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OSC-462H

ANALOG SPEED CONTROL BOARD
FOR IB462HE STEPPING MOTOR DRIVERS

OPERATING INSTRUCTIONS

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IB462He Half/Full Step Driver Hybrid Operating Instructions
Revision 05.24.2004

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The OSC-462H Variable Speed Control

Section Overview

The purpose of this appendix is to aquaint the user with the OSC-462H variable speed control optional add-on for the IB462He driver hybrid. Covered are:

- OSC-462H Features
- OSC-462H Specifications
- Installation and Wiring
- The Analog Speed Control Configuration Utility
- Configuring the OSC-462H
- Application Example

OSC-462H Features

The OSC-462H Analog Speed Control Interface Board offers the system designer the capability of adding low cost, intelligent velocity control to the functionality of the IB462He Half/Full Step Hybrid motor driver. The IB462He plugs easily into a 21 pin receptacle on the bottom-side of the interface board.

The OSC-462H features a tunable digital oscillator for accurate velocity control. This oscillator has an output frequency range of 0 - 60 kilohertz. The output frequency of the oscillator will vary with the level of the 0 to +5 volt speed control input.

The speed control board has 10 setup parameters which are configured using an included software utility. This utility enables the user to communicate to the OSC-462H via its Serial Peripheral Interface (SPI) to set up the operational parameters.

The OSC-462H is powered by a single +12 to +48 VDC power supply, which will also provide power to the IB462He driver.

The OSC-462H may be configured to be used with a joystick or as a linear velocity device. A joystick or potentiometer is connected between the on-board +5 VDC output and the speed control input. The joystick center position may then be set using the configuration utility to the desired position, which will be seen by the OSC-462H as a zero reference position. Moving the joystick will then control the axis speed and direction.

To use velocity mode, a 10 kOhm potentiometer or 0 to +5 VDC reference voltage is used to control the axis velocity and the center position is set to 0. The velocity will vary between a user configured initial velocity and a maximum velocity with voltage level applied to the input. Axis direction is controlled by the direction input.

In addition to this powerful array of features, the OSC-462H has buffered step clock and direction outputs to facilitate cascading of drives. These outputs will follow the primary step clock and direction outputs of the speed control board.

Interface wiring is accomplished using a convenient 15 pin removable screw terminal (P1). The parameter setup cable simply plugs into the 10 pin IDC header (P3) and your PC parallel port.

The OSC-462H allows for a simple, cost effective solution in applications requiring variable velocity or joystick control.

The OSC-462H features:

- Digital oscillator for accurate speed control.
- Low cost.
- Extremely compact (2.54 x 1.69 x 1.02 inches)(64 x 43 x 26 mm).
- May be configured for Joystick and Velocity operation.
- 0 to +5 VDC speed control input.
- Step clock & direction outputs for cascading multiple drives.
- Single supply.
- Included graphical user interface (GUI) for parameter setup.
- Serial Peripheral Interface (SPI) communications interface.
- 15 pin removable screw terminal interface.
- Optional Mounting L-Bracket (MB-21).

OSC-462H Specifications

Mechanical Specifications

Dimensions in Inches (mm)

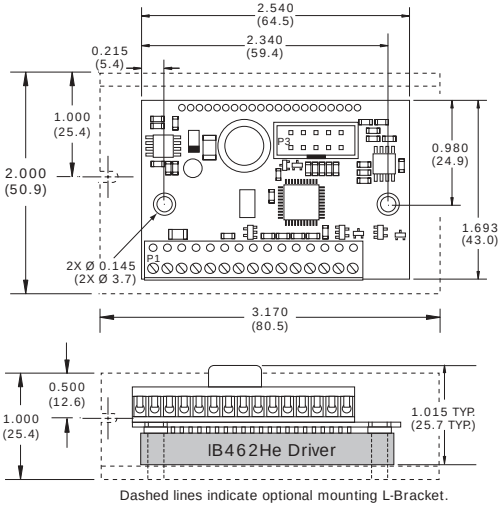


Figure 1: OSC-462H Dimensional Information

Thermal Specifications

Specification	Unit
Ambient Temperature	0 to +50°C
Storage Temperature	-40 to +125°C
Maximum Plate Temperature	70°C

Table 1: OSC-462H Thermal Specifications

Electrical Specifications

Specification	Test Condition	Min	Typ	Max	Unit
Speed Control Input Voltage		0		5	V
A/D Resolution			10		Bit
Speed Control Potentiometer Resistance			10		kΩ
Input Voltage (+V)		12		48	V
Phase Output Current*	Per Phase (IB462He Driver)	0.1		2	A
Low Level Input Voltage	Stop/Start, Direction and Step Clock	-0.5		1.5	V
High Level Input Voltage	Stop/Start, Direction and Step Clock	3.0		5.5	V
Low Level Input Voltage	Enable	0.5		1.65	V
High Level Input Voltage	Enable	3.85		5.5	V
Input Pull-up Resistance (to +5 VDC)	Stop/Start, Direction Step Clock, Enable		4.99		kΩ
Output Drain-Source Voltage	Direction and Step Clock Outputs			80	V
Output Drain Current	Direction and Step Clock Outputs			120	mA
Drain-Source On-Resistance	Direction and Step Clock Outputs			6	Ω

Table 2: OSC-462H Electrical Specifications

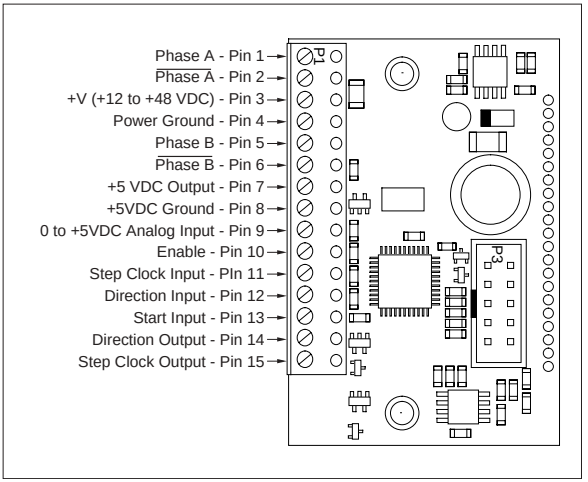


Figure 2: OSC-462H Connector P1 Pin Configuration

Pin #	Pin Name	Description
1	Phase A	Phase A of the stepping motor.
2	Phase $\overline{A}$	Phase $\overline{A}$ of the stepping motor.
3	+V (+12 to 48 VDC)	+12 to +48 VDC unregulated power supply input.
4	Power Ground	Power supply ground (return).
5	Phase B	Phase B of the stepping motor.
6	Phase $\overline{B}$	Phase $\overline{B}$ of the stepping motor.
7	+5VDC Output	+5VDC output (10kΩ potentiometer signal end).
8	Logic Ground	+5V Ground (10kΩ potentiometer ground end).
9	Speed Control Input	0 to +5VDC velocity control input (10kΩ potentiometer wiper).
10	Enable Input	Active HIGH driver enable input.
11	Step Clock Input	Step clock input. Internally pulled-up to +5VDC.
12	Direction Input	CW / CCW direction input. The function of this input is dependant on the mode specified by the MODE instruction. Internally pulled-up to +5VDC.
13	Stop / $\overline{\text{Start}}$ Input	Active LOW Stop / $\overline{\text{Start}}$ Input toggles the internal step clock generator. The function of this input is specified by the MODE instruction. Internally pulled-up to +5VDC.
14	Direction Output	Buffered direction output.
15	Step Clock Output	Buffered step clock output.

Table 3: OSC-462H Connector P1 Pin Assignment and Description

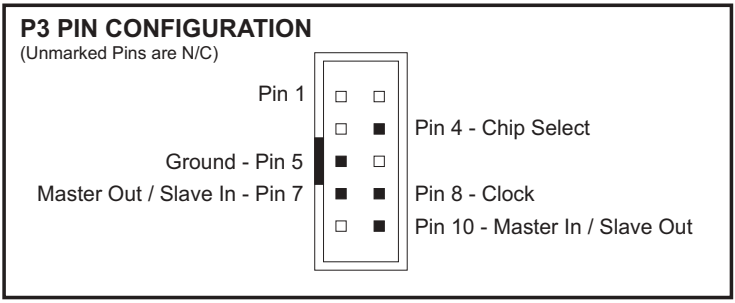


Figure 3: Connector P3 Pin Configuration

NOTE: Recommended Parameter Setup Cable:
IMS Part # OSC-CC100-000

P3 - 10 Pin IDC Header Pin Assignment And Description		
Pin #	**Function**	**Description**
1	N/C	No Connect
2	N/C	No Connect
3	N/C	No Connect
4	$\overline{CS}$	Chip Select
5	GND	Communications ground.
6	N/C	No Connect
7	MOSI	Master Out/Slave In
8	CLK	Step Clock
9	N/C	No Connect
10	MISO	Master In/Slave Out

Table 4: Connector P3 Pin Assignment and Description

NOTE: See IB462He Operating Instructions for IB462He pin configuration and specifications!

Mounting the OSC-462H

The OSC-462H/IB462He must be mounted to a heat sink in order to maintain a rear plate temperature of less than 70°C on the IB462He driver.

The first installation step is to insert your IB462He into the OSC-462H P2 connector located on the bottom side of the OSC-462H board. When inserting, the rear plate will be facing away from the OSC-462H PCB (Figure 4).

The second step is to mount the IB462He/OSC-462H assembly to a heat sink plate (Figure 5). Included with your IB462He driver is the thermal isolating pad TI-462H. This isolating pad **MUST** be positioned between the IB462He

rear plate and the heat sink surface! For additional mounting configurations, an L-bracket is also available as an option.

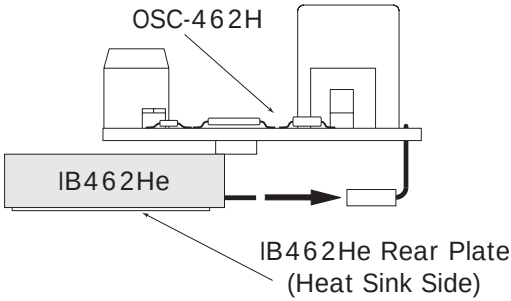


Figure 4: Inserting the IB462He into the OSC-462H

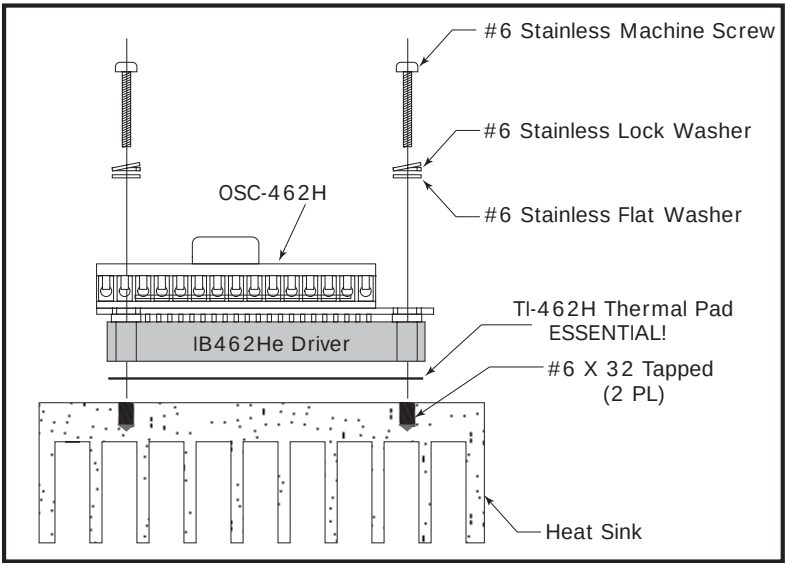


Figure 5: Mounting the IB462He/OSC-462H Assembly

NOTE: The #6 Mounting Screw Torque is 5.0 to 7.0 lb-in. (0.6 to 0.8 N-m)

WARNING: The Heat Sink mounting surface must be smooth, flat, and free from burrs, protrusions, cuttings, or other foreign objects.

OSC-462H Wiring and Connections

Wiring Specifications

P1: Power, Motor, Control Signals

The OSC-462H uses a removeable 15 pin screw terminal for wiring connection. The following wiring practices are recommended when connecting to the OSC-462H:

- Wire Size: 18 - 26 AWG
- Strip Length: 0.197" (5mm)
- Screw Torque: 3.0 lb-in (0.33 N-m)

P3: SPI Communications

The SPI communications connector uses a 10 pin IDC header. The recommended method of connecting to this connector is the Parameter Setup Cable OSC-CC100-000.

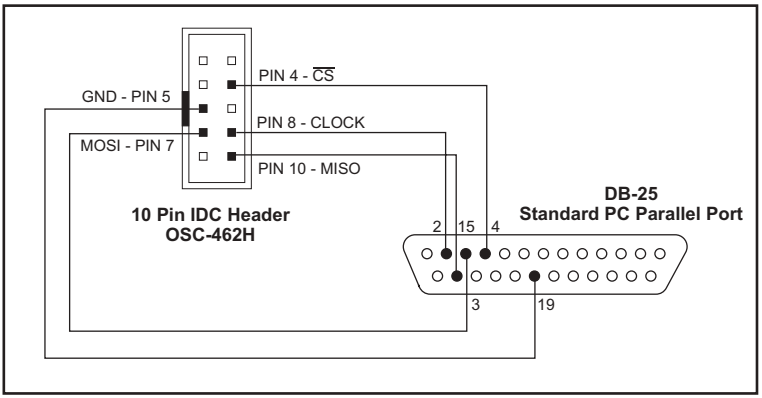


Figure 6: Connecting the SPI Interface

Power and Motor Connection and Specifications

Motor Power/Ground (+V - Pin 3, GND - Pin 4)

Motor power for the OSC-462H/IB462He assembly will have the same recommended specifications as found in the Power Supply recommendations for the IB462He.

The power supply ground will be connected to Pin 4 (GND) and the DC output to Pin 3 (+V). See the *Minimum Required Connections* figure in this appendix for a connection diagram.

Stepping Motor (ØA - Pins 1 & 2, ØB - Pins 5 & 6)

Motor selection for the OSC-462H/IB462He will have the same recommended specifications as the IB462He.

See the *Minimum Required Connections* figure in this document for a connection diagram.

Input Connections

Speed Control Input (Pin 9)

The Speed Control input is the input by which the internal step clock frequency, hence the velocity of the axis, is controlled.

This 0 - 5 volt analog input will typically be interfaced using a 10kΩ potentiometer as illustrated in Figure 2.2.7, a joystick wiper or by a 0 to 5V (4 - 20 mA) analog output. If a constant velocity is desired, the speed control input can be connected directly to the +5VDC output and the desired velocity set using the VM parameter. When at 0 volts + DB (value of the potentiometer deadband parameter) the step clock frequency will be at the value specified by the initial velocity (VI) parameter. When at FS (the value specified by the full

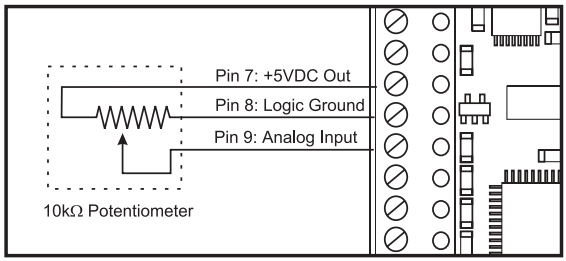


Figure 7: Interfacing the Speed Control Input with a Potentiometer

scale parameter), it will be at the value specified by the maximum velocity (VM) parameter. See *Setting the Initial/Maximum Velocity*, for more details.

Recommended Potentiometer

Bourns 53AAA-B28-B15. This is available from Digikey (P/N 53AAA-B28-B15-ND) and Newark Electronics (Stock No. 90F6563).

Enable Input (Pin 10)

The enable input is internally pulled-up to +5VDC through a 4.99kΩ resistor. When HIGH, or disconnected, the driver outputs are enabled. A LOW will disable the driver outputs. This input is independent of the step clock input.

This input may be connected by means of a switch between the input (Pin 10) and logic ground (Pin 8) or a sinking output.

Step Clock (Pin 11)

The Step Clock input is internally pulled-up to +5VDC through a 4.99kΩ resistor. This input would be used if an external 0 - 40kHz clock input is being used as a motion clock for the IB462He. This input will increment the motor **only** if the /Start input is in a logic HIGH (internal oscillator stopped) state. The Direction input will function normally.

Direction (Pin - 12)

The CW/CCW direction input is internally pulled-up to +5VDC through a 4.99kΩ resistor.

This input may be connected by means of a switch between the input (Pin 12) and logic ground (Pin 8) or a sinking output.

NOTE: The physical direction of the motor with respect to the direction input will depend upon the connection of the motor windings.

/Start (Pin 13)

The Stop/Start input is internally pulled-up to +5VDC through a 4.99kΩ resistor. When in a logic HIGH, or disconnected, state the internal step clock generator will be off. Connecting this input to logic ground (pin 8) or a sinking output in a LOW state will enable the internal step clock oscillator.

This input may be controlled by means of a switch between the input (pin 13) and logic ground (pin 8) or a sinking output.

NOTE: The Stop/Start input must be in the stopped position (logic HIGH) in order to use an external step clock to index the motor.

Output Connections

+5VDC Output (Pin 7)

The +5VDC output is to be connected to the signal end of the 10kΩ potentiometer used to control velocity **only**.

WARNING! It is not the design intent of the +5VDC output to supply power to external loads! This voltage output is only to be used to supply voltage to the internal circuitry of the OSC-462H/IB462He assembly and the speed control input!

Direction Output (Pin 14)

The Direction output is buffered through an open-drain N-channel FET. This output will follow the direction input.

Step Clock Input (Pin 15)

The Step Clock output is buffered through an open-drain N-channel FET. This output will follow the step clock signal.

Minimum Required Connections

The following connections illustrated in Table 5 and Figure 8 are required to operate the OSC-462H/IB462He assembly.

P1 - 15 Pin Screw Terminal		
Pin #	**Function**	**Description**
1	Phase A	Phase A of the stepping motor.
2	Phase $\overline{A}$	Phase $\overline{A}$ of the stepping motor.
3	+V (+12 to 48VDC)	+12 to +48VDC unregulated power supply input.
4	Power Ground	Power supply ground (return).
5	Phase B	Phase B of the stepping motor.
6	Phase $\overline{B}$	Phase $\overline{B}$ of the stepping motor.
7	+5VDC Output	+5VDC output (10kΩ potentiometer signal end).
8	Logic Ground	+5V ground (10kΩ potentiometer ground end).
9	Speed Control Input	0 to +5VDC velocity control input (10kΩ potentiometer wiper).
12	Direction Input	CW/CCW direction input. Internally pulled-up to +5VDC.
13	$\overline{\text{Start}}$ Input	Active LOW $\overline{\text{Start}}$ input enables the internal step clock generator. Internally pulled-up to +5VDC.
P3 - 10 Pin IDC Header		
4	$\overline{CS}$	$\overline{\text{Chip Select}}$.
5	GND	Ground.
7	MOSI	Master Out/Slave In.
8	CLK	Clock.
10	MISO	Master In/Slave Out.

Table 5: OSC-462H Required Connections

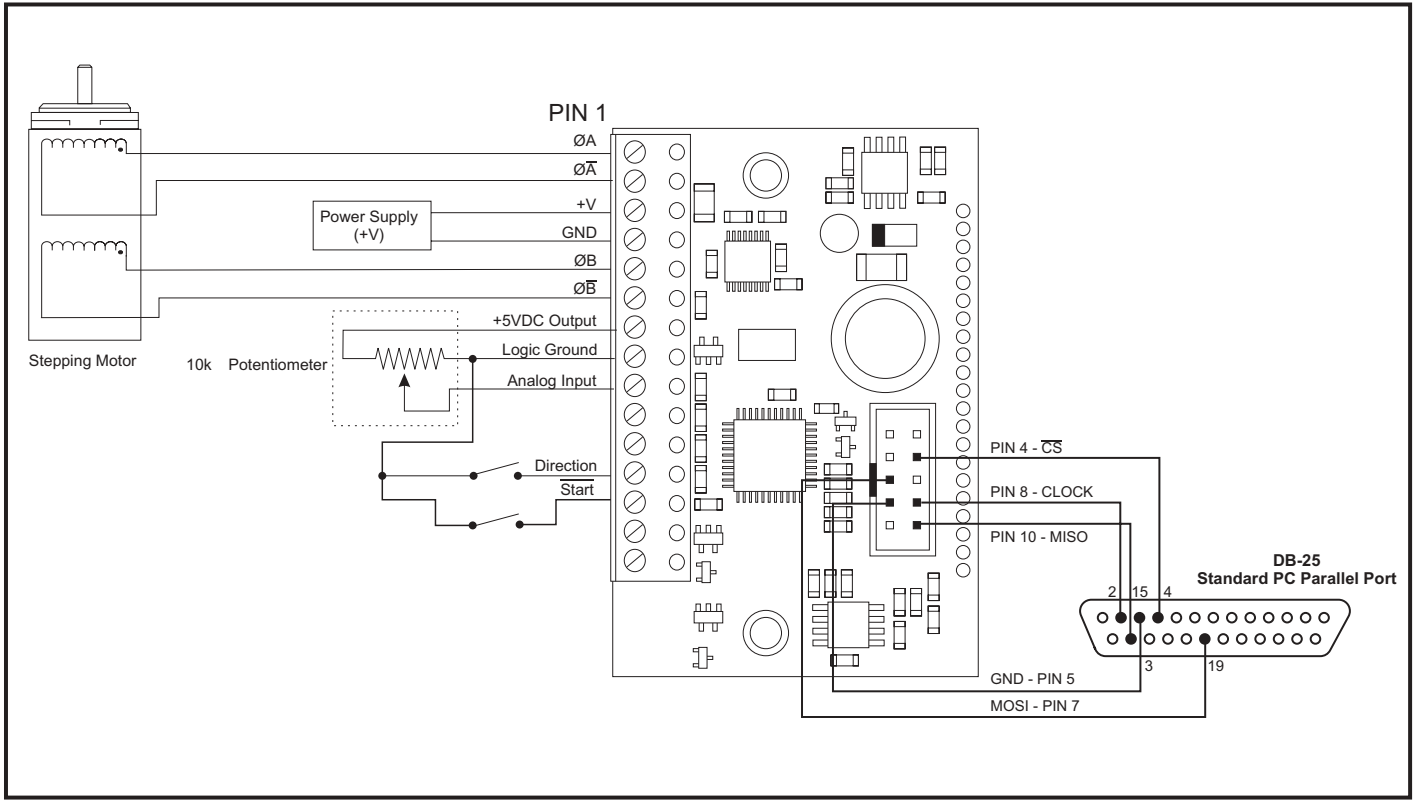


Figure 8: IB462He/OSC-462H Minimum Connections

Configuring The OSC-462H

Using the Configuration Utility

The IMS Analog Speed Control Configuration Utility is an easy to install and use software program. Use of this utility is required in order to configure the OSC-462H. It is included on the CD that ships with the OSC-462H or is available for download at *www.imshome.com.* This utility features the following:

- Easy installation.
- Ease of use via single screen interface.
- Automatic communication configuration.
- Will not allow out-of-range values to be set.
- Tool-tips display valid range settings for each option.

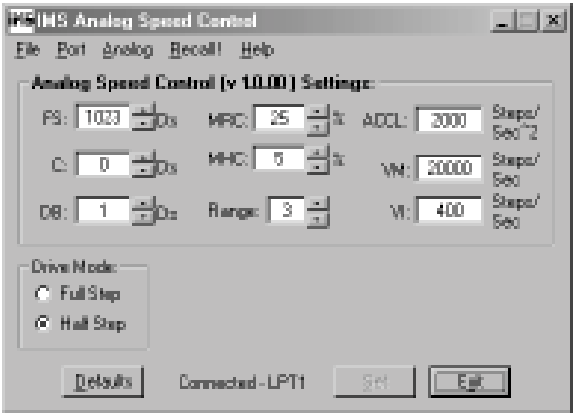


Figure 9:OSC-462H Configuration Utility Screen

Installation

To install and use the configuration utility a Pentium class or higher PC running Windows 98, NT 4.0 or 2000 is required. The installation procedure is:

1] Place the CD in your CD-ROM drive, the 3.5" CD will work in any horizontally mounted tray type drive.
2] On the Start Menu, click, "Start>Run".
3] Type the following into the text box: X:\OSC462\Setup.exe (Replace the "X" with the letter which designates your CD-ROM drive).
4] Follow the on-screen prompts to complete the installation.

Start-up

Select "Start>Programs>Analog Speed Control>Analog Speed Control". The Configuration Utility will automatically scan your LPT ports for the connected OSC-462H/IB462He assembly and configure communications.

The connection status and port are displayed at the bottom of the configuration screen (See Figure 8).

NOTE: It is only possible to configure the OSC-462H when the /Start input is in the “Stopped” state!

Configuration Parameters Explained

There are 10 configuration parameters for the OSC-462H. Parameter settings are automatically saved to memory when the “SET” button is clicked on the Configuration Utility screen.

Table 6 summarizes the parameters and their function, range, units and default setting.

Acceleration (ACCL)

The ACCL parameter sets the acceleration and deceleration in steps per second^2. If the IB462He is in half step mode (STEP=H) the acceleration/deceleration will be in half steps per second^2. If in full step mode (STEP=F) then the units for ACCL will be in full steps per second^2.

Joystick Center Position (C)

The parameter sets the center position of the joystick. It can be set by two methods. Using method one the user will manually enter a value between 0 (default) and 1022 into the parameter box. This count will represent the voltage that the OSC-462H will interpret as the zero-reference position. Any

OSC-462H Parameters				
Parameter	**Function**	**Range**	**Units**	**Default**
ACCL	Acceleration/Deceleration	2000-65000	Steps/sec^2	2000
C	Joystick Center Position	0 to 1022 (0.005 to 4.995)	Counts (Volts)	0 (0.000)
DB	Potentiometer/Joystick Deadband	0 to 255 (0.000 to 1.245)	Counts (Volts)	1 (0.005)
FS	Full Scale of the Potentiometer/Joystick	1 to 1023 (0.005 to 4.995)	Counts (Volts)	1023 (4.995)
MHC	Motor Holding Current	0 - 100	Percent	5
MRC	Motor Run Current	1 - 100	Percent	25
RANGE	VI / VM Range Setting	1 - 8	-	3
STEP	Half/Full Step Operation Select	H or F	-	H
VI	Initial Velocity	1-60000	Steps/sec.	800
VM	Maximum Velocity	1-60000	Steps/sec.	20000

Table 6: OSC-462H Parameter Summary

voltage seen on the speed control input will accelerate from 0 to the maximum set velocity. See the setup procedure located in “Setting the Configuration Parameters”, the next sub-section of this document.

> **NOTE:** In order to acheive the maximum set velocity (VM) on both sides of the joystick center position, the “C” parameter must be set between 500 and 900 counts (2.441 and 4.395 volts).

Potentiometer Deadband (DB)

The DB parameter sets the deadband of the potentiometer. The range for this parameter is a relative term as the actual deadband value is based upon the settings of the VI and VM parameters. The deadband is the amount of deflection seen on the potentiometer until the velocity is changed. With DB=1 it is possible that the motor will oscillate between two velocities. This can be eliminated by setting the deadband to a higher value.

Note that when the voltage seen at the speed control input is ≤ 0.005V, the step clock output of the oscillator will be 0. When the potentiometer or joystick deflects to the level specified by the DB parameter the axis will start to accelerate, beginning at the velocity specified by the VI, or initial velocity parameter.

> **USAGE NOTE:** If the motor oscillates between two velocities, increase the potentiometer deadband to a higher value. This will add coarseness to the pot and eliminate the oscillation.

Full Scale (FS)

The full scale parameter sets the deflection of the potentiometer or joystick. While the min/max range of the speed control input is 0 to 1023 counts (0.005 to 4.995 volts) (0 counts = no motion, 1023 counts = max velocity, or VM) the user has the option of setting the full scale to a different value. For instance, setting FS=500 counts (2.411 volts) will cause the OSC-462’s oscillator to output the appropriate step clock frequency set for VM when the voltage on the speed control input is 2.441V.

Motor Holding Current (MHC)

The MHC parameter sets the motor holding current as a percentage of the full output current of the driver. If the hold current is set to 0, the output circuitry of the driver will disable when the hold current setting becomes active.

The hold current setting becomes active 200ms following the last step clock pulse.

Motor Run Current (MRC)

The Motor Run Current (MRC) parameter sets the motor run current to a percentage of the full output current of the driver.

Velocity Range (RANGE)

The RANGE parameter specifies the maximum ranges available for the initial velocity (VI) and the maximum velocity (VM). When the range is set to a value, the VI and VM parameters will automatically default to the value specified by the range setting. The value of VI and VM can then be set within the range specified by RANGE. Table 7 illustrates the range settings.

Range Parameter Settings								
Range	1	2	3	4	5	6	7	8
VI	200	100	50	20	10	5	2	1
VM	100000	50000	25000	10000	5000	2500	1000	500

Table 7: RANGE Parameter Values

Half/Full Step Mode (STEP)

The STEP parameter specifies the mode of operation for the IB462He, either half step or full step.

Initial Velocity (VI)

The VI parameter establishes the initial velocity of the controlled axis in steps per second. The setting of this parameter represents the slowest speed the motor will turn. This is the velocity of the axis when the voltage on the speed control input = 0V. The valid settings for VI is dependent on the RANGE setting.

Maximum Velocity (VM)

The VM parameter establishes the maximum velocity of the controlled axis in steps per second. The setting of this parameter represents the highest speed that the motor will turn. This is the velocity of the axis when the voltage on the speed control input = 5V. The valid setting for VM is dependent on the RANGE setting.

Setting the Configuration Parameters

In order to follow the procedures set forth in this subsection, the following is necessary:

- The Parameter Setup Cable (MX-CC300-000) or equivalent must be connected between your PC Parallel (Printer) Port and the 10 pin IDC connector (P3) on the OSC-462H.
- The Analog Speed Control configuration utility must be installed and operating on your PC. Correct connection of the device and operation of the software will be indicated by a “Connected - LPTx” message at the bottom of the configurator screen.
- The Stop/Start input must be in a HIGH (Disconnected, Stopped) state.

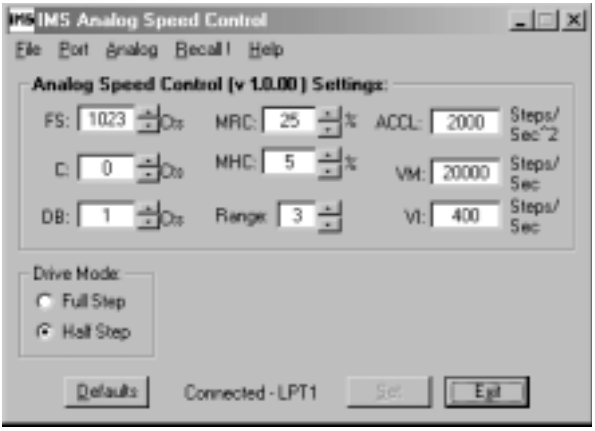


Figure 10:OSC-462H Configuration Utility Screen

Setting the OSC-462H Up For Velocity

When operating as a velocity device the OSC-462H will output step clock pulses to the IB462He driver. The initial and maximum frequency of these pulses, and the rate which they accelerate between these values is established by the following four parameters:

1] Initial Velocity (VI)

2] Maximum Velocity (VM)

3] Acceleration (ACCL)

4] Velocity Range (RANGE)

Set the Run Current (MRC) and the Holding Current (MHC) to the desired value. See the IB462He manual and the documentation from your motor's manufacturer for information on determining the output current

When using the OSC-462H in this fashion the settings for FS, C and DB will likely be left in their default state. These three parameters may be displayed as either counts or volts. The displayed value is changed by clicking the "Cts" to the right of the parameter's text box. It may be changed from volts back to counts by clicking "volts".

If the motor oscillates between frequencies, increase the potentiometer deadband (DB). If desired these may be changed. For example: Setting the FS parameter to 511 would configure the OSC-462H such that it will be at maximum velocity when the potentiometer is at 1/2 of its full deflection.

Test the settings by pulling the Stop/Start input to ground by means of a switch or sinking output. Turn the potentiometer between its stops, the motor should accelerate and decelerate between the VI and VM settings. Note that there will be no motion at the zero reference point of the potentiometer. The motion will not start until the speed control input sees the voltage equivalent of 0 + DB.

Fine-tune the ACCL, VI, VM and RANGE settings to the requirements of your application. Clicking the "Set" button saves the parameter settings to nonvolatile memory.

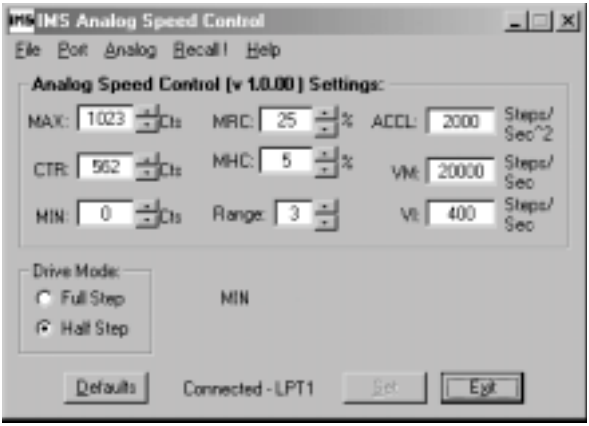


Figure 11: Intitialization Mode

Setting the OSC-462H as a Joystick Interface

When operating as a joystick interface it is necessary that the joystick be calibrated. First, a joystick center position must be established, as well as the full scale range of the joystick in two directions. The following steps outline the joystick calibration procedures.

1] With the joystick in the center position, click "Analog>Initialize" on the menu bar.

2] Move the joystick to its full scale position, first in the max direction, then in the min direction. Re-center the joystick.

3] Click the "Accept" button.

4] Set the other parameters to the desired value.

5] Click the "Set" button to save the parameter settings to the OSC-462H NVM.

Application Example #1: Sample Connection and External Step/Direction

This application example shows the OSC-462H/IB462He connected to an external step clock/direction source, in this case a LYNX Control Module. The IB462He's motion can be controlled by the LYNX, or third party motion controller with TTL or sinking (NPN) outputs. The OSC-462H responds to step clock and direction inputs when the /Start input is left N/C.

This same configuration applies if the OSC-462H is being used as a joystick interface. The joystick connects the same as the potentiometer.

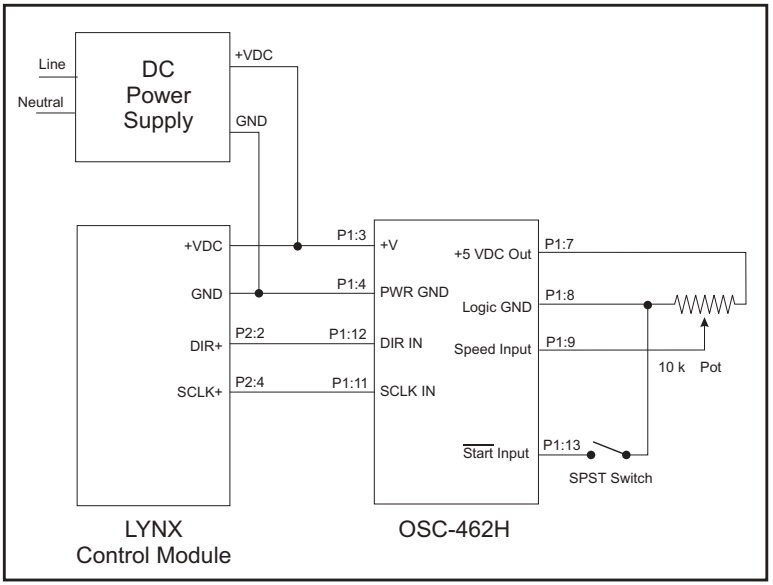


Figure 12: OSC-462H Application Example #1

Application Example #2: Sample Connection of OSC-462 to Additional Half/Full Step Driver

This application sample shows a secondary IB series drive, such as an IB463 or IB1010, cascaded off of the OSC-462H step clock and direction outputs. Connected in this fashion the secondary driver will "follow" the primary drive, the IB462He.

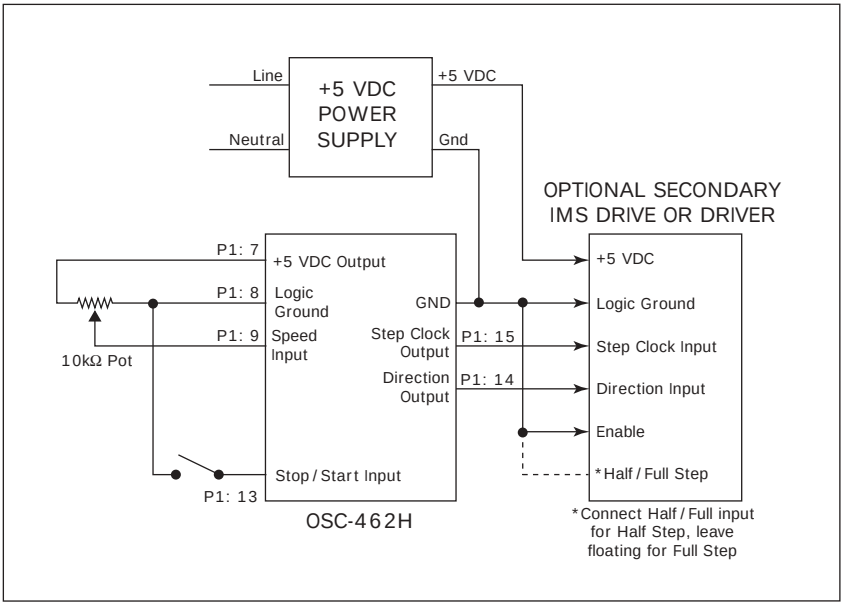


Figure 13: OSC-462H Application Example #2

APPENDIX a

Recommended Cable Configurations: DC Supply to IMS Driver

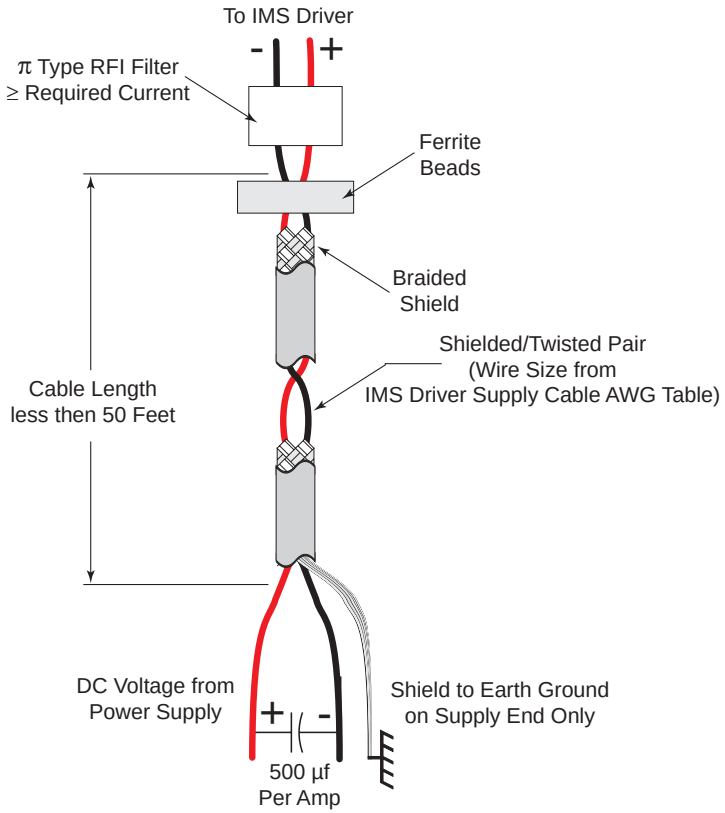
Cable length, wire gauge and power conditioning devices play a major role in the performance of your IMS Driver and Motor.

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

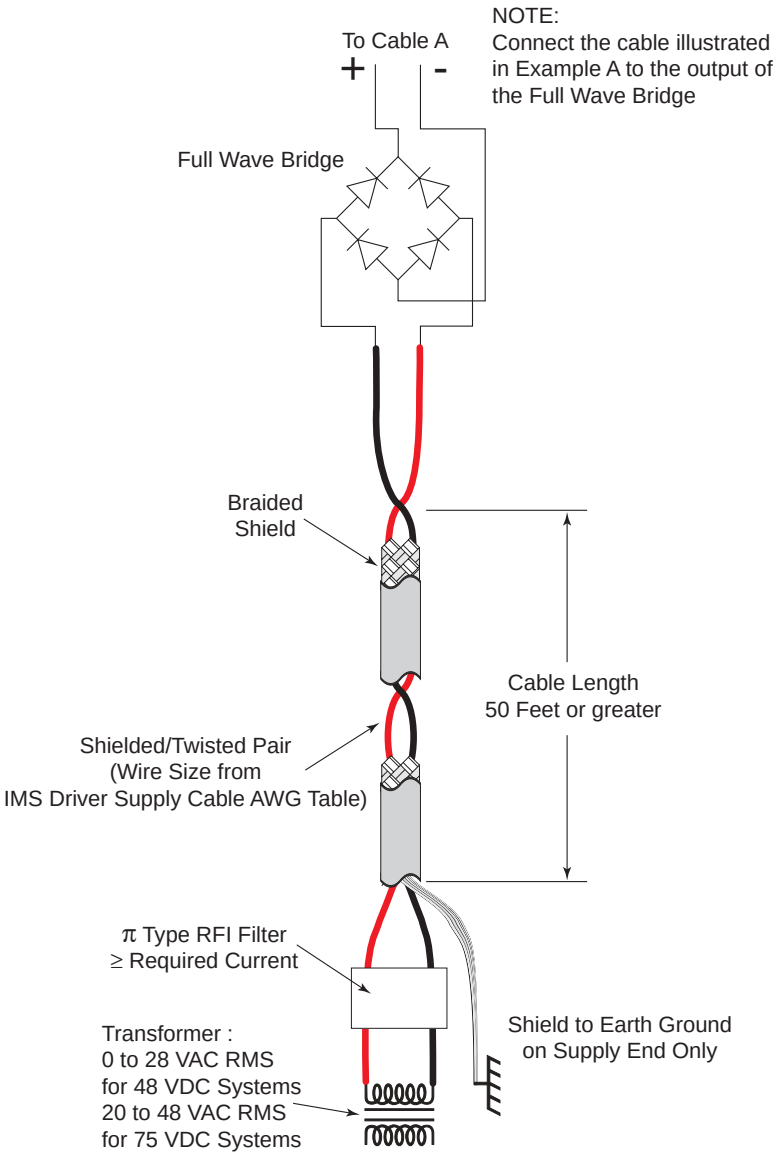
Example A demonstrates the recommended cable configuration for DC power supply cabling under 50 feet long. If cabling of 50 feet or longer is required, the additional length may be gained by adding an AC power supply cable (see Examples B & C).

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

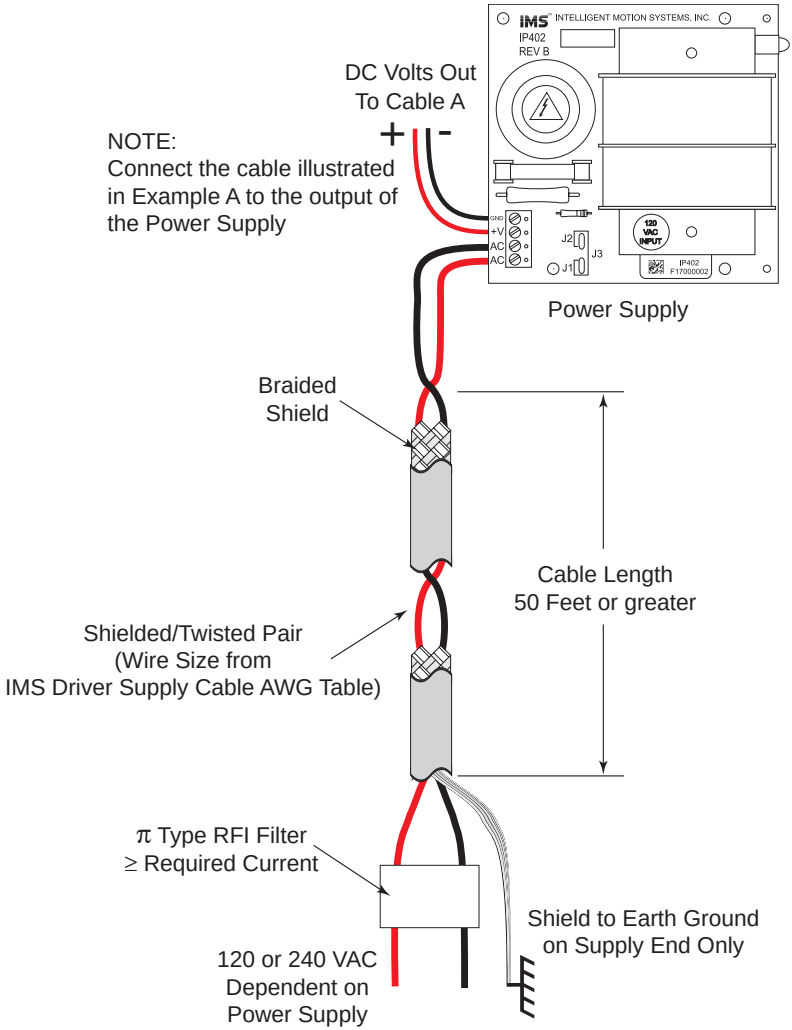
Example A – Cabling Under 50 Feet, DC Power



Example B – Cabling 50 Feet or Greater, AC Power to Full Wave Bridge



Example C – Cabling 50 Feet or Greater, AC Power to Power Supply



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.

IMS Driver Supply Cable AWG Table					
1 Ampere (Peak)					
Length (Feet)	10	25	50*	75*	100*
Minimum AWG	20	20	18	18	16
2 Amperes (Peak)					
Length (Feet)	10	25	50*	75*	100*
Minimum AWG	20	18	16	14	14
3 Amperes (Peak)					
Length (Feet)	10	25	50*	75*	100*
Minimum AWG	18	16	14	12	12
4 Amperes (Peak)					
Length (Feet)	10	25	50*	75*	100*
Minimum AWG	18	16	14	12	12
* Use the alternative methods illustrated in Examples A and B 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 IMS Driver DC Supply Cable, the AC Supply Cable and the IMS Driver to Motor Cable.

Recommended Cable Configurations: IMS Driver to Motor

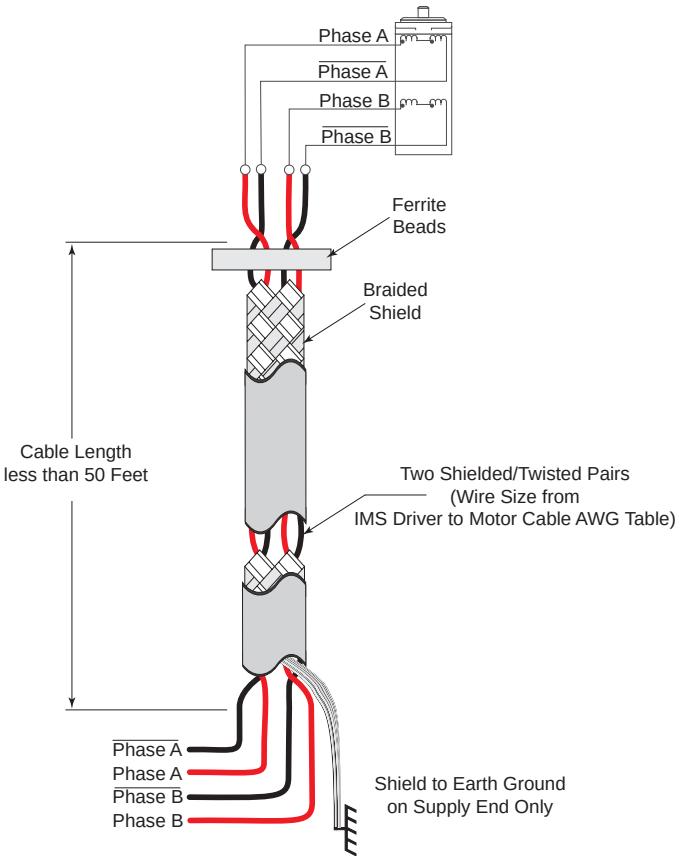
Cable length, wire gauge and power conditioning devices play a major role in the performance of your IMS Driver and Motor.

NOTE: The length of the DC power supply cable between the IMS Driver and the Motor should not exceed 50 feet.

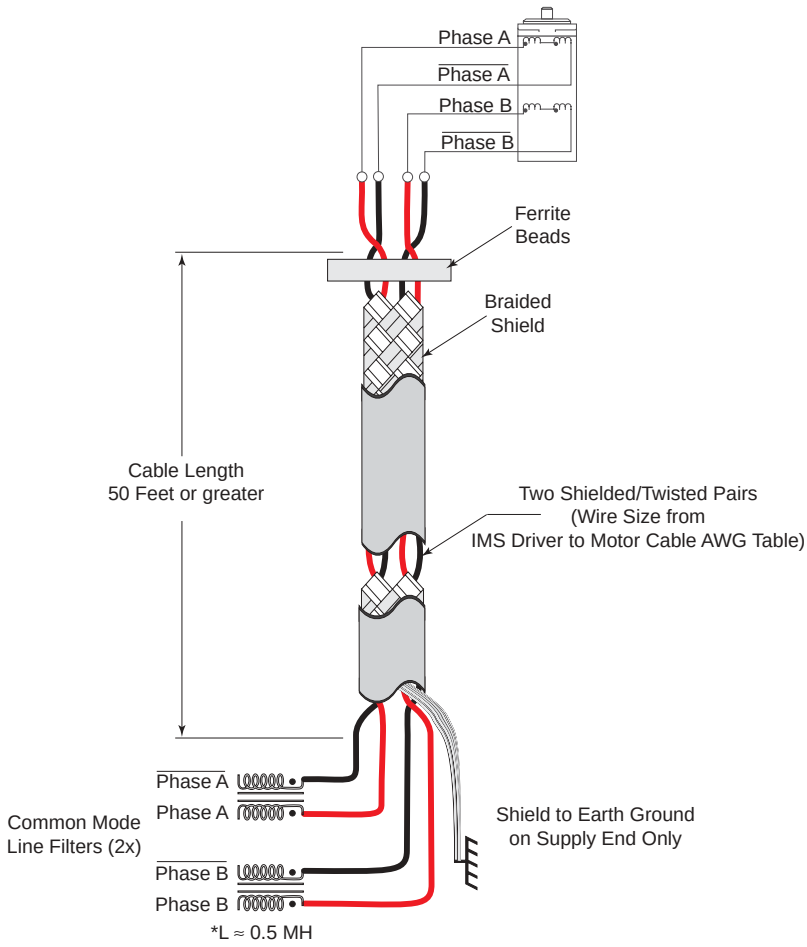
Example A demonstrates the recommended cable configuration for the IMS Driver to Motor cabling under 50 Feet long. If cabling of 50 feet or longer is required, the additional length can be gained with the cable configuration in Example B.

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

Example A - Cabling Under 50 Feet, IMS Driver to Motor



Example B - Cabling 50 Feet or Greater, IMS Driver to Motor



* 0.5 MH is a typical starting point for the Common Mode Line Filters. By increasing or decreasing the value of L you can set the drain current to a minimum to meet your requirements.

IMS Driver to Motor Cable AWG Table												
1 Ampere (Peak)						5 Amperes (Peak)						
Length (Feet)	10	25	50*	75*	100*	Length (Feet)	10	25	50*	75*	100*
Minimum AWG	20	20	18	18	16	Minimum AWG	16	16	14	12	12
2 Amperes (Peak)						6 Amperes (Peak)						
Length (Feet)	10	25	50*	75*	100*	Length (Feet)	10	25	50*	75*	100*
Minimum AWG	20	18	16	14	14	Minimum AWG	14	14	14	12	12
3 Amperes (Peak)						7 Amperes (Peak)						
Length (Feet)	10	25	50*	75*	100*	Length (Feet)	10	25	50*	75*	100*
Minimum AWG	18	16	14	12	12	Minimum AWG	12	12	12	12	12
4 Amperes (Peak)						* Use the alternate method illustrated in Example B when cable length is ≥ 50 feet.						
Length (Feet)	10	25	50*	75*	100*							
Minimum AWG	18	16	14	12	12							

Driver to Motor Supply Cable Wire Size

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.

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

WARRANTY

TWENTY-FOUR (24) MONTH LIMITED WARRANTY

Intelligent Motion Systems, Inc. ("IMS"), warrants only to the purchaser of the Product from IMS (the "Customer") that the product purchased from IMS (the "Product") will be free from defects in materials and workmanship under the normal use and service for which the Product was designed for a period of 24 months from the date of purchase of the Product by the Customer. Customer's exclusive remedy under this Limited Warranty shall be the repair or replacement, at Company's sole option, of the Product, or any part of the Product, determined by IMS to be defective. In order to exercise its warranty rights, Customer must notify Company in accordance with the instructions described under the heading "Obtaining Warranty Service."

This Limited Warranty does not extend to any Product damaged by reason of alteration, accident, abuse, neglect or misuse or improper or inadequate handling; improper or inadequate wiring utilized or installed in connection with the Product; installation, operation or use of the Product not made in strict accordance with the specifications and written instructions provided by IMS; use of the Product for any purpose other than those for which it was designed; ordinary wear and tear; disasters or Acts of God; unauthorized attachments, alterations or modifications to the Product; the misuse or failure of any item or equipment connected to the Product not supplied by IMS; improper maintenance or repair of the Product; or any other reason or event not caused by IMS.

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This Limited Warranty shall be void if the Customer fails to comply with all of the terms set forth in this Limited Warranty. This Limited Warranty is the sole warranty offered by IMS with respect to the Product. IMS does not assume any other liability in connection with the sale of the Product. No representative of IMS is authorized to extend this Limited Warranty or to change it in any manner whatsoever. No warranty applies to any party other than the original Customer.

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OBTAINING WARRANTY SERVICE

Warranty service may obtained by a distributor, if the Product was purchased from IMS by a distributor, or by the Customer directly from IMS, if the Product was purchased directly from IMS. Prior to returning the Product for service, a Returned Material Authorization (RMA) number must be obtained. Complete the form at http://www.imshome.com/rma.html after which an RMA Authorization Form with RMA number will then be faxed to you. Any questions, contact IMS Customer Service (860) 295-6102.

Include a copy of the RMA Authorization Form, contact name and address, and any additional notes regarding the Product failure with shipment. Return Product in its original packaging, or packaged so it is protected against electrostatic discharge or physical damage in transit. The RMA number MUST appear on the box or packing slip. Send Product to: Intelligent Motion Systems, Inc., 370 N. Main Street, Marlborough, CT 06447.

Customer shall prepay shipping changes for Products returned to IMS for warranty service and IMS shall pay for return of Products to Customer by ground transportation. However, Customer shall pay all shipping charges, duties and taxes for Products

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