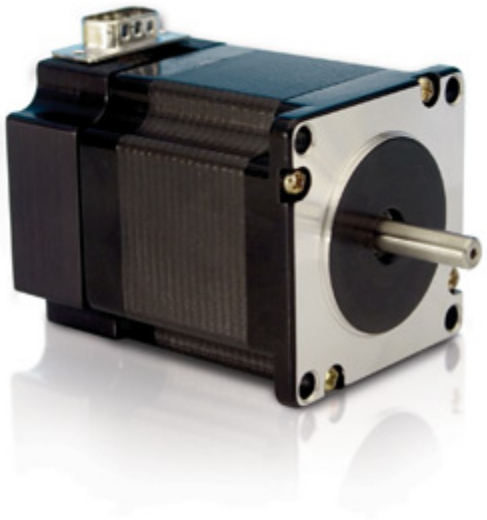
IMD23 / IMDE23

Integrated NEMA 23 Motor and Drive With Encoder



User Manual

And Commands Guide

Version 1.02

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Thank you for purchasing the IMD23/IMDE23 Integrated Motor and Driver. This product is warranted to be free of manufacturing defects for one (1) year from the date of purchase.

PLEASE READ BEFORE USING

Before you start, you must have a suitable step motor, a DC power supply suitable for the motor. The power supply voltage must be between 4 times and 20 times the motor's rated voltage.

DISCLAIMER

The information provided in this document is believed to be reliable. However, no responsibility is assumed for any possible inaccuracies or omissions. Specifications are subject to change without notice.

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Special Symbols

Indicates a WARNING and that this information could prevent injury, loss of property, or even death (in extreme cases).

IMD23 User Manual

Product: IMD23 Manual
Version: 1.02
Date: 03/13/2006

Version History		
Version	Date	Description of Changes
1.02	03/13/2006	New Formatting, minor fixes

Table of Contents

1. FEATURES

- NEMA Size 23, 2 Phase, 1.8° Bipolar Step Motor w/ Built-In Microstepping Driver
- Operates from +15 to 48 VDC
- Phase currents from 0.3 to 3.0 Amp Peak
- Step Resolutions from Half Step to 256x Microstepping
- 4 Selectable Damping modes
- Smooth motion
- Three optically isolated control inputs and one optically isolated control output
- Pole Damping™ Technology integrated within driver board

Pole Damping™ Technology

Pole Damping™ Technology (PDT) enhances step motor performance by dampening each full step in order to create a more accurate and smooth motion profile. Microstepping the step motor will optimize Pole Damping™ Technology. PDT outputs the correct amount of run and hold currents to the motor, at the right time. Thus, it will overcome the step motor's natural tendency to want to forcefully pull towards the full step ON position.

Optically Isolated Inputs and Output

The default usage of the three optically isolated inputs is Step, Direction and Disable. The assignment of Disable is fixed; however the other two inputs can be assigned to other functions as part of software customization. For example one can be used for Go-Resume and the other for Stop-Quit.

The normal usage of the single optically isolated output is to indicate motion by sending a pulse every time a step is made.

IMDE23 – Encoder Features

- 400 cycles per revolution (CPR)
- 1600 pulses per revolution (PPR)
- 2 Channel Quadrature
- TTL Squarewave Outputs and optional index (3rd Channel)
- E2 US Digital Encoder

Pin Number	Function
1	Ground
2	Index
3	Channel A
4	+ 5 VDC
5	Channel B

Default Settings

Default Settings	
Step Resolution	256 microstepping
Damping Mode	35% damping
Direction of rotation	Counterclockwise
Holding Current	25% of motor's rated Current

2. ELECTRICAL SPECIFICATIONS

Power Supply Requirements

Voltage	+15 VDC to 48 VDC

Driver

Peak Current:	0.3 to 3.0 Amps

Motor Specifications

NEMA Size 23

Motor Rated Current:

IMD23-S	Amps RMS
IMD23-M	Amps RMS
IMD23-L	Amps RMS

Holding Torque:

IMD23-S	72 oz-in
IMD23-M	130 oz-in
IMD23-L	210 oz-in

Steps per Revolution (1.8° Motor)

400, 800, 1600, 3200, 6400, 12800, 25600, 51200

I/O Specifications

3x Optically Isolated Inputs (1 fixed)

1x Optically Isolated Output

3. OPERATING SPECIFICATIONS

Maximum Step Frequency:	2.5 MHz
Operating Temperature*:	Low end – 0° C High end – Dependent on case temperature, bracket temperature must not exceed 45° C

* RMS Technologies integrated motor and drive products are designed and fully tested to withstand the rated operating temperature ranges.

Automatic Motor Holding Current reduction available from 0.3 to 2.5 Amps

Logic Timing

Minimum Step Pulse Width	200 nanoseconds
Minimum Step Low Time	200 nanoseconds
Maximum Power-Down Recovery Time	20 milliseconds

4. MECHANICAL SPECIFICATIONS

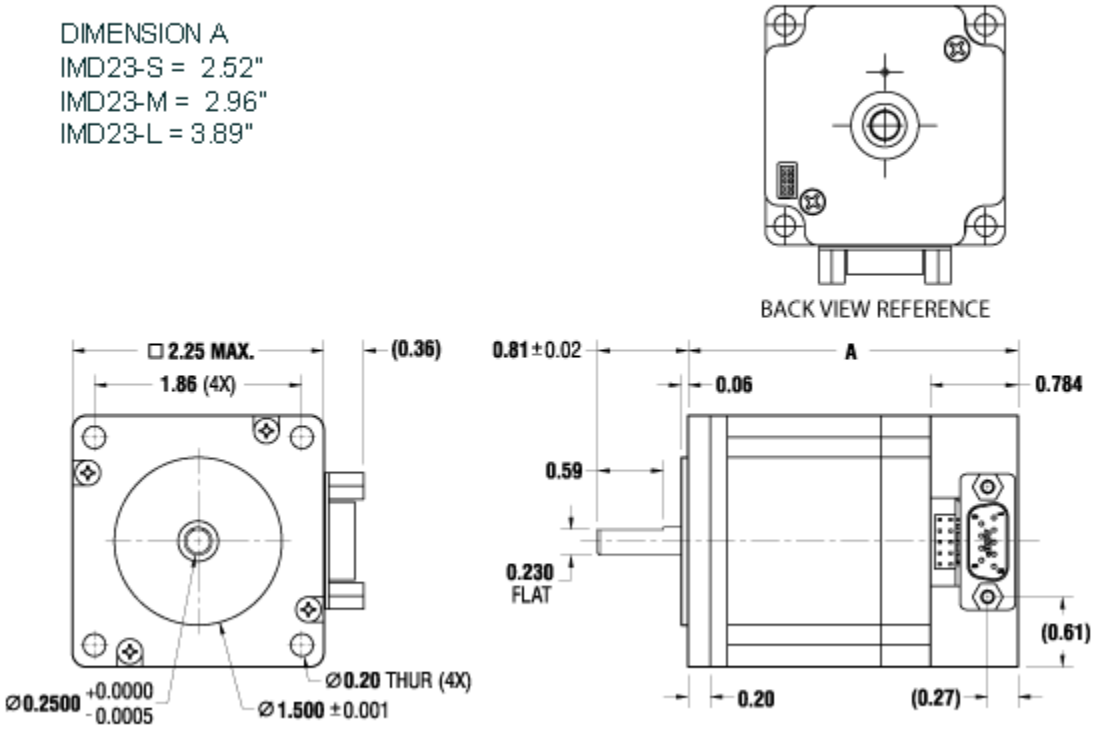
Motor Front Shaft Extension Length
Standard length is 0.81".

Motor Shaft Diameter
Standard shaft diameter is 0.25".

Overall Body Length
Motor body length is available in various lengths

IMD23-S (2.52")
IMD23-M (2.96")
IMD23-L (3.89")

Dimensions



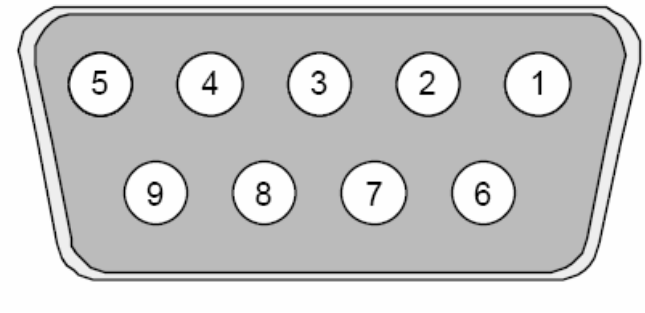
Dimensions Diagram

5. PIN ASSIGNMENTS

A female DB-9 connector cable receives power and provides the control connections for the IMD23 unit. Active signals are optically isolated. An open collector drive is required to provide pulses for Step, levels for Direction, and Disable/Enable.

All of these signals are optically isolated. Open-collector drives are required to provide pulses for Step, levels for Direction, and Disable. The common +ve supply can be +ve 5 to 30 VDC with respect to the signal input; however if the supply is greater than 5 VDC then a resistor must be inserted in series with each signal line to limit the current to 10 mA.

As you may have noticed, Pins 1 & 6 are connected to power positive and Pins 2 & 7 are connected to the negative. It is recommended that both sets of pins be used to connect to the power supply.



View on Face of Mating Socket

Pin	Function	Description
1 & 6	PWR +ve	Motor Supply Voltage. +15 to 48 VDC
2 & 7	PWR –ve	The ground or return of the power supply connects here
3	+5VDC Out	An alternative source for Opto-Common, but no opto-isolation if used.
4	Step	Active low, connects to the open collector drive. (Step occurs on –ve going edge)
5	Disable	Active low, this input is used to disable the output of the driver
8	Opto-Com	+5 VDC input used to supply power to the isolated logic inputs. Series resistors must be used if the supply is greater than 5 VDC
9	Direction	Active low, this input is used to change the rotation direction of the motor

Pin Assignments

6. CONNECTION SPECIFICATIONS

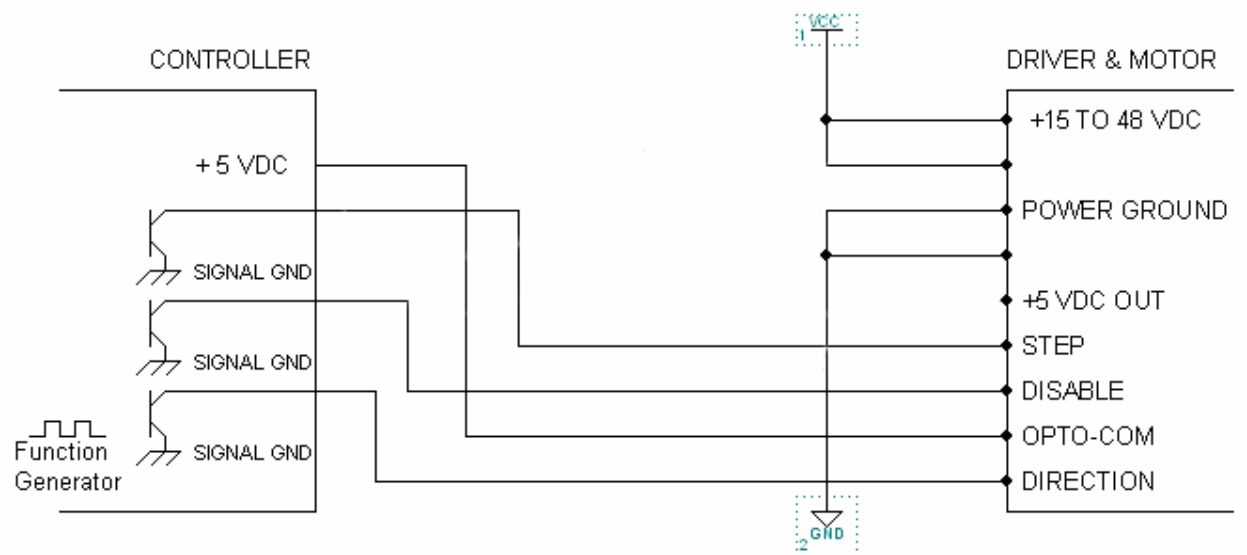
In order to properly connect your new IMD23 unit, examine the figure below.

Connecting the IMD23 to a Controller

List of components needed to spin the motor:

- +15-48 VDC Power Supply
- Additional 5 Volt Power Supply
- Signal Generator

1. Ensure that the IMD23 is not connected to the Main Power Supply until the following procedures have been properly carried out.
2. Connect Pin 8 to the Positive Terminal of the +5 VDC Power Supply.
3. Connect the Negative Terminal of the +5 VDC Power Supply to the Negative Terminal of the Signal Generator. This will be referred to as the Signal Ground.
4. Connect Pin 1 & Pin 6 to the Positive Terminal of the Main Power Supply and Pin 2 & Pin 7 to the Negative Terminal.
5. Adjust the Frequency of the Signal Generator to achieve the desired operating speed.



Connection Schematic – Connecting to a Controller

Pin 4 (Step): Use a pulse generator or function generator to receive pulses into the IMD23. Connect the POSTIVE end of the pulse generator to Pin 4. The NEGATIVE end will be connected to the NEGATIVE end of the +5VDC supply if using a separate power source. If using the internal +5VDC supply, connect the NEGATIVE end of the pulse generator to Power GROUND.

Pin 9 (Direction): To switch the direction of motor rotation; connect Pin 9 with Pin 2 & 7, Power Ground. An open or closed connection to Power Ground will change the direction.

Pin 3: This is the internal +5VDC. Use this for testing purposes or if optical isolation of the I/O's is not desired.

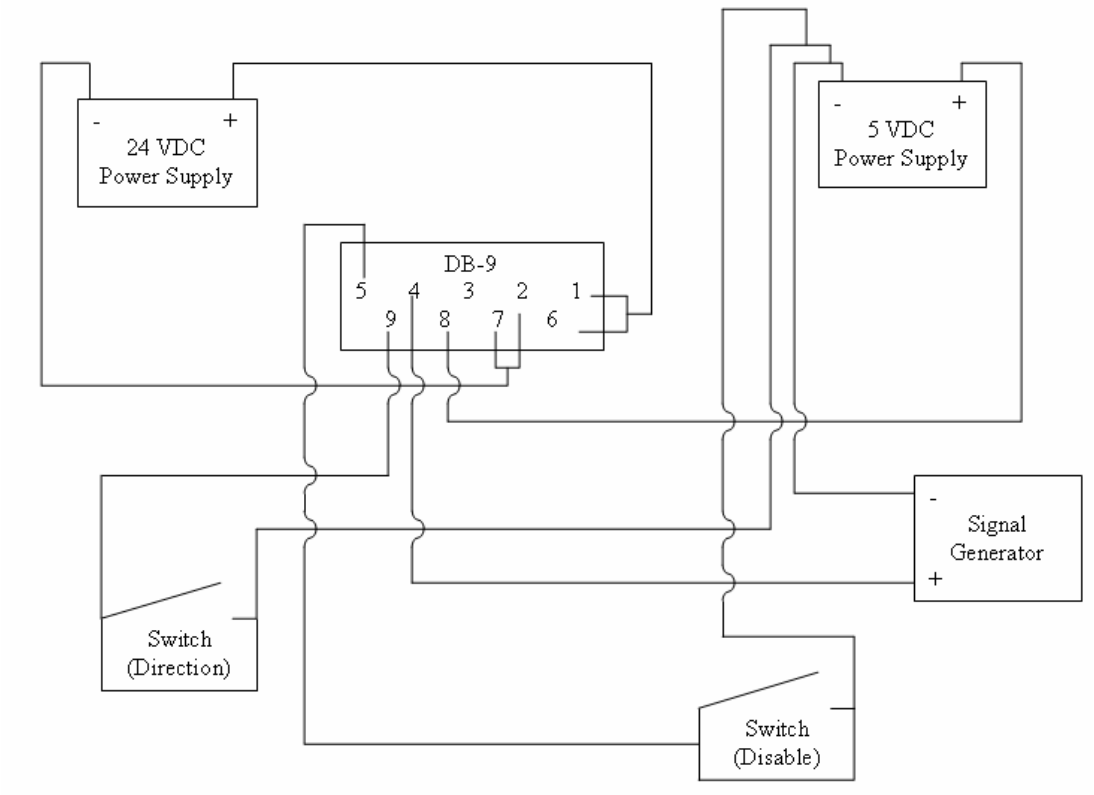
Pin 5 (Disable): To enable and disable the drive, connect Pin 5 with Pin 2 & 7, Power Ground. An open or closed connection to Power Ground will enable and disable the drive, respectively.

Pin 2 & 7: Connect the NEGATIVE of the Power Supply to this terminal.

Pin 1 & 6: Connect the POSITIVE of the Power Supply to this terminal. (+15 to 48VDC)

WARNING! DO NOT DISCONNECT THE DB-9 CABLE FROM THE IMD23 UNIT WHILE POWER IS STILL BEING SUPPLIED. THIS MAY CAUSE DAMAGE TO THE INTERNAL DRIVER BOARD.

WARNING! If you do not have a +5 VDC Power Source, use a Resistor in series to limit the current of the opto isolators. See following page for Resistor values. **If the current exceeds 10 mA, the opto couplers cease to function.**



Connection Schematic – Connecting to a Signal Generator

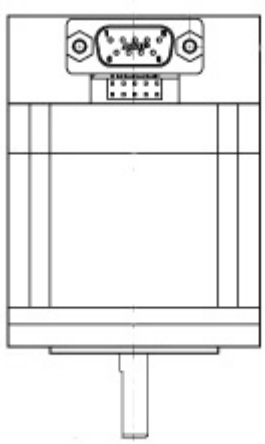
Connecting the Power

The IMD23 requires a supply voltage of +15-48 VDC. First, connect the positive end of the power supply to Power (Pins 1 & 6), and then connect the negative of the power supply to the Ground (Pins 2 & 7) on the IMD23.

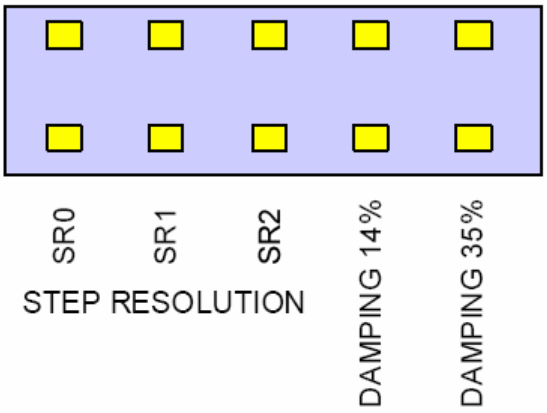
WARNING! Be careful not to reverse the polarity from the power supply to the driver. Reversing the connection will destroy your driver and void the warranty.

Configuring the IMD23

Setting the Step Resolution using Jumpers



Orientation of Jumpers in relation to Silverpak unit



Jumper Pin Layout

RES	SR0	SR1	SR2
2X	OFF	OFF	OFF
4X	ON	OFF	OFF
8X	OFF	ON	OFF
16X	ON	ON	OFF
32X	OFF	OFF	ON
64X	ON	OFF	ON
128X	OFF	ON	ON
256X (default)	ON	ON	ON

Table: Step Resolution Jumper Settings

Damping Mode	Damping 14%	Damping 35%
Fast Decay Mode	OFF	OFF
Slow Decay Mode	ON	ON
14%	ON	OFF
35% (default)	OFF	ON

Table: Damping Mode Jumper Settings

Damping Modes

Damping modes are provided in order to aid in resonance and vibration within the motor. This is also known as mixed decay. The current waveform is dampened to create a smoother motion profile. The most effective damping mode is motor dependent.

7. BASIC STEP AND DIRECTION OPERATION

The four control signals *Step*, *Direction*, *Disable*, and *Fault Out* are optically isolated, with a common positive connection (usually 5 VDC).

The common positive connection (Pin 1) is typically 5 VDC. Each of the inputs is set to TRUE by supplying a signal level 5V below the common positive connection powering the optical isolators. The input is set FALSE by putting the signal within 0.5 VDC below the common positive value.

Example: If 5 VDC is supplied to Pin 1 (common positive connection), TRUE is 0V, and FALSE is any value between 4.5 VDC to 5 VDC.

For test purposes, and some applications where input isolation is not required, the internal 5 VDC supply at Pin 4 of the I/O connector can be used as the common positive connection, by linking pins 1 and 4 on the connector.

If this is done then each input is set TRUE by bringing the voltage level at the input equal to, or more negative than the Power Supply negative connection at Pin 11.

With this arrangement *Direction*, *Disable*, and *Fault Out* control can be effected by simple switch closure between the input and the power negative connection at Pin 11.

If the *Step* input is obtained from a Function Generator, then careful adjustment of the Offset control is needed to ensure that the negative level of the input signal is equal to, or more negative than, the power negative connection at Pin 11.

The minimum duration of the active (negative) *Step* input signal level is 200 nanoseconds and also this is the minimum for the inactive (positive) level. This limits the maximum usable step rate to 2.5 MHz.

The optimum operating arrangement (minimum power usage) is for a constant width negative going pulse of 200 nanoseconds with the pulse interval varying with pulse rate.

For test purposes, setting the Function Generator duty cycle to 50%, and just varying frequency is satisfactory.

8. TROBLESHOOTING

IMD23 is not functioning correctly

Check if power is being supplied to the unit. If the shaft of the motor is hard to turn, power is on. Next, check if the signal generator is supplying pulses correctly. Verify that the 5V is being supplied to the opto couples either via a separate power source or the internal 5V from Pin 3..

IMD23 motor is not moving

Verify that the 5V is being supplied to Pin 8.

9. Appendix A

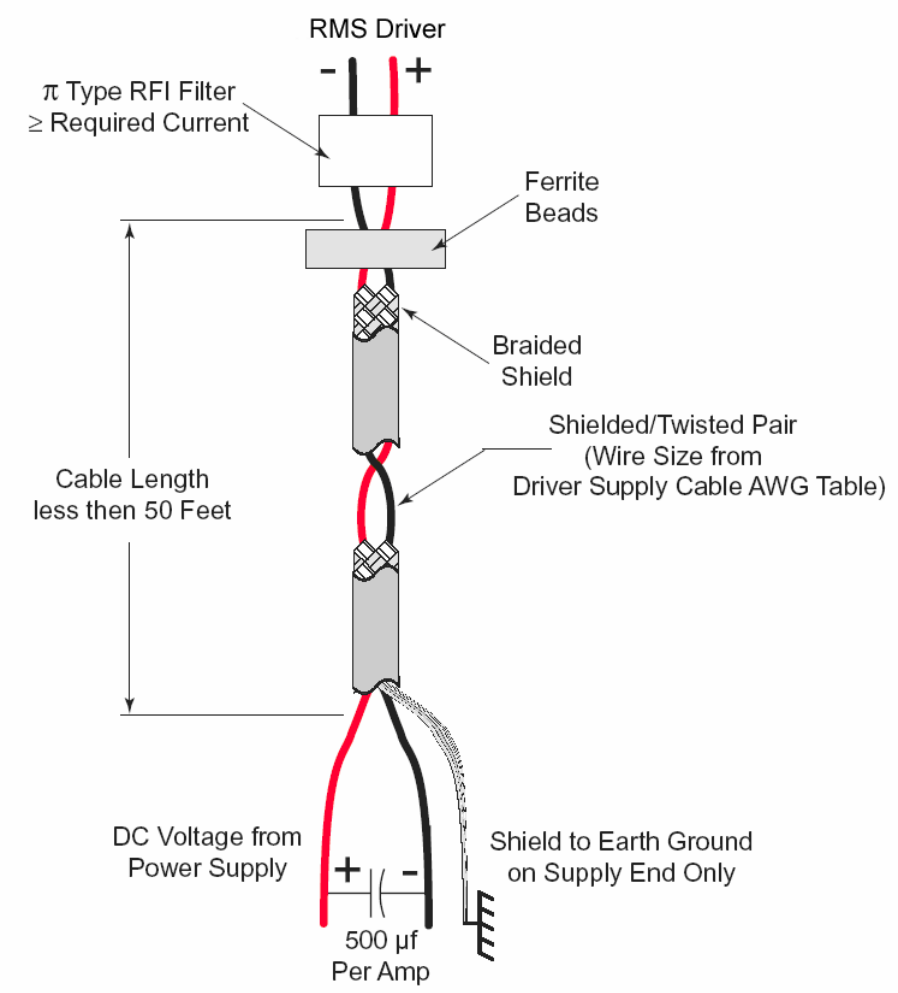
Recommended Cable Configurations: DC Supply to Driver

Cable length, wire gauge and power conditioning devices play a major role in the performance of your RMS Technologies Driver and Motor.

NOTE: The length of the DC power supply cable to the Driver should not exceed 50 feet.

Example A demonstrates the recommended cable configuration for DC power supply cabling under 50 feet long. If cabling of 50 feet or longer is required, the additional length may be gained by adding an AC power supply cable (see Examples B & C).

Correct AWG wire size is determined by the current requirement plus cable length. Please see the Driver Supply Cable AWG Table in this Appendix.



NOTE: These recommendations will provide optimal protection against EMI and RFI. The actual cable type, wire gauge, shield type and filtering devices used are dependent on the customer's application and system.

Driver Supply Cable AWG Table					
1 Amp (Peak)					
Length (Feet)	10	25	50*	75*	100*
Minimum AWG	20	20	18	18	16
2 Amp (Peak)					
Length (Feet)	10	25	50*	75*	100*
Minimum AWG	20	18	16	14	14
3 Amp (Peak)					
Length (Feet)	10	25	50*	75*	100*
Minimum AWG	18	16	14	12	12
* Use the alternative methods illustrated in Examples B and C when the cable length is ≥ 50 feet. Also, use the same current rating when the alternate AC power is used					

Driver Supply Cable Wire Size

NOTE: Always use Shielded/Twisted Pairs for the Driver DC Supply Cable, the AC Supply Cable and the Driver to Motor Cable.