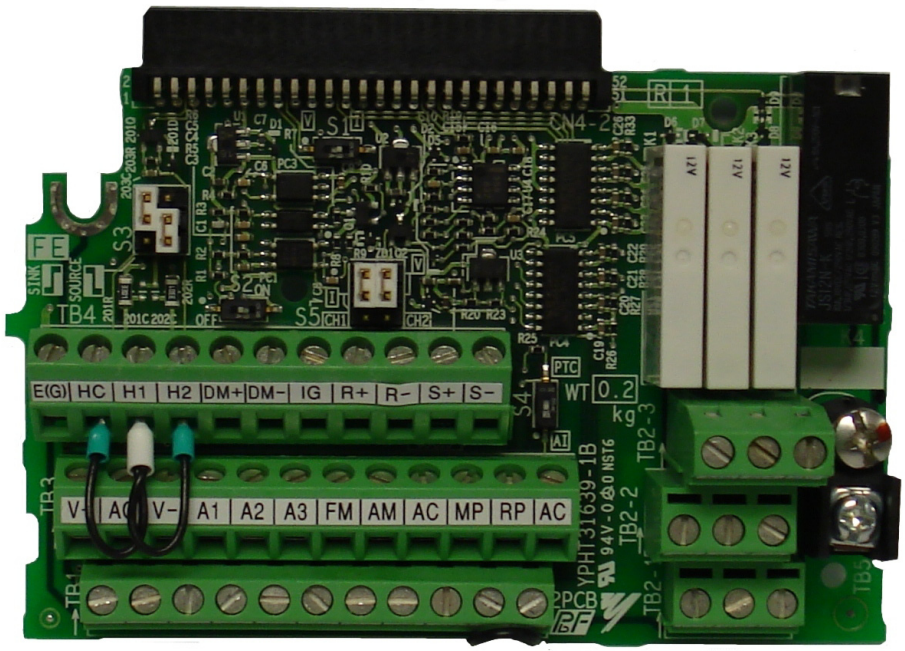



# IMPULSE·G+ & VG+ Series 4

Adjustable Frequency/Vector Crane Controls

# 24 VDC Interface Card Installation Manual

MAGNETEK
MATERIAL HANDLING

October 2011
Part Number: 144-27014

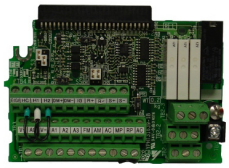
# 1. Preface and Safety

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 interface card:

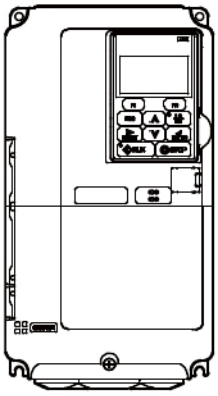
### 24 VDC Interface Card



**IMPULSE®•G+/VG+ Series 4**
**24 VDC Interface Card**
**Installation Manual**
**Manual No: 144-27014**

Read this manual first.
The installation manual is packaged with the interface card and contains information required to install the card.

### MPULSE•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

**Option:** IMPULSE®•G+/VG+ Series 4 24 VDC Interface Card

## Registered Trademarks

Trademarks are the property of their respective owners.

## Supplemental Safety Instructions

Read and understand this manual before installing, operating, or servicing this interface card. Install the card 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 or option 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 or option to halogen group disinfectants.*
Failure to comply may cause damage to the electrical components in the drive or option.
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. Product Overview

## About This Product

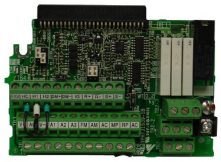
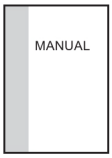
The S4IF-024DC00 interface card allows the user to connect 24 VDC digital inputs, relay outputs, analog inputs, analog outputs, and RS-485 Modbus RTU control circuits to the IMPULSE®•G+/VG+ Series 4 drives.

# 3. Receiving

Please perform the following tasks upon receiving the option:

- Inspect the interface card for damage. Contact the shipper immediately if the interface card appears damaged upon receipt.
- Verify receipt of the correct model by checking the model number printed on the option nameplate (refer to Figure 1 on page 7 for more information).
- Contact your supplier if you have received the wrong model or the interface card does not function properly.

## Option Package Contents

| Description: | Interface Card | Installation Manual |
|---|---|---|
| -- |  |  |
| Quantity | 1 | 1 |

## Tools Required for Installation

- A Phillips screwdriver (M3 metric / #1, #2 U.S. standard size) is required to install the option.
- A straight-edge screwdriver (blade depth: 0.015” [0.4 mm], width: 0.098” [2.5 mm]) is required to wire the option terminal block.
- A pair of diagonal cutting pliers.
- A small file or medium-grit sandpaper.

*NOTE: Tools required to prepare option cables for wiring are not listed in this manual.*

# 4. Interface Card Components

## 24 VDC Interface Card

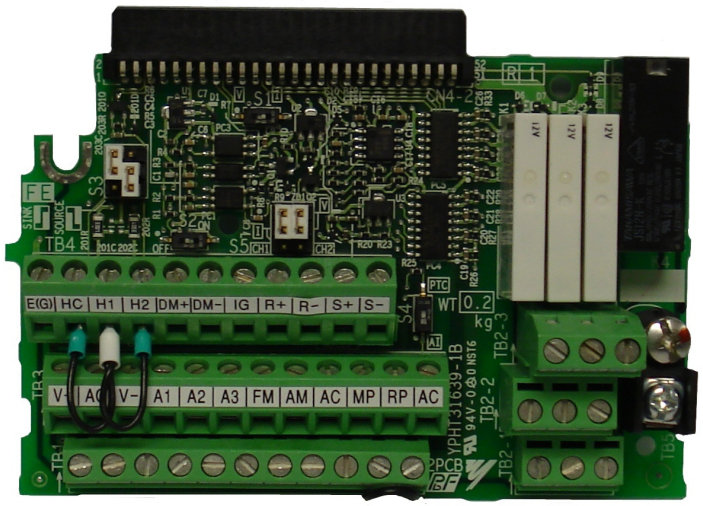



***Figure 1: 24 VDC Interface Card***

## Terminal Configuration

The control circuit terminals are arranged as shown in Figure 2.

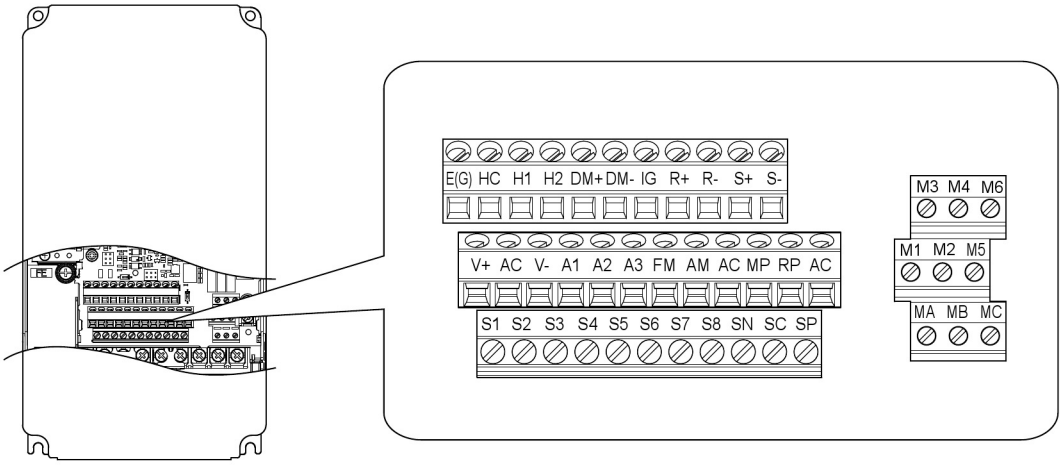



***Figure 2: Control Circuit Terminal Arrangement***

Refer to Table 2 on page 13 for details on terminal functions and signal levels.

# 5. Installation Procedure

## Section Safety

**DANGER**

**Electric Shock Hazard**

*Do not connect or disconnect wiring while the power is on.*
Failure to comply will result in death or serious injury.

Disconnect all power to the drive and wait at least the amount of time specified on the drive front cover safety label. After all indicators are off, measure the DC bus voltage to confirm safe level, and check for unsafe voltages. The internal capacitor remains charged after the power supply is turned off.

**WARNING**

**Electrical Shock Hazard**

*Do not remove the front cover of the drive while the power is on.*
Failure to comply could result in death or serious injury.

The diagrams in this section may include options and drives without covers or safety shields to show details. Be sure to reinstall covers or shields before operating any devices. Use the option according to the instructions described in this manual.

*Do not allow unqualified personnel to use equipment.*
Failure to comply could result in death or serious injury.

Maintenance, inspection, and replacement of parts must be performed only by authorized personnel familiar with installation, adjustment, and maintenance of this product.

*Do not touch circuit boards while the power to the drive is on.*
Failure to comply could result in death or serious injury.

*Do not use damaged wires, place excessive stress on wiring, or damage the wire insulation.*
Failure to comply could result in death or serious injury.

**Fire Hazard**

*Tighten all terminal screws to the specified tightening torque.*
Loose electrical connections could result in death or serious injury by fire due to overheating of electrical connections.

## NOTICE

**Damage to Equipment**

*Observe proper electrostatic discharge (ESD) procedures when handling the option, drive, and circuit boards.*
Failure to comply may result in ESD damage to circuitry.

*Never shut the power off while the drive is running or outputting voltage.*
Failure to comply may cause the application to operate incorrectly or damage the drive.

*Do not operate damaged equipment.*
Failure to comply may cause further damage to the equipment.
Do not connect or operate any equipment with visible damage or missing parts.

*Do not use unshielded cable for control wiring.*
Failure to comply may cause electrical interference resulting in poor system performance.
Use shielded twisted-pair wires and ground the shield to the ground terminal of the drive.

*Properly connect all pins and connectors.*
Failure to comply may prevent proper operation and possibly damage equipment.

*Check wiring to ensure that all connections are correct after installing the option and connecting any other devices.*
Failure to comply may result in damage to the option.

## Wiring the Control Circuit Terminal

This section describes the proper procedures and preparations for wiring the control terminals.

**WARNING**

**Electrical Shock Hazard.** Do not remove covers or touch the circuit boards while the power is on. Failure to comply could result in death or serious injury.

**NOTICE**

Separate control circuit wiring from main circuit wiring (terminals R/L1, S/L2, T/L3, B1, B2, U/T1, V/T2, W/T3, -, +1, +2) and other high-power lines. Improper wiring practices could result in drive malfunction due to electrical interference.

Separate wiring for digital output terminals MA, MB, MC, and M0 to M6 from wiring to other control circuit lines. Improper wiring practices could result in drive or equipment malfunction or nuisance trips.

Use a class 2 power supply when connecting to the control terminals. Improper application of peripheral devices could result in drive performance degradation due to improper power supply. Refer to NEC Article 725 Class 1, Class 2, and Class 3 Remote-Control, Signaling, and Power Limited Circuits for requirements concerning class 2 power supplies.

Insulate shields with tape or shrink tubing to prevent contact with other signal lines and equipment. Improper wiring practices could result in drive or equipment malfunction due to short circuit.

Connect the shield of shielded cable to the appropriate ground terminal. Improper equipment grounding could result in drive or equipment malfunction or nuisance trips.

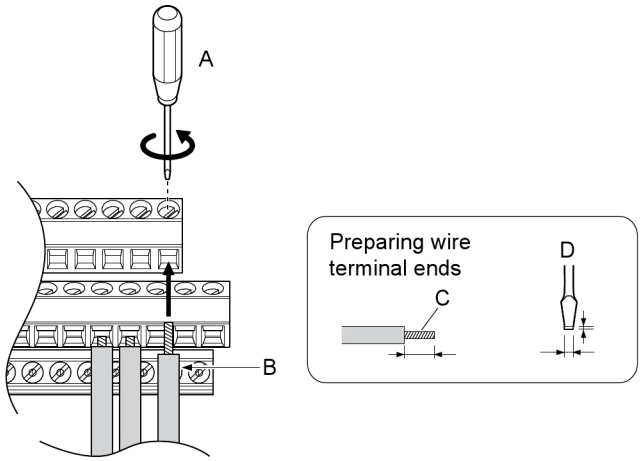
Wire the control circuit only after terminals have been properly grounded and main circuit wiring is complete. Refer to Figure 3 for details. Refer to Wire Gauges on page 12.

**NOTICE**

Do not tighten screws beyond the specified tightening torque. Failure to comply may result in erroneous operation, damage to the terminal block, or cause a fire.

Use shielded twisted-pair cables as indicated to prevent operating faults. Improper wiring practices could result in drive or equipment malfunction due to electrical interference.

Connect control wires as shown in Figure 3.




**A – Loosen screw to remove wire.**
**B – Single wire or stranded wire**

**C – Avoid fraying wire strands when stripping insulation from wire. Strip length 5.5 mm.**
**D – Blade depth of 0.4 mm or less Blade width of 2.5 mm or less**

***Figure 3: Terminal Board Wiring Guide***

## Switches and Jumpers on the Terminal Board

The terminal board is equipped with several switches used to adapt the drive I/Os to the external control signals. Figure 4 shows the location of these switches. Refer to the Interface Circuit Board in the IMPULSE®•G+/VG+ Series 4 Instruction Manual for setting instructions.

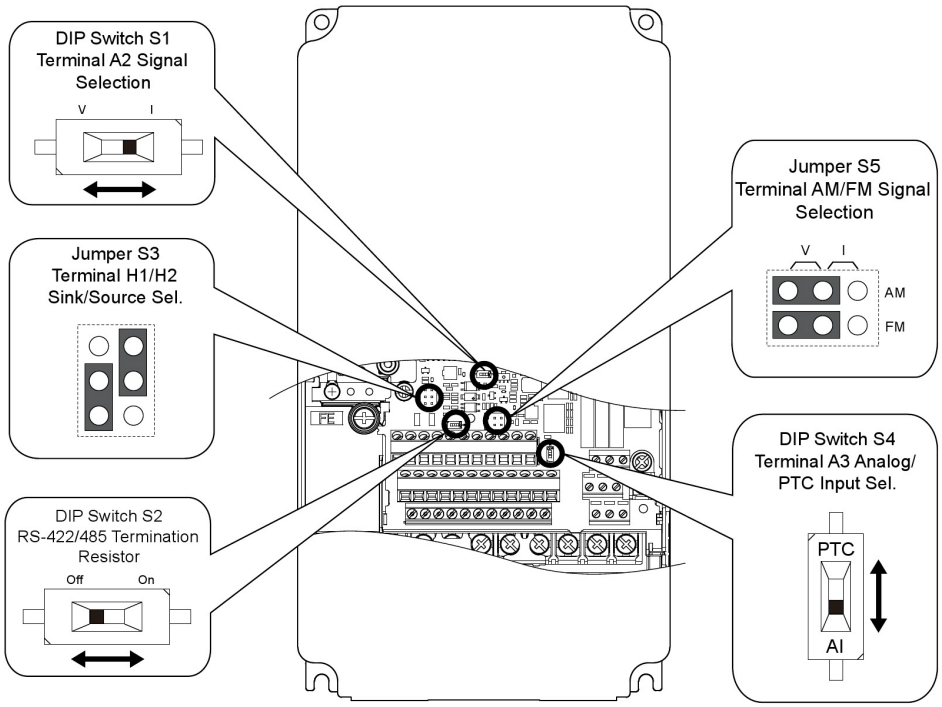



***Figure 4: Locations of Jumpers and Switches on the Terminal Board***

## Wire Size and Torque Specifications

Select appropriate wire type and gauges from Table 1. For simpler and more reliable wiring, use crimp ferrules on the wire ends.

**Table 1: Wire Gauges and Tightening Torques**

| Terminal | Screw Size | Tightening Torque N-m (in-lb) | Bare Wire Terminal | | Ferrule-Type Terminal | | Wire Type |
|---|---|---|---|---|---|---|---|
| | | | Applicable wire size $mm^2$ (AWG) | Recomm. wire size $mm^2$ (AWG) | Applicable wire size $mm^2$ (AWG) | Recomm. wire size $mm^2$ (AWG) | |
| S1-S8, SC, SN, SP | M3 | 0.5 to 0.6 (4.4 to 5.3) | Stranded wire: 0.2 to 1.0 (24 to 16) Solid wire: 0.2 to 1.5 (24 to 16) | 0.75 (18) | 0.25 to 0.5 (24 to 20) | 0.5 (20) | Shielded wire, etc. |
| H1, H2, HC | | | | | | | |
| RP, V+, V-, A1, A2, A3, AC | | | | | | | |
| MA, MB, MC | | | | | | | |
| M1-M6 | | | | | | | |
| MP, FM, AM, AC | | | | | | | |
| DM+, DM- | | | | | | | |
| R+, R-, S+, S-, IG | | | | | | | |

## Control Circuit Terminal Block Functions

Drive parameters determine which functions apply to the multi-function digital inputs (S1 to S8), multi-function digital outputs (M0 to M6), multi-function analog inputs (A1 to A3), and multi-function analog monitor output (FM, AM). The default setting is listed next to each terminal in Figure 3-1 in the IMPULSE®•G+/VG+ Series 4 Instruction Manual.

**WARNING**

Sudden Movement Hazard. Always check the operation and wiring of control circuits after being wired. Operating a drive with untested control circuits could result in death or serious injury.

**WARNING**

Sudden Movement Hazard. Confirm the drive I/O signals and external sequence before starting test run. Setting parameter A1-06 may change the I/O terminal function automatically from the factory setting. Refer to the IMPULSE®•G+/VG+ Series 4 Instruction Manual. Failure to comply may result in death or serious injury.

### Input Terminals

Table 2 lists the input terminals on the drive. Text in parenthesis indicates the default setting for each multi-function input.

**Table 2: Control Circuit Input Terminals**

| Type | No. | Terminal Name (Function) | Function (Signal Level) Default Setting |
|---|---|---|---|
| Sequence Input Signal | S1 | MFDI 1 (Run Forward) | • Photocoupler<br>• 24 VDC, 8 mA<br>• Set the S3 jumper to select between sinking, sourcing mode, and the power supply. Refer to Sinking/Sourcing Mode Switch for Digital Inputs in the IMPULSE®•G+/VG+ Series 4 Instruction Manual |
| | S2 | MFDI 2 (Run Reverse) | |
| | S3 | MFDI 3 (Speed 2) | |
| | S4 | MFDI 4 (Speed 3) | |
| | S5 | MFDI 5 (Speed 4) | |
| | S6 | MFDI 6 (Speed 5 | |
| | S7 | MFDI 7 (External Fault) | |
| | S8 | MFDI 8 (Microspeed Gain 1) | |
| | SC | Multi-function input common | Multi-function input common |
| | SP | Digital input power supply +24 VDC | 24 VDC power supply for digital inputs, 150 mA max (only when not using digital input option DI-A3)<br>NOTICE: Do not jumper or short terminals SP and SN. Failure to comply will damage the drive. |
| | SN | Digital input power supply 0 V | |

<1> Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to EN61800-5-1, ISO13849 Cat.3, IEC/EN61508 SIL2, Insulation coordination: class 1.

| Type | No. | Terminal Name (Function) | Function (Signal Level) Default Setting |
|---|---|---|---|
| Safe Disable Inputs | H1 | Safe Disable input 1 <1> | • 24 VDC, 8 mA<br>• One or both open: Output disabled<br>• Both closed: Normal operation<br>• Internal impedance: 3.3 kΩ<br>• Off time of at least 1 ms<br>• Disconnect the wire jumpers shorting terminals H1, H2, and HC to use the Safe Disable inputs. Set the S5 jumper to select between sinking, sourcing mode, and the power supply as explained in the IMPULSE®•G+/VG+ Series 4 Instruction Manual. |
| | H2 | Safe Disable input 2 <1> | |
| | HC | Safe Disable function common | Safe disable function common |
| Analog Inputs/ Pulse Train Input | RP | Multi-function pulse train input (Frequency reference) | • Input frequency range: 0 to 32 kHz<br>• Signal Duty Cycle: 30 to 70%<br>• High level: 3.5 to 13.2 VDC, low level: 0.0 to 0.8 VDC<br>• Input impedance: 3 kΩ |
| | +V | Power supply for analog inputs | 10.5 VDC (max allowable current 20 mA) |
| | -V | Power supply for analog inputs | -10.5 VDC (max allowable current 20 mA) |
| | A1 | Multi-function analog input 1 (Master Frequency Reference) | -10 to 10 VDC, 0 to 10 VDC (input impedance: 20 kΩ) |
| | A2 | Multi-function analog input 2 (Not Used) | • -10 to 10 VDC, 0 to 10 VDC (input impedance: 20 kΩ)<br>• 4 to 20 mA (input impedance: 250 Ω)<br>• Voltage or current input must be selected by DIP switch S1 and H3-09. |
| | A3 | Multi-function analog input 3 (Master Frequency Reference) | • -10 to 10 VDC, 0 to 10 VDC (input impedance: 20 kΩ)<br>• Use DIP switch S4 on the terminal board to select between analog and PTC input. |
| | AC | Analog Common | 0 V |
| | E (G) | Ground for shielded lines and option cards | -- |

<1> Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to EN61800-5-1, ISO13849 Cat.3, IEC/EN61508 SIL2, Insulation coordination: class 1.

## Table 3: Control Circuit Output Terminals

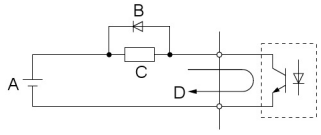
| Type | No. | Terminal Name (Function) | Function (Signal Level) Default Setting |
|---|---|---|---|
| Fault Relay Output | MA | Fault annunciate<br>Terminals MA-MC: N/O<br>Terminals MB-MC: N/C | Terminals MA & MC N/O closed at major faults<br>Terminals MB & MC N/C open at major faults<br>Form C Relay: 250 VAC, 1A; 30 VDC, 1A |
| | MB | | |
| | MC | | |

<1> Refrain from assigning functions to digital relay outputs that involve frequent switching, as doing so may shorten relay performance life. Switching life is estimated at 200,000 times (assumes 1 A, resistive load).
<2> Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to EN61800-5-1, ISO13849 Cat.3, IEC/EN61508 SIL2, Insulation coordination: class 1.

| Type | No. | Terminal Name (Function) | Function (Signal Level) Default Setting |
|---|---|---|---|
| Multi-Function Digital Output <1> | M1 | MFDO (Brake Release) | Form A Relay: 250 VAC, 1A; 30 VDC, 1A |
| | M2 | | |
| | M3 | MFDO (X-Press Programming) | |
| | M4 | | |
| | M5 | MFDO (X-Press Programming) | |
| | M6 | | |
| Monitor Output | MP | Pulse train output (Output frequency) | 32 kHz (max) |
| | FM | MFAO 1 (Output frequency) | -10 to +10V, 2mA; 0 to +10V, 2mA; 4 to 20mA |
| | AM | MFAO 2 (Output current) | -10 to +10V, 2mA; 0 to +10V, 2mA |
| | AC | Analog common | 0 V |
| Safety Monitor Output <2> | DM+ | Safety monitor output | Outputs status of Safe Disable function. Closed when both Safe Disable channels are closed. Up to +48 VDC 50 mA |
| | DM- | Safety monitor output common | |

<1> Refrain from assigning functions to digital relay outputs that involve frequent switching, as doing so may shorten relay performance life. Switching life is estimated at 200,000 times (assumes 1 A, resistive load).
<2> Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to EN61800-5-1, ISO13849 Cat.3, IEC/EN61508 SIL2, Insulation coordination: class 1.

Connect a suppression diode as shown in Figure 5 when driving a reactive load such as a relay coil. Ensure the diode rating is greater than the circuit voltage.




**A – External power, 48 V max.**
**B – Suppression diode**
**C – Coil**
**D – 50 mA or less**

***Figure 5: Connecting a Suppression Diode***

## Serial Communication Terminals

### Table 4: Control Circuit Terminals: Serial Communications

| Type | No. | Signal Name | Function (Signal Level) | |
|---|---|---|---|---|
| MEMOBUS/ Modbus Communication <1> | R+ | Communications input (+) | MEMOBUS/Modbus communication: Use an RS-485 or RS-422 cable to connect the drive. | RS-485/422 MEMOBUS/ Modbus communication protocol 115.2 kbps (max.) |
| | R- | Communications input (-) | | |
| | S+ | Communications output (+) | | |
| | S- | Communications output (-) | | |
| | IG | Shield ground | 0 V | |

<1> Enable the termination resistor in the last drive in a MEMOBUS/Modbus network by setting DIP switch S2 to the ON position. Refer to S4IF Interface Circuit Board in the IMPULSE®•G+/VG+ Series 4 Instruction Manual for more information on the termination resistor.