6.00
1627h	C03-05	Lower Limit 1 Decel Time	--	0.0 to 25.5 sec***	1.0
1628h	C03-06	Lower Limit 2 Stop Time	--	0.0 to 25.5 sec***	1.0
1628h	C03-07	Limit Stop Method	0	Decel to Stop	2**
			1	Coast to Stop	
			2	Use B03-03 Method	
162Ah	C03-08	UL3 Stop Method	0	Decel/Alarm (No further raise allowed)	4
			1	Coast/Alarm (No further raise allowed)	
			2	Use B3-03/Alarm (No further raise allowed)	
			3	Decel/Fault	
			4	Coast/Fault	
			5	Use B03-03/Fault	
162Bh	C03-09	UL3 Decel Time	--	0.0 to 25.5 sec	1.0

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
162Ch	C03-10	Phantom Stop Met	0	Decel to Stop	1
			1	Coast to Stop	
			2	Use B03-03 Method	
162Dh	C03-11	Load Share Limit	0	Disabled	0
			1	Enabled	
162Eh	C03-12	Klixon Action	0	Use B3-03 Method	0
			1	Allow Lower Only	
162Fh	C03-13	Height Measure	--	0–65535	250
1630H	C03-14	Hook Height Home	0	Home = UL2	2
			1	Home = LL2	
			2	Home MFDI Upper	
			3	Home MFDI Lower	
			4	Home = UL3	
1631H	C03-15	Hook Height Out	0	At Home = 0%	1631H
			1	At Home = 100%	
1632H	C03-16	UL2 Revolutions		0–65535 Rev	0
1633H	C03-17	UL1 Revolutions		0–65535 Rev	0
1634H	C03-18	LL1 Revolutions		0–65535 Rev	0
1635H	C03-19	LL2 Revolutions		0–65535 Rev	0
1636h	C04-01	Load Float Time 2	--	0 to 65535 seconds	10
1DAh	C04-02	Load Float Gain	--	0 to 100	10/20
1DBh	C04-03	Load Float Count	--	0 to 16383	10
1638h	C05-01	Load Check	0	Disabled	0
			1	Hold & Measure	
			2	Hold & Meas Once	
			3	Immediate	
			9	LC Set Up	
1639h	C05-02	LC Alarm Action	0	Alarm Only	4
			1	Decel to Stop	
			2	Coast to Stop	
			3	Fault Stop	
			4	Use B3-03 Method – Can lower only (Alarm)	
163Ah	C05-03	Holding Time	--	0.00 to 2.55 sec	0.15
163Bh	C05-04	Testing Time	--	0.00 to 2.55 sec	0.25

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
163Ch	C05-05	I/T Margin Acc	--	0 to 50%	5
163Dh	C05-07	I/T Margin	--	0 to 20%	5
163Eh	C05-08	Alarm Speed	--	1.0 to 30.0 Hz	6.0
163Fh	C05-09	I/T Level 01	--	1 to 160%	0
1640h	C05-10	I/T Level 02	--	1 to 160%	0
1641h	C05-11	I/T Level 03	--	1 to 160%	0
1642h	C05-12	I/T Level 04	--	1 to 160%	0
1643h	C05-13	I/T Level 05	--	1 to 160%	0
1644h	C05-14	I/T Level 06	--	1 to 160%	0
1645h	C05-15	I/T Level 07	--	1 to 160%	0
1730h	C05-16	I/T Level 08	--	1 to 160%	0
1731h	C05-17	I/T Level 09	--	1 to 160%	0
1732h	C05-18	I/T Level 10	--	1 to 160%	0
1733h	C05-19	I/T Level 11	--	1 to 160%	0
1734h	C05-20	I/T Level 12	--	1 to 160%	0
1735h	C05-21	I/T Level 13	--	1 to 160%	0
1736h	C05-22	I/T Level 14	--	1 to 160%	0
1737h	C05-23	I/T Level 15	--	1 to 160%	0
1738h	C05-24	I/T Level 16	--	1 to 160%	0
1739h	C05-25	LC Integral Time	--	0.0 to 2.55 sec	0.05
173Ah	C05-26	LC Delay Time	--	0.0 to 2.55 sec	0.25
173Bh	C05-27	Min Rvs-> Fwd Tim	--	0.0 to 25.5 sec	0
173Ch	C05-28	Dly Trig Freq	--	0.0 to 60.0 Hz	30
1646h	C06-01	Swift-Lift (V/F and OLV) Ultra-Lift (FLV)	0	Disabled	0
			1	Enabled Auto	
			2	Enabled by MFDI	
			3	Enabled Adaptive (Ultra-Lift Only)	
			4	Adaptive by MFDI (Ultra-Lift Only)	
1647h	C06-02	SwiftLift FWDSpd (V/f and OLV) UltraLift FWD pd (FLV)	--	0.1 to 150.0 Hz	60.0
1648h	C06-03	SwiftLift REVSpd (V/f and OLV) UltraLift REVSpd (FLV)	--	0.1 to 150.0 Hz	60.0

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
1649h	C06-04	SL FWD Motor Current (V/F) SL FWD Torque (OLV) UL FWD Torque (FLV)	--	1 to 100%	50
1646Ah	C06-05	SL Rev Motor Current (V/F) SL Rev Torque (OLV) UL Rev Torque (FLV)	--	1 to 100%	30
164Bh	C06-06	SL Enabling Speed (V/f and OLV) UL Enabling Speed (FLV)	--	0.1 to 150.0 Hz	59.0
164Ch	C06-07	SL Delay Time (V/f and OLV) UL Delay Time (FLV)	--	0.0 to 25.5 sec	2.0
164Dh	C06-08	SFS Acc Gain	--	0.1 to 9.9	1.0
164F	C06-10	Mtr Trq QuickSet	0	Custom	3
			1	Very Low Torque	
			2	Low Torque	
			3	Standard	
			4	High Torque	
1650	C06-11	Mtr Trq 1	--	1–100%	45
1651	C06-12	Mtr Spd 1	--	0.0–150.0 Hz	90.0
1652	C06-13	Mtr Trq 2	--	1–100%	25
1653	C06-14	Mtr Spd 2	--	0.0–150.0 Hz	120.0
1654	C06-15	AUL FWD Offset	--	0–100%	10
1655	C06-16	AUL REV Offset	--	0–100%	20
4A7h	C07-01	Trq Limit FWD	--	0 to 300%	150
4A8h	C07-02	Trq Limit REV	--	0 to 300%	150
4A9h	C07-03	Trq Lmt FWD Rgn	--	0 to 300%	180
4AAh	C07-04	Trq Lmt REV Rgn	--	0 to 300%	180
1656h	C07-05	T-Lim FWD Gain	--	0.00 to 2.55	1.25
1657h	C07-06	T-Lim REV Gain	--	0.00 to 2.55	1.25

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
1658h	C07-07	T-Lim RGN Gain	--	0.00 to 2.55	1.25
4ACh	C07-08	Trq Lim I Time	--		200
4C9h	C07-09	Torque Limit Sel	0	P-ctrl @ Acc/Dec	0
			1	I-ctrl @ Acc/Dec	
1659h	C07-10	Trav Trq Limiter	0	Disabled	0
			1	Enabled	
165Ah	C07-11	Limiter Freq	--	0.5 to 10.0	2.0
165Ch	C08-02	IFB OK Timer	--	0.00 to 2.55 sec	1.00
165Dh	C08-03	Min Brk Rel Trq	--	0 to 300%	10
165Eh	C08-04	Rollback Timer	--	0.00 to 2.55 sec	0.30
165Fh	C08-05	Roll Back Count	--	0 to 15000 pulses	800
1660h	C08-06	BE3/Alt Torq Tim	--	0.00 to 2.55 sec	0.30
1661h	C08-07	BE3 Detect Count	--	0 to 15000 pulses	10
1662h	C08-08	Alt Rev Trq Lim	--	0 to 300%	25
1663h	C08-09	Zero Speed Level	--	0.0 to 10.0 Hz	1.0
1664h	C08-10	Load Float Time	--	0 to 65535 sec	10*
1665h	C08-11	Brake Set Delay	--	0.0 to 25.5 sec	0.7
1666h	C08-12	BE6 Detect Time	--	0.0 to 25.5 sec	5.0
1667h	C08-13	BE6 Max Count	--	0 to 15000 pulses	250
1668h	C08-14	Brake Hold Speed	--	0.0 to 25.5% (FLV)	0.0-FLV 0.1-V/f 5.0-OLV
1669h	C08-15	Load Float Ext T	--	0 to 65535 sec	10
166Ah	C08-16	Init FWD Brk Trq	--	10 to 300%	100
166Bh	C08-17	Init REV Brk Trq	--	10 to 300%	20 (OLV) 10 (CLV) Else 10
166Ch	C08-18	BE6 Up Speed Lim	--	0.00 to 150.00 Hz	6.00
166Dh	C08-19	LdFit Alm Reset	0	Disabled	1
			1	Enabled	
166Eh	C08-22	Brk Slip Detect	0	Disabled	0
			1	Enabled	

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
166Fh	C08-23	Brk Slip Det Spd	--	0.0 to 10.0 Hz	1.0
1670h	C08-24	Brake Test Torq	--	0 to 6553.5 Flb	1.25[E2-11 * 5252 / RPM]
1671h	C08-25	Brake Speed Test	--	0 to 10 Hz	6
1672h	C08-27	Zero Spd Brk	0	Use Brake	0
			1	Don't Use Brake	
			2	Coast to Stop	
1673h	C08-28	Trq Check Time	--	0.00 to 2.55 sec	0.05
1674h	C08-29	Min REV Time	--	0.0 to 25.5 sec	1.2
1675h	C08-30	Pos Trq Time	--	0.00 to 2.55 sec	0.40
1676h	C08-31	Pos Trq Speed	--	0.0 to 10.0 Hz	6.0
1677h	C09-01	Digital In Sel	0	Disabled	0
			1	Enabled S4IO	
			2	Enabled DI-A3	
1678h	C09-02	DIO Terminal 1	--	00 to FF	0F
1679h	C09-03	DIO Terminal 2	--	00 to FF	0F
167Ah	C09-04	DIO Terminal 3	--	00 to FF	0F
167Bh	C09-05	DIO Terminal 4	--	00 to FF	0F
167Ch	C09-06	DIO Terminal 5	--	00 to FF	0F
167Dh	C09-07	DIO Terminal 6	--	00 to FF	0F
167Eh	C09-08	DIO Terminal 7	--	00 to FF	0F
167Fh	C09-09	DIO Terminal 8	--	00 to FF	0F
1680h	C09-10	DIO Terminal 9	--	00 to FF	0F
1681h	C09-11	DIO Terminal 10	--	00 to FF	0F
1682h	C09-12	DIO Terminal 11	--	00 to FF	0F
1683h	C09-13	DIO Terminal 12	--	00 to FF	0F
1684h	C09-14	DIO Terminal 13	--	00 to FF	0F

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
1685h	C09-15	DIO Terminal 14	--	00 to FF	0F
1686h	C09-16	DIO Terminal 15	--	00 to FF	0F
1687h	C09-17	DIO Terminal 16	--	00 to FF	0F
1688h	C09-18	DIO Terminal 17	--	00 to FF	0F
1689h	C09-19	DIO Terminal 18	--	00 to FF	0F
168Ah	C10-01	Load Weight	0	Disabled	0
			1	Auto - I/T	
			2	Auto - Analog	
168Bh	C10-02	LW Start	0	At C10-05	0
			1	By MFDI=5C	
168Ch	C10-03	LW Display Hold	0	Hold Display	0
			1	Hold Disp 3 Sec	
168Dh	C10-04	LW Conversion	--	0 to 39999	0
168Eh	C10-05	Test Freq	--	0 to 400 Hz	6
168Fh	C10-06	Unit Displayed	0	Tons	4
			1	Pounds	
			2	Kilograms	
			3	Metric Tons	
			4	Percent Load	
1690h	C10-07	Holding Time	--	0.00 to 2.55 sec	1.00
1702h	C10-09	Full Load Torque		0.0 to 200.0%	100.0
1691h	C10-10	No Load Torque	--	0.0 to 200.0%	20.0
1692h	C11-01	Slack Cable 0/1	0	Disabled	0
			1	Enabled	
1693h	C11-02	Action at SLC	0	No Action	2
			1	No Act/C3-04	
			2	Decel/C3-04	
			3	Decel/No Opr	
			4	Dec Stop/C3-04	
5	Dec Stop/No Opr				
1694h	C11-03	SLC Detect Torq	--	0 to 100%	30
1695h	C11-04	SLC Detect Spd 1	--	0 to E1-04 Hz	2
1696h	C11-05	SLC Delay Time 1		0.00 to 2.55 sec	0.50

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
1697h	C11-06	SLC Detect Spd 2		0 to E1-04 Hz	60
1698h	C11-07	SLC Delay Time 2		0.00 to 2.55 sec	0.10
1699h	C11-08	Snap Shaft 0/1	0	Disabled	0
			1	Enabled	
169Ah	C11-09	Action at Snap	0	Brake/Fault Out	0
			1	Alarm Only	
169Bh	C11-10	Delta Speed	--	0.0 to E1-04 Hz	1.0
169Ch	C11-11	Delay Time	--	0 to 2000 ms	250
169Dh	C11-12	Gear Ratio Num	--	1 to 65535	10000
169Eh	C11-13	Gear Ratio Den	--	1 to 65535	10000
169Fh	C12-01	Brake Jog Delay	--	0.0 to 100.0 sec	0.0
16A0h	C12-02	Brake Run Delay	--	0.0 to 100.0 sec	0.0
1A3h	C12-03	Delay-ON Timer	--	0.0 to 3000.0 sec	0.0
1A4h	C12-04	Delay-OFF Timer	--	0.0 to 3000.0 sec	0.0
16A1h	C12-05	Maintenance Tmr	--	0 to 32767 hr	0
16A2h	C12-06	Maintenance Gain	--	0.00 to 1.00	0.50
16A3h	C13-01	Inch Run Time	--	0.0 to 2.55 sec	1.00
16A4h	C13-02	Repeat Delay Tim	--	0.0 to 2.55 sec	1.00
16A5h	C13-03	Index Run Ref	--	0.01 to 60.0 Hz	0.10
16A6h	C13-04	Index Revs	--	0 to 65535 rev	0
16A7h	C13-05	Index Count	--	0 to 65535 pulses	100
16A8h	C13-06	Index Rpt Delay	--	0.00 to 60.00 sec	0.00
16A9h	C13-07	Index Complete	--	0 to 32767	10
16AAh	C13-08	Index Zsv Gain	--	0 to 100	10
16ABh	C13-09	Index ASR P Gain	--	0.00 to 300.00	30.00
16ACh	C13-10	Index ASR I Time	--	0.000 to 10.000 sec	0.200
16ADh	C13-11	Acc/Dec Gain	--	0.0 to 5.0	1.0

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
16AEh	C13-12	Index Brake Ctrl	0	Open on Index	NLB: 2 else: 0
			1	Open on Each Run (Traverse Only)	
			2	Ltch Open on Run	
189h	D01-01	DCInj Start Freq	--	0.0 to 10.0 Hz	0.5
18Ah	D01-02	DCInj Current	--	0 to 100%	50
18Bh	D01-03	DCInj Time@Start	--	0.00 to 10.00 sec	0.00
18Ch	D01-04	DCInj Time@Stop	--	0.00 to 1.00	0.05
20Fh	D02-01	Slip Comp Gain	--	0.0 to 2.5	V/f: 0.0 OLV: 1.0 FLV: 1.0
210h	D02-02	Slip Comp Time	--	0 to 10000 ms	V/f: 2000 OLV: 200
211h	D02-03	Slip Comp Limit	--	0 to 250%	200
212h	D02-04	Slip Comp Regen	0	Disabled	0
			1	Enabled >6 Hz	
			2	Enabled >D2-07	
213h	D02-05	Output V Lim Sel	0	Disabled	0
			1	Enabled	
215h	D03-01	Torq Comp Gain	--	0.00 to 2.50	1.00
216h	D03-02	Torq Comp Time	--	0 to 60000 ms	V/f: 200 OLV: 20
217h	D03-03	F Torq Cmp@start	--	0.0 to 200.0%	0.0
218h	D03-04	R Torq Cmp@start	--	-200.0 to 0.0%	0.0
219h	D03-05	TorqCmp Delay T	--	0 to 200 ms	10
21Ah	D03-06	Start Torq Time	--	0 to 10000 ms	150
21Bh	D04-01	ASR P Gain 1	--	0.00 to 300.00	**
21Ch	D04-02	ASR I Time 1	--	0.000 to 10.000 sec	**
21Dh	D04-03	ASR P Gain 2	--	0.00 to 300.00	**
21Eh	D04-04	ASR I Time 2	--	0.000 to 10.000 sec	**
21Fh	D04-05	ASR Limit	--	0.0 to 20.0%	5.0
220h	D04-06	ASR Delay Time	--	0.000 to 0.500 sec	**
221h	D04-07	ASR Gain SW Freq	--	0.0 to 150.0 Hz	0.0
222h	D04-08	ASR I Limit	--	0 to 400%	400

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
386h	D04-09	I Op In Acc/ Dec	0	Disabled	0
			1	Enabled	
29Ah	D05-01	Torq Control Sel	0	Speed Control	0
			1	Torque Control	
29Bh	D05-02	Torq Ref Filter	--	0 to 1000 ms	0
29Ch	D05-03	Speed Limit Sel	1	Fref Limit	2
			2	Speed Limit Sel	
29Dh	D05-04	Speed Lmt Value	--	-120 to 120%	105
29Eh	D05-05	Speed Lmt Bias	--	0 to 120%	10
29Fh	D05-06	Ref Hold Time	--	0 to 1000 ms	0
2B5h	D05-08	Drctn SpdLmt Sel	0	Disabled	1
			1	Enabled	
20Bh	D09-01	SCrv Acc @ Start	--	0.00 to 10.00 sec	0.20**
20Ch	D09-02	SCrv Acc @ End	--	0.00 to 10.00 sec	0.20**
20Dh	D09-03	SCrv Dec @ Start	--	0.00 to 10.00 sec	0.20**
20Eh	D09-04	SCrv Dec @ End	--	0.00 to 10.00 sec	0.20
223h	D10-01	Heavy/ NormalDuty	0	Heavy Duty	0
			1	Normal Duty	
224h	D10-02	CarrierFreq Sel	1	Fc=2.0 kHz	1
			2	Fc=5.0 kHz	
			3	Fc=8.0 kHz	
			4	Fc=10.0 kHz	
			5	Fc=12.5 kHz	
			6	Fc=15.0 kHz	
			7	Swing PWM1	
			8	Swing PWM2	
			9	Swing PWM3	
			A	Swing PWM4	
F	User defined (determined by D10-03 through D10-05)				
225h	D10-03	CarrierFreq Max	--	1.0 to 15.0 kHz	2.0
226h	D10-04	CarrierFreq Min	--	1.0 to 15.0 kHz	2.0
227h	D10-05	CarrierFreq Gain	--	1 to 99	0
580h	D11-01	Hunt Prev Select	0	Disabled	1
			1	Enabled	

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
581h	D11-02	Hunt Prev Gain	--	0.00 to 2.50	1.00
582h	D11-03	Hunt Prev Time	--	0 to 500 ms	10
530h	D11-05	Hunt Prev G Rvs	--	0.00 to 2.50	0
300h	E01-01	Input Voltage	--	230V: 155–255 VAC 460V: 310–510 VAC 575V: 446–733 VAC	230 460 575
302h	E01-03	V/f Selection	0	60 Hz, Level 0 (Default for A1-03 = 0 (Traverse), A1-03 = 4 (Braketronic))	**
			1	60 Hz, Level 1	
			2	60 Hz, Level 2	
			3	60 Hz, Level 3	
			4	60 Hz, Level 4 (Deault for A1-03 = 1 (MLB Hoist))	
			5	60 Hz, Level 5	
			6	60 Hz, Level 6	
			7	60 Hz, Level 7	
			8	60 Hz, Level 8	
			9	72 Hz, Level 0	
			A	72 Hz, Level 1	
			B	72 Hz, Level 2	
			C	90 Hz, Level 0	
			D	90 Hz, Level 1	
			E	90 Hz, Level 2	
	F	Custom V/f, E1-04 through E1-13 settings define the V/f pattern, (Default for A1-03 = 2 (NLB)). When A1-03 = 0, 1, 3, or 4 and E1-03 is changed to 0F, the values for E1-04 through E1-13 are the same as E1-03 = 4. See V/f tables for appropriate voltage			
	FF	Custom with no lower limits on E01-xx.			
303h	E01-04	Max Frequency	--	40.0 to 150.0 Hz	60.0
304h	E01-05	Max Voltage	--	230 V: 0.0–255.0 460 V: 0.0–510.0 575 V: 0.0–733.1	Det by O02-04
305h	E01-06	Base Frequency	--	0.0 to 150.0 Hz	Det by E01-03
306h	E01-07	Mid Frequency A	--	0.0 to 150.0 Hz	Det by E01-03
307h	E01-08	Mid Voltage A	--	230 V: 0.0–255.0 460 V: 0.0–510.0 575 V: 0.0–733.1	Det by E01-03

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
308h	E01-09	Min Frequency	--	0.0 to 150.0 Hz	Det by E01-03
309h	E01-10	Min Voltage	--	230 V: 0.0–255.0 460 V: 0.0–510.0 575 V: 0.0–733.1	Det by E01-03
30Ah	E01-11	Mid Frequency B	--	0.0 to 150.0 Hz	0.0
30Bh	E01-12	Mid Voltage B	--	230 V: 0.0–255.0 460 V: 0.0–510.0 575 V: 0.0–733.1	0.0
30Ch	E01-13	Base Voltage	--	230 V: 0.0–255.0 460 V: 0.0–510.0 575 V: 0.0–733.1	0.0
30Eh	E02-01	Motor Rated FLA	--	Determined by O02-04 and D10-01	O02-04 and D10-01
30Fh	E02-02	Motor Rated Slip	--	0.00–20.00 Hz	O02-04 and D10-01
310h	E02-03	No-Load Current	--	0–[(E02-01)-0.01]	O02-04 and D10-01
311h	E02-04	Number of Poles	--	2–48	4
312h	E02-05	Term Resistance	--	0.000–65.000 Ω	O02-04 and D10-01
313h	E02-06	Leak Inductance	--	0.0–40.0%	O02-04 and D10-01
314h	E02-07	Saturation Comp1	--	0.00–0.50	0.50
315h	E02-08	Saturation Comp2	--	E02-07–0.75	0.75
316h	E02-09	Mechanical Loss	--	0.0–10.0%	0.0
317h	E02-10	Tcomp Iron Loss	--	0–65535 W	O02-04 and D10-01
318h	E02-11	Rated Horsepower	--	0.0–650.0 HP	O02-04 and D10-01
380h	F01-01	PG1 Pulses/Rev	--	0 to 60000 ppr	1024
384h	F01-02	PG1 Rotation Sel	0	FWD = C.C.W.	0
			1	FWD = C.W.	
385h	F01-03	PG1 Output Ratio	--	1 to 132	1

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
38Bh	F01-04	PG1 #Gear Teeth1	--	0 to 1000	0
38Ch	F01-05	PG1 #Gear Teeth2	--	0 to 1000	0
3B4h	F01-06	PGO-1-H	--	0 to 100 ms	15
3B0h	F01-11	PG-2 Pulses/ Rev	--	0 to 60000 ppr	1024
3B1h	F01-12	PG2 Rotation Sel	0	FWD = C.C.W.	0
			1	FWD = C.W	
33B2h	F01-13	PG2 #Gear Teeth1	--	0 to 1000	0
3B3h	F01-14	PG2 #Gear Teeth2	--	0 to 1000	0
3BEh	F01-15	PG2 Output Ratio	--	1 to 132	1
3B5H	F01-16	PGO-2-H	--	0–100 ms	15
381h	F01-21	PG Fdbk Loss Sel	0	Decel to stop	1
			1	Coast to stop	
			2	Fast Stop	
			3	Alarm only	
38Dh	F01-22	PGO-1-S Det Time	--	0.0 to 10.0 sec	2.0
382h	F01-23	PG Overspeed Sel	0	Decel to stop	1
			1	Coast to stop	
			2	Fast Stop	
			3	Alarm only	
387h	F01-24	PG Overspd Level	--	0 to 120%	105
388h	F01-25	PG Overspd Time	--	0.0 to 2.0 sec	0.0
383h	F01-26	PG Deviation Sel	0	@Spd Agree-Decel	5
			1	@Spd Agree-Coast	
			2	@Spd Agree-F-Stop	
			3	@Spd Agree-Alm	
			4	@Run-Decel	
			5	@Run-Coast	
			6	@Run-Fast Stop	
7	@Run-Alarm Only				
389h	F01-27	PG Deviate Level	--	0 to 50%	10
38Ah	F01-28	PG Deviate Time	--	0.0 to 10.0 sec	0.3
38Fh	F02-01	AI Function Sel	0	3ch Individual	0
			1	3ch Addition	

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
368h	F02-02	AI Input Gain	--	-999.9 to 999.9%	100.0
369h	F02-03	AI Input Bias	--	-999.9 to 999.9%	0.0
391h	F04-01	AO Ch1 Select	--	000 to 999	102
392h	F04-02	AO Ch1 Gain	--	-999.9 to 999.9%	100.0
??	F04-03	AO Ch2 Select	--	000 to 999	103
394h	F04-04	AO Ch2 Gain	--	-999.9 to 999.9%	50.0
395h	F04-05	AO Ch1 Bias	--	-999.9 to 999.9%	0.0
396h	F04-06	AO Ch2 Bias	--	-999.9 to 999.9%	0.0
397h	F04-07	AO Opt Level Ch1	0	0 to 10 V	0
			1	-10 to 10 V	
398h	F04-08	AO Opt Level Ch2	0	0 to 10 V	0
			1	-10 to 10 V	
399h	F05-01	DO Ch1 Select	--	0 to 148	F
39Ah	F05-02	DO Ch2 Select	--	0 to 148	F
39Bh	F05-03	DO Ch3 Select	--	0 to 148	F
39Ch	F05-04	DO Ch4 Select	--	0 to 148	F
39Dh	F05-05	DO Ch5 Select	--	0 to 148	F
39Eh	F05-06	DO Ch6 Select	--	0 to 148	F
39Fh	F05-07	DO Ch7 Select	--	0 to 148	F
3A0h	F05-08	DO Ch8 Select	--	0 to 148	F
3A1h	F05-09	DO-A3 Selection	0	8 Ch Individual	2
			1	Binary Output	
			2	8 Ch selected	
3A2h	F06-01	Comm Bus Fit Sel	0	Decel to stop	1
			1	Coast to stop	
			2	Fast Stop	
			3	Use B3-03 Method	
			4	Alarm Only	
3A3h	F06-02	EF0 Detection	0	Always Detected	0
			1	Only During Run	

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
3A4h	F06-03	EF0 Fault Action	0	Decel to stop	1
			1	Coast to stop	
			2	Fast Stop	
			3	Use B3-03 Method	
			4	Alarm Only	
3A5h	F06-04	Bus Err Det Time	--	0.0 to 5.0 sec	2.0
16BAh	F06-05	Current Unit Sel	0	A Display	0
			1	100 % / 8192	
3A7h	F06-06	Torq Ref/Lmt Sel	0	Disabled	0
			1	Enabled	
3A8h	F06-07	Fref PrioritySel	0	Net/Com Ref	0
			1	MultiStep Speed	
36Ah	F06-08	Com Prm Init Sel	0	Init Com Prms	0
			1	No Init Com Prms	
3CBh	F06-30	PB Node Address	--	0 to 125	0
3CCh	F06-31	PB Clear Select	0	Reset to Zero	0
			1	Hold Prev Value	
3CDh	F06-32	PB Map Select	0	PPO Type	0
			1	Conventional	
3D0h	F06-35	CO Node Address	--	0 to 126	0
3D1h	F06-36	CO Baud Rate	0	Auto-detect	6
			1	10 kbps	
			2	20 kbps	
			3	50 kbps	
			4	125 kbps	
			5	250 kbps	
			6	500 kbps	
			7	800 kbps	
8	1 Mbps				
3C1h	F06-50	DN Mac Address	--	0 to 64	64
3C2h	F06-51	DN Baud Rate	0	125 kbps	4
			1	250 kbps	
			2	500 kbps	
			3	Set from Network	
			4	Automatic	
3C3h	F06-52	DN PCA Selection	--	0 to 225	21
3C4h	F06-53	DN PPA Selection	--	0 to 225	71

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
3C5h	F06-54	DN Idle Flt Det	0	Enable	0
			1	Disable	
3C6h	F06-55	DN BAUD RATE MEM	0	125 kbps	0
			1	250 kbps	
			2	500 kbps	
3D7h	F06-56	DN Speed Scale	--	-15 to 15	0
3D8h	F06-57	DN Current Scale	--	-15 to 15	0
3D9h	F06-58	DN Torque Scale	--	-15 to 15	0
3DAh	F06-59	DN Power Scale	--	-15 to 15	0
3DBh	F06-60	DN Voltage Scale	--	-15 to 15	0
3DCh	F06-61	DN Time Scale	--	-15 to 15	0
3DDh	F06-62	DN Heart Beat	--	0 to 10	0
3DEh	F06-63	DN MAC ID MEM	--	0 to 63	0
353H	F07-01	IP Address 1	--	0 to 255	192
3E6h	F07-02	IP Address 2	--	0 to 255	168
3E7h	F07-03	IP Address 3	--	0 to 255	1
3E8h	F07-04	IP Address 4	--	0 to 255	20
3E9h	F07-05	Subnet Mask 1	--	0 to 255	255
3EAh	F07-06	Subnet Mask 2	--	0 to 255	255
3EBh	F07-07	Subnet Mask 3	--	0 to 255	255
3ECh	F07-08	Subnet Mask 4	--	0 to 255	0
3EDh	F07-09	Gateway IP Add 1	--	0 to 255	192
3EEh	F07-10	Gateway IP Add 2	--	0 to 255	168
3EFh	F07-11	Gateway IP Add 3	--	0 to 255	1
3F0h	F07-12	Gateway IP Add 4	--	0 to 255	2
3F1h	F07-13	IP Add Mode Sel	0	Static	2
			1	BOOTP	
			2	DHCP	

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
3F2h	F07-14	Duplex Select	0	Half duplex forced	1
			1	Auto Negotiate	
			2	Full Duplex	
3F3h	F07-15	Baud Rate	10	10 Mbps	10
			100	100 Mbps	
3F4h	F07-16	CommLoss Tout	--	0 to 300 deciseconds	0
438h	H01-01	Term S1 Select	--	0 to 81	80 (FWD)
439h	H01-02	Term S2 Select	--	0 to 81	81 (REV)
400h	H01-03	Term S3 Select	--	0 to 81	**
401h	H01-04	Term S4 Select	--	0 to 81	**
402h	H01-05	Term S5 Select	--	0 to 81	**
403h	H01-06	Term S6 Select	--	0 to 81	**
404h	H01-07	Term S7 Select	--	0 to 81	**
405h	H01-08	Term S8 Select	--	0 to 81	**
409h	H01-14	Alt Ref Override	--	0, 1	0
40Bh	H02-01	Term M0-M1 Sel	--	0 to 1FF	**
40Ch	H02-02	Term M2-M3 Sel	--	0 to 1FF	**
40Dh	H02-03	Term M5-M6 Sel	--	0 to 1FF	**
437h	H02-06	Wh Disp Units	0	0.1 kWh units	0
			1	1 kWh units	
			2	10 kWh units	
			3	100 kWh units	
			4	1000 kWh units	
410h	H03-01	Term A1 Level	0	0 to 10 V	**
			1	-10 to 10 V	
434h	H03-02	Term A1 FuncSel	--	0 to 31	**
411h	H03-03	Terminal A1 Gain	--	-999.9 to 999.9%	100.0
412h	H03-04	Terminal A1 Bias	--	-999.9 to 999.9%	0.0
413h	H03-05	Term A3 Level	0	0 to 10 V	0
			1	-10 to 10 V	

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
414h	H03-06	Terminal A3 Sel	--	0 to 31	**
415h	H03-07	Terminal A3 Gain	--	-999.9 to 999.9%	100.0
416h	H03-08	Terminal A3 Bias	--	-999.9 to 999.9%	0.0
417h	H03-09	Term A2 Level	0	0 to 10 V	2
			1	-10 to 10 V	
			2	4 to 20 mA	
			3	0 to 20 mA	
418h	H03-10	Terminal A2 Sel	--	0 to 31	1F
419h	H03-11	Terminal A2 Gain	--	-999.9 to 999.9%	100.0
41Ah	H03-12	Terminal A2 Bias	--	-999.9 to 999.9%	0.0
41Bh	H03-13	Filter Ave Time	--	0.00 to 2.00 sec	0.03
41Ch	H03-14	A1/A2/A3 Sel	1	A1 Available	7
			2	A2 Available	
			3	A1/A2 Available	
			4	A3 Available	
			5	A1/A3 Available	
			6	A2/A3 Available	
			7	All Available	
2F0h	H03-16	TerminalA1 Offset	--	-500 to 500	0
2F1h	H03-17	TerminalA2 Offset	--	-500 to 500	0
2F2h	H03-18	TerminalA3 Offset	--	-500 to 500	0
41Dh	H04-01	Terminal FM Sel	--	000 to 630	102
41Eh	H04-02	Terminal FM Gain	--	-999.9 to 999.9%	100.0
41Fh	H04-03	Terminal FM Bias	--	-999.9 to 999.9%	0.0
420h	H04-04	Terminal AM Sel	--	000 to 630	103
421h	H04-05	Terminal AM Gain	--	-999.9 to 999.9%	50.0
422h	H04-06	Terminal AM Bias	--	-999.9 to 999.9%	0.0
423h	H04-07	FM Level Select	0	0 to 10 V	0
			1	-10 to 10 V	
			2	4 to 20 mA	

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
424h	H04-08	AM Level Select	0	0 to 10 V	0
			1	-10 to 10 V	
			2	4 to 20 mA	
425h	H05-01	Serial Comm Adr	--	01 to FF	1F
426h	H5-02	Serial Baud Rate	0	1200 bps	3
			1	2400 bps	
			2	4800 bps	
			3	9600 bps	
			4	19.2 kbps	
			5	38.4 kbps	
			6	57.6 kbps	
			7	76.8 kbps	
427h	H05-03	Serial Com Sel	0	No parity	0
			1	Even parity	
			2	Odd parity	
428h	H05-04	Serial Fault Sel	0	Decel to stop	0
			1	Coast to stop	
			2	Fast stop	
			3	Alarm only	
429h	H05-05	Serial Flt Dtct	0	Disabled	0
			1	Enabled	
42Ah	H05-06	Transmit WaitTIM	--	5 to 65 ms	5
42Bh	H05-07	RTS Control Sel	0	Disabled	1
			1	Enabled	
435h	H05-09	CE Detect Time	--	0.0 to 10.0 sec	2.0
436h	H05-10	CommReg 25h Unit	0	0.1 V units	0
			1	1 V units	
43Ch	H05-11	Enter CommandSel	0	Enter Required	1
			1	No Enter Required	
43Dh	H05-12	Run Command Sel	0	FWD Run & REV Run	0
			1	Run & FWD/REV	
42Ch	H06-01	Pulse Input Select	0	Frequency Ref	0
			3	Simple PG	
42Dh	H06-02	Pulse In Scaling	--	1000 to 32000 Hz	1440
42Eh	H06-03	Pulse Input Gain	--	0.0 to 1000.0%	100.0
42Fh	H06-04	Pulse Input Bias	--	-100.0 to 100.0%	0.0

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
430h	H06-05	Pulse In Filter	--	0.00 to 2.00 sec	0.10
431h	H06-06	Pulse Moni Sel	--	0 to 120	102
432h	H06-07	Pulse Moni Scale	--	0 to 32000 Hz	1440
43Fh	H06-08	Pulse Min Freq	--	0.1 to 1000.0 Hz	0.5
480h	L01-01	Mtr OL Charact	0	OL1 Disabled	3
			1	VT Motor	
			2	CT Motor	
			3	Vector motor	
481h	L01-02	MOL Time Const	--	0.1 to 5.0 min	1.0
482h	L01-03	Mtr OH Alarm Sel	0	Decel to Stop	3
			1	Coast to Stop	
			2	Fast Stop	
			3	Alarm Only	
483h	L01-04	Mtr OH Fault Sel	0	Decel to Stop	1
			1	Coast to Stop	
			2	Fast Stop	
484h	L01-05	Mtr Temp Filter	--	0.00 to 10.00 sec	0.20
46Dh	L01-13	Mtr OL Mem Sel	0	Disabled	1
			1	Enabled	
485h	L02-01	PwrL Selection	0	Disabled	0
			1	Enbl with Timer	
			2	Enbl whl CPU act	
			3	KEB Mode	
			4	KEB Stop Mode	
486h	L02-02	PwrL Ridethru t	--	0.0 to 25.0 sec	Det by O02-04
487h	L02-03	PwrL Baseblock t	--	0.1 to 5.0 sec	Det by O02-04
488h	L02-04	PwrL V/F Ramp t	--	0.0 to 5.0 sec	Det by O02-04
489h	L02-05	PUV Det Level	--	230V: 150–210 VAC 460V: 300–420 VAC 575V: 431–604 VAC	Det by E01-01
48Fh	L03-01	StallP Accel Sel	0	Disabled	1
			1	General purpose	
			2	Intelligent	
490h	L03-02	StallP Accel Lvl	--	0 to 150%	Det by D10-01

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
491h	L03-03	StallPAcc LowLim	--	0 to 100%	50
492h	L03-04	StallP Decel Sel	0	Disabled	0
			1	General Purpose	
			2	Intelligent	
			3	StallP+Resistor	
			4	High Flux Brake	
493h	L03-05	StallP Run Sel	5	High Flux Brake2	1
			0	Disabled	
			1	Decel time 1	
			2	Decel time 2	
494h	L03-06	StallP Run Level	--	30–150%	Det by D10-01
4C7h	L03-11	OV Inhibit Sel	0	Disabled	0
			1	Enabled	
462h	L03-17	DC Bus Reg Level	--	230 V: 150–400 VAC 460 V: 300–800 VAC 575 V: 431–1150 VAC	230 V: 375 V 460 V: 750 V 575 V: 930 V
465h	L03-20	DC Bus Gain P	--	0.00–5.00	A01-02
466h	L03-21	Acc/Dec P Gain	--	0.10–10.00	A01-02
4FDh	L03-23	CHP Stall P Sel	0	Lvl set in L3-06	0
			1	Autom. Reduction	
46Eh	L03-24	Mtr Accel Time	--	0.001–10.000 sec	O02-04 or E05-01
499h	L04-01	Spd Agree Level	--	0.0–150.0 Hz	0.0
49Ah	L04-02	Spd Agree Width	--	0.0–20.0 Hz	2.0
49Bh	L04-03	Spd Agree Lvl±	--	-150.0–150.0 Hz	0.0
49Ch	L04-04	Spd Agree Wdth±	--	0.0–20.0 Hz	2.0
48Eh	L04-05	Ref Loss Sel	0	Stop	0
			1	Run@L04-06PrevRun	
4C2h	L04-06	Fref at Floss	--	0.0–100.0%	80.0
470h	L04-07	Freq Detect Sel	0	No Detection @BB	0
			1	Always Detected	
16DCh	L05-01	TM Enabled	0	Disabled	0
			1	Enabled	

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
4A1h	L06-01	Torq Det 1 Sel	0	Disabled	0
			1	OT@SpdAgree-Alm	
			2	OT At RUN - Alm	
			3	OT@SpdAgree-Flt	
			4	OT At RUN - Flt	
			5	UT@SpdAgree-Alm	
			6	UT At RUN - Alm	
			7	UT@SpdAgree-Flt	
8	UT At RUN - Flt				
4A2h	L06-02	Torq Det 1 Lvl	--	0–300%	150
4A3h	L06-03	Torq Det 1 Time	--	0.0–10.0 sec	0.1
4A4h	L06-04	Torq Det 2 Sel	0	Disabled	0
			1	OT@SpdAgree-Alm	
			2	OT At RUN - Alm	
			3	OT@SpdAgree-Flt	
			4	OT At RUN - Flt	
			5	UT@SpdAgree-Alm	
			6	UT At RUN - Alm	
			7	UT@SpdAgree-Flt	
8	UT At RUN - Flt				
4A5h	L06-05	Torq Det 2 Lvl	--	0–300%	150
4A6h	L06-06	Torq Det 2 Time	--	0.0–10.0 sec	0.1
468h	L06-08	Mech Fatigue Sel	0	Disabled	0
			1	Alm Spd>L6-09	
			2	Alm [Spd]>L6-09	
			3	Flt Spd>L6-09	
			4	Flt [Spd]>L6-09	
			5	Alm Spd<L6-09	
			6	Alm [Spd]<L6-09	
			7	Flt Spd<L6-09	
8	Flt [Spd]<L6-09				
469h	L06-09	MechFat Det Spd	--	-110.0–110.0%	110.0
46Ah	L06-10	MechFat Det Time	--	0.0–10.0 sec	0.1
46Bh	L06-11	MechFat Det Hour	--	0–65535	0
4AEh	L08-02	OH Pre-Alarm Lvl	--	50–150°C	****

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
4AFh	L08-03	OH Pre-Alarm Sel	0	Decel to stop	3
			1	Coast to stop	
			2	Fast Stop	
			3	Use B3-03 Method	
			4	Alarm Only	
			5	Run@L8-19 Rate	
4B1h	L08-05	Ph Loss In Sel	0	Disabled	1
			1	Enabled	
4B3h	L08-07	Ph Loss Out Sel	0	Disabled	1
			1	1PH Loss Det	
			2	2/3PH Loss Det	
4B5h	L08-09	Ground Fault Sel	0	Disabled	1
			1	Enabled	
4B6h	L08-10	Fan On/Off Sel	0	Dur Run (OffDly)	0
			1	Always On	
4B7h	L08-11	Fan Delay Time	--	0–300 sec	60
4B8h	L08-12	Ambient Temp	--	-10–50°C	40
4B9h	L08-13	UV3 Detect	0	Disabled	1
			1	Enabled	
4BBh	L08-15	OL2 Sel @ L-Spd	0	Disabled	1
			1	Enabled	
4BEh	L08-18	Soft CLA Sel	0	Disabled	0
			1	Enabled	
4BFh	L08-19	Fc Red dur OHAlm	--	0.1–0.9 Hz	0.8
4E2h	L08-32	MC,FAN Fault Sel	0	Decel to Stop	1
			1	Coast to Stop	
			2	Fast-Stop	
			3	Use B3-03 Only	
			4	Alarm Only	
4ECh	L08-35	Installation Sel	0	IP20/Open-chassis	****
			1	Side-by-Side	
			2	IP20/Nema Type 1	
4EFh	L08-38	Fc Reduct dur OL	0	Disabled	****
			1	Active below 6Hz	
			2	Active @ any Spd	
4F1h	L08-40	FC Reduct Time	--	0.00–2.00 sec	A01-02
4F2h	L08-41	High Cur Alm Sel	0	Disabled	0
			1	Enabled	

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
16E1h	L09-01	Reset Select	0	Disabled	1
			1	Enabled	
49Eh	L09-02	Reset Attempts	--	0–10	3
4A0h	L09-03	Reset Time	--	0.5–180.0	0.5
16E2h	L09-04	Reset Flt Sel 1	--	0–FFFF	1
16E3h	L09-05	Reset Flt Sel 2	--	0–FFFF	E000
49Fh	L09-06	Flt Contact Sel	0	Flt Outp Disabld	1
			1	Flt Outp Enabled	
500h	O01-01	User Monitor Sel	--	104–813	106
501h	O01-02	Power-On Monitor	1	Frequency Ref	3
			2	FWD/REV	
			3	Output Freq	
			4	Output Current	
			5	User Monitor	
502h	O01-03	Display Scaling	0	0.01 Hz	A01-02
			1	0.01%	
			2	RPM	
			3	User Units	
503h	O01-04	Display Units	0	Hz	A01-02
			1	r/min	
504h	O01-05	LCD Contrast	--	0–5	3
520H	O01-10	UserDisp Scaling	--	1–60000	6000
521H	O01-11	UserDisp Dec Sel	0	No Dec (XXXXX)	2
			1	1 Dec (XXXX.X)	
			2	2 Dec (XXX.XX)	
			3	3 Dec (XX.XXX)	
505h	O02-01	Mode/Service Key	0	Mode/Service	0
			1	Local/Remote	
506H	O02-02	Oper STOP Key	0	Coast to Stop	0
			1	Decel to Stop	
			2	Use B03-03 Method	
507H	O02-03	User Default Sel	0	No change	0
			1	Set defaults	
			2	Clear all	
508H	O02-04	Inverter Model #	--	0x00–0xFF - default is determined by drive capacity	--
509H	O02-05	Operator M.O.P.	0	Disabled	0
			1	Enabled	

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
50Ah	O02-06	Oper Detection	0	Disabled	1
			1	Enabled	
527h	O02-07	FWD/REV Sel@PwrUp	0	Forward	0
			1	Reverse	
??	O02-19	Parameter Set Sel	0	Disabled	0
			1	Enabled	
50Bh	O03-01	Elapsed Time Set	--	0–9999 hr	0
50Ch	O03-02	Elapsed Time Run	0	Power-On Time	1
			1	Running Time	
50Eh	O03-03	Fan ON Time Set	--	0–150%	0
51Dh	O03-05	BusCap Maint Set	--	0–150%	0
525h	O03-09	IGBT Maint Set	--	0–150%	0
510h	O03-11	Fault Data Init	0	No Reset	0
			1	Reset	
512h	O03-12	kWh Monitor Init	0	No Reset	0
			1	Reset	
528h	O03-13	Run Counter Init	0	No Reset	0
			1	Reset	
1700h	O03-14	OL/LC Cntr Init	0	No Reset	0
			1	Reset	
515h	O04-01	COPY Function Sel	0	Copy Select	0
			1	INV → OP READ	
			2	OP → INV WRITE	
			3	OP ↔ INV VERIFY	
516H	O04-02	Read Allowable	0	Disabled	1
			1	EnableD	
523h	O04-07	ChrgCirc MaintSet	--	0–150%	0
701h	T01-01	Tuning Mode Sel	0	Standard Tuning	0
			1	Tune-No Rotate	
			2	Term Resistance	
702h	T01-02	Rated Horsepower	--	0.00–650.00 Hz	****
703h	T01-03	Rated Voltage	--	0.0–733.1 V	****
??	T01-04	Rated Current	--	10–200% DRC 0–3000.0 Amps	****
705h	T01-05	Rated Frequency	--	0.0–400.0 Hz	60.0
706h	T01-06	Numbr of Poles	--	2–48	4

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Register No.	Parameter	Parameter Function	Parameter Setting	Limits/Description	Initial Value
707h	T01-07	Rated Speed	--	0–24000 r/min	1750
708h	T01-08	PG Pulses/Rev	--	0–60000 ppr	1024
709h	T01-09	No-Load Current	--	0–T01-04	--
70Ah	T01-10	Motor Rated Slip	--	0.00–20.00 Hz	--

* Scaling depends on the setting of O1-03.

** Initial value is determined by X-Press Programming

*** Range is extended to 0.0–6000.00 when B05-16 = 1.

**** Initial value is dependent on drive size, which is determined by O02-04 (kVA selection)

Special Registers

Table 25: Special Registers (Read/Write)

Register No.	Function	Data Set	Description
FFDDh	ACCEPT	0	Activates newly written data
FFFDh	ENTER	0	Activates newly written data and saves to Non-Volatile memory

7. Error Codes and Troubleshooting

Communication Error

Once the data, sent from the master device, is received by the IMPULSE® Series 4 drive, the received data is checked for CRC, parity, overrun, framing, and receiving buffer overflow. If all checked items pass, the data has been received normally. A communication error is declared if any of the checked data does not pass. A time-out detection can also cause a communication error. A time-out occurs if the drive does not receive a valid message addressed to itself within two seconds. A time-out will only cause a communication error if enabled by parameter H05-05 (as shown below).

Table 26:

H05-05 Setting	Description
0	Time-out detection disabled.
1	Time-out detection enabled.

The default setting of H05-05 is '1'.

The IMPULSE® Series 4 drive will operate according to the setting of parameter H05-04 when a communication error (CE) occurs. The settings of H05-04 are as follows:

Table 27:

H05-04 Setting	Description
0	Deceleration to stop, and the Digital Operator flashes 'CE'
1	Coast to stop, and the Digital Operator flashes 'CE'
2	Deceleration to stop (B05-08), and the Digital Operator flashes 'CE'
3	Operation continues, and the Digital Operator flashes 'CE'

The default setting of H05-04 is '0'.

Modbus Error Codes

If there is an error in the command message, an error code will be returned in the response message. A fault response message is structured as follows:

Table 28: Fault Response Message

SLAVE ADDRESS	xxh	
80h + FUNCTION CODE	xxh	
ERROR CODE	03h	
CRC-16	LOWER	xxh
	UPPER	xxh

The following table indicates the fault code for the specific type of fault that occurred.

Table 29: Error Codes

Error Code	Name	Fault Content
01h	Function Error	Function Code other than 3, 8, 10 (hex)
02h	Register No. Error	Unregistered Register Number
03h	No. of Registers	Number of registers > 16
21h	Data Setting Error	Attempted to write beyond register's data limits
22h	Write-in Error	Write function is disabled for specified register
23h	Write during UV-Fault	Writing during drive main circuit under voltage condition
24h	Write during Processing	Attempting to write while processing parameters

IMPULSE[®] Series 4 Drive Fault Codes

The IMPULSE[®]•G+/VG+ Series 4 drive can have a fault, such as undervoltage, overload, external fault, etc. When a drive fault occurs, it can be classified as an alarm, a minor fault, or a major fault. The drive reacts differently with each type of fault. An alarm displays a warning indication, however operation continues. Minor faults allow continued operation, and a contact will close only if one of the multi-function outputs is set up as a minor fault contact. The major faults cause the motor to coast to stop, and the fault signal output is present at terminals MA, MB, and MC.

The IMPULSE[®] Series 4 drive's parameters: U02-01 (Current Fault), U02-02 (Last Fault), and U03-01 through U03-04 (Last Fault; Fault Message 2, 3, & 4), each displays a fault code representing the type of drive fault. The following table indicates the abbreviation displayed on the digital operator and the hexadecimal code viewed in drive parameters U02-01, U02-02 and U03-01 when a specific drive fault occurs. The table also indicates whether the drive failure is an A - alarm, m - minor fault, or M - major fault.

Table 30: IMPULSE[®] Series 4 Drive Fault Codes

IMPULSE [®] Series 4 Drive Fault	Digital Operator Display	Hexadecimal Code
DC Bus Fuse Open	PUF	1
DC Bus Undervoltage	UV1	2
CTL PS Undervoltage	UV2	3
MC Answerback	UV3	4
Short Circuit	SC	5
Ground Fault	GF	6
Overcurrent	OC	7
Overvoltage	OV	8
Heatsink Temperature	OH	9
Drive Overheat	OH1	A
Motor Overload	OL1	B
Drive Overload	OL2	C
Overtorque 1	OL3	D
Overtorque 2	OL4	E
Dynamic Braking Transistor	RR	F
Dynamic Braking Resistor	RH	10
External Fault 3	EF3	11
External Fault 4	EF4	12

IMPULSE® Series 4 Drive Fault	Digital Operator Display	Hexadecimal Code
External Fault 5	EF5	13
External Fault 6	EF6	14
External Fault 7	EF7	15
External Fault 8	EF8	16
Fan Fault	FAN	17
Overspeed	OS	18
Speed Deviation	DEV	19
PG Open	PGO	1A
Input Phase Loss	PF	1B
Output Phase Loss	LF	1C
DCCT Fault	CF	1D
Operator Disconnected	OPR	1E
EEPROM R/W Error	ERR	1F
Reserved	--	20
Modbus Com Error	CE	21
Communication Option Card	OPBUS	22
Serial Communication Error	E15	23
Option CPU Down	E10	24
Control Fault	CFxx	25
Zero Servo Fault	SVE	26
Noisy Encoder Fault	SVR	27
Snap Shaft	SS	28
Load Check Fault	LC1	29
Brake Answerback Fault	BE7	2A
PG Monitor Fault	PG02	2B
MFI Pulse Fault	PROX	2C
Out of Sync	SYNC	2D
Option External Fault	EF0	2E
Reserved	--	2F–82
Base Block Circuit Fault	CPF02	83
EEPROM Fault	CPF03	84
Internal A/D Converter Fault	CPF04	85
External A/D Converter Fault	CPF05	86
Option Card Fault	CPF06	87
Reserved	--	88–90
Control Circuit Fault 20	CPF20	91
Control Circuit Fault 21	CPF21	92
Control Circuit Fault 22	CPF22	93
Control Circuit Fault 23	CPF23	94

NOTE: Further detail on drive faults can be found in Chapter 6 of the IMPULSE® G+/VG+ Series 4 drive instruction manual.

Table 31: Run Operative Parameters

Register No.	Parameter	Parameter Description	Initial Value	Unit
100h	A01-00	Language Selection	0	--
101h	A01-01	Access Level Selection	2	--
280h	B01-01	Frequency Reference 1	15.00*	Hz
281h	B01-02	Frequency Reference 2	30.00*	Hz
282h	B01-03	Frequency Reference 3	60.00*	Hz
283h	B01-04	Frequency Reference 4	0.00*	Hz
284h	B01-05	Frequency Reference 5	0.00*	Hz
285h	B01-06	Frequency Reference 6	0.00*	Hz
286h	B01-07	Frequency Reference 7	0.00*	Hz
287h	B01-08	Frequency Reference 8	0.00*	Hz
288h	B01-09	Frequency Reference 9	0.00*	Hz
28Bh	B01-10	Frequency Reference 10	0.00*	Hz
28Ch	B01-11	Frequency Reference 11	0.00*	Hz
28Dh	B01-12	Frequency Reference 12	0.00*	Hz
28Eh	B01-13	Frequency Reference 13	0.00*	Hz
28Fh	B01-14	Frequency Reference 14	0.00*	Hz
290h	B01-15	Frequency Reference 15	0.00*	Hz
291h	B01-16	Frequency Reference 16	0.00*	Hz
292h	B01-17	Jog Reference	6.00	Hz
293h	B02-03	Master Speed Reference Lower Limit	2*	%
200h	B05-01	Acceleration Time 1	5.0*	sec
201h	B05-02	Deceleration Time 1	3.0*	sec
202h	B05-03	Acceleration Time 2	10.0	sec
203h	B05-04	Deceleration Time 2	10.0	sec
204h	B05-12	Acceleration Time 3	3.0	sec
205h	B05-13	Deceleration Time 3	3.0	sec
206h	B05-14	Acceleration Time 4	3.0	sec
207h	B05-15	Deceleration Time 4	3.0	sec
161Bh	C01-02	Quick Stop Time	1.0	sec
161Eh	C01-04	Reverse Plug Decel Time	2.0	sec
161Fh	C01-05	Reverse Plug Accel Time	2.0	sec
1624h	C03-02	Upper Limit 1 Decel Time	1.0	sec
1625h	C03-03	Upper Limit 2 Stop Time	1.0	sec
1627h	C03-05	Lower Limit 1 Decel Time	1.0	sec
1628h	C03-06	Lower Limit 2 Stop Time	1.0	sec
162Fh	C03-13	Height Measure	250	--
1636h	C04-01	Load Float Time 2	10	sec
1DBh	C04-03	Load Float Count	10	--
1664h	C08-10	Load Float Time	10*	sec
1666h	C08-12	BE6 Detect Time	5.0	sec
1669h	C08-15	Load Float Extension Time	10	sec
169Dh	C11-12	Gear Ratio Numerator	10000	--

* Determined by X-Press Programming.

Register No.	Parameter	Parameter Description	Initial Value	Unit
169Eh	C11-13	Gear Ratio Denominator	10000	--
20Fh	D02-01	Slip Compensation Gain	V/f: 0.0 OLV: 1.0 FLV: 1.0	--
215h	D03-01	Torque Compensation Gain	1.0 (determined by A01-02)	--
21Bh	D04-01	ASR Proportional Gain 1	determined by A01-02	--
21Ch	D04-02	ASR Integral Time 1	determined by A01-02	sec
21Dh	D04-03	ASR Proportional Gain 2	determined by A01-02	--
21Eh	D04-04	ASR Integral Time 2	determined by A01-02	sec
392h	F04-02	AO Channel 1 Gain	100.0	%
394h	F04-04	AO Channel 2 Gain	50.0	%
395h	F04-05	AO Channel 1 Bias	0.0	%
396h	F04-06	AO Channel 2 Bias	0.0	%
411h	H03-03	Terminal A1 Gain	100.0	%
415h	H03-07	Terminal A3 Gain	100.0	%
416h	H03-08	Terminal A3 Bias	0.0	%
417h	H03-09	Terminal A2 Signal Level Selection	2	--
418h	H03-10	Terminal A2 Function Selection	1F	--
41Eh	H04-02	Terminal FM Gain	100.0	%
41Fh	H04-03	Terminal FM Bias	0.0	%
421h	H04-05	Terminal AM Gain	50.0	%
422h	H04-06	Terminal AM Bias	0.0	%
42Dh	H06-02	Pulse Input Scaling	1440	Hz
42Eh	H06-03	Pulse Input Gain	100.0	%
42Fh	H06-04	Pulse Input Bias	0.0	%
430h	H06-05	Pulse Input Filter Time	0.10	sec
431h	H06-06	Pulse Monitor Selection	102	--
432h	H06-07	Pulse Monitor Scaling	1440	Hz
500h	O01-01	User Monitor Selection	106	--
501h	O01-02	Power-On Monitor	3	--
504h	O01-05	LCD Contrast	3	--

* Determined by X-Press Programming.

