



# Impulse G+/VG+ Series 2 to Series 3

---

## Product Transition Guide



**MAGNETEK**  
MATERIAL HANDLING

Part Number 144-42596-R1  
April 2008

©Copyright 2008 Magnetek Material Handling

**NOTICE**

The information contained within this document is the proprietary property of Magnetek and may not be copied, reproduced or transmitted to other parties without the expressed written authorization of Magnetek. No patent liability is assumed with respect to the use of the information contained herein. Moreover, because Magnetek is constantly improving its high-quality products, the information contained in this document is subject to change without notice. Every precaution has been taken in the preparation of this document. Nevertheless, Magnetek assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained in this publication.

Feature Overview.....	5
Series 2 to Series 3 Feature Differences .....	7
Digital Operator Comparison.....	9
Front Cover & Cooling Fan Comparison .....	9
Main Control PCB Comparison .....	10
Physical Dimensions .....	11
Series 2 to Series 3 Terminal Comparison.....	12
Network Communications .....	16
Details on New SERIES 3 Features & Functions.....	17

Page Intentionally Left Blank

## Feature Overview

This document details differences between the Series 2 and Series 3 product to assist in product transition and new product introduction.



## Series 2 Drive

Magnetek's Material Handling Electromotive Systems Division has a proven track record of providing unmatched product performance and reliability to the overhead material handling industry. That's why our IMPULSE G+ and VG+ Series 2 Drives are the leading crane controls in the industry. Featuring our exclusive crane and hoist software, these third generation controls offer many features designed for ease of use and enhanced safety.



## Series 3 Drive

Then next generation is here! Electromotive Systems' IMPULSE® Series 3 Crane Controls incorporate the latest in advanced control technology to maximize the performance and safety of your material handling system. Yet there's no need to learn complicated new programming. The Series 3 has been designed to mirror the programming of our IMPULSE Series 2 product line, making the move to Series 3 an easy transition.

## Series 3 Features & Functions

- Analog outputs with new 4-20ma selection and 10 bit resolution.
- Improved input voltage specification.
- Enhanced digital operator with copy function
- Simplified parameter menu navigation
- New LCD contrast adjustment
- More preset speed selections
- More relay outputs
- More versatile analog outputs
- New pulse I/O
- New quick disconnect terminal I/O
- New cooling fan on/off control and elapsed time and cassette replacement design
- New 12-pulse diode bridge
- Built-in RS485 communication with self test mode
- New drive enable input selection
- New automatic derating based on ambient temperature setting
- New motor temperature analog input
- New motor overheat alarm outputs
- Addition under torque selections
- New HP and heat-sink temp monitors
- Enhanced fault storage (Qty. 10 faults)
- Improved Auto-Tuning Functions

## Series 3 Performance

- Auto-tuning 3-Methods (R1/Static/Dynamic)
- Static no load auto-tuning offers same torque accuracy performance as dynamic auto-tuning at base speed & below
- DC input compatible (all models) simplified connection to DC power, removal of internal DC bus choke not required.

## Series 2 to Series 3 Feature Differences

Feature	Item	Impulse Series 2	Impulse Series 3
HP Range	230V	0.5 to 150HP <sup>1</sup>	0.5 to 150HP
	460V	0.5 to 400HP <sup>1</sup>	0.5 to 500HP
	575V	2 to 200HP	N/A
Input Voltage	Rated Voltage	3-phase, 200-230Vac 3-phase, 380-460Vac	3-phase, 200-240Vac 3-phase, 380-480Vac
PWM Carrier Frequency	Range	See Appendix 1	See Appendix 1
Max. Output Frequency	Hz	150Hz	150/300Hz 400Hz Consult Factory <sup>2</sup>
Keypad Design	Display	2 Line x 16 Character LCD	5 Line x 16 Character LCD
	Copy Function	No	Yes
Digital Input Terminal	NPN/PNP	24VD – NPN	24VD Switchable NPN/PNP
		24VAC 48VAC 120VAC	24VAC (optional) 48VAC (optional) 120VAC(standard)
Digital Output Terminal	Open Collector	2	0
	Relay Output	1 x Form A, 1 x Form C	2 x Form A, 2 x Form C
Analog Output	Output Level	2 channels 0-10V or -10V to +10V (9 bit plus sign)	2 channels with independent level selections 0-10V (10 bit plus sign) or -10-+10V or (10 bit plus sign) or 4-20ma (10 bit plus sign)
Pulse Input	Qty.	0	1
	Input Freq.	Not Available	1-32kHz
Pulse Output	Qty.	0	1
	Output Freq.	Not Available	0-32kHz
Quick Disconnect Terminals	Type	No	Yes (Phoenix)
Auto Tuning	Rotating/Stationary	Rotating	Rotating/Stationary/ Primary Resistance
Preset Speeds	Qty.	8	17
Speed Search	Bi/Uni-Directional	Uni-Directional	Bi-Directional
	Method	Current	Current/ Speed
Braking Function	DB Transistor	Built-in to 10HP (230V) Built-in to 25HP (460V)	Built-in to 25HP
Cooling Fan On/Off Control	Power/Run	No	Run Based / Selectable
Timer Function	On/Off Delay	n/a	On/Off Delay (0-3000 sec)
Fault Code Additions	-	n/a	10 additional
Torque Limit / Current Limit / Stall Prevention	-	Stall Prevention During Accel/Run/Decel (V/F) Torque Limit in 4 Quadrants (Vector)	Stall Prevention During Accel/Run/Decel (V/F) Torque Limit in 4 Quadrants (Vector) Software current limit

<sup>1</sup> Larger Series 2 models available by HHP modular design.

<sup>2</sup> De-rating is required.

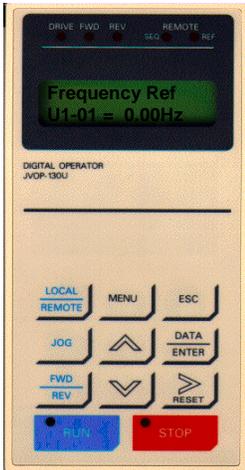
<b>Feature</b>	<b>Item</b>	<b>Impulse Series 2</b>	<b>Impulse Series 3</b>
Harmonic Counter Measures	-	Filters/Reactors (Options)	12 Pulse: 30HP and Above Filters/Reactors (Options)
	Built-In DC Bus Reactor	230Vac: 18.5-75kW 460Vac: 18.5-160kW	230Vac: 22-110kW 460Vac: 22-300kW
Ambient Temperature	°C	-10°C ~ +40°C (IP21) -10°C ~ +45°C (IP00)	-10°C ~ +40°C (IP21) -10°C ~ +45°C (IP00) (Automatic OL protection curve based on ambient temperature setting of L8-12)
Storage Temperature	°C	-10°C ~ +60°C	-20°C ~ +60°C
Network Communications	Standard	Modbus RTU via RS232	Modbus RTU via terminal I/O RS485/422
	Optional	RS232 to RS485, DeviceNet, ProfibusDP, ModbusPlus	Profibus-DP, Ethernet IP, Modbus RTU, Ethernet Modbus TCP/IP, Modbus Plus
Split front cover	-	No	Yes
Modular heat sink fan	-	No	Yes
I/O Terminal Arrangement	-	Numerically labeled	Alpha Numeric labels
Mounting Conversion Kit		Yes (Series 1 to Series 2)	No

# Digital Operator Comparison

- Enhanced LCD operator with built-in copy function and parameter verify for IMPULSE Series 3
- LCD contrast adjustment
- The SERIES 3 has a similar key layout and parameter structure as SERIES 2 for “ease” of programming

## Series 2 Operator

LCD Display  
2 Line x 16 Characters



## Series 3 Operator

LCD Backlit Display  
5 Line x 16 Characters



SERIES 3 operator indicates:

- Present selection
- Factory default setting
- Programmed value



- SERIES 3 copy keypad is capable of uploading all of the parameter settings from the SERIES 3 drive memory.
  - Upload of SERIES 2 parameters to SERIES 3 not possible at this time
  - SERIES 3 Drives must have the same software version, model, motion and control mode to copy parameters.

## Simplified Menu Structure in SERIES 3:

Series 2	Series 3
Operation	Operation “DRIVE”
—	—
Programming (Monitor, User, Advanced)	Programming “ADV”
Modified Constants	Modified Constants “VERIFY”
Auto-Tuning	Auto-Tuning “A.TUNE”
Initialize	

# Front Cover & Cooling Fan Comparison

## Front Cover

The difference between the G+ Series 2 and the VG+ Series 3 Front Covers is the VG+ Series 3 cover is now a split cover. This allows terminal only access and limits exposed control PCB or power structure during wiring.

## Cooling Fan

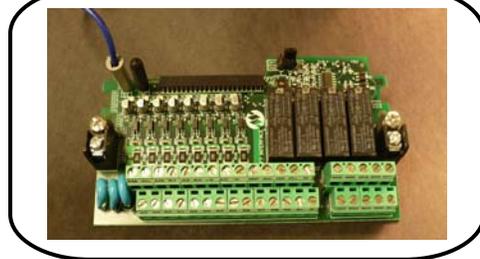
The series 3 Cooling Fan features an easy to remove heat sink cooling fan. The fan operation can be controlled via programming parameters. Hours of fan operation can be viewed via the digital operator to aid in preventive maintenance.

## Main Control PCB Comparison

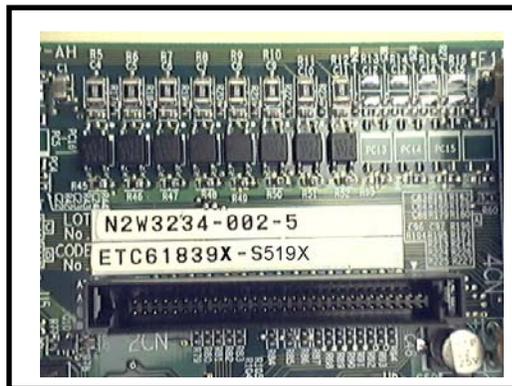
Series 2 Control PCB



New Series 3 Control PCB



Removable Series 3 terminal Block 120 VAC card



Control PCB part number designation

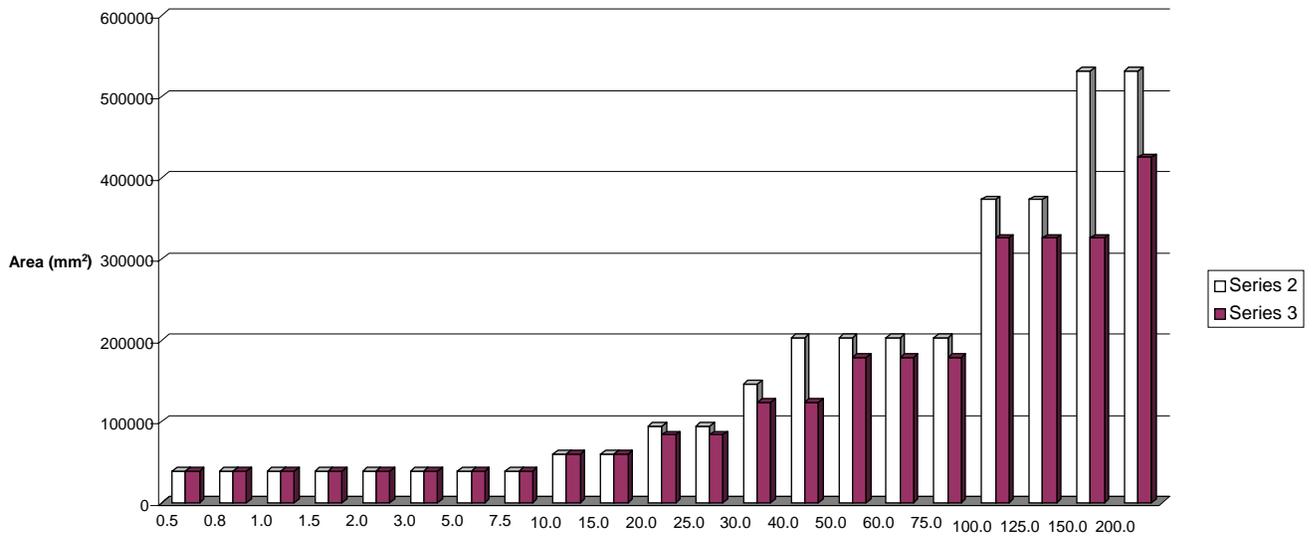
# Physical Dimensions

Between 20 - 200 HP, the SERIES 3 is 18% smaller volume on average than the equivalent SERIES 2. (See appendix 1)



Based on meeting NEC full load amp requirements, the SERIES 3 footprint can offer a space savings over the SERIES 2.

SERIES 3 vs. Series 2 Footprint area

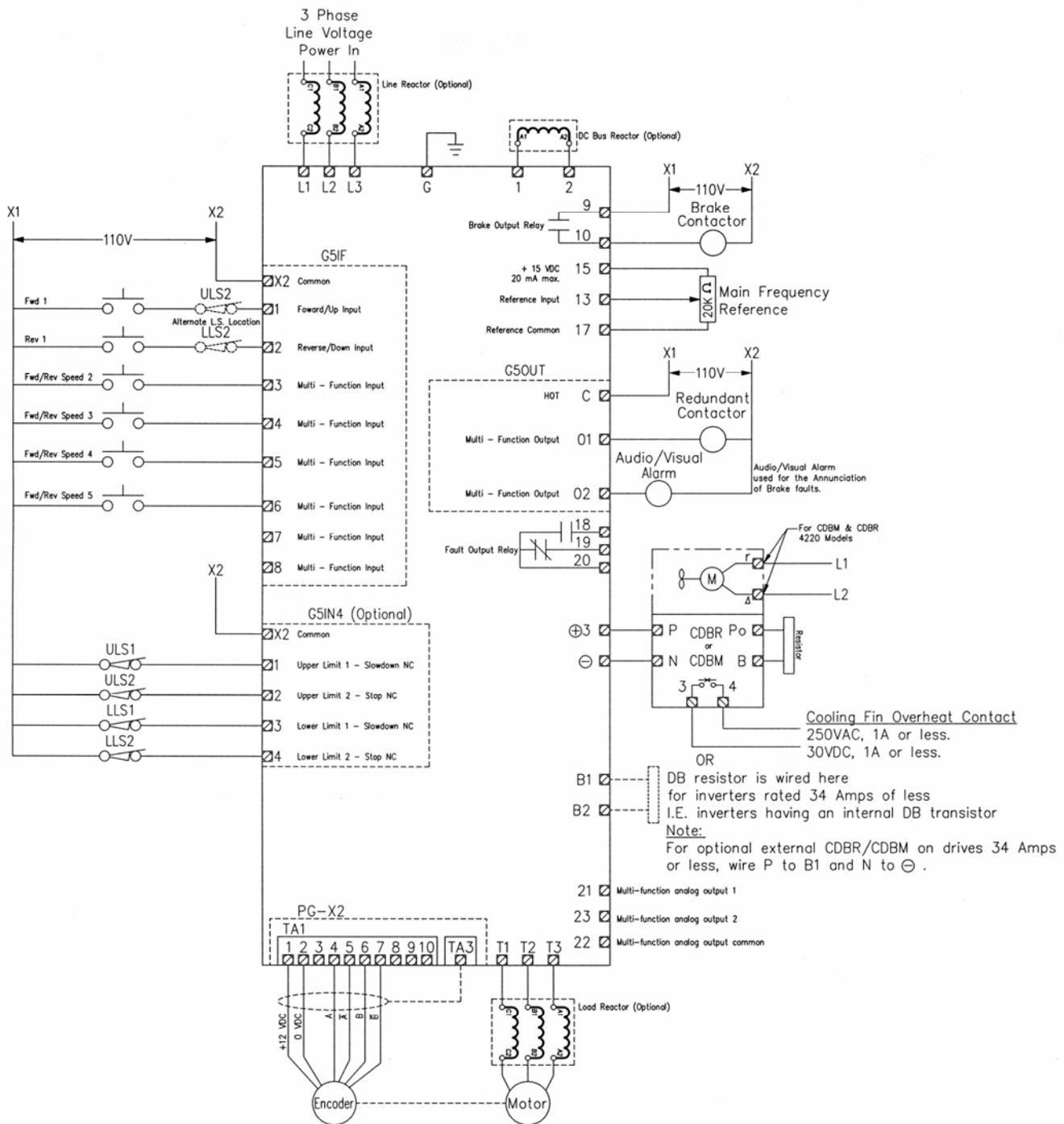


Note: 645.16 square mm to 1 square inch      NEC HP Rating

## Series 2 to Series 3 Terminal Comparison

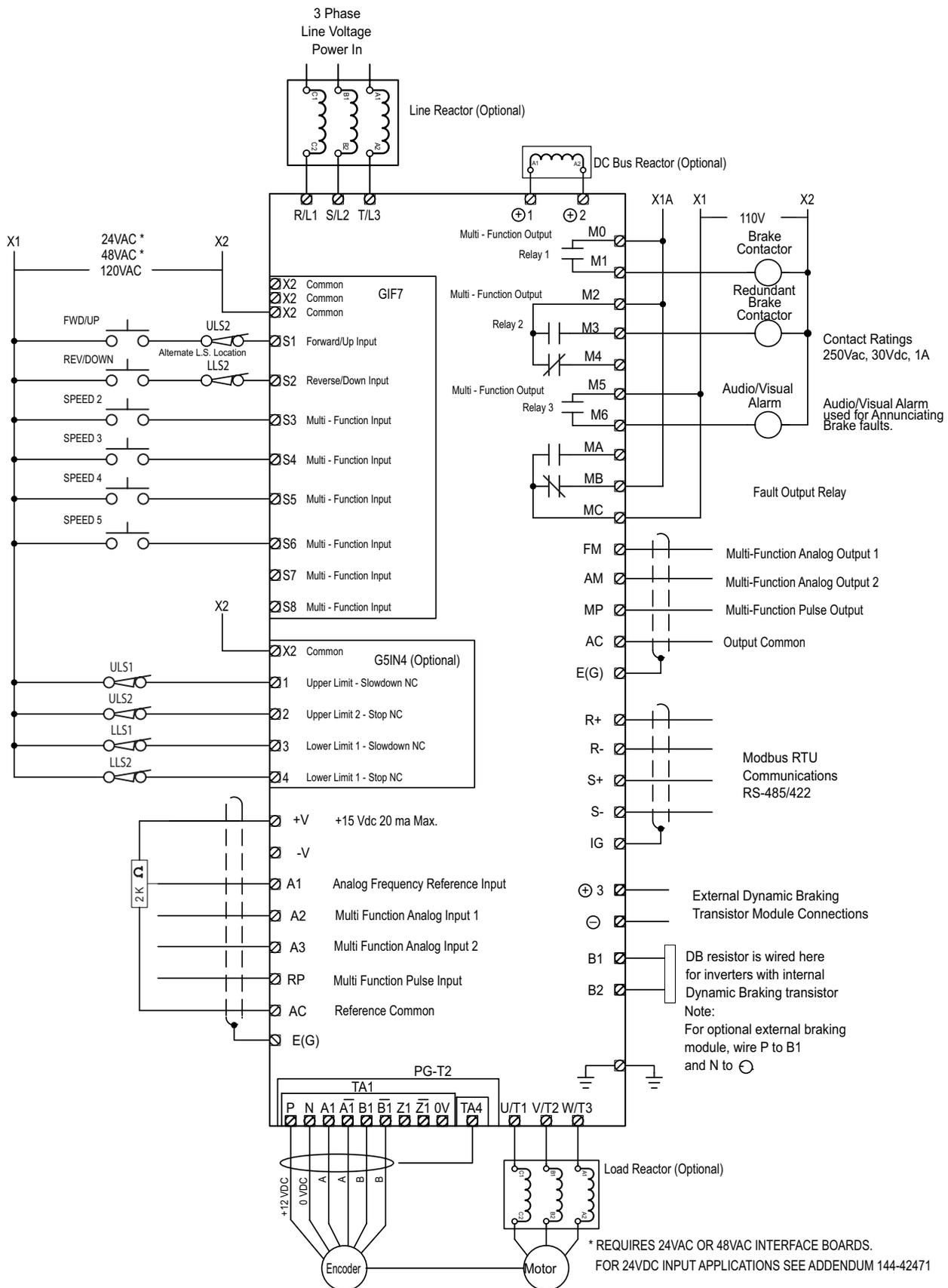
Series 2 Terminal			Series 3 Terminal			
Type	SERIES 2 Terminal	Default Function	SERIES 3 Terminal	Default Function	SERIES 3 Description	
Digital Input Signals	1	Forward run/stop Signal level: (120VAC)	S1	Forward run/stop command	–	
	2	Reverse run/stop Programmable input	S2	Reverse run/stop command	–	
	3	Programmable input	S3	Programmable input	Multi-function digital inputs. Functions set by: H1-01 to H1-06. 120VAC Photo coupler isolation	
	4	Programmable input	S4	Programmable input		
	5	Programmable input	S5	Programmable input		
	6	Programmable input	S6	Programmable input		
	7	Programmable input	S7	Programmable input		
	8	Programmable input	S8	Programmable input		
Analog Input Signals	15	+15V Power supply output for analog command (Allowable current 20 mA max.)	+V	+15Vdc power output		+15Vdc (Max. current: 20 mA)
	33	-15V Power supply output for analog command (Allowable current 20mA max.)	-V	-15Vdc power output		-15Vdc (Max. current: 20 mA)
	13	Master frequency ref. (voltage) -10 to +10V (20k ohms) 0 to +10V/(20k ohms)	A1	Analog input or speed command	0 to +10Vdc=100% 0 to +/-10Vdc =100% (H3-01) (20k ohm)	
	14	Master frequency ref. (current) 4 to 20mA (250 Ohms)	A2	Add to terminal A1	4 to 20 mA=100%/(250 ohms) 0 to +10Vdc=100%/(20kohm) Function set by H3-09.	
	16	Multi-function analog input -10 to +10V (20k ohms), 0 to +10V/(20k ohms)	A3	Aux. frequency reference 1	0 to +10Vdc=100%/(20 kohm) 0 to +/-10Vdc=100% Function set by H3-05	
	17	Common for control circuit 0V	AC	Analog common	–	
	12	Connection to shield sheath of signal lead	E(G)	Shield wire, optional ground line connection point	–	
Digital Output Signals	9	During running (NO contact) Dry contact capacity: 250VAC, 1A or less 30VDC, 1A or less	M0 ~ M1	Brake output (N.O. contact)	Form A Dry contacts capacity: 1 A max. at 250Vac 1 A max. at 30Vdc Multi-function digital output. Function set by H2-01.	
	10					
	25	Zero speed detection Open collector output 48V, 50mA or less	M2, M3, M4	Brake output	Form C Dry contacts capacity: 1 A max. at 250Vac 1 A max. at 30Vdc Multi-function digital output. Function set by H2-02.	
	27	Open collector output common				
	26	Speed agree detection Open collector output 48V, 50mA or less	M5 ~ M6	Fault annunciate	Multi-function digital output. Function set by H2-03.	
27	Open collector output common					

Series 2 Terminal			Series 3 Terminal		
Type	SERIES 2 Terminal	Default Function	SERIES 3 Terminal	Default Function	SERIES 3 Description
Digital Output Signals (continued)	<b>18</b>	Fault contact output (NO/NC contact) When faulted : Closed between terminals 18 and 20 Open between terminals 19 and 20 Dry contact capacity: 250VAC 1A or less, 30VDC 1A or less	<b>MA</b>	Fault output signal (SPDT)	Form C Dry contacts capacity: 1 A max. at 250Vac 1 A max. at 30Vdc
	<b>19</b>		<b>MB</b>		
	<b>20</b>		<b>MC</b>		
Analog Output Signals	<b>21</b>	Frequency meter output 0 to ±10V/100% frequency 0 to ±11V Max. ±5% 2mA or less	<b>FM</b>	Output frequency	0 to +10Vdc or +/-10Vdc 500 ohm input 10V=100% Output frequency (Max current 2 mA). 4 to 20mA 20mA=100% Output frequency Function set by H4-01.
	<b>23</b>	Current monitor 5V/inverter rated current	<b>AM</b>	Output current	0 to +10Vdc or -10 to +10Vdc 500 ohm input 10V=100% Drive output current (Max current 2 mA) 4 to 20mA / 100% Drive's rated output current / Function set by H4-04.
	<b>22</b>	Common (Current Monitor)	<b>AC</b>	Analog common	–
Pulse I/O	<b>N/A</b>	–	<b>RP</b>	Pulse input	0 to 32kHz (3k ohms) ±5% High level voltages 3.5 to 13.2 Low level voltages 0.0 to 0.8 Duty Cycle (on/off) 30% to 70% Function set by H6-01.
	<b>N/A</b>	–	<b>MP</b>	Pulse monitor	0 to 32kHz +5V output (Load: 1.5k ohms) Function set by H6-06.
RS-485/422	<b>N/A</b>	–	<b>R+</b>	Modbus communication	–
	<b>N/A</b>	–	<b>R-</b>	Differential input, PHC isolation	
	<b>N/A</b>	–	<b>S+</b>	Modbus communication	
	<b>N/A</b>	–	<b>S-</b>	Differential output, PHC isolation	
	<b>N/A</b>	–	<b>IG</b>	Signal common	



**IMPULSE VG+ Series 2 Terminal Diagram**  
(Reference 005-1068 Instruction manual)

NOTE: Wiring may vary between DBU and CDBR.



**IMPULSE VG+ Series 3 Terminal Diagram**  
 (Reference 140-10257 Instruction manual)

# Network Communications

Series 2	Series 3
DeviceNet 	DeviceNet, Not supported
	EtherNet ModBus TCP/IP
	EtherNet IP
Profi-Bus 	Profi-Bus
ModBus Plus	ModBus Plus
ModBus RTU (RS-232)	(New) Built-in RS-485 (ModBus RTU)

# Details on New SERIES 3 Features & Functions

Note: This section details only a few of the new SERIES 3 features.

## New Auto Tuning

The SERIES 3 has three different Auto-tuning functions to help to optimize the drive performance: Leakage inductance is also auto-tuned, this improved torque linearity.

Feature	SERIES 2	SERIES 3
Primary Resistance Auto-tuning	No	Yes
Static Auto-tuning	No	Yes
Dynamic Auto-tuning	Yes	Yes

### Primary Resistance Auto-tuning

SERIES 3 performs a non-rotational stator resistance measurement. This method applies to the V/Hz modes only.

### Static Auto-tuning

This tuning method is for motors that prohibit uncoupling of the load. This method involves no motor shaft rotation. This method applies to both the Open Loop Vector and Closed Loop (Flux) Vector modes.

### Dynamic Auto-tuning

This tuning method is for motors that are uncoupled from a load that allow motor shaft rotation. This method applies to both the Open Loop Vector and Closed Loop (Flux) Vector modes.