This is a Discontinued Product

Contact Kollmorgen Customer Support at 1-540-633-3545 or email us at support.kollmorgen.com if assistance is required.

Industrial Devices Corporation

iMpulse
microstepping drive

The Only Microstepping Drive with:

Open Loop Stall Detect^{TM} (OLSD^{TM})

Multi-Stepping^{TM}

Dynamic Smoothing^{TM}

Xtreme Smoothness^{TM}

Motion Node

User's Manual

P/N PCW-5181   Version 1.0

<u>Revision History</u>

Version: 1.0

April 2001

Industrial Devices Corporation (IDC) strives to maintain effective communication with all users and potential users of our products. If you have any questions or concerns regarding this technical manual or the product it covers, please contact:

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Chapter 1 - Impulse Overview

The Impulse is the latest microstepping drive from Industrial Devices Corporation and this innovative drive will move your applications with a combination of features previously unheard of in the motion control industry.

The Impulse is a self-contained microstepping drive designed to operate permanent-magnet linear and rotary hybrid step-motors. Its internal control hardware is based on a digital signal processor (DSP) operating a pair of IGBT power amplifiers. The Impulse is fully protected against short-circuits and overheating.

Responding to users who demand the ultimate in value and reliability, the Impulse employs the following features and performance enhancements:

Feature	Function
Open Loop Stall Detect^{TM}	Allows a motor to run without an encoder and still be able to detect a stall
Dynamic Smoothing^{TM}	Move profiles are smoothed to minimize jerk
Multi-Stepping^{TM}	For full-stepping with the smoothness of microstepping
Motion Node	7 simple moves can be stored in the Impulse and activated via inputs or serial port. This feature is optional.
Xtreme Smoothing^{TM}	6 component "gain" settings for low-speed smoothness, reduced vibration, and more usable torque
IDeal Performance Probe	Automatic fine-tuning of the Impulse for optimum performance with the con-figured motor
I/O Capabilities	4 configurable inputs and one configurable output provide the user with flexibility
Configurable I/O Polarity	I/O polarity can be set to Active High or Active Low ensuring compatibility with a wide range of controls
Diagnostic LED	Green for power ON/ENABLED, flashing green for DISABLED, red for ON/UNCONFIGURED, flashing red for FAULTS
Ultra-Compact Packaging	Top-notch performance, while consuming a minimal amount of space
Resolution	Up to 100,000 steps/rev
FLASH Firmware	Downloadable software facilitates quick upgrades over the internet
Current Reduction Modes	**Enable Stop** (current reduced to 75% of drive setting if no motion occurs during a user-programmed amount of time) **Enable Idle** (user-defined current reduction percentage if no motion occurs during a user-programmed amount of time)
Anti-Resonance	Provides optimum torque and nulls mid-range instability
Integrated Cooling Tunnel	For maximum performance and multiple drive mounting capability
Regenerative Circuit	Dumps excessive power during deceleration

This manual will enable you to 1) quickly setup and verify that your Impulse is operational, 2) configure and program the Impulse for your specific application, and 3) successfully troubleshoot possible performance problems.

Chapter 2 - Shipping Contents

Your Impulse will arrive equipped as listed in section #1. If any parts or accessories are missing, please call IDC Customer Support at: (800) 747-0064. Sections 2 and 3 are provided as reference material.

1 - What You Will Receive if You Ordered the Following:

Impulse + FP100 (or FP220) Keypad	Impulse Only	Impulse + FP100-RS485 (or FP220-RS485) Keypad
1. Impulse Microstepping Drive	1. Impulse Microstepping Drive	1. Impulse Microstepping Drive
2. AC power cord for Impulse	2. Motor Connector	2. AC power cord for Impulse
3. Motor Connector	3. AC power cord for Impulse	3. Motor Connector
4. FP100 (or FP220) Keypad	4. IDCMotion Software	4. FP100 (or FP220) -RS485 Keypad
5. Remote cable for Keypad	5. Impulse Quick Setup/Ref. Guide	5. Keypad Power Supply
6. Keypad mounting gasket	6. Impulse User's Manual	6. Remote cable for Keypad
7. Keypad mounting template		7. Keypad mounting gasket
8. IDCMotion Software		8. Keypad mounting template
9. Impulse Quick Setup/Ref. Guide		9. IDCMotion Software
10. Impulse User's Manual		10. Impulse Quick Setup/Ref. Guide
		11. Impulse User's Manual

2 - Ordering and Identifying an Impulse

Using the tables below, fill in the boxes and you will be able to order or identify your Impulse:

IMPULSE	Input Power	Capability	Drive Type	Communication		Accessories
IM	L		T4			

Input Power	
L	Line Voltage 120 VAC

Drive Type	
T4	Stepper Drive, 4 A

Accessories (order separately)	
*FP_ _ _- _ _	Keypad Configuration
DB25BO	25 pin D-Shell Breakout Board
SS-IO	25 pin I/O Cable - 2 ft.
SS-IO-6	25 pin I/O Cable - 6 ft.
SS-RS232	Serial Comm. Cable
PCS-5004	Keypad to PC Cable
PCS-5110	Screw-Mounting Bracket
PCS-5111	DIN Rail Mounting Bracket

Capability	
M	Motion Node Version
D	Drive Version

Communication	
2	RS232
4	RS485

*FP100, FP220, FP100-RS485, or FP220-RS485

3 - Accessories Currently Available for the Impulse

SS-RS232 Impulse to PC Cable

SS-IO (2ft. cable) SS-IO-6 (6ft. cable)

PCS-5110 Screw-Mount Bracket

DB25BO Screw Terminal Breakout Board

PCS-5004 Keypad to PC Cable

PCS-5111 DIN Rail Mounting Bracket
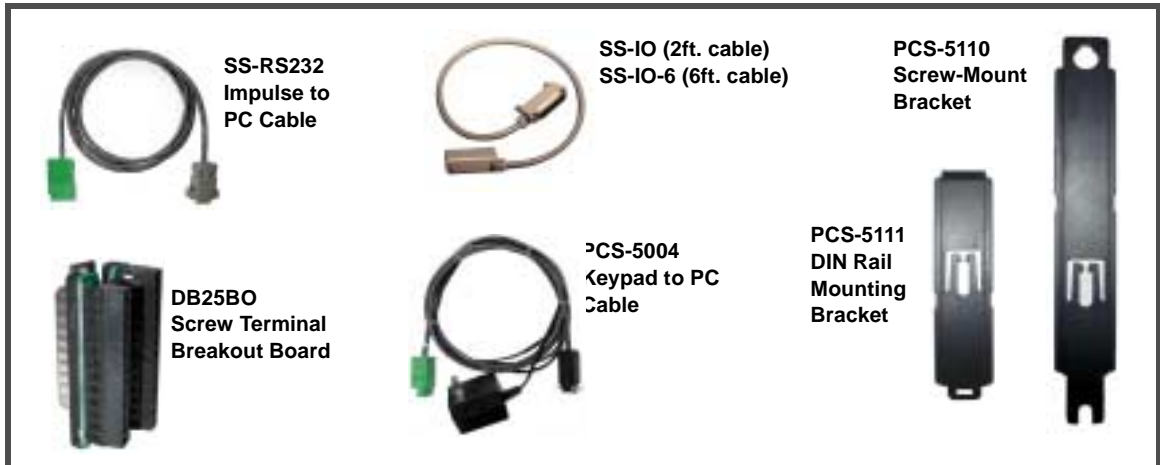
Chapter 3 - Connecting and Installing Your Impulse

The purpose of this chapter is to provide information that will help you connect and install your Impulse drive in its intended application.

The Impulse drive easily interfaces with a PC, PLC, Step & Direction Motion Controller, or IDC keypad. Block diagrams of several Impulse-based applications are shown below.

Typical Impulse Applications
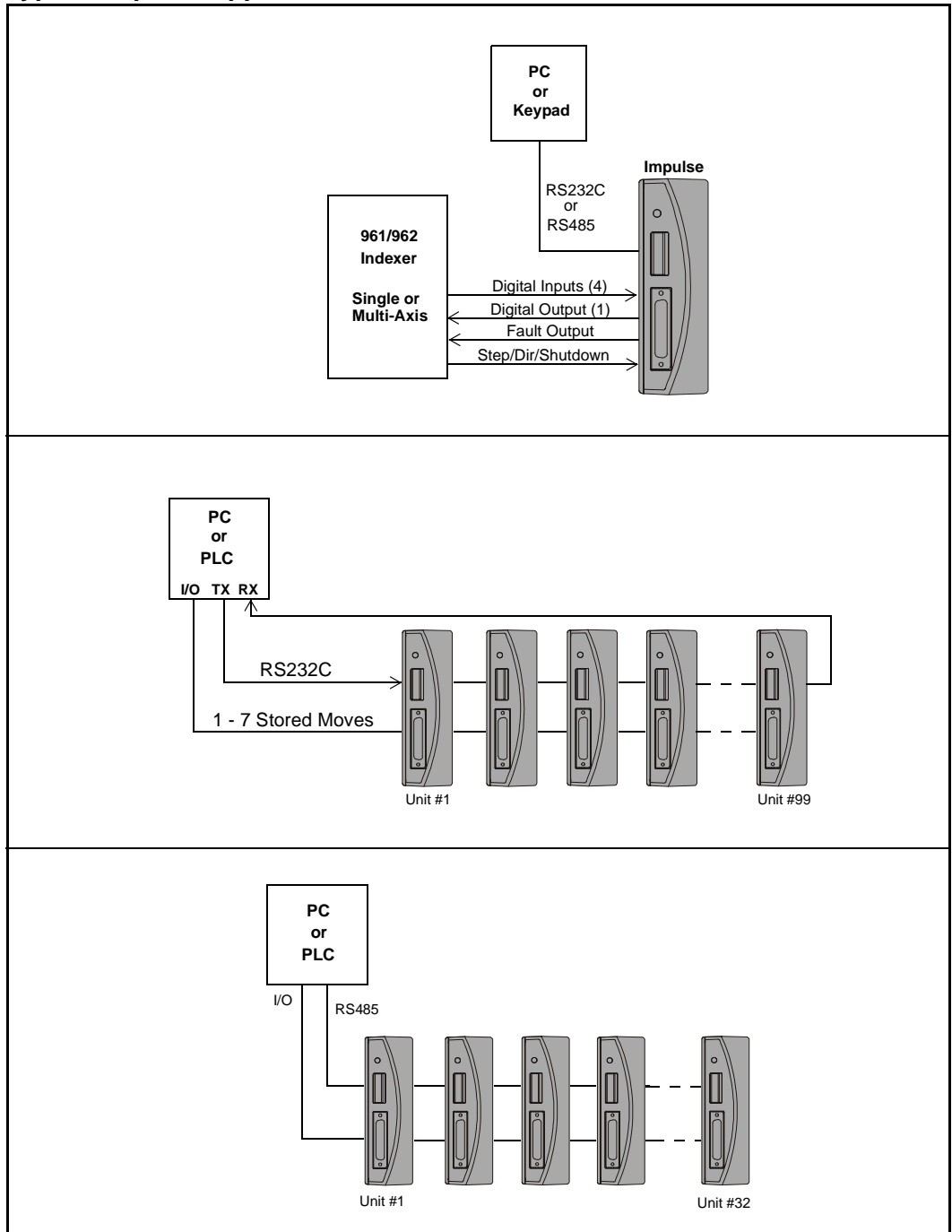
Read This Page Before Your Begin!

CAUTION!

- **Always use caution** when working with mechanical systems. Gears and screw-driven cylinders are capable of exerting tremendous force against an obstruction.

- **Always ensure that power to your system is OFF** before performing any maintenance activity, or making any connections or adjustments.

- **Do not insert objects into the Impulse drive**. High voltages could cause personal injury, and equipment could be damaged beyond repair.

- **Do not open the Impulse drive.** The factory warranty will be voided if the drive is opened.

A. Connecting a Motor to the Impulse

Connecting an IDC Motor

The **A+, A-, B+,** and **B-** phase outputs power the motor windings.

Connect motor wires to the motor connector (supplied) and plug the wired connector into the drive. Drawings below provide color codes for IDC motors.

GND is internally connected to the earth pin on the power connector. This provides a convenient terminal for grounding the motor frame and a motor cable shield. Note: If the motor is mounted on a machine that is grounded, do not connect the motor to GND.

The two **INTLK** pins must be jumpered together on the motor connector to allow power to the motor.

CAUTION! Do not remove the motor connector from the Impulse drive while power is applied. Removing the connector while power is applied could damage the connector pins.
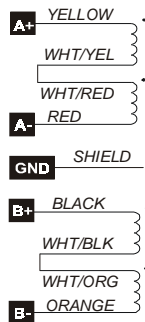
Do not extend the interlock jumper wire to provide protection for another connector interface. The interlock circuit is susceptible to trips caused by noise-pickup in cables (20 kHz switching).

Note: This is a high-impedance safety-interlock circuit. If the interlock wire breaks, or the connector is removed, the current to the motor is immediately stopped, the drive faults (latches) and the LED on the front panel of the Impulse will flash five times (see LED Diagnostics on p. 3-8).

Motor Connector

IDC Motor Wiring/Color Codes

S12/21/23/32/33
Series

A+	YELLOW
	WHT/YEL
	WHT/RED
A-	RED
GND	SHIELD
B+	BLACK
	WHT/BLK
	WHT/ORG
B-	ORANGE

P21/22, S21/23
Parallel

YELLOW	A+
WHT/RED	
RED	
WHT/YEL	A-
SHIELD	GND
BLACK	B+
WHT/ORG	
ORANGE	
WHT/BLK	B-

P31/32/33
Parallel

YELLOW	A+
WHT/RED	
RED	
WHT/YEL	A-
GREEN/YEL	GND
BLACK	B+
WHT/ORG	
ORANGE	
WHT/BLK	B-
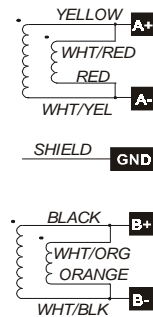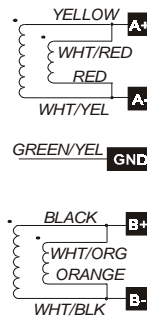
Quick Disconnect Cable Wire Color	
A+	Red
A-	Red/Yellow
*GND	Green
B+	Red/White
B-	Red/Black
*Gray-colored Quick Disc. cables are shielded - connect shield to GND.	

Connecting a Non-IDC Motor

One of the Impulse drive's more advanced features, Open Loop Stall Detect™, is guaranteed only when matched with one of IDC's S or P-series motors.

IDC's S and P series motors have custom windings to provide optimum dynamic performance with the Impulse. If you use another manufacturer's motor, refer to *Non-IDC Motors* in Chapter 6, Hardware Reference, for more information.

B. Serial Communication Connections

Making RS-232/RS-485 Connections

The standard Impulse drive uses a 3-wire implementation of RS-232C. The RX, TX, and COM lines are the serial signals supported. No hardware handshaking is required. Note that some RS-232C devices require handshaking, such as RTS and CTS. It is the responsibility of the user to disable this handshaking via software or hardware (see *Troubleshooting RS-232C Communication Problems* on page 3-6 for more information).

If you will be using RS-485 communication, the typical 5-wire interface connection to a "host" is shown below. See "Multi-Dropping Impulse Drives with RS-485" on the next page for information on using termination resistors. **Note**: the maximum cable length for RS-485 communication is 4,000 feet.

Make your RS-232C connection as shown below. The PC Cable (IDC P/N SS-RS232) shown below, is an ideal choice for making trouble-free RS-232C connections to the Impulse.

IDC P/N SS-RS232

COM PORT		
		5V
3 (TX)		RX
2 (RX)		TX
5 (COM)		COM
		SHIELD

9-Pin Connector — RS-232C

COM PORT		
TX-		5V
TX+		RX
RX-		TX
RX+		COM
COM		SHIELD

RS-485 Host — RS-485

Comm Port Settings RS-232C/RS-485	
Baud Rate	19200 (fixed)
Stop Bits	1
Data Bits	8
Parity	None
XON/XOFF	Yes
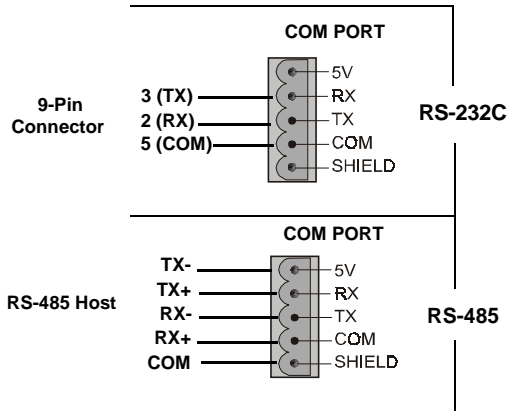
Daisy-Chaining Impulse Drives

Your Impulse also supports daisy chaining. The unit address (range 1-99) can be set via the keypad or in Application Developer.

Rules for Daisy Chain Operation

1. Units on a daisy chain must be "device addressed' (numbered) in order for communications to work properly. A unit's address should increment upward as you move down the daisy chain from the PC (see illustration below).

2. Do not duplicate unit addresses.

3. Any loose RS-232C connections or miswiring along the daisy chain will cause communications to fail. Please double check wiring if communication problems arise.

4. Please call IDC if you need to daisy chain more than 99 drives.

5. The hardware diagram below shows how to connect the daisy chain.
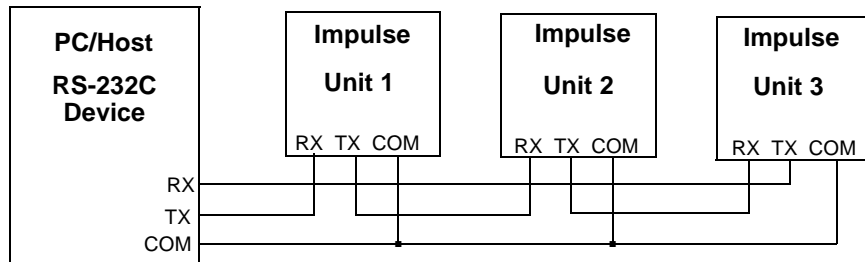
Multi-Dropping with RS-485

If you will be "multi-dropping" Impulse drives with RS485, add 120-ohm termination resistors across RX and TX connections of the last unit as shown below:
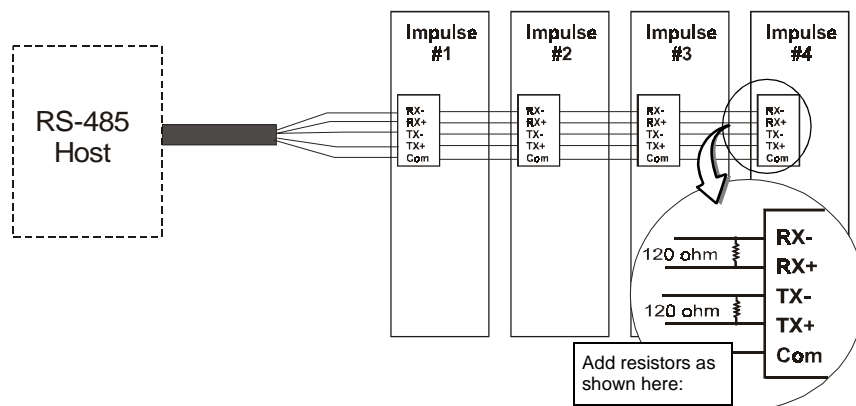
Troubleshooting RS-232C Communication Problems

If communications between computer and Impulse are unsuccessful, one or more of the following procedures will usually solve the problem:

1. Host transmit (TX) must be connected to receive (RX) of the drive unit, and receive (RX) of the host must be connected to transmit (TX) of the drive. If communication fails, try switching connections on either the host or the drive.

2. Some serial ports may require handshaking. Jumper RTS to CTS, and DSR to DTR (see table).

Jumpers	9 pin D	25 pin D
RTS to CTS	7 to 8	4 to 5
DSR to DTR	4 to 6	6 to 20

3. Check your ground connections. The COM terminal should be isolated from earth ground. Use DC common or signal ground as your reference - do not use earth ground or shield.

4. Voltage between TX and COM should be -8.0 to -12.0 VDC. Voltage between RX and COM should be 0 to -0.5 VDC. Consult factory if measured voltages are outside these ranges.

5. For RS-232C only: If any cable is more than 50 ft. long, you should use a line driver, optical coupler, or shield. Shields must be connected to earth ground at one end only.

6. Reminder for PDA Users: Programs such as Palm's Hotsync Manager take over a comm. port. Be sure to close/exit these types of programs if you are using serial communication with your Impulse.

7. **Important Application Note Regarding PC Com Port**: PC FIFO (First In First Out) Buffers should be used and adjusted to the highest settings for fastest performance. This applies to both Receive and Transmit Buffers.

   • In your Windows operating system, go to **Start** > **Settings** > **Control Panel** > **System** > **Device Manager** > **Ports** (Com 1, Com 2) > **Port Settings** > **Advanced > Buffer**.


   • Select **Use FIFO Buffers**, and ensure both Buffers (Receive and Transmit) are adjusted to the **High** setting for best performance.

C. Connecting an IDC Keypad

Two versions of IDC keypads can be used with the Impulse drive. The FP100 works only with the Impulse, while the FP220 can be used with the Impulse as well as IDC's Smart Drives (see keypad-specific information below).

The COM PORT on the front panel of the Impulse is used for connecting either version of keypad.

Power is applied to either version of keypad when power is connected to the Impulse.

COM PORT
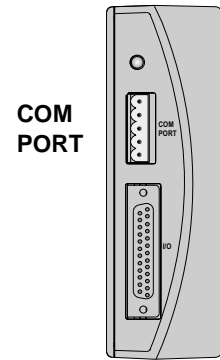
Using a Keypad with Impulse RS232C

FP100 Keypad

Connect the FP100 Keypad to the Impulse with the cable supplied with the keypad.

FP220 Keypad (Version 3.0 or higher)

Only FP220 Keypad versions 3.0 and higher will work with the Impulse drive.

To use an FP220 keypad with your Impulse, you must set DIP-switch #3 to the ON position and switch #s 1, 2, and 4 to OFF.

The FP220 uses the same keypad cable as the FP100.

Keypad with Impulse RS232C
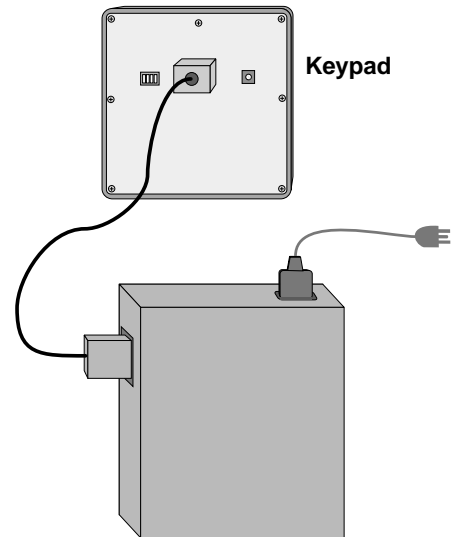
Keypad

Using a Keypad with Impulse RS485

Impulse RS485 requires either the FP100-RS485 or FP220-RS485 keypad.

On the FP220-RS485 keypad only, set DIP switches as described above. Both FP100-RS485 and FP220-RS485 keypad are connected as follows:

1. Connect the keypad cable to the keypad and to the Impulse.
2. Connect the keypad power supply cable to the keypad as shown in the illustration.
3. Plug in the AC adapter.

Keypad with Impulse RS485

Keypad
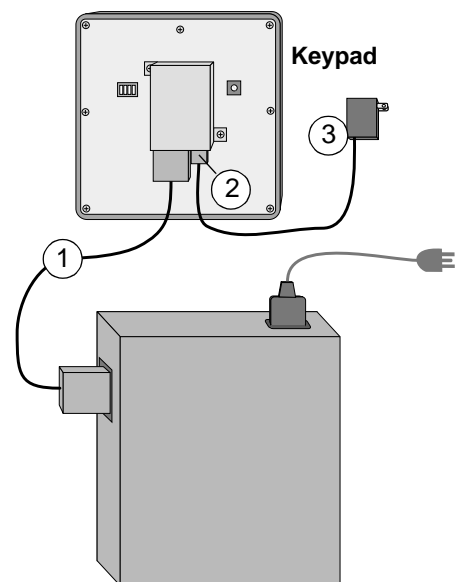
D. Connecting AC Power

There is no ON/OFF switch on the Impulse. AC power is applied by plugging the *power cord (included) into the connector on top of the Impulse.

Input voltage must be in the range of 120 VAC ± 10%, single phase, 50/60 Hz, 500 VA max @ 4 Amps. Operation outside these specifications will result in reduced performance, drive faults, and may damage the drive.

When power is applied, the LED on front of the drive should briefly turn red, then steady green. If a red light is present, see Section E of this chapter for more information on fault detection codes.

To AC Power Supply

*Note: If the AC power cord requires replacement, the replacement must be rated for **Hard Usage** or **Extra Hard Usage**.
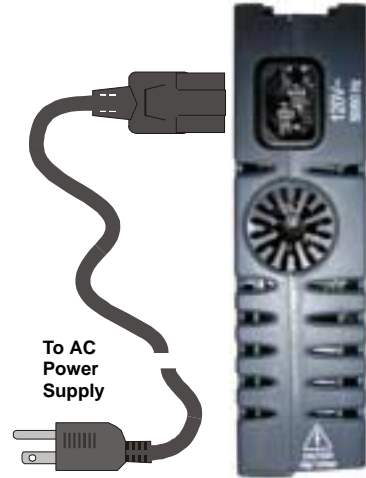
E. LED Diagnostic Indications

The Impulse drive detects and resolves fault conditions (see table below). Faults are signaled by either a steady red or a flashing red LED on the front panel. A solid green LED indicates normal operation. A slowly flashing green LED indicates a shutdown (disabled), while a rapidly flashing green LED signals a regen dump. Faults are cleared by either 1) cycling power, 2) sending a RESET command via the serial port or configurable logic input, or 3) probing the motor if the LED is steady red.

For more detailed explanation of faults refer to Chapter 7, *Troubleshooting the Impulse*.

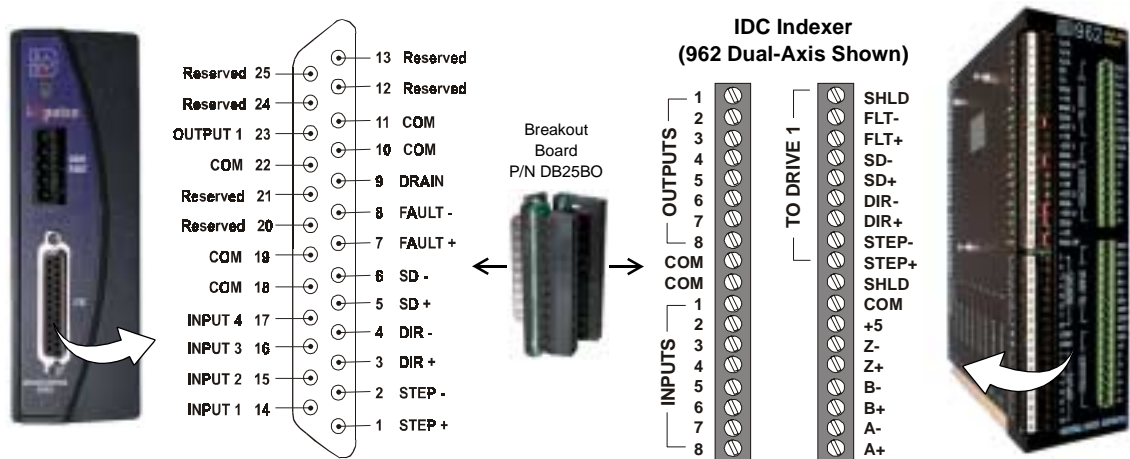| Diagnostic LED Indications	
LED Signal	**Indication**
Green (steady)	Normal Operation
Slow Flashing Green	Shutdown
Quick Flashing Green	Regen Dump
Red (steady)	Motor Not Probed
1 Flash Red	Stalled
2 Flashes Red	Undervoltage Fault
3 Flashes Red	Overvoltage Fault
4 Flashes Red	Overcurrent Fault
5 Flashes Red	Interlock Fault
6 Flashes Red	Overtemperature Fault
7 Flashes Red	EEPROM Checksum Fault

LED

F. Connecting Inputs and Outputs

Connect your inputs and outputs to IDC's 961/962 Indexer according to the information below. Schematics for Impulse I/O circuits can be found in Chapter 6, Hardware Reference

Application Notes

1. On 961/2, ensure that Step/Direction and Differential Jumpers are installed (see 961/2 manual).

2. If using IDC P/N SS-I/O or SS-I/O-6 cable, cut one end of the cable if necessary (see table below for SS-I/O cable color-code). If making your own cable, or using a non-IDC indexer, refer to the Impulse I/O Schematics (Chap. 6) and the 25-pin Connector drawing below.

3. Use a shielded cable, and **connect the shield only at the Impulse**. Connect shield to pin 9.

4. IDC offers a 25-pin screw-terminal breakout board (shown below) to add convenience and flexibility to your application. Terminals on the breakout board match the pins of the 25-pin connector on the Impulse.

5. When wiring TTL signals to other manufacturer's indexers, the Step TTL command signals from the controller should be wired to **Step +**, the Direction signal to **Dir +**, and the Shutdown signal to **SD +** (**Step -**, **Dir -,** and **SD -** should not be connected). Remember, the drive common must be connected to the controller common.

6. Activating the Shutdown input disables the drive amplifier and de-energizes the motor. When this input is OFF the drive is enabled and the motor is energized. The polarity of this input is configurable.

7. The open-collector **Fault Output** turns **ON** (Active High) when any one of the LED-indicated conditions occur (see Section E, LED Diagnostic Indicators). The output stays ON while the LED flashes.

IDC Cable P/N: SS-IO/SS-IO-6								
Pin	Impulse Signal	Wire Color	Pin	Impulse Signal	Wire Color	Pin	Impulse Signal	Wire Color
1	STEP +	Brown	10	COM	Gray	19	COM	Black/White
2	STEP -	Red	11	COM	White	20	Reserved	Red/Black
3	DIR +	Orange	12	Reserved	Black	21	Reserved	Orange/Black
4	DIR -	Pink	13	Reserved	Brown/White	22	COM	Yellow/Black
5	SD +	Yellow	14	INPUT 1	Red/White	23	Output 1	Green/Black
6	SD -	Green	15	INPUT 2	Orange/White	24	Reserved	Gray/Black
7	FAULT +	Light Green	16	INPUT 3	Green/White	25	Reserved	Pink/Black
8	FAULT -	Blue	17	INPUT 4	Blue/White	**Note:** Cable SHIELD is internally connected to the DB25 metal housing.		
9	Drain	Violet	18	COM	Violet/White			

G. Mounting the Impulse Drive

This section includes installation requirements, Impulse dimensions, installing and removing mounting brackets, and mounting the Impulse on a DIN rail.

Environmental and Installation Requirements

- Operating Ambient Temperature: Max. 50º C (122º F) @ 4 Amps

- Storage Temperature: Max. 65º C (149º F)

- Not intended for use in humidity above 95% (non-condensing), or at altitudes greater than 3,048 meters [10,000 ft.]

- Heat Dissipation @ 4 A (typical): 32 Watts

- Leave 6 inches above and below drives for airflow and wiring.

- Leave 0.1 inch between drives for easier mounting.

- Air supplied to the Impulse must be uncontaminated.

Mounting Arrangements

The illustration on the right shows an example of an acceptable mounting arrangement.

6.0 in.
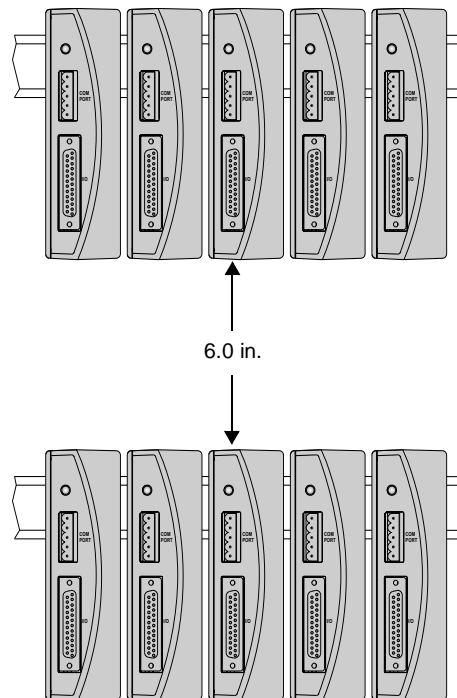
Impulse Dimensions

Impulse with DIN-rail Mounting Bracket (P/N PCS-5111

TS 35 DIN RAIL

5.599

1.779

6.365

Impulse with Screw-type Mounting Bracket (P/N PCS-5110)

10-32 screw with
.305'' head $\varnothing$

5.599

6.000

1.779

6.365

1.779

Inserting and Removing Mounting Brackets from the Impulse

Both Impulse mounting brackets are interchangeable and each is inserted or removed according to the following procedures. No tools are required to insert a bracket, however a flat-bladed screwdriver is required for removal. If additional brackets are required, see Chapter 2, *Shipping Contents*, for part numbers.
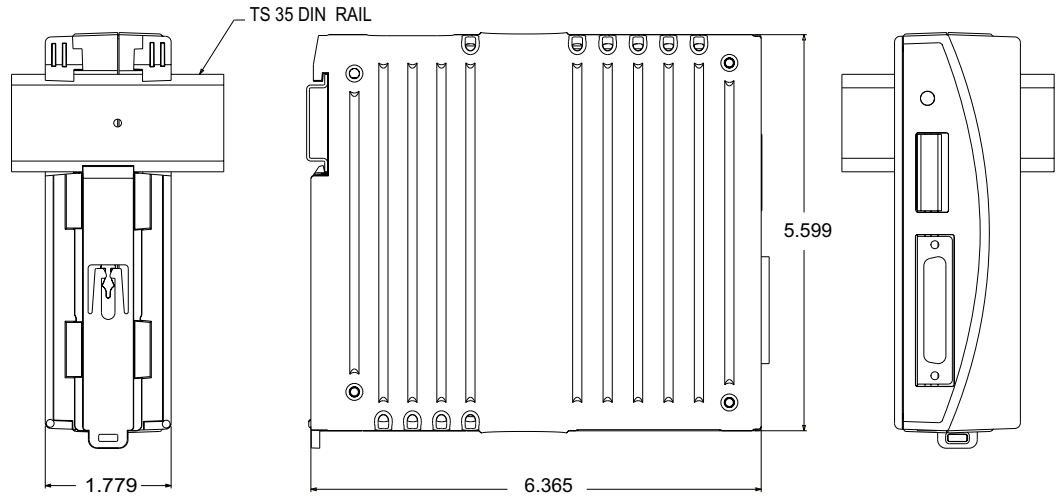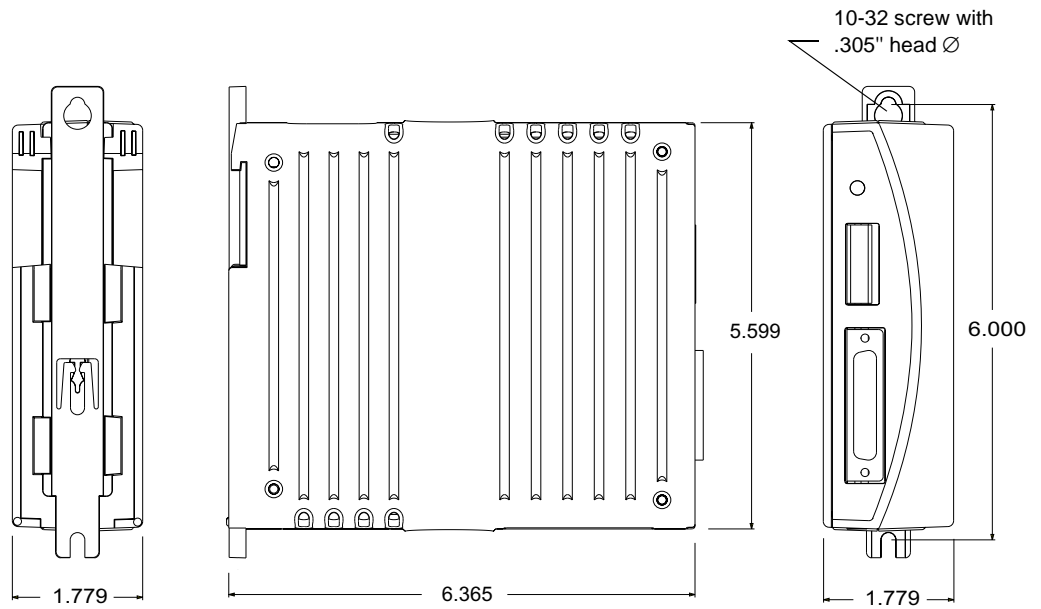
Installation of Bracket (DIN Rail Bracket Shown)

1. Insert the bracket into the bracket housing from the top side of the Impulse as shown in the drawing on the right.

2. Slide bracket downward until a single click is felt (detent position). The bracket will be seated in the position shown at right. **Note**: If you push the bracket beyond the detent position (second click), it will be necessary to push the bracket back to the detent position.

   Do not attempt to remove the bracket by pulling it from the bottom of the bracket housing. Both bracket and bracket housing could be permanently damaged.
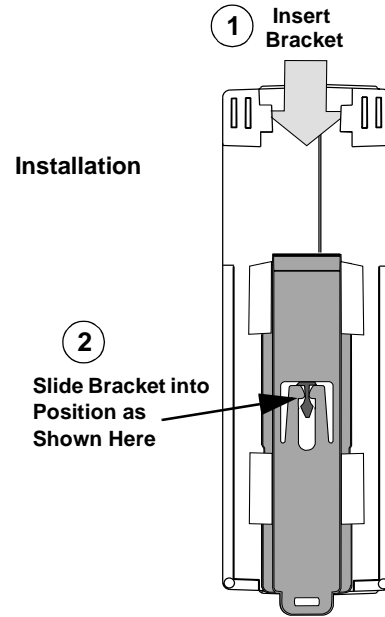
Removal of Bracket (DIN Rail Bracket Shown)

1. Insert the tip of a flat-bladed screwdriver between the bracket-release arms as shown in the drawing at right.

2. Gently twist the tip of the screwdriver until the arms are spread apart enough to clear the detent mechanism on the housing. Maintain this position.

3. While holding the arms apart with the screwdriver, push the bracket toward the top of the bracket housing as shown in the drawing.

   Do not attempt to remove the bracket by pulling it from the bottom of the bracket housing. Both bracket and bracket housing could be permanently damaged.

Impulse DIN-Rail Mounting

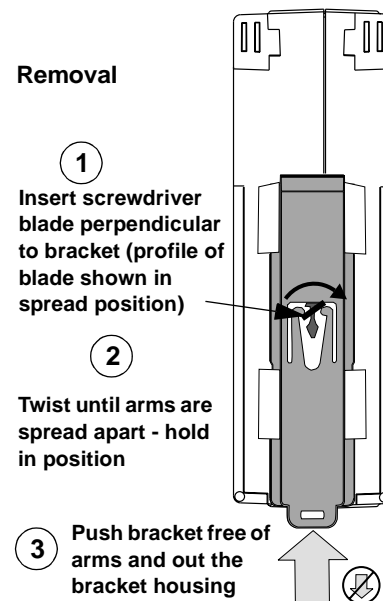The DIN-rail mounting system is a combination of 1) a removable mounting bracket, which locks the drive onto the DIN-rail (installation on previous page), plus 2) the DIN-rail hanger on the upper rear part of the housing that suspends the weight of the drive on the rail.

Mounting

Mounting the Impulse on the DIN-Rail

1. Hook the top of the DIN-rail hanger over the top of the DIN-rail.

2. Rotate the Impulse drive downward until it locks into place on the rail.

3. Pull back slightly on the drive to ensure it is securely fastened to the rail.
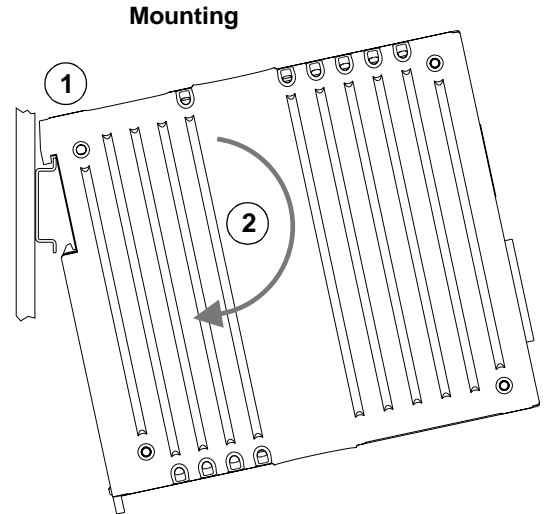
Impulse Securely Mounted on DIN-Rail
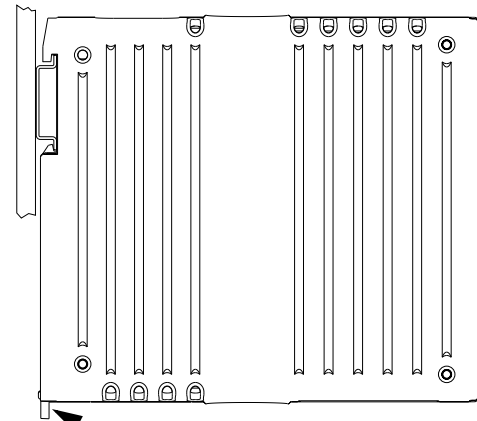
Removal of Impulse from the DIN-Rail

1. Ensure power to the drive is **OFF**.

2. Remove the motor connector.

3. Insert tip of flat-bladed screwdriver into slot provided on the bottom of the mounting bracket (see drawings on the right).

4. Gently pry downward until the bracket disconnects from the rail. **Note**: The bracket will fall approximately 1 inch, but will still be retained by the Impulse housing. **Do not** attempt to remove the bracket by pulling it from the housing.

5. The bracket can be reset to the detent position by pushing upward until a click is felt (see "Installation of Bracket" on the previous page).

Removal

Insert screwdriver blade and pull downward
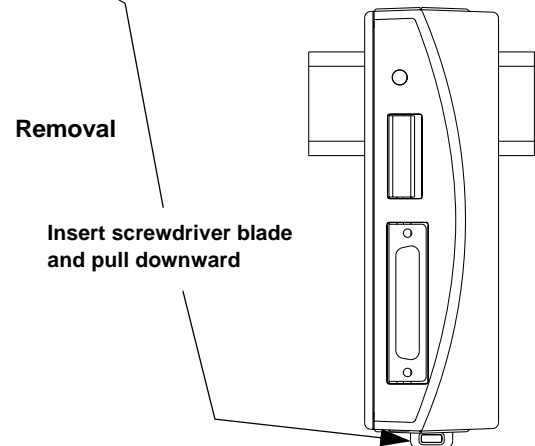
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Chapter 4 - Configuring Impulse with Application Developer™

This chapter covers the installation and use of IDC's Application Developer software to configure your Impulse drive.

Installing Application Developer on Windows 95/98/2000/ME/NT

1. Place the IDC CD in your CD-ROM drive and click on the **Start** button.

2. Click on **Run**.

3. Type the following in the **Command Line** box that appears (replace "x" with your CD drive letter if different):   **x:\App_Dev\Setupex.exe**

4. Click OK and follow the onscreen instructions.

5. Restart Windows (recommended).

There are no known installation problems with Application Developer, but please call the IDC Applications Department at (800) 747-0064 or (707) 789-1000 (from outside U.S.) if you need assistance installing this software.

Using Application Developer

Application Developer's graphic user interface allows you to configure and program your Impulse using an appropriately equipped computer. Upon starting Application Developer you will be given four options for beginning the configuration of your application (see window below).

Select from one of the following options to begin configuring your Impulse:

1. **Upload Project**. If your drive has already been configured, this option allows you to upload a project file from the drive for editing (modification), troubleshooting, etc. See **Upload Project** on the next page for more information on using this option. The Project Wizard is the best method for initial drive configuration and building a new project file.

2. **Launch Now** - Allows you to go directly to the main menu or tool bar buttons to quickly configure or change project parameters. See **Launch Now** on page 4-4 for more information.

3. **Project Wizard - Clicking on the Project Wizard button will take you through the quickest, most accurate method of configuring the initial setup parameters for your project file (see page 4-5 for details).**

4. **Open an Existing Project**. To bypass the Project Wizard and select a stored file from the Open File window, click on the **Open an Existing Project** button (see page 4-4).

Upload Project

1. Begin by clicking the Upload Project button on the Application Developer Startup window. You will see the **Control Type Selection** menu (shown right).

2. Configuration begins by selecting your Impulse from the list of Steppers. Click OK.

3. Select the **Port** you will use to connect the Impulse.

Comm Port Settings	
(for reference only)	
RS-232C/RS-485	
Baud Rate	19200 (fixed)
Stop Bits	1
Data Bits	8
Parity	None
XON/XOFF	Yes

4. Select the **Unit Number** (from 1 - 99) of the Impulse being configured.

5. To test communication using the current setup, click on **Test Connection**. Click OK.

OR

6. Skip the section on *Using the Project Wizard* and go to *Fine Tuning Your Application*.

Note: Echo and Mode are not available; they have no effect on the Impulse drive.

Launch Now

This method of beginning Application Developer is typically used by more experienced users of IDC products. Select your Impulse version and press OK. You can now go directly to the Main Menu or tool bar buttons to configure the Impulse (see *Fine-Tuning Your Application*).

Open an Existing Project

If you want to open a project file which has been stored on disk (not in the Impulse), select **Open an Existing Project**. Select the desired file and click on the **Open** button. After opening an existing project file, it is still possible to use the Project Wizard at any time by simply clicking on the Wizard toolbar button. See *Fine-Tuning Your Application* if you do not wish to use the Project Wizard.
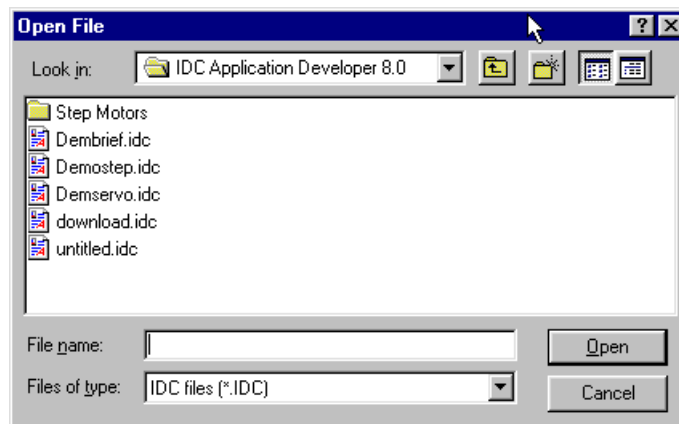
Using the Project Wizard

1. Click the **Project Wizard** button on the Application Developer Startup window.

    • Select the product you are configuring, **Impulse** in this case, and click on **Next**.

    • The Wizard Navigator (left side of window) allows you to quickly locate your current position in the setup process. The column of boxes represents the parameter being configured. A box's color represents its configuration status, i.e. **gray** indicates a parameter not yet configured, **yellow** indicates the parameter currently being configured, and **black** indicates completed configuration of the parameter.

Wizard Navigator

2. Click on the **Next** button and the **Motor** setup window will appear. The configuration procedure in Motor Setup differs slightly depending upon whether you are using IDC or Custom (user-defined) motor (see Appendix C to configure a custom motor). IDC-supplied motors have been precisely characterized in motor files which reside in an Application Developer directory. These files cannot be altered or deleted. User-defined (custom) motor files must be created by the user.

    If you want to change the operational characteristics of an IDC motor, you can do so by selecting an IDC motor from the scrollable list and saving it under a new file name in the Motor Editor (the original motor file remains unchanged under its original file name).
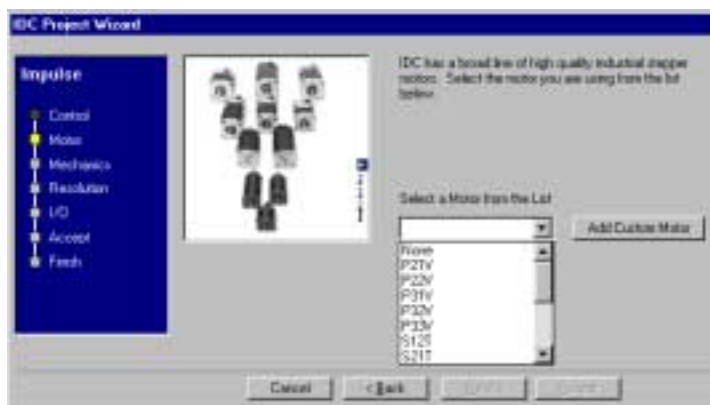
    • From the pulldown menu, select the IDC motor you will be using, or click on **Add Custom Motor** and see **Appendix C** for information on configuring a custom motor file.

3. Click **Next** and the first of three possible **Mechanics** setup windows will appear. The Mechanics window that appears depends on the selection made in the **Select an IDC Mechanical System** list.

Mechanics window **A** (shown below) appears when a **Motor Only** is being configured. This window shows the IDC motor *or* user-defined file name in the Part # text input box, and the Motor Rotor Inertia (in kg-cm^2) of the motor being configured.

• Select **Motor Only**.

• **Load Inertia** - Enter Load Inertia in the text input box.

• **Move Unit** - Choose your move unit from the pulldown menu.
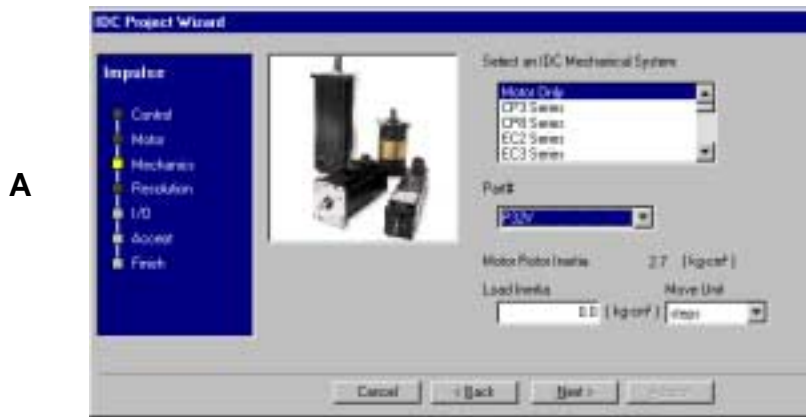
Mechanics window **B** (below) will appear if an IDC Mechanical System (other than Motor Only) is selected. This window allows you to select an IDC Mechanical System, the Part # of the system, and the Stroke Length, Travel, Gear Ratio, or Table Diameter of the system.

• Select the category of IDC Mechanical System you are using.

• Select the **Part #** of the system.

• Select the **Stroke Length** (cylinders), **Travel** (tables), **Gear Ratio** (gearmotors), or **Table Diameter** (rotary tables).

• Enter the **Load Mass** (cylinders and tables), or Load **Inertia** (gearmotors and rotary tables).

• Select the **Move Unit** for the system.

Mechanics window **C** will appear if you select **Non-IDC Mechanics** from the "system" list.

- Enter your **Total System Inertia** (Load + Mechanics + Motor).

- Select your **Move Unit** (steps, revs, mm, or inches) from the pulldown menu.

- Enter your **Distance Ratio** (only if inches or mm are the selected Move Units). You cannot enter Distance Ratio if either steps or revs has been selected.

C

4. Click **Next** and the **Resolution** setup window will appear

- Select your Step Resolution from the pulldown menu, or enter a step resolution in increments of 200.
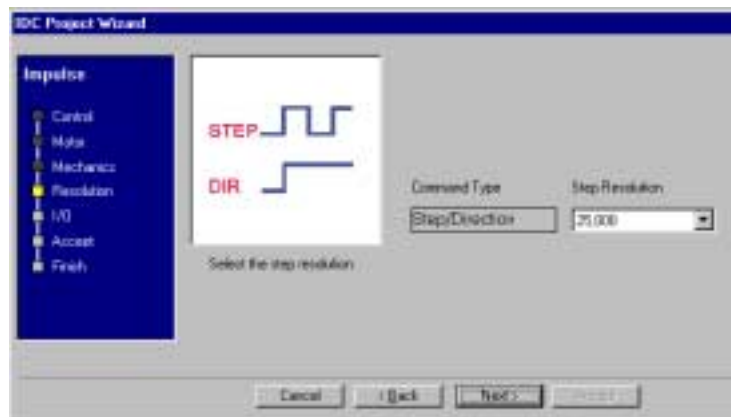
5. Click on **Next** and the **I/O** (Input/Output) setup window will appear. Using the pulldown menus, select configurations for up to four (4) Discrete Inputs and one (1) Discrete Output. The buttons to the right of the inputs and outputs are provided for toggling between Active High (A.H.) and Active Low (A.L.).

Discrete Inputs (see pulldown menu)
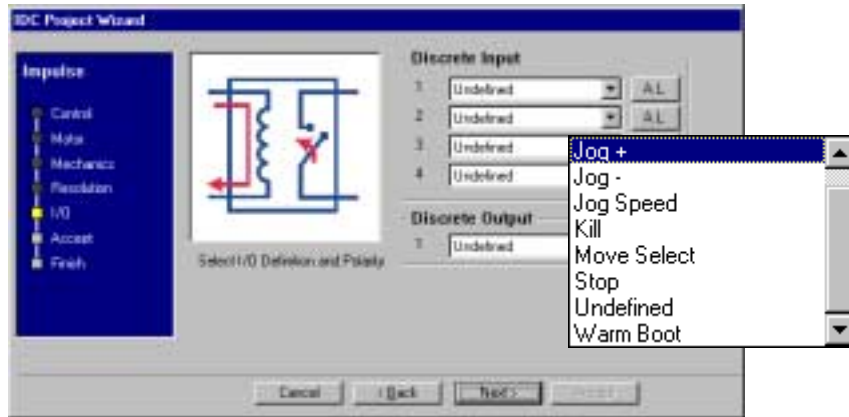
Discrete Outputs (see pulldown menu)
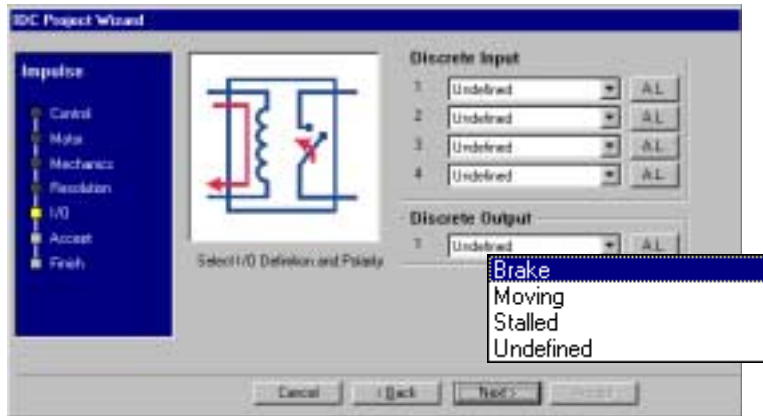
6. When all parameters have been configured, click **Next** and the **Accept** window will appear. This display allows you to review the settings made earlier, or gives you an opportunity to return (Back button) to any parameter you may want to change.

   • When satisfied with the setup of your system, click on **Accept**. The Wizard Navigator should now indicate that all setup parameters have been configured. Use the scroll.bar/buttons to review the project file.
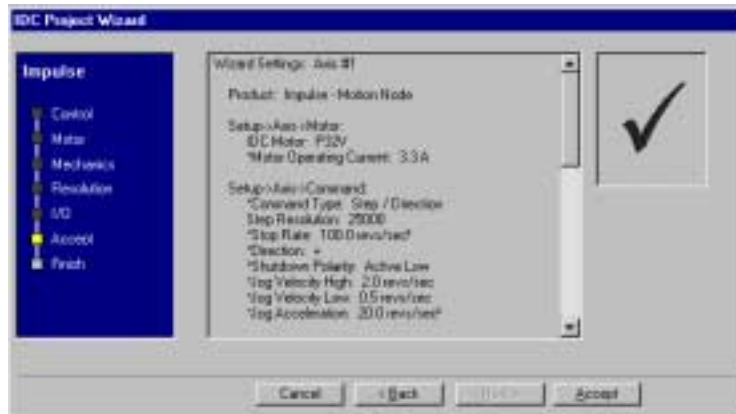
7. Your basic project file has now been configured but the four "Finish" steps must be completed in order to send the project file to the drive and probe the motor.

    • Click on **Config. Comm Port (#1)** and select the Port to which you are connecting the Impulse. Next, select a Unit Number (from 1 - 99) for the Impulse being configured. To test communication using the current setup, click on Test Connection. Click OK.

    • Click on **Send All (#2)** to send the project setup parameters to the drive.
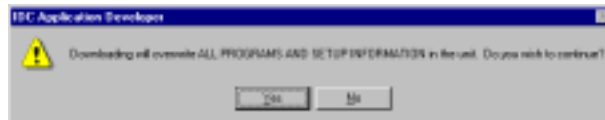
    • Click on **Probe Motor (#3)**. Pressing this button tells the drive to execute an electronic probe of the motor to determine a host of proprietary, internal settings for use in the anti-resonance/stall detect features. Any time the drive is connected to a different type of motor, or if a new motor file is selected, the motor must be re-probed. When the drive is probing the attached motor, a 1 kHz tone will be heard emanating from the motor. Depending on motor type, this tone may persist for up to 15 seconds. Motor probe is not required each time the Impulse is powered on. .
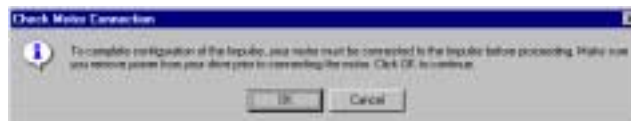
    • Click on **Set Tuning Values (#4)** and enter the values from your IDC motor label.

    • The project file has been sent to the drive and your application can now be fine-tuned using the **Axis Setup** menu (starting on the next page).

Fine-Tuning Your Application

Your basic system setup parameters have been configured by the Project Wizard, and though the system is functional, your application will probably require further configuration and fine-tuning.

The remainder of this chapter provides information on configuring your Impulse with Application Developer's setup and I/O menus. In addition to the parameters configured by the Project Wizard, these menus provide additional features for more control of your system and greater capacity for applications. Also covered in this chapter is the Motion Node or Stored Move option.

The Project Wizard remains available at any time by clicking on the **Project Wizard** button. The **Toolbar Buttons** provide access to the setup parameters and other features that will be covered in the remainder of this chapter.

Toolbar Buttons

The Application Developer toolbar buttons allow quick access to most of the menus available on the menu bar. The toolbar buttons shown below are available when configuring an Impulse drive. If a button or item on the menu bar is grayed-out, that function is not available to Impulse users.

New Project	Project Wizard	Edit Stored Moves	Send All	Reset Impulse
Open Project	Axis Setup	View Configuration	Receive All	
Save Project	I/O Setup			
Print				
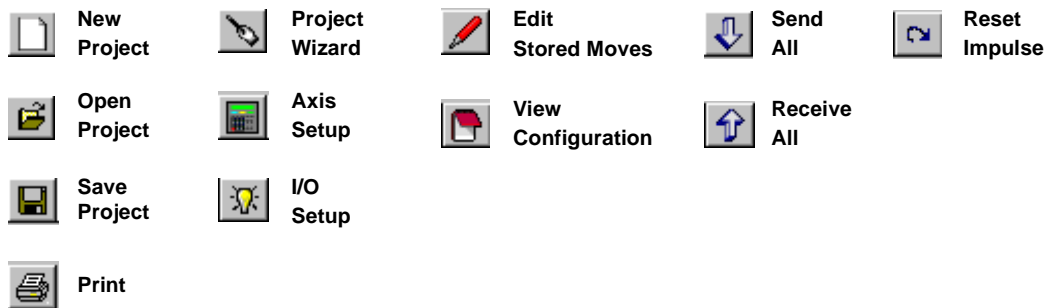
Axis Setup

- The **Axis Setup** menus consists of five configurable sub-menus. Click on the **Axis Setup** button or go to File > Axis Setup on the main menu bar.

- The first menu to appear will be the **Motor** menu tab (begins on the following page).

- **Important!** After making changes in the **Axis Setup** menu, remember to perform a **Send All** command (Send All button or Communications > Send All) to send newly configured parameters to the drive.

Motor

- **Motor Name** - Select your motor from the list, or click on the **Edit Motor** button to create a custom motor file or edit an existing IDC motor file.

- **Electrical** - These text input boxes display the electrical characteristics of the selected motor. If a text input box displays a zero (0), that particular electrical characteristic has not been configured as part of the motor file. To create or change a motor file, see **Edit Motor**.

- **Mechanical** - These text input boxes display the mechanical characteristics of the selected motor. If a text input box displays a zero (0), that particular mechanical characteristic has not been configured as part of the motor file. To create or change a motor file, see **Edit Motor**.

- **Edit Motor** - See **Appendix C** for information on using this feature. The "Advanced" tuning feature is also covered in Appendix C.

**See Appendix C
to Edit a Motor**
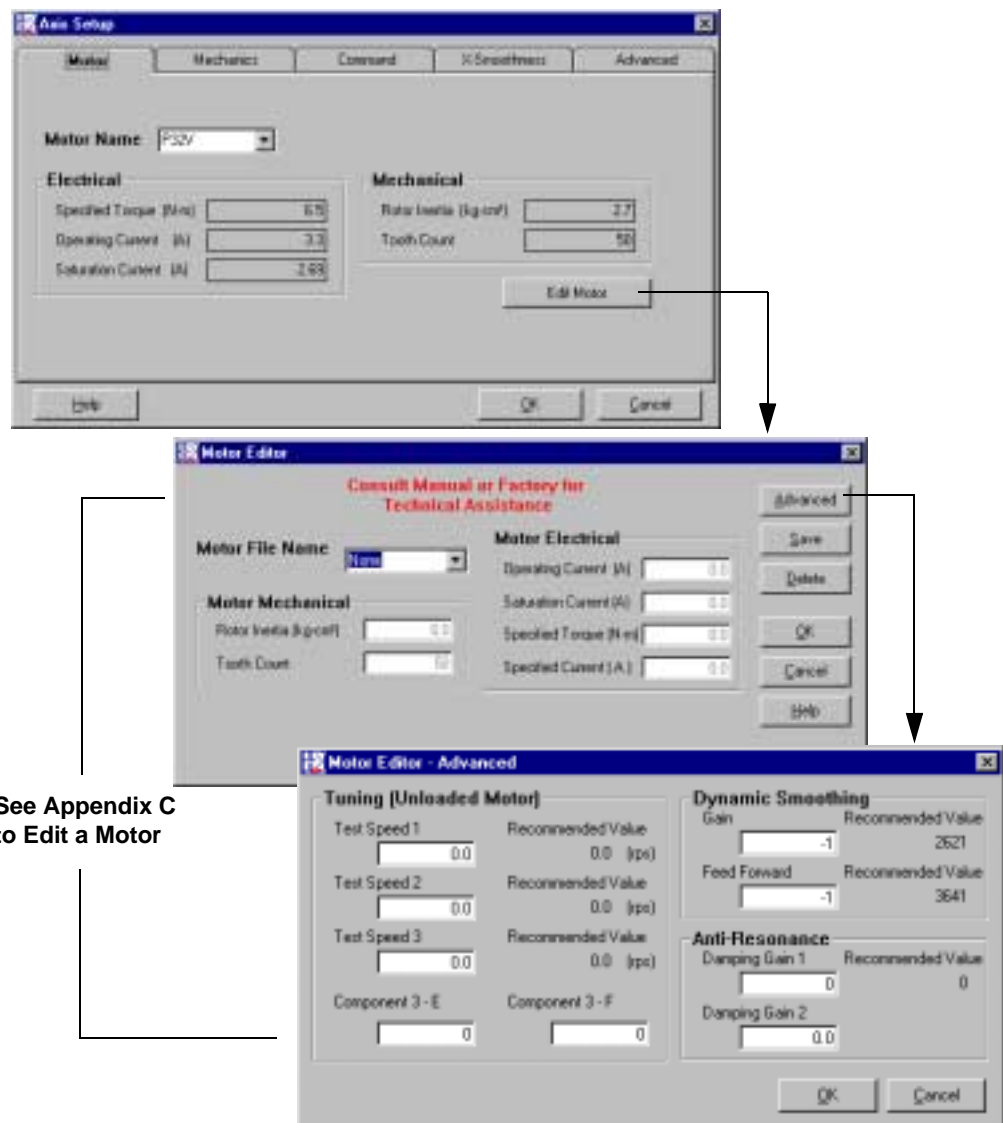
Mechanics

Move Unit and **Total Inertia** (kg-cm^2) are displayed on this tab, but they are not editable parameters. Click on the **Change Mechanical System/Units** button to edit your mechanical parameters.

- **Change Mechanical System/Units** - The text input-box parameters (in each available **Setup Mechanical System** window) are dependent upon the selection you make from the **Select Mechanical System** list. Examples of different mechanical parameters are shown below.
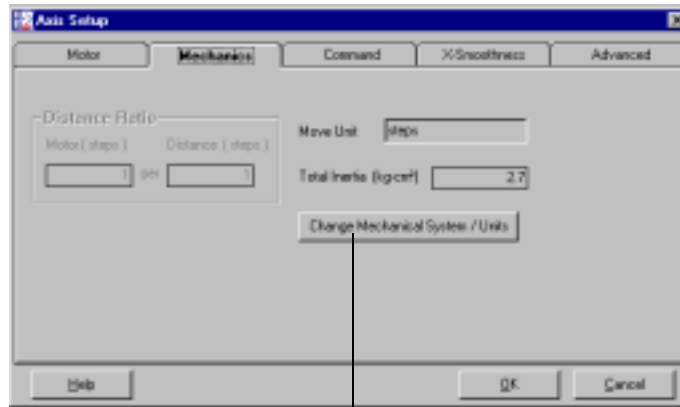
Windows for Configuring IDC Mechanical System Parameters
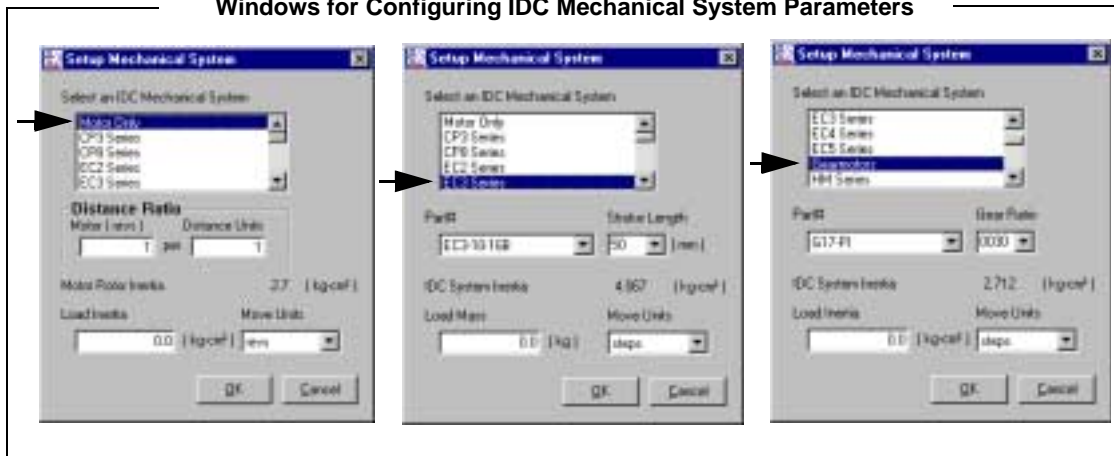
Parameters for non-IDC Mechanics

Notes:

- **Motor Rotor Inertia** is provided for reference only.
- Enter your **Total System Inertia** (Load + Mechanics + Motor).
- Ensure all units have been converted to **kg-cm^2**.

Command

The Command Tab allows you to configure the **Command Signal** and **Jog Input** parameters, and to select the level of **Numeric Precision** that Application Developer will use to build the project file.
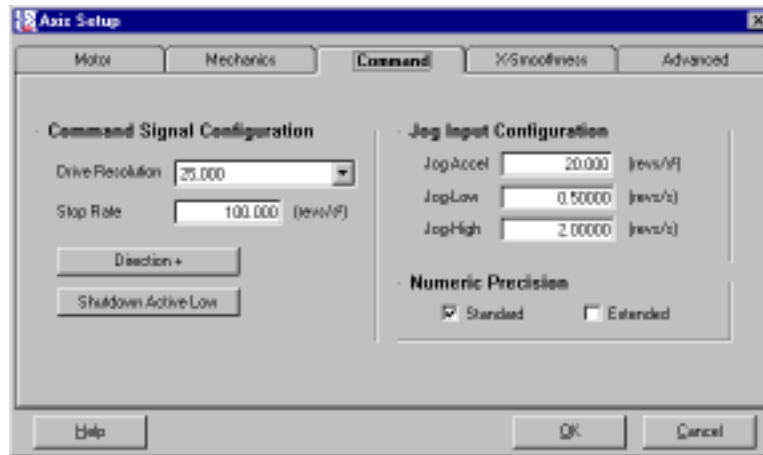
Command Signal Configuration

- **Drive Resolution** - Enter the operating step resolution in integer multiples of four times the tooth count of the motor (50 tooth count x 4 = 200), or select a resolution from the scrollable list. Note: the default resolution is 25,000 and the valid range is 200 to 100,000.

- **Stop Rate** - Enter the *deceleration rate* of the motor when a STOP or EOT input is activated (see Limits Tables in Ch. 9, *Troubleshooting the Impulse*). **Notes**: (1) The Stop Rate units are user-defined (selected). (2) The Stop Rate should be a value that ensures enough torque to control deceleration while not allowing the motor to stall.

- **Direction** - Sets motor direction. Toggle the Direction button to select Direction + (CW) or Direction - (CCW).

- **Shutdown Polarity** - Toggle the Shutdown Polarity button to select **Shutdown Active Low** or **Shutdown Active High**.

Jog Input Configuration

This option allows you to modify the jog parameters (Jog Accel, Jog Low, Jog High) to be used by the Jog Inputs (JOG+, JOG-, JOG SPEED). These values will be in displayed in units selected in the Project Wizard (Mechanical Setup Move Units) or in Axis Setup > Mechanics > Change Mechanical Sytem/Units.

Note: Numeric entries made in the **Jog Input Configuration** section of the Command tab are applied using the user-defined units shown. If the units are changed (Setup > Axis > Mechanical > Change Mechanical System/Units), the user must edit the **Jog Input Configuration** values to obtain the intended velocities and acceleration in terms of the new units. Application Developer does not automatically translate the numeric values when the units are changed.

Enter Jog values directly in the text input boxes or use default values (shown below).

- **Jog Accel** (Jog Accel/Decel) - Default = 20.00 (user-defined units)

- **Jog Low** (Jog Low Speed) - Default = 0.50 (user-defined units)

- **Jog High** (Jog High Speed) - Default = 2.00 (user-defined units)

Numeric Precision

- Select **Standard** to limit the decimal precision of accelerations, decelerations, velocities, and distances to the following:

  Accels and Decels: #.x   (One decimal place)
  Velocities: #.xx   (Two decimal places)
  Distances: #.xxx   (Three decimal places)

  The **Standard** decimal precision is sufficient for most applications. **Standard** is the default setting.

  Note: The keypad (FP100 or FP220) only supports **Standard** decimal precision, therefore project files intended to be used in conjunction with the keypad must be created using the **Standard** setting. Attempting to load a project file into the keypad without **Standard** decimal precision will result in an error.

- Select **Extended** to limit the decimal precision of accelerations, decelerations, velocities and distances to the following:

  Accels and Decels: #.xxx   (Three decimal places)
  Velocities: #.xxxxx (Five decimal places)
  Distances: #.xxxxx (Five decimal places)

  Project files created with **Extended** decimal precision may be edited *only* in Application Developer.

X-Smoothness (Xtreme Smoothing™)

The X-Smoothness tab is the most advanced low-speed tuning feature currently available on any microstepping drive. The benefits of low-speed smoothness are 1) reduced vibration, and 2) an increase in torque, which was typically lost to vibration before the arrival of the Impulse drive.

Achieving this revolutionary smoothness is easily and quickly accomplished by following the simple procedure below. **Note: the motor must be disconnected from its load while performing Xtreme Smoothing™**.

- **X-Smoothness Sliders -** Click and drag the indicator to change a value.

- **Test Speed** - This text input box displays the **Recommended Test Speed** and may be edited if necessary.

- **Recommended Test Speed** - This value has been either 1) pre-configured for IDC motors, or 2) calculated when a custom motor file was created in the Advanced Motor Editor. Verify that this value has been entered in the Test Speed display.

- **Run Test**/**Stop Test** Button - Toggles between Run Test and Stop Test.

- **Restore -** Restores each X-Smoothness to the previous values.

Adjusting X-Smoothness #1, #2, #3

Important: Whether using an IDC motor or a non-IDC (custom) motor, all six X-Smoothness values (L1, L2, M1, M2, H1, H2) must be adjusted in the order described in the following procedure. **Note**: Slider bars L1 and L2 are interactive, as are M1 and M2, and these interactive sliders should be alternately adjusted until the deepest null setting is achieved.

X-Smoothness #1

Recommended values for L1 and L2 have been pre-configured for IDC motors, but we recommend that these settings be verified and adjusted if necessary by the following procedure. If you are using a custom motor file, these values were calculated in the Advanced Motor Editor.

1. Press the **Run Test** button.
2. Move slider **L1** left and right until the smoothest running condition is reached.
3. Move slider **L2** left and right until the smoothest running condition is reached.
4. Press **Stop Test**.

X-Smoothness #2

Recommended values for M1 and M2 have been pre-configured for IDC motors, but we recommend that these settings be verified and adjusted if necessary by the following procedure.

5. Press the **Run Test** button.
6. Move slider **M1** to approximately 8,000.
7. Move slider **M2** left and right until the smoothest running condition is reached.
8. Move slide **M1** left and right until the smoothest running condition is reached.
9. Press **Stop Test**.

X-Smoothness #3

10. Press the **Run Test** button.
11. Move slider **H1** left and right until the smoothest running condition is reached.
12. Move slider **H2** left and right until the smoothest running condition is reached.
13. Press **Stop Test**.
14. Click **OK**.

Advanced (Advanced Tuning)

The **Advanced** tab allows you to enable/disable and modify various advanced performance features of the Impulse drive.

Note: Observe decrease in Gain when **Multi-Stepping** is Enabled.

Anti-Resonance

- Enable this feature by selecting the **Enabled** check box. Ensure that *both* **Damping Gains** are configured if Anti-Resonance is enabled.

Current Reduction Mode

- Select **Stop** to enable the stop mode current reduction time-out period. Stop Mode reduces current by 25%. This time-out period is directly entered in milliseconds. The valid range is 6 to 19,656 ms.

- Select **Idle** to set the idle mode current reduction time-out period. This time-out period is directly entered in seconds. The valid range is 0 to 3600 seconds (0 = disabled).

- In the **%** box, enter the **percentage that current will be reduced** after the idle mode time-out has expired. The valid range is 0 to 100%.

Profiling

- Select **Dynamic Smoothing Enabled** by clicking on the check box and entering the recommended gain in the input box. Dynamic Smoothing™ is an IDC proprietary method of automatically reducing "jerk" (sudden change of acceleration) which is often inherent in move sequences generated by indexers. Dynamic Smoothing™ is similar in effect to so-called S-curve profiles. The softening of accel/decel transients sharply reduces ringing in the motor and various attached structures.

- Select **Multi-Stepping Enabled** for more aggressive dynamic smoothing. Gain will be 1/10 of the recommended gain when **Dynamic Smoothing** is enabled. Multi-Stepping™ is an IDC proprietary method of obtaining very smooth motion from step motors when using low resolution indexers, i.e. 200, 400, 1000 steps/rev. The Multi-Stepping™ feature, when enabled, executes coarse stepping regimens by using microsteps to fill-in between the widely-spaced, low-resolution steps. This is a form of interpolation that produces smooth motion in an otherwise coarse and noisy stepping system.

Stall Detection

- Select **Stall Detection** to enable the Open Loop Stall Detect™ encoderless stall detection feature.

- Stall detection becomes active at velocities of 0.5 RPS and greater.

Remember to perform a "Send All" command to send the modified project file to the drive.

I/O Setup

After configuring the Axis Setup parameters, the discrete inputs (4 ea.) and output (1 ea.) will need to be configured for your application. See I/O Descriptions below for details.

- Click on the I/O Setup tool bar button.
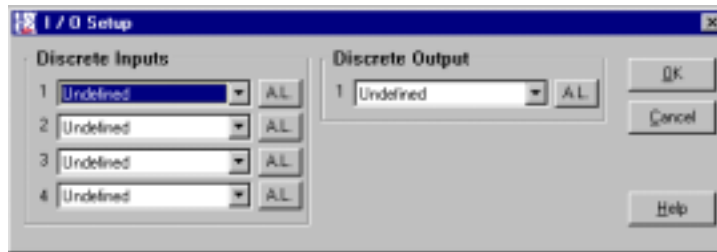
- Select up to four Discrete Inputs and one Discrete Output from the pulldown menus.

- Use the toggle buttons to right of the inputs to select between Active Low (A.L.) and Active High (A.H.).

I/O Descriptions

Input Descriptions

EOT (End of Travel): Activation of an End of Travel input during any motion (external steps or internal move engine) will terminate motion at the rate specified by the Stop Rate parameter, and latch the direction. Motion is only allowed in the direction opposite of the latched EOT direction until a negative edge (activation on to activation off) is made. This guards against the switch activator becoming **"**trapped" if the Stop Rate was insufficient to stop motion in the activation region. The EOT input is also required in the execution of Home type moves. See **Stored Move**

Setup - Editing Stored Moves later in this chapter for more information on Home moves.

Jog +: Activation of a Jog+ input will jog the motor at the acceleration rate specified by the Jog Accel parameter and the velocity specified by the current state of a **Jog Speed** input in the positive direction. If a **Jog Speed** input has not been configured, the motor is jogged at the velocity specified by the Jog-Low parameter.

Jog -: Activation of a Jog- input will jog the motor at the acceleration rate specified by the Jog Accel parameter and the velocity specified by the current state of a **Jog Speed** input in the negative direction. If a **Jog Speed** input has not been configured, the motor is jogged at the velocity specified by the Jog-Low parameter.

Jog Speed: The **Jog Speed** input toggles between the low and high velocities for the **Jog+** and **Jog-** inputs as specified by the Jog-Low and Jog-High parameters. If the state of **Jog Speed** input is changed while a **Jog+** or a **Jog-** input is asserted, the motor will accel or decel at the Jog Accel rate to the high or low velocity respectively.

Kill: Activation of a **Kill** input terminates any motion (external steps or internal move engine) instantly without a deceleration ramp.

Move Select: The **Move Select** input is used to trigger one of the 7 possible stored moves (Motion Node option only). Each configured **Move Select** input serves as a bit in a 3-bit binary number therefore allowing the binary representation of numbers 0-7. The **Move Select** configuration option is only available on inputs #1-#3 with input #1 being the least significant bit (LSB) and input #3 being the most significant bit (MSB). Note that the bit places are *fixed* with respect to the input numbers. For example, if input #1 were configured as an **EOT** and input #2 were configured as a **Move Select,** asserting input #2 would run stored move #2 *not* stored move #1. Below is a **Move Select** assertion table:

Move Select Inputs			
Input #3 State	Input #2 State	Input #1 State	Result
Inactive	Inactive	Inactive	Idle
Inactive	Inactive	Active	Run Stored Move #1
Inactive	Active	Inactive	Run Stored Move #2
Inactive	Active	Active	Run Stored Move #3
Active	Inactive	Inactive	Run Stored Move #4
Active	Inactive	Active	Run Stored Move #5
Active	Active	Inactive	Run Stored Move #6
Active	Active	Active	Run Stored Move #7

To guard against inadvertently selecting moves during input transitions, all **Move Select** inputs must be stable for the time specified by the Move Select Input Scan Time. See the "Editing Stored Moves" section for more information on setting the Move Select Input Scan Time.

Stop: Activation of a **Stop** input terminates any motion (external steps or internal move engine) at the rate specified by the Stop Rate parameter.

Warm Boot: Activation of a **Warm Boot** input resets the drive and clears any latched fault condition. To guard against a **Warm Boot** input being inadvertently held asserted, the **Warm Boot** input is negative edge triggered (activation on to activation off). To insure the negative edge is latched, the **Warm Boot** input must be held asserted for at least 500μs before releasing.

Output Descriptions

Brake: The **Brake** output is activated on any fault condition. This provides a control signal to engage a brake when the Impulse loses torque due to a fault. The **Brake** output also provides a polarity-configurable fault output since the dedicated fault output is fixed as an active high, sinking output. Note: The **Brake** output is not intended nor designed as a power source for a mechanical brake.
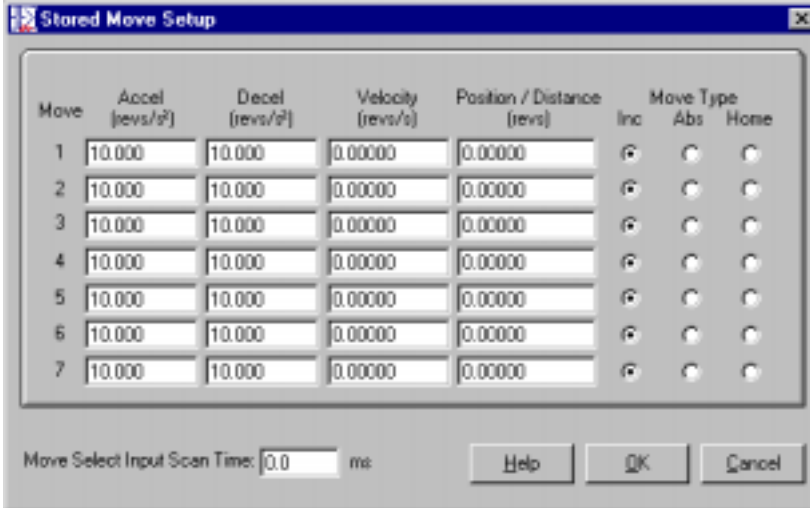
In Motion: The **In Motion** output is activated upon receiving incoming step pulses or when a stored move (Motion Node option) is running. The minimum step frequency that the internal velocity tachometer can render is 156.25 Hz (156.25 / Step Resolution in RPS). Input step frequencies below 156.25 Hz will not activate the **In Motion** output.

Stall: The **Stall** output is activated when OLSD™ (Open Loop Stall Detect) detects a motor stall.

Stored Move Setup - Editing Stored Moves

If your Impulse is equipped with the **Motion Node** option you will be able to access the **Stored Move Setup** menu shown below. The Impulse will store seven (7) moves which can be invoked through binary inputs, by serial commands (see Appendix B), or via the **Run > Stored Move** window. Moves are edited in the **Stored Move Setup** window via **Edit > Stored Move** or the Edit Stored Moves tool bar button.

• Click on the **Edit Stored Moves** button.

• Use the information provided below to configure your Stored Moves in the Stored Move Setup menu.

Stored Moves are defined by the parameters **Accel** (acceleration rate), **Decel** (deceleration rate), **Velocity**, **Position/Distance**, and **Move Type**. Distance Units pertaining to the four dynamic parameters are selected in the Project Wizard or the Axis Setup tab (Setup > Axis > Mechanics > Change Mechanical System/Units). The three move types are Incremental, Absolute, and Home, each selectable by a radio button.

Incremental moves are indexed to the commanded position from the current position.
Absolute moves are indexed to the commanded distance.
Home moves function as follows:

1. The drive moves at the specified velocity (direction selected by velocity sign) until it sees an EOT input go active.

2. On the active going transition, the drive decelerates according to the specified Stop Rate parameter.

3. The drive reverses direction and moves at 1/16 of the specified Velocity until it sees an active-to-inactive transition on the EOT input. This locates the inside edge of the EOT sensor precisely.

4. The drive stops the slow move and executes an incremental move defined by the Distance entry. This final move is always in the opposite direction to the initial search direction specified by the sign of the Velocity parameter. This move constitutes an offset from the edge of the EOT sensor.

5. After the final position is reached, the drive zeros its position counter. All subsequent "absolute" moves will be relative to this Home position.

Note: Homing is predicated on the assumption that the system is positioned somewhere between the EOT switches when the home move is invoked. If the system is initially outside the interval between the EOT switches, the homing routine will fail in one of two ways: (1) carriage will be driven against mechanical end-stop. (2) carriage will end up "homed" outside the interval between the EOT switches.

Digital inputs are configurable as EOT (Active High/Active Low) on the Setup > I/O menu. More than one Home move can be specified and stored simultaneously if it serves a purpose.

Input Scan Time - This is the time the drive requires the binary input selection to be stable prior to triggering a move. Its primary purpose is for debouncing inputs. Scan time can be configured from 0 to 19,656 milliseconds.

File Menu

New Project
Open Project
Save
Save As...

Delete File

Print...
Printer Setup...

Exit

untitled.idc
data.idc
c:\program files\idc application developer II.0\untitled.idc
c:\program files\idc application developer II.0\demoservo.idc
c:\program files\idc application developer II.0\data.idc

- Selecting **New Project** will take you to the **Project Wizard**.

- The default file suffix is *.idc.

- Project files may be stored on disk as DOS files.

- All other selections under the File menu are generic to all Windows applications.

Edit Menu

Stored Move
Motor File
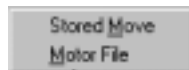
- **Stored Move** and **Motor File Editors**, both discussed previously, can also be accessed from the menu bar.

Setup Menu

I/O
Axis
Misc

Project Wizard
Controller Type

- **I/O**, **Axis**, and **Project Wizard**, accessible from toolbar buttons, have been discussed previoulsy.

- Select **Controller Type** as the first step in starting a new project file. You must select a controller before you can build a new project file.

Control Type Selection

Indexers:
  ○ 961 Indexer   ○ 962 Indexer

Steppers:
  ○ S6961   ○ SmartStep
  ○ S6962   ○ SmartStep23
  ○ Impulse   ○ SmartStep 240
  ○ Impulse Motion Node

Servos:
  ○ B8961   ○ B8962

  OK   Cancel

Communications Menu
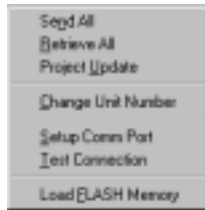
- Use **Send All** to download a project file to the drive. A Send All toolbar button is also available.

- Use **Retrieve All** to upload a project file from the drive for modification.

- **Project Update** allows you to accelerate the configuration of multiple drives when all drives have the same setup configuration. After configuring your first drive with the Project Wizard, select **Project Update** and follow the onscreen prompts for each additional drive.

- **Change Unit Number** is used to set the unit address of each drive to be used on a daisy chain. Each drive must have its own unique software address. The unit number must be set before the units are connected in the daisy chain.

  Press **Query Address** if the address is unknown. This feature can only be used with a single drive connected to the computer. An attempt to Query Address of a unit on a daisy chain will result in an error message.

- **Setup Comm Port** is used to select a Comm Port when your PC has multiple serial ports. This dialog box also contains a Comm Port test utility to verify proper RS-232/485 operation.

- Select **Test Connection** to command an instant communication test (also available in Setup Comm Port).

- For information on **Load Flash Memory,** see **Updating Your Impulse Operating System** at the end of this chapter.

Run Menu

Stored Move
Probe Motor
Jog Motor
Reset Impulse
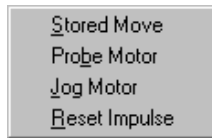
- The **Run > Stored Move** menu is available only on drives equipped with the Motion Node option and can only be accessed from the menu bar. This menu allows you to view all stored move profiles and to run and stop each stored move.

- **No editing of moves is available on this menu**. During the execution of any stored move, the Impulse ignores the step and direction inputs. Any activity on those inputs is completely lost. In other words, stored moves are not added in with incoming step commands. Typically, it is not a useful control stratagem to trigger a stored move while engaged in motion commanded via the step and direction inputs.

- Binary inputs (digital inputs 1, 2, and 3) may be configured as Move Inputs (Active High/Active Low) for triggering stored moves (Setup > I/O).

- Serial Commands - A host system may trigger moves over the serial RS-232/485 connection. This procedure involves the transmission of Unit Addressing, Parameter Indexes, Data and Checksum. The advanced topic of serial communications protocol is covered separately in Appendix B.
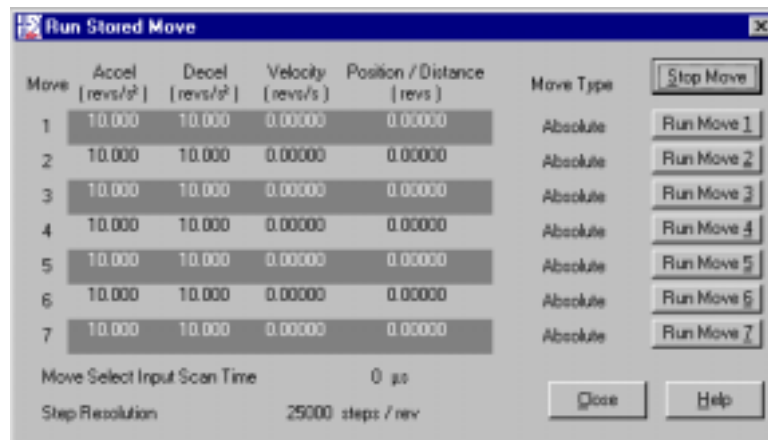
- Click on **Probe Motor** to probe the motor at any time. Probe the motor when a steady red LED is present.

- Select **Jog Motor** to access the jog utility shown below. **Jog Low** and **Jog High** may be changed for immediate effect but the configured input speeds (set in the Axis Setup > Command menu) will not be changed. The center button toggles between High and Low speeds, and the arrow buttons change motor direction.

- Click on **Reset Impulse** to clear a fault. Reset is a warm boot.

View Menu
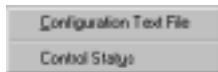
- Select **Configuration Text File** to see your system configuration status. All configuration parameters are listed and may be viewed by scrolling the list.

- Select **Control Status** for a quick look at current I/O configuration, motor position and velocity, fault history, and basic internal drive information (i.e. firmware version, etc.).
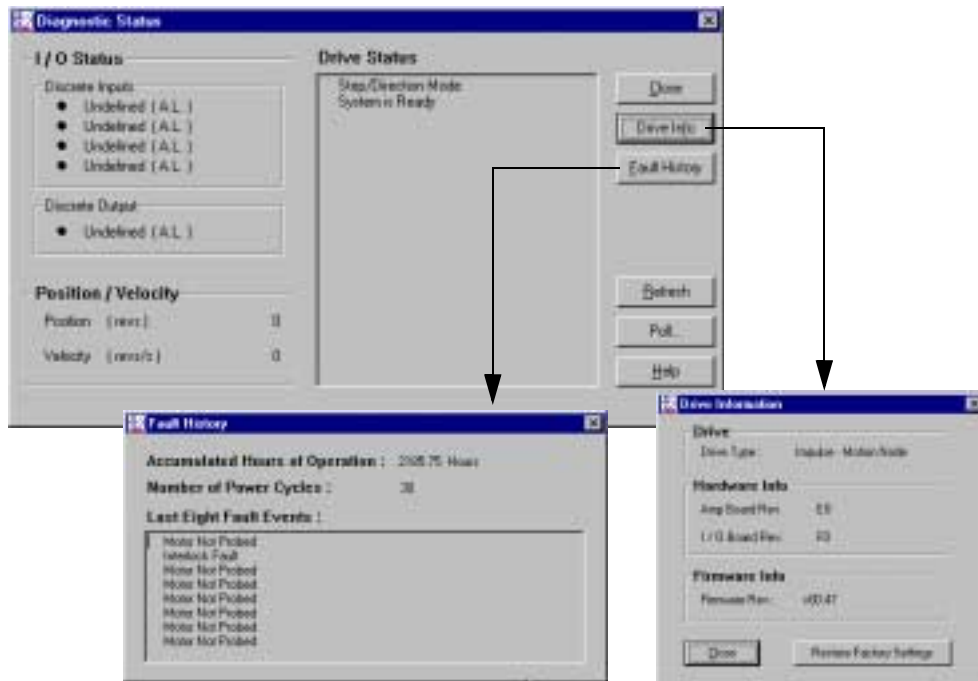
- Click **Drive Info** for a look at hardware and firmware versions. In the unlikely event that the Impulse sustains an EEPROM Fault (7 red LED flashes) the **Restore Factory Settings** button is used to clear the current memory contents and restore the factory default configuration of the Impulse.

- Click **Fault History** to look at the eight most recent drive faults, accumulated hours of operation, and the number of power cycles.

- Click **Refresh** to get a quick snapshot of the Drive Status.

- Press the **Poll** button to continuously check drive status. **Stop Polling** turns polling off and restores the Refresh button.

Updating Your Impulse Operating System:

Your Impulse drive contains FLASH memory technology allowing the flexibility and convenience of upgrading the operating system using Application Developer and a PC RS232 or RS485 serial connection. The latest released Impulse operating system version is available for download at our web site http://www.idcmotion.com.

> **WARNING:** Upgrading the operating system should only be performed when instructed by the factory. The potential for FLASH corruption exists if the operating system upgrade is interrupted while in progress. If the FLASH memory becomes corrupted, it will need to be reprogrammed at the factory.

NOTE: Upgrading the operating system will reset the drive setup to factory default settings. Be sure to save the drive setup as a .idc file or in a keypad before upgrading the operating system.

Loading the Operating System

> **WARNING: DO NOT** attempt to load the operating system over an RS232 daisy chain or RS485 bus. Attempting to load multiple units simultaneously will result in a FLASH corruption of all units.

1. Obtain the new operating system file from http://www.idcmotion.com or directly from the factory.

2. With a **single** Impulse drive connected, select **Communications > Load FLASH Memory** from Application Developer.

3. Use the Open File dialog box to select the desired .hex operating system file.

4. Application Developer will establish a FLASH memory connection and begin the transfer. The warning and progress screens (shown below) will appear when the FLASH transfer begins.

Chapter 5 - Configuring Impulse with an IDC Keypad

Section 1 of this chapter is intended primarily to familiarize new IDC keypad users with the FP100 Impulse Keypad, and we recommend this section be reviewed by those experienced with the FP220 keypad as well. If you are using an FP220 keypad (version 3.00 and above) to configure the Impulse, it is imperative that the keypad DIP-switches be set as shown on the next page.

Section 2 provides step-by-step procedures for configuring the Impulse with either the FP100 or FP220 keypad.

Section 1 - Introduction to the FP100 Impulse Keypad

The FP100 version of the IDC keypad was developed solely for the Impulse drive, while the FP220 (version 3.00 and higher) can also be used with the Impulse *and* with IDC's extensive line of Smart Drives. The FP100-RS485 and FP220-RS485 keypads may be used with an Impulse and RS-485 communication.

The keypad was designed to provide operators with a convenient way to configure an application, and though it functions primarily as an operator interface, it is also effective as a troubleshooting tool.

Application Note: If a project file was created in Application Developer using the **Extended** level of Numeric Precision (Axis Setup > Command > Numeric Precision > Extended), you will receive a *precision error* message when the file is loaded into a keypad. Only the **Standard** level of numeric precision (Axis Setup > Command > Numeric Precision > Standard) is compatible with the precision level of the keypad. See Chapter 4, Configuring Impulse with Application Developer.

Keypad Features

- Easy-to-read, two-line, 40-character, back-lit display

- Can be sealed to IP65 (NEMA 4) wash-down environment

- Large, scratch-proof keys with audible and tactile feedback

- Connects to the Impulse with a remote cable

- Allows project files to be copied to and from a PC.

Keypad Hardware Features

Adjusting Contrast

On the back of the keypad there is a plastic potentiometer, adjustable with a flathead screwdriver. This is used to adjust the contrast on the LCD display. If the Impulse drive and keypad were purchased together, this adjustment has been made by IDC. Some adjustment may still be necessary to accommodate a variety of lighting conditions or viewing angles.

Remote-Mounting the Keypad

The keypad can easily be mounted and sealed to NEMA 4 specifications by using the included mounting gasket and 6-foot communication cable. See Chapter 6, *Hardware Reference*, for important information on mounting the keypad and extending cable length.

DIP Switch Settings

DIP-switch settings on the back of the FP100 keypad have no effect on either the keypad or the Impulse drive.

NOTE: If you are using an FP220 keypad with your Impulse, you must set DIP-switch #3 to the ON position and switch #s 1, 2, and 4 to OFF. Setting switch #3 to ON does not apply when using the FP220 with other IDC drives or controls. See appropriate user's manual or call IDC Applications Engineering for information on keypad applicability.

Back of Keypad

DIP Switch	Keypad Connector Pins	Contrast
	N/C GND RX TX +5VDC	
ON ↑ 1 2 3 4	5 4 3 2 1	

ON ↑ 1 2 3 4   FP220 Settings (#3 ON)
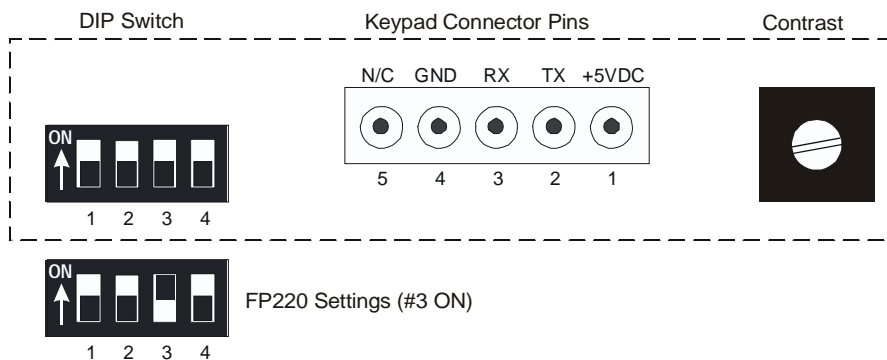
Functions of the FP100 Keypad Keys

F Keys (F1-F2-F3)
Used as menu or sub-menu item selectors.

0-9 Keys
Enters numbers directly, and letters when preceded by the ALPHA key.

Menu Keys

RUN - Run stored moves, probe and jog the motor, warm-boot the drive, and enable/disable software shutdown.

EDIT - Configure and tune the setup and stored move parameters. Select, edit, and load project files.

HELP - Displays keypad, firmware, and hardware versions. Shows drive and I/O status, and fault history.

COPY - Copies project files to and from a drive.

DEL - Deletes project files or characters in a text-entry editor.

←↑→↓
For scrolling through menu options, setup choices, and files in the editor.
Moves motor in JOG mode.

COMMA
May be used in file names.

DECIMAL POINT
Used to enter fixed-point numbers when the text-entry editor allow it.

ESC
Saves an entry and moves back one menu level.

±
Serves as a minus or hyphen key on the FFP100 keypad. The + symbol is not available on the FP100.

ALPHA
ALPHA plus a numeric key selects alphabet characters. Pressing:
ALPHA >1 enters "A"
ALPHA >1>1>1>1 enters "a"

ENTER
Selects project files and saves edits to project files in the File Options menu.

Keypad Menu Structure

Most operations using the keypad are menu-driven. A menu consists of a title bar on the top display line and as many as three options (or sub-menus) at a time on the bottom display line. Each option is displayed above one of the function keys, F1, F2, or F3. Press a function key to select the corresponding option.

If a menu has more than three options, arrows will appear on both sides of the display to indicate that more options are available. Press the appropriate arrow key to scroll, one display at a time, through all options in that menu. To exit a menu without making a selection, or to back up one menu level, press ESC.

The following table shows the Menus which are accessible from the Main Display by pressing the RUN, EDIT, HELP, COPY and DEL keys:

FP100 Main Menu and Sub-Menus				
RUN	EDIT	HELP	COPY	DEL
MOVE (F1) Run a stored move	**FILE (F1)** Open, Save, or Rename a Project File	**START (F1)** N/A on FP100	**TO PAD (F1)** Send project file to the drive	Delete a project file or a character in the EDIT > FILE sub-menus
PROBE (F2) Probe the motor for internal characteristics	**SETUP (F2)** Configure system components and operating limits	**VERSN (F2)** Provides Operating System, Hardware, and Keypad Version numbers	**FROM PAD (F3)** Retrieve project file from the drive	
JOG (F3) Jog motor at LOW (F1) or HIGH (F2) speeds	**MOVE (F3)** Optional Feature Configure and edit stored moves.	**STATUS (F3)** Provides I/O, Drive Status, and Operating History of the Impulse		
WMBOOT (F1) Reset the drive without cycling power	**UNIT#** Configure Impulse unit number for use in a daisy chain			
SHTDWN (F2) Enable/disable software shutdown				

Menu Options

Apply Power to the Keypad

Power is supplied to the FP100 keypad through its connection to the Impulse COM PORT. **Note:** If you are using an FP100-RS485, see Chapter 3, Section C for connection procedure.

When power is first applied to the keypad (prior to any menu being selected) you should observe the display shown on the right. The top line of the display shows the device your keypad is connected to (Impulse or PC), while the bottom line shows the open project file name and status. **Note**: If your Impulse is equipped with the optional Motion Node, the top line of the display will read: **CONNECT: Impulse MN**

> **CONNECT: Impulse**
> **FILE: untitled ***

File status is indicated by an asterisk (*). If and asterisk appears next to the file name, this indicates that the data in the open file has not been sent to the drive. The asterisk disappears when a COPY > TO PAD or a COPY > FRM PAD is performed. The asterisk reappears when a new project file is opened or when changes have been made to the currently open project file. See **Using the EDIT Menus** in this chapter for opening, saving, and naming files

General Rules for Using the Keypad

Entering Characters with the ALPHA key

The ALPHA key allows you to enter alphabet characters into a project file from the keypad. The ALPHA key acts as a toggle button between the alphabet characters and the number on a key

- Any letter located above a number on a numeric key may be inserted into a file name, i.e. the A, B, or C on the top part of the #1 key.

- You must press ALPHA prior to each letter you wish to enter. You must press ALPHA again if you want to enter a number immediately following the letter, hence .

- Press a key 1, 2, and 3 times to enter the upper case letters.

- Press a key 4, 5, and 6 times to enter the lower case letters.

- Press the ← or → arrow keys to move the cursor to the next space.

ESC Key

Use the ESC key to save an entry or selection and move back one screen on the display.

ENTER Key

Use the ENTER key to select or save a file in the FILE OPTIONS MENU.

Sending the Factory Default Configuration to the Impulse

In the unlikely event that the Impulse sustains an EEPROM Fault (7 red LED flashes), this fault can be cleared by restoring the factory default configuration. To restore the default configuration:

1. Press the decimal key.

2. Press the right arrow key.

3. Press the DEL key.

| RUN | **Using the RUN Menus** |

Press the RUN key to display the MOVE, PROBE, JOG, WMBOOT, and SHTDWN menus.

```
————↑ RUN ↓————
MOVE   PROBE   JOG
```

```
————↑ RUN ↓————
WMBOOT   SHTDWN
```

Run Stored Move (MOVE)

Note: The MOVE feature is available only if you purchased the optional Motion Node version of the Impulse

```
——↑ RUN  MOVE ↓——
 1        2        3
```
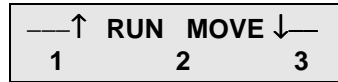
RUN > MOVE allows you to select and run one of the seven stored moves in the drive. Once a move is selected, the move will run until completion, or the move can be stopped at any time by pressing the ESC key. See **Move Menus - Using Stored Moves,** later in this chapter, to configure stored moves.

Probe the Motor (PROBE)

RUN > PROBE allows a quick motor probe when a steady red light is present on the LED diagnostic indicator.

```
Probing Motor..............
```
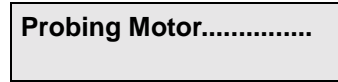
Jog Motor (JOG)

RUN > JOG allows you to jog a properly configured motor. The distance is displayed in the units selected under EDIT > SETUP > MECH > UNITS, and the default velocity is HIGH.

```
JOG:  0.0 Revs
 LOW      <HIGH>
```
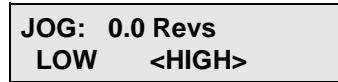
The jog velocities and jog acceleration are defined under EDIT > SETUP > COMAND > JOG. The motor is jogged by pressing and holding the direction-respective arrow key. The motor is stopped by releasing the arrow key.

Warm Boot System (WMBOOT)

RUN > WMBOOT will reset the drive without recycling power.

```
Warm Booting.............
```
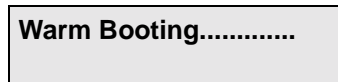
Disable Amplifier (SHTDWN)

RUN > SHUTDWN allows you to override the hardware SHUTDOWN input for disabling the drive only. If the hardware input has asserted an amplifier shutdown, this feature will not override the input to enable the drive.

```
—— Software Shutdwn ——
 ↑       ENABLED       ↓
```
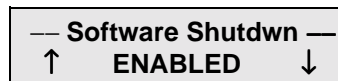
EDIT **Using the EDIT Menus**

Press the EDIT key to display the FILE, SETUP, MOVE, and
UNIT# menus.

```
————↑ EDIT ↓————
FILE    SETUP    MOVE
```

```
————↑ EDIT ↓————
UNIT#
```

File Menu (FILE OPTIONS)

The FILE menu allows you to select, save, and name or rename your project files.

EDIT **> FILE**

```
—— FILE OPTIONS ——
OPEN  SAVE  RENAME
```

Opening a Project File

This option allows you to select one of eight (8) stored project files. All eight project files are
initialized to the default configuration and are named "untitled". The project files are selected by
scrolling the names up or down using the arrow keys.

EDIT **> FILE > OPEN**

```
——↑ Select File ↓——
1: untitled
```

Saving a Project File

This option allows you to save a project file. If a custom project file has not been selected since the
keypad was powered-up, you will be prompted to select a project file location (file #) to overwrite.
A project file location is selected by scrolling the filenames using the up or down arrow keys and
pressing the ENTER key. Once a project file is selected, you will be prompted to enter a new name
for the file.

EDIT **> FILE > SAVE**

```
——↑ Select File ↓——
1: untitled
```
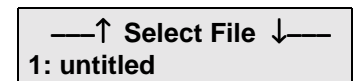
Project file names may consist of a combination of numeric digits and alphabet letters and are limited
to 10 characters. Alphabet characters are accessed by pressing the ALPHA key and repeatedly
pressing the numeric key until the desired letter is displayed on the screen. Use the right and left
arrow keys to move the cursor.

If a custom project file is currently open, you will be prompted to overwrite the currently open
project file. If YES is selected, the open project file will be overwritten with the data currently in the
keypad. If NO is selected, you will be prompted again to select a project file location to overwrite
and rename if desired.

Renaming an Open Project File

This option allows you to rename (or name) the currently-open project file. Project file names are entered using a combination of the ALPHA and numeric keys. Project file names consist of numeric digits and alphabet letters and are limited to 10 characters. Alphabet characters are accessed by pressing the ALPHA key and repeatedly pressing the numeric key until the desired letter is displayed on the screen. Use the right and left arrow keys to move the cursor.

If RENAME is selected and a project file is not open, an error message will be displayed.

| EDIT | **> FILE > RENAME** | **Requires Open File OK** |

Using the SETUP Sub-Menus for Configuring Your System

The following table shows the structure within the **EDIT > SETUP** sub-menu. For more detailed descriptions of setup parameters, see Chapter 5 - *Configuring Impulse with the FP100 or FP220 Keypad*.

Sub-Menu	Setup Parameter	Description of Setup Parameter
COMMAND	Direction	Positive or negative motor direction
	Shutdown	Active Low or Active High polarity
	Drive Resolution	Operating step resolution
	Stop Rate	Deceleration rate
	Jog	Acceleration/Deceleration, and High/Low Jog speeds
MOTOR	Probe the Motor	Probes for motor characteristics and sends 1 kHz tone
	Motor Type	IDC motor type
	Motor Current	Operating current
MECHANICS	User Units	Choose inches or millimeters, or toggle between revolutions and steps
	Units Gear Ratio	Units scaling ratio for distance, velocity, and acceleration
TUNING	X-SM1, X-SM2, X-SM3	Empirical fine tuning of the X-Smoothness
ADVANCED	Anti-Resonance	Anti-resonance gain settings
	Profiling	Enabling Multi-Stepping and Dynamic Smoothing
	Stop Reduction Timeout	Set the stop mode current reduction timeout period
	Idle Mode Reduction	Set the idle mode current reduction timeout period
	Stall Detection	Enables Open Loop Stall Detect
I/O	Input	Configure 4 inputs
	Output	Configure 1 output
	Polarity	Select Active High or Active Low polarity

HELP

Using the HELP Menu

Versions

- Press the **HELP** > **VERSN** (F2) for access to Operating System, Hardware, and Keypad versions (see examples on the right).

- Press F1, F2, or F3 for respective version displays.

- Press the **ESC** key to exit the HELP menu.

```
———— HELP ————
START  VERSN  STATUS
```

```
      VERSIONS
OPSYS  HDRWAR  KPAD
```

```
  OpSystem Version
       vXXX
```

```
  Hardware Version
AMP: E0    I/O F0
```

```
  Keypad Version
      vXXX
```

Status

- Press **HELP > STATUS** for I/O configurations, current drive status, and the operating history of the drive.

- Press **I/O** to check the configuration of four discrete inputs and one output.

- Press **DRIVE** for current drive status. The example shows no fault condition.

- Press **HISTRY** for the following operating histories: number of hours in operation, number of power cycles, and last eight drive faults.

- Press **HR_OP** for the total number of hours the Impulse has been in operation.

- Press **PWR_CY** for the number of times power has been cycled.

- Press **FAULT** to look scroll through the last eight (8) drive faults. **Stored Fault #1** is the most recent fault.

```
       STATUS
I/O     DRIVE   HISTRY
```

```
In1  In2  In3  In4  Out1
OFF  OFF  OFF  OFF  OFF
```

```
System is Enabled
FAULT: ****
```

```
OPERATING  HISTRY
HR _OP   PWR_CY  FAULT
```

```
  Hours Operation
     XXX.XX
```

```
  Num Power Cycles
       XXX
```

```
↑  Stored  Fault #1  ↓
  Overcurrent (example)
```

COPY **Using the COPY Menu**

Downloading project files between keypads and Impulse or between keypad and PC can save a significant amount of time when configuring your drive with an FP100 keypad.

Press COPY for the following two options:

```
         COPY
TO PAD      FRM PAD
```

FROM PAD

This option allows you to send the currently open project file to the drive. Answering YES to the send prompt will send the open project file and overwrite the current setup in the drive.

```
Send Current Setup?
 YES          NO
```
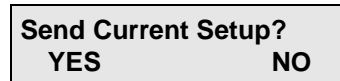
TO PAD

Allows you to retrieve the current setup from the drive. Answering YES to the retrieve prompt will extract the project file from the drive and make it the "open" file in the keypad. The extracted file is not saved to non-volatile memory and must be saved under EDIT > FILE > SAVE if the data is to be stored.

```
Retreve Drive Setup?
 YES          NO
```
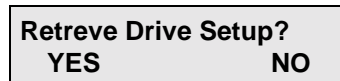
Application Note: Keypads do not provide the same decimal-level precision as IDC's Application Developer software. A project file created at higher precision will cause a "precision error message" when loaded into a keypad.

DEL **Using the DEL (Delete) menu**

To Delete a Project File

1. Press DEL.

2. Using the up and down arrow keys, select the project file to be deleted by scrolling through the list of eight (8) existing files.

```
- - ↑ Select File ↓ - -
1: untitled
```

3. Press ENTER to select the file to be deleted. Confirm deletion by pressing YES or NO.

```
Delete File?
 YES          NO
```
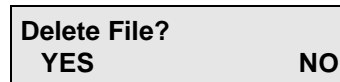
To Delete a Single Entry in the EDIT > FILE > RENAME File Editor:

1. Move the cursor over the entry you wish to delete (move with ← or →).

2. Press DEL.

Section 2 - Configuring Impulse with an IDC Keypad

This chapter contains information and steps for developing an Impulse project file with the FP100 keypad. Configuring all parameters in the EDIT menu will ensure that your project file is setup correctly.

The task of configuring your Impulse for a specific application consists of customizing a number of software parameters to match the mechanics of the system. These parameters include motor setup, I/O, jog, stored move profiles, and advanced tuning.

Application Note: If a project file was created in Application Developer using the **Extended** level of Numeric Precision (Axis Setup > Command > Numeric Precision > Extended), you will receive a *precision error* message when the file is loaded into a keypad. Only the **Standard** level of numeric precision (Axis Setup > Command > Numeric Precision > Standard) is compatible with the precision level of the keypad. See Chapter 4, Configuring Impulse with Application Developer.

The configuration procedures in this section will follow the format of the example below:

Parameter Being Configured (example: Motor Type)

1. Press EDIT, then SETUP, then MOTOR, then TYPE		**2**. You will see this display on the keypad

EDIT	**> SETUP > MOTOR > TYPE**	——↑ **Motor Type** ↓——
		None

3. Default configuration, if any, will be shown on the bottom line of the display

1. Using ↑↓ arrow keys, scroll the list of motors and stop when the your motor appears.

2. Press ESC.

4. Follow these steps to configure this parameter
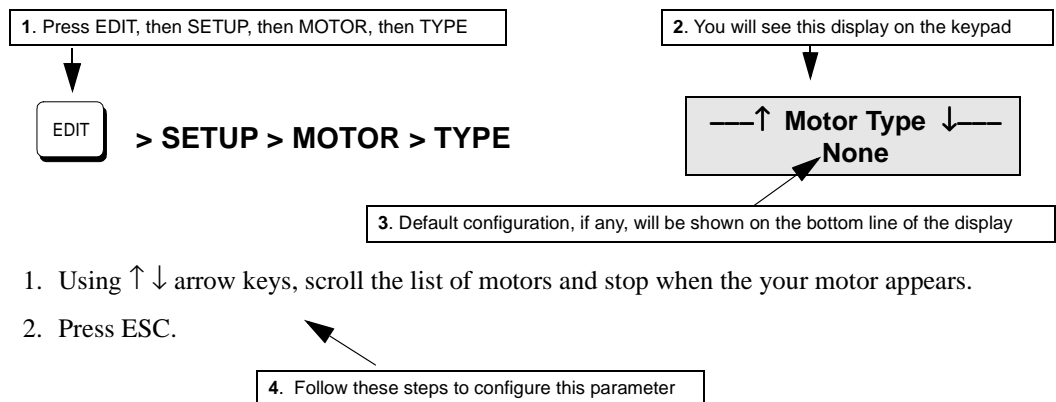
Configuring Impulse with the Keypad

Open a File

Using the EDIT > FILE menu, open a project file.

Using the EDIT > SETUP Menus to Configure the Impulse

The EDIT > SETUP menus allow you to configure your motor, mechanical units, I/O, operating characteristics, and perform advanced tuning of your system for optimum performance.

```
———↑ SETUP ↓———
COMAND MOTOR MECH
```

```
———↑ SETUP ↓———
TUNING  ADVNCE  I/O
```
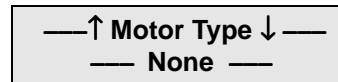
MOTOR SETUP

Configuring Motor Type

This menu allows you to select a preconfigured IDC motor type. In addition to IDC motor types, the keypad can store one custom motor type. The keypad does not contain a motor editor, so custom motor types must be created using the Application Developer *motor editor, then loaded into the keypad via a project file.

*See Application Developer > Axis Setup > Motor Tab > Edit Motor

[EDIT] **> SETUP > MOTOR**

```
——↑ Motor Type ↓ ——
—— None ——
```

1. Using ↑↓ arrow keys, scroll the list of motors until the desired motor appears on the bottom line.

2. Press ESC to save your motor selection.

Probing the Motor

A new drive setup must be instructed to probe itself after you have selected motor type on the keypad (procedure on next page). The internal setup parameters obtained during the motor probe are stored in nonvolatile memory so that the process need not be repeated every time the power is cycled.

Each time a different type of motor is connected to the drive, the motor must be probed. The drive should always be reconfigured for a new motor to avoid degrading the anti resonance feature and OLSD™. When the drive is probing the attached motor, a short 1 kHz tone will be heard emanating from the motor. Depending on motor type, this tone may persist for anywhere from several seconds to half a minute.

The motor probe may be initiated (1) immediately after configuring motor type, or (2) after all parameters in the EDIT menus have been configured. In either case, the following procedure applies:

To Probe the Motor:

1. Return to the initial keypad display (no menu selected).

2. Press RUN > PROBE (F2). At the end of the 1 kHz tone, the motor has been probed.

   Probing Motor............

3. Press ESC.

4. Continue configuring the EDIT Menu parameters if they have not been completely configured, or go to step 5.

5. Press COPY > FRM PAD (F3) to send the project file to the drive. Your project file now contains parameters vital to the advanced performance features of the Impulse.

COMMAND SETUP

The following five parameters are configured in the COMMAND sub-menu:

DIR   Motor Direction (POSITIVE=CW or NEGATIVE=CCW)
SHDWN   Shutdown Polarity (ACTIVE LOW or ACTIVE HIGH)
D-RES   Drive Resolution (steps/rev)
STPRTE   Stop Rate (user-units^2)
JOG   Jog Parameters (ACCEL, LOW VELOCITY, or HIGH VELOCITY)

| EDIT | > SETUP > COMAND |

| –↑ COMMAND SETUP ↓– |
| DIR   SHDWN   D-RES |

| –↑ COMMAND SETUP ↓– |
| STPRTE   JOG |

Configuring Motor Direction

| EDIT | > SETUP > COMAND > DIR |

| - Motor   Direction - |
| ↑   POSITIVE   ↓ |

1. Press the ↑ ↓ arrow keys to select the POSITIVE (CW) or NEGATIVE (CCW) motor direction.

2. Press ESC.

Configuring Shutdown Polarity

| EDIT | > SETUP > COMAND > SHDWN |

| - Shutdwn Polarity - |
| ↑   ACTIVE LOW   ↓ |

1. Press the up or down arrow key to select ACTIVE LOW (default) or ACTIVE HIGH.

2. Press ESC.

Configuring Drive Resolution

| EDIT | **> SETUP > COMAND > D-RES** |

```
- Drive  Resolution -
        25000
```

1. Using the numeric keys, enter the operating step resolution. The valid range for drive resolution is 200 to 100,000 in increments of 200 (divisible integer of 4X the tooth count of the motor).

2. Press ESC.

Configuring Stop Rate

This option allows you to define the *deceleration rate* to be used when a STOP or EOT input is activated or the ESC key is pressed. The units are user-defined in units^2 and the valid range is 0.1 to 1000.00.

| EDIT | **> SETUP > COMAND > STPRTE** |

```
----- Stop  Rate ----
      100.0 RPS²
```

1. Using the numeric and decimal keys, enter the desired stop rate. Note: this value will be in units selected in EDIT > SETUP > MECH > UNITS > User Units

2. Press ESC.

Configuring Jog Parameters

This option allows you to modify the jog parameters which are used by the Jog inputs (JOG+, JOG-, JOG SPEED), and in the RUN > JOG menu of the keypad. The parameters to be configured are:

ACCEL = Jog Accel/Decel (default = 20 User-Units^2)
LOW_V = Jog Low Speed (default = 0.50 User-Units)
HIGH_V = Jog High Speed (default = 2.00 User-Units)

| EDIT | **> SETUP > COMAND > JOG** |

```
JOG  PARAMETERS
ACCEL  LOW_V  HIGH _V
```

To enter a value for **ACCEL** (F1), **LOW_V** (F2), or **HIGH_V** (F3):

1. Press the F-key of the jog parameter being modified.

2. Using the numeric and decimal keys, enter the desired value. Note: this value will be in units selected in EDIT > SETUP > MECH > UNITS > User Units.

3. Press ESC.

MECHANICAL SETUP

The MECH SETUP menu allows you to configure (enter) the mechanical units and gear ratio for your application. Once configured, your keypad will use these units in all display and position reporting modes.

EDIT	> SETUP > MECH

```
     MECH SETUP
UNITS   RATIO
```
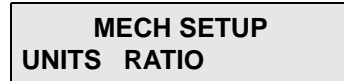
Configuring Mechanical Units (User Units)

This option allows you to select the units of distance, velocity, and acceleration used in the system. The units act only as a label and actual unit scaling is achieved by properly setting the gear ratio in EDIT > SETUP > MECH > RATIO. The unit of STEPS can be selected by toggling between REVS and STEPS (F3).

EDIT	> SETUP > MECH > UNITS

```
      User Units
[INCH]     MM     REVS
```

1. Press F1 for inches; press F2 for millimeters; or toggle F3 for revolutions per second or steps.

2. Press ESC.

Configuring Units Gear Ratio

This option allows you to enter the desired units-scaling-ratio for distance, velocity, and acceleration. The ratio is motor revolution per user unit. Note: If user units REVS or STEPS has been selected, the **Units Gear Ratio** will be a "Fixed Ratio." *Inches* or *millimeters* must be selected to allow entry of a gear ratio (see "Configuring Mechanical Units above).

EDIT	> SETUP > MECH > RATIO

```
   Units Gear Ratio
     1    to   1
```

To change the Numerator (motor revs):

1. Press any numeric key and the Numerator value entry screen will appear. In the example to the right, #1 was pressed.

```
- - - - Numerator - - - -
     1 _
```

2. Enter the numerator value. Any number can be entered by moving the cursor to the left.

3. Press ESC.
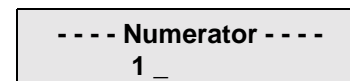
To change the Denominator (user unit):

1. Press the right arrow key (→) and the Denominator value entry screen will appear.

```
- - - - Denominator - - - -
     _
```

2. Using the numeric keys, enter the numerator value.

3. Press ESC.
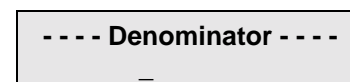
MOTOR TUNING SETUP (X-Smoothness)

Fine-tuning of the motor is recommended for all applications and should be accomplished **before** the motor load is connected. Fine-tuning produces extremely smooth performance at 2 rps and below and is accomplished by configuring the three X-Smoothness components (X-SM1, X-SM2, and X-SM3).

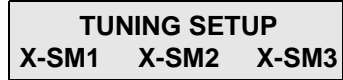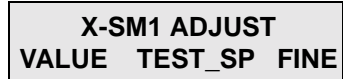| EDIT	> SETUP > TUNING

```
      TUNING SETUP
X-SM1    X-SM2    X-SM3
```

Adjusting X-SM1 (X-SM2 and X-SM3 are adjusted using the same procedures)

EDIT	> SETUP > TUNING > X-SM12

```
      X-SM1 ADJUST
VALUE   TEST_SP   FINE
```
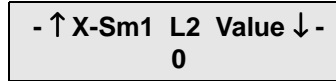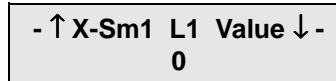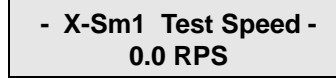
VALUE

1. Press VALUE (F1) to enter the X-Sm1 value directly.

2. Using the numeric keys, enter a value for L1.

3. Press the down arrow key (↓) to access the L2 Value screen.

4. Enter a value for L2.

5. Press ESC.

```
- ↑ X-Sm1  L1  Value ↓ -
           0
```

```
- ↑ X-Sm1  L2  Value ↓ -
           0
```

TEST SPEED (TEST_SP)

This option allows you to modify the default test speed for component X-SM1. The speed is fixed in units of RPS. This component must be defined before moving to the next component, FINE adjustments.

```
- X-Sm1  Test Speed -
       0.0 RPS
```

1. Press TEST_SP (F2).

2. Using numeric and decimal keys, enter the test speed.

3. Press ESC.

FINE (Fine Adjustments)

This option allows fine adjustment of values L1 and L2 of X-SM1. When this menu is entered, the motor will run at the test speed configured in the TEST SPEED option of X-SM1 (see

```
↑ [L1] ←--*--→ 0
↓  L2  ←--*--→ 0
```

above). Values L1 and L2 are selected by using the up and down arrows. The value is incremented (increased) by using the right arrow key (→) and decremented (decreased) by using the left arrow (←). Hold the arrow key down to increase/decrease the rate. The value is displayed on the right side of the display (display example shows 0). Stop the motor at any time by pressing ESC. If an adjustment has been made to values L1 or L2, you will be prompted whether or not to keep the new setting. Select YES to save the settings; select NO to restore the original settings.
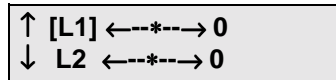
1. Press FINE (F3).

2. Using the up and down arrow keys, select L1 or L2.

3. Using the left and right arrow keys, increase or decrease the Fine Adjustment value.

4. Press ESC.

5. Press YES (F1) to save the new settings, or press NO (F3) to restore the original settings.

Keep New Settings?
YES   NO

Configure X-SM2 and X-SM3 using the same procedures as X-SM1 (i.e. VALUE, TEST SPEED, and FINE).

ADVANCED SETUP

The following parameters must be configured in the ADVANCED SETUP sub-menu:

ANTI-RESONANCE (A-RES)
GAIN 1
GAIN 2

Profiling (PRFILE)
MULTI (Multistepping)
DYNSM (Dynamic Smoothing)
DSGAIN (Dynamic Smoothing Gain)

STOP RED TIMEOUT (I-STOP)

IDLE MODE REDUCTION (I-IDLE)
TIMEOUT
%RED

STALL DETECTION (STALL)
DISABLED
ENABLED

EDIT   **> SETUP > ADVNCE >**

-↑ ADVANCED SETUP ↓-
A-RES DYN-SM I-STOP

-↑ ADVANCED SETUP ↓-
I-IDLE STALL

Configuring Anti-Resonance Gain

EDIT   **> SETUP > ADVNCE > A-RES**

- - ANTI-RESONANCE - -
GAIN1   GAIN2

GAIN 1
This option allows you to configure the anti-resonance gain (#1) between 0 and 32,767. Setting gain at 0 disables the anti-resonance feature, regardless of the GAIN2 setting.

1. Press GAIN1 (F1).

2. Using numeric keys, enter a gain of between 0 and 32,767.

3. Press ESC.

- Anti-Res Gain #1 -
0

GAIN2 (required only if GAIN1 was configured)
This option allows you to configure the anti-resonance gain (#2) between 0.1and 25.0.

1. Press GAIN2 (F2).

2. Using numeric keys, enter a gain of between 0.1 and 25.0.

3. Press ESC.

- Anti-Res Gain #2 -
0

Configuring Profiling Parameters

EDIT **> SETUP > ADVNCE > DYN-SM**

```
     - PROFILING -
 MULTI   DYNSM   DSGAIN
```

MULTI (Multi-Stepping™)
This option allows you to enable or disable Multi-Stepping™ feature.

1. Press MULTI (F1).

2. Using arrow keys, select ENABLED or DISABLED.

3. Press ESC.

```
──── Multi-Stepping ────
 ↑       DISABLED      ↓
```

DYNSM (Dynamic Smoothing™)
This option allows you to enable of disable the Dynamic Smoothing™ feature.

1. Press DYNSM (F2).

2. Using arrow keys, select ENABLED or DISABLED.

3. Press ESC.

```
  Dynamic Smoothing
 ↑       DISABLED      ↓
```

DSGAIN
This option allows you to enter a dynamic smoothing gain of between 20 and 2621. Setting gain to 2621 effectively disables the Dynamic Smoothing™ feature. If Multi-Stepping™ been selected, the Dynamic Smoothing Gain will be fixed.

1. Press GAIN (F1).

2. Using numeric keys, enter a gain (0 to 2621).

3. Press ESC.

```
──── Dyn Sm Gain ────
          2621
```

Configuring Stop Mode Current-Reduction Timeout (I-STOP)

This option allows you to set the Stop Mode current-reduction timeout in milliseconds. When the timeout period has elapsed, the command motor current will be reduced by up to 25%. Full current is restored on the next commanded step. The valid range for the timeout is from 0 ms to 19656 ms. Setting the timeout to 0 disables the Stop Mode feature and the display will read "Off".

EDIT **> SETUP > ADVNCE > I-STOP**

```
  - Stop Red Timeout -
          Off
```

1. Using the numeric keys, enter the desired current-reduction timeout period.

2. Press ESC.

Configuring Idle Mode Current Reduction Parameters

Use this option to set the Idle Mode current-reduction parameters (TIMEOUT and %RED).

TIMEOUT sets the Idle Mode current reduction period in seconds. When the TIMEOUT period has elapsed, the commanded motor current will be reduced by the percentage defined in EDIT > SETUP > ADVNCE > I-IDLE > %RED. Full current is restored on the next commanded step. The valid range for the timeout is 0 to 3600 seconds. Setting the timeout to 0 disables the Idle Mode feature and the display will read "Off".

%RED (percentage of reduction) sets the percentage of current reduction that occurs after the Idle Mode TIMEOUT has expired. The valid range for percentage of reduction is 0 to100%. The Idle Mode reduction percentage takes precedence over the Stop Mode 25% reduction if *both* modes have been enabled.

EDIT	> SETUP > ADVNCE > I-IDLE

```
- IDLE MODE REDUCT -
TMEOUT    %RED
```

TIMEOUT

1. Press TMEOUT (F1).

2. Using the numeric and decimal keys, enter the desired current-reduction period (seconds).

3. Press ESC.

```
- Idle Mode Tmeout -
        Off
```

%REDUCTION (required only if TIMEOUT was configured)

1. Press %RED (F2).

2. Using the numeric keys, enter the desired percentage of reduction (no decimal).

3. Press ESC.

```
- Idle Mode %Redct -
        0%
```

Configuring Encoderless Stall-Detection (OLSD™)

This option allows you to enable or disable the OLSD™ feature. OLSD™ becomes active at velocities of 0.5 RPS and greater.

EDIT	> SETUP > ADVNCE > STALL

```
-  Stall  Detection  -
↑      DISABLED      ↓
```
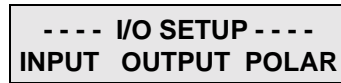
1. Using the up and down arrows, toggle to DISABLED or ENABLED OLSD™ .

2. Press ESC twice to return to the EDIT > SETUP menu.

I/O SETUP

This option allows you to configure up to (4) digital inputs and one (1) digital output.

| EDIT | > SETUP > I/O

```
- - - -  I/O SETUP - - - -
INPUT   OUTPUT  POLAR
```

Configuring Inputs

The input number (#1 - #4) is selected by using the right or left arrow key. The input function is selected by scrolling the list using the up or down arrow key. The INPUT menu consists of the inputs described in the table below.

Configurable Inputs	Input Description
UNDEFINED	The input position currently has no function
JOG +	Jogs the motor in the positive direction
JOG -	Jogs the motor in the negative direction
JOG SPEED	Toggles between High and Low jog velocity
STOP	Stops motion at the Stop Rate (internal move engine or external steps)
KILL	Instantly stops motion (internal move engine or external steps)
EOT	End-of-Travel (also used for Homing moves)
[RESERVED]	Reserved for future use - acts as UNDEFINED
MOVE SELECT	Acts as a bit in a binary move selection number
WARM BOOT	Resets the drive

1. Press INPUT (F1).

2. Using the right or left arrow key, select the Input # (position) to be configured.

```
- - - ←↑ Input #1  ↓→ - - -
        UNDEFINED
```

3. Using the up or down arrow key, select the desired input function.

4. Press ESC

Configuring Outputs

The output function is selected by using the up or down arrow key. The OUTPUT menu consists of the outputs described in the table below.

Configurable Inputs	Input Description
UNDEFINED	The output position has no function
BRAKE	Activated on a fault
MOVING	Activated when receiving steps or the internal move engine is active
[RESERVED]	Reserved for future use - acts as UNDEFINED
STALLED	Activated when the OLSD™ detects a stall

1. Press OUTPUT (F2).

2. Using the up or down arrow key, select the desired output function.

3. Press ESC

```
- - - - ↑ Output #1 ↓ - - - -
         UNDEFINED
```

Configuring Input/Output Polarities

This option allows you to define the active polarity of the inputs and output. The polarity refers to the electrical sense of the node (i.e. an ACTIVE LOW input must be grounded to be asserted).

The inputs and output are selected by using the left and right arrow keys. The polarity is selected by toggling between ACTIVE LOW and ACTIVE HIGH using the up and down arrow keys.

1. Press POLARITY (F3).

2. Using the right or left arrow key, select the desired input or output.

3. Using the up or down arrow key, toggle to the desired polarity.

4. Press ESC.

```
- - - ←↑ Input #1 ↓→ - - -
         ACTIVE LOW
```
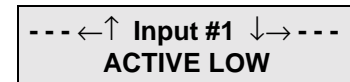
Move Menus - Using Stored Moves

This feature is only available of your Impulse is equipped with the optional Motion Node.

The MOVE menu allows you to edit the Stored-Move parameters (also see Edit > Stored Move menu in Application Developer).

| EDIT | **> MOVE** |

```
- - -  STORED MOVES - - -
PROFLE  SCAN
```

Stored-Move Profiles

The PROFLE (profile) menu allows you to configure the seven (7) possible stored -move profiles executed by the internal move engine. The move number is selected by using the up or down arrow keys, and the move profile parameters are selected by using the left or right arrow keys. Units of acceleration, deceleration, velocity, and distance are defined in EDIT > SETUP > MECH > UNITS, and scaled by EDIT > SETUP > MECH > RATIO.

There are three (3) types of stored-move profiles:
INC - Incremental
ABS - Absolute
HOME - Home Routine

Incremental moves are indexed the commanded distance from the current position.

Absolute moves are indexed to the commanded position.

Home moves provide a built-in routine to automatically find an exact position to reference all moves from (i.e. to find the zero position after a system power cycle.) Home moves require the use of at least one EOT limit switch and one input configured as an EOT. Home moves do not require the use of a home switch.

Home moves are executed as follows:

1. The drive begins moving in the direction specified by the sign of the velocity. **Note**: Negative velocities are only valid with Home moves. The move distance is always forced to be the sign opposite of the velocity sign.

2. The drive moves at the commanded velocity until an EOT switch is encountered and decels at the rate defined in EDIT > SETUP > COMAND > STPRTE.

3. The drive then switches direction and moves at 1/16 the commanded velocity to find the leading edge of the EOT switch.

4. The drive then performs a final incremental move from the edge of the EOT switch equal to the defined move distance.

Configuring Stored-Move Profiles

There are five (5) stored move parameters to be configured: Acceleration, Deceleration, Velocity, Distance, and Move Type.

1. Press PROFLE (F1).

2. Using the up or down arrow key, select the Move # (1 - 7) to configured.

3. Using the right or left arrow key, select the move parameter to be configured.

   Note: Step 4 applies to Accel, Decel, Velcty, and PosDis. Step 5 applies to MvType.

4. Using the numeric and decimal keys, enter the desired value of the parameter.

5. Using F1, F2, or F3, select the Move Type.

6. Press ESC.

←↑ **Move #1 Accel** ↓→
0.0 RPS²

←↑ **Move #1 Decel** ↓→
0.0 RPS²

←↑ **Move #1 Velcty** ↓→
0.0 RPS²

←↑ **Move #1 PosDis** ↓→
0.0 RPS²

←↑ **Move #1 MvType** ↓→
[INC]   ABS   HOME

Move Selection Input Scan Time

This option allows you to set the move selection input scan time in milliseconds. The scan time serves as a timeout for which the move selection inputs must be held in a stable state. If any move selection input changes state within the scan time, the timeout is reset (debounce). When the scan time has expired, the move corresponding to the binary number on the move selection inputs will be executed. The valid range of the scan time is 0 ms to 19660 ms.

Configuring Scan Time

1. Press SCAN (F2).

2. Using the numeric keys, enter the desired scan time in milliseconds.
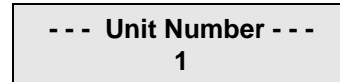
3. Press ESC twice to return to the EDIT menu.

Move Sel Scan Time
0 ms

UNIT#

This menu allows you to configure the unit number for use in RS232C daisy chains or RS485 buses. The valid range for unit numbers is 1 - 99.

| EDIT | > UNIT#

```
- - - Unit Number - - -
          1
```

1. Using the numeric keys, enter the desired unit number for the drive.

Very Important! - Send the File to the Drive

When all setup parameters have been configured and the motor has been probed, use the COPY menu (COPY > FRM PAD) to send the project file to the drive.

Chapter 6 - Hardware Reference

Impulse Specifications

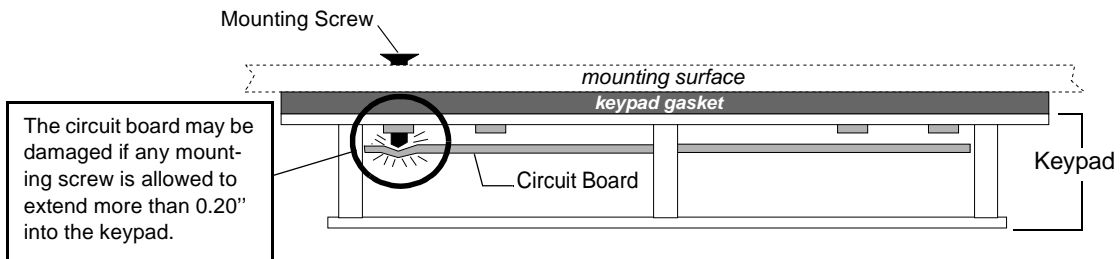| Electrical Characteristics	
Power Requirements	120 VAC ±10% single phase, 50/60 Hz, 500 VA max @ 4 A
Current Output Range	0.75 - 4.0 Amps
Motor Inductance Range	2 - 80 mH
Motor Resolution	25,600 Steps/Rev internal. Pre-scaled for the range 200 - 100,000
Motor Frame Size - NEMA	17 - 34
Step & Direction Inputs	
Input Voltage	*5 VDC (see note at bottom)
Input Current	5 - 15 mA
Setup Time (Direction)	250 ns
Max. Frequency (Step)	2 MHz
Shutdown Inputs	
Single-Ended Mode Input Voltage (VDC)	*HIGH:* 3 V min. to 5 V max. *LOW:* 0 V min. to 1.5 V max.
Differential Mode (VDC between + and -)	*HIGH:* 2 V min. to 5 V max. *LOW:* -5 V min. to -2 V max.
Input Current (any terminal @ 0 V to Gnd)	-1 mA to 15 mA
Digital Inputs	
Input Voltage	*HIGH:* 3 V min. to 24 V max. *LOW:* 0 V min. to 1.5 V max.
Input Current @ 0 V	-2.5 mA (inputs 1 & 2); -3.8 mA (inputs 3 & 4)
Digital Output	
Current Sink (ON state, Max.)	100 mA
Output Voltage (ON state @ 100 mA Max.)	0.4 V
Output Voltage (OFF state, Max.)	24 V
Environmental	
Operating Ambient Temperature	0 to 50° C
Storage Temperature	-40 to 80° C
Relative Humidity (Maximum)	95% non-condensing
Altitude above Sea Level	10,000 ft. [3,048 m]
Thermal Characteristics	
Cooling	Internal
Heat Dissipation @ 4 A (typical)	32 W
Physical Characteristics	
Dimensions (inches [mm])	H = 5.60 [142]; W = 1.78 [45]; D = 6.37 [162]
Weight	1.75 lbs [.794 kg]
*External current-limiting resistor required for 12V and 24V power supply connections. Use 560 Ohm, 1/4 W resistor for 12 V connection. Use 1.3 KΩ resistor for 24 V connection.	

Remote Mounting Your Keypad

The keypad can easily be mounted and sealed to NEMA 4 specifications by using the included mounting gasket and 6-foot communication cable. **Warning: Do not attach the gasket to the keypad.** Attach the gasket with the adhesive side toward the mounting enclosure. A pressure-seal is formed between the gasket and the keypad, while the adhesive maintains the seal between the enclosure and the gasket.

A Keypad Mounting Template is included with every keypad, and a *not to scale* mounting dimensions drawing can be found on the next page for reference. Please pay particular attention to the **CAUTION** on the template.

> ### Warning
> **1) When mounting the keypad on wall-type surfaces (as shown in the illustration below) be absolutely certain that you have accurately estimated the proper length of mounting screws. Your keypad may be damaged if a mounting screw is allowed to extend more than *0.20 inches* into the keypad.**
>
> **2) When mounting the keypad to a metal surface, it is highly advisable that the keypad be insulated from the metal surface by using non-conductive fasteners (screws, washers, etc.).**

End View of Wall-Mounted Keypad with Cover Removed

Mounting Screw

mounting surface
keypad gasket

The circuit board may be damaged if any mounting screw is allowed to extend more than 0.20'' into the keypad.

Circuit Board

Keypad

Extending the Cable Length to Your Keypad

The keypad cable may be extended if necessary, but at longer distances your keypad may require a separate, regulated 5 VDC (500mA) power supply as shown in the illustration below. Consult IDC Applications Engineering if you have questions about this procedure.
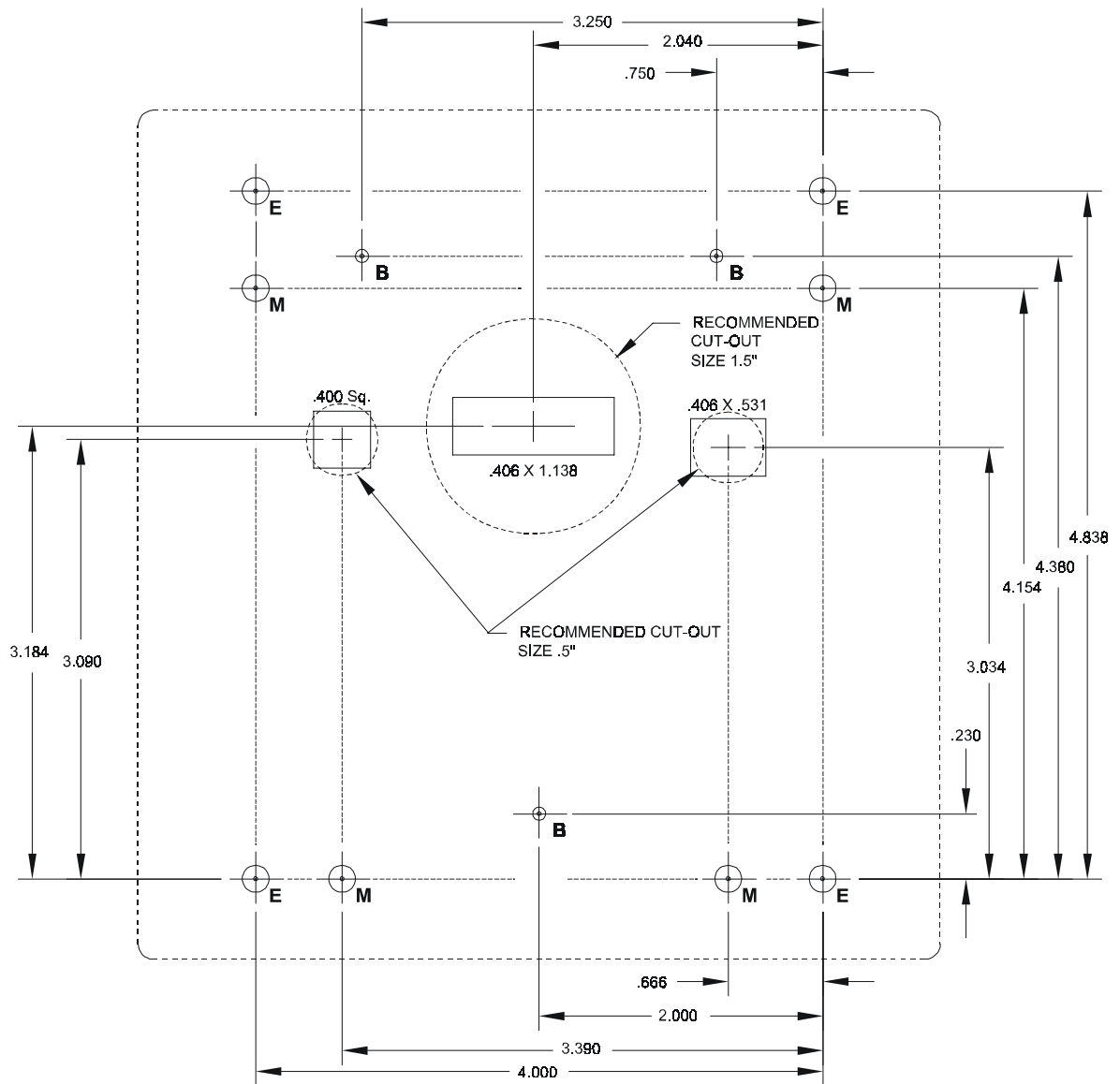

N/C GND RX TX +5V

GND
+5V

+5V Regulated
Power Supply

KEYPAD

+5V
RX
TX
COM
SHLD

COM
PORT
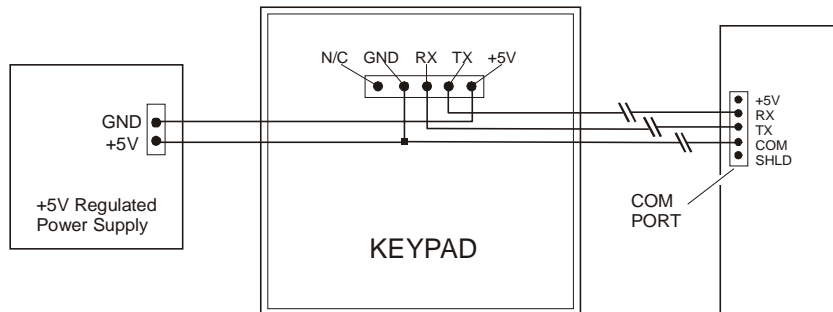
Keypad Mounting *Template

*CAUTION - this is *scaled-down version* of the keypad template. Use this drawing only for dimensions and locations of mounting holes. The actual template is included with your keypad and may also be found at: http://www.idcmotion.com/support/index.html
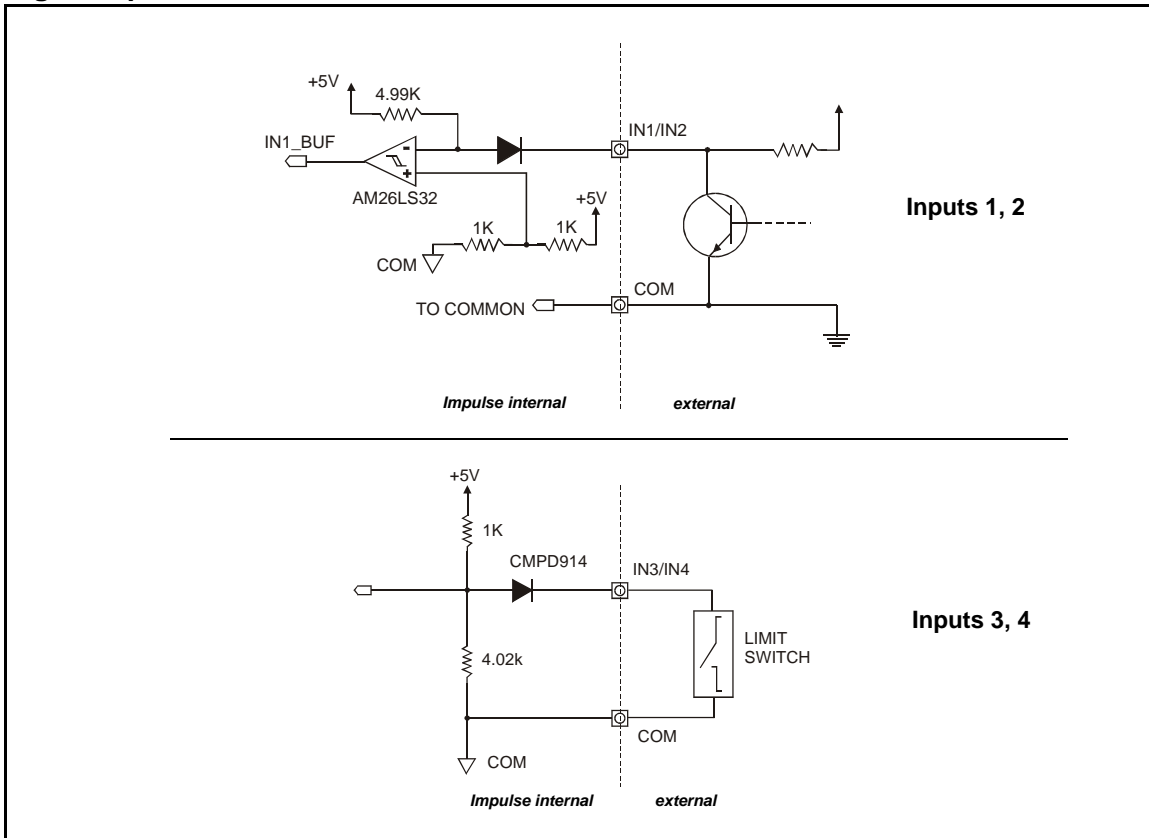
KEYPAD MOUNTING TEMPLATE

CAUTION: Your Keypad will be damaged if mounting screws extend more than 0.2 inches into the keypad.

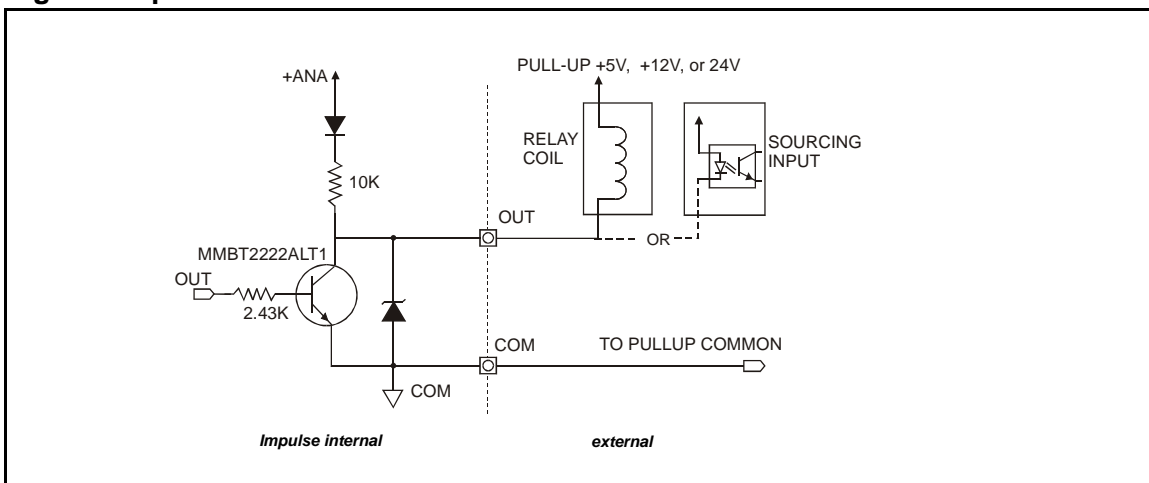| E	3/16" CLEARANCE HOLES (4)	CUT THESE HOLES FOR 6/32 CAPTIVE MOUNTING.
M	3/16" CLEARANCE HOLES (4)	CUT THESE HOLES FOR M3.5 CAPTIVE MOUNTING.
B	5/32" CLEARANCE HOLES (3)	CUT THESE HOLES FOR BALL-HEAD REMOVABLE MOUNTING.

Impulse I/O Schematics

Digital Inputs

+5V
4.99K
IN1_BUF
AM26LS32
IN1/IN2
1K
1K
+5V
COM
COM
TO COMMON

Inputs 1, 2

Impulse internal   *external*

+5V
1K
CMPD914
IN3/IN4
4.02k
LIMIT
SWITCH
COM
COM

Inputs 3, 4

Impulse internal   *external*

Digital Output

+ANA
10K
MMBT2222ALT1
OUT
2.43K
OUT
COM
COM

PULL-UP +5V, +12V, or 24V
RELAY
COIL
SOURCING
INPUT
OR
TO PULLUP COMMON

*Impulse internal*   *external*

6-4

Step, Direction, and Shutdown Inputs

Application Notes:

1. When wiring TTL signals to other manufacturer's indexers, the Step TTL command signals from the controller should be wired to **Step +**, the Direction signal to **Dir +**, and the Shutdown signal to **SD +** (**Step -**, **Dir -,** and **SD -** should not be connected). Remember to connect commons.

2. Activating the Shutdown input (logic low) disables the drive amplifier and de-energizes the motor. When this input is off (logic high) the drive is enabled and the motor is energized.
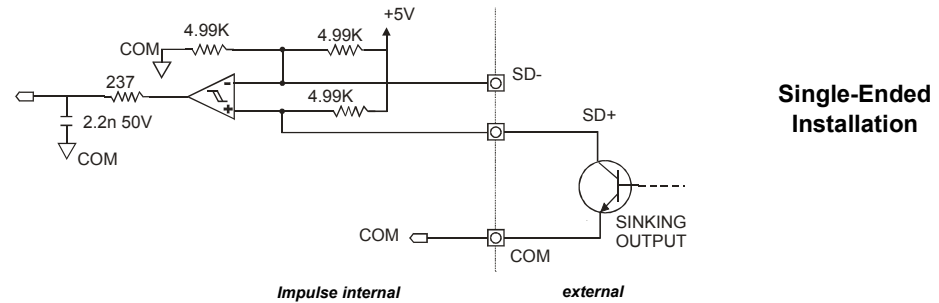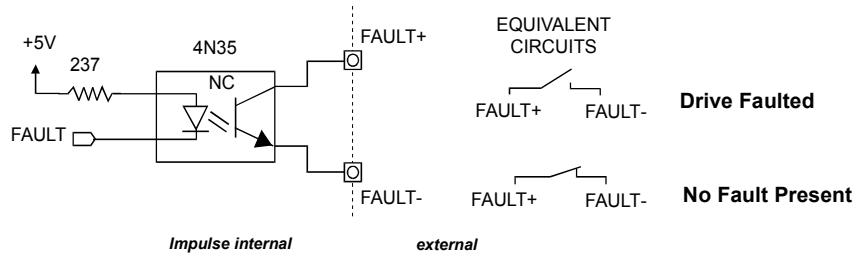
Single-Ended Installation
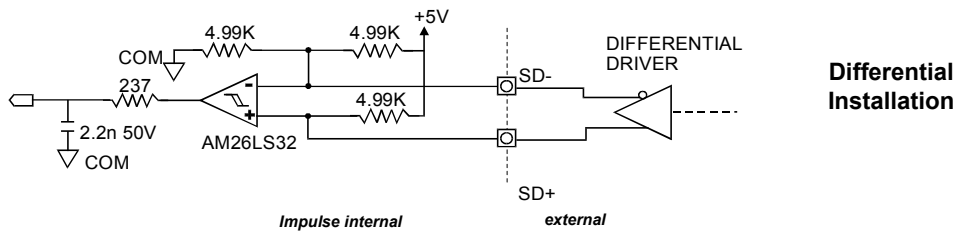
Differential Installation
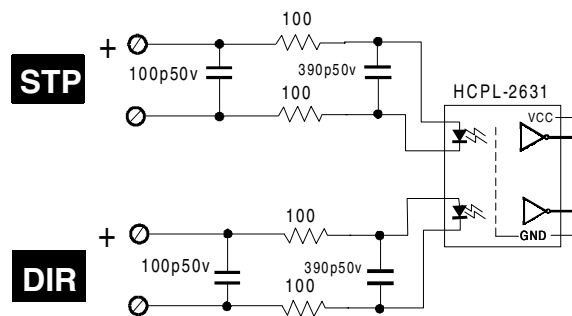
See next page for Step and Direction schematic.

Fault Output

Internal Circuits

*External current-limiting resistor required for 12V or 24V connections. Use 560ohm, 1/4 W for 12V connection. Use 1.3 Kohm, 1/2W for 24V connection.

Using IDC Position Sensors as EOT Limit Switches with the Impulse

Four IDC position sensors may be used as EOT limit switches with the Impulse. Connection information for all four sensors is provided below.

PSR-2

- The **PSR-2** position sensor is a normally closed Reed Switch and must be connected to two (2) separate inputs, as shown here. This leaves two (2) inputs for move selects, which allows for the selection of three (3) stored moves.

- The **PSR-2** position sensor contains a series diode and cannot be used in series, as is the RPS-2 sensor shown below.

- **Note**: If you need to configure more than 3 stored moves, the position sensors below only require one input for connection.

RPS-2

- The **RPS-2** position sensor is a normally closed Reed Switch and must be connected in series as shown here.

**RPS-1
PSR-1**

- The **RPS-1 or PSR-1** position sensors are normally open Reed Switches and must be connected in parallel as shown here.

Optional Accessories for Your Impulse

Impulse I/O Accessories	
Accessory (P/N & Description)	
DB25BO Screw Terminal Breakout Board See page next page for connection information.	Dimensions: 2.0L x 1.0W x 0.8D
SS-IO **SS-IO-6** 25-pin D-Shell I/O cable that connects Impulse to other devices or PLC SS-IO is 2 ft. SS-IO-6 is 6 ft. See the next page for wire color codes	
SS-RS232 Cable for connecting Impulse to PC (9-pin Comm. Port)	
PCS-5004 PC-Keypad Cable for copying programs between keypad and PC	

DB25BO Screw Terminal Breakout Board

When connected to the Impulse, the DB25BO terminals will match the pinouts of the 25-pin connector as shown below.
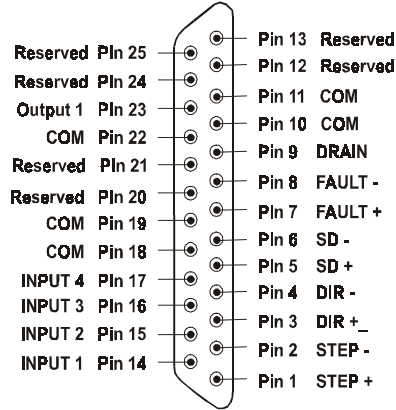
DB25BO

Reserved Pin 25		Pin 13 Reserved
Reserved Pin 24		Pin 12 Reserved
Output 1 Pin 23		Pin 11 COM
COM Pin 22	DB25BO	Pin 10 COM
Reserved Pin 21	Screw	Pin 9 DRAIN
Reserved Pin 20	Terminal	Pin 8 FAULT -
COM Pin 19	Breakout	Pin 7 FAULT +
COM Pin 18	Board	Pin 6 SD -
INPUT 4 Pin 17		Pin 5 SD +
INPUT 3 Pin 16		Pin 4 DIR -
INPUT 2 Pin 15		Pin 3 DIR +_
INPUT 1 Pin 14		Pin 2 STEP -
		Pin 1 STEP +
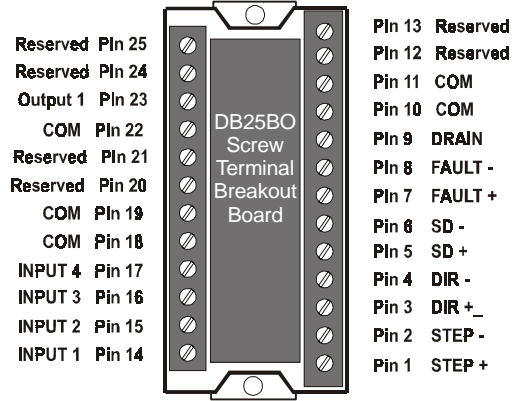
25-pin Connector on Impulse Drive

Reserved Pin 25	Pin 13 Reserved
Reserved Pin 24	Pin 12 Reserved
Output 1 Pin 23	Pin 11 COM
COM Pin 22	Pin 10 COM
Reserved Pin 21	Pin 9 DRAIN
Reserved Pin 20	Pin 8 FAULT -
COM Pin 19	Pin 7 FAULT +
COM Pin 18	Pin 6 SD -
INPUT 4 Pin 17	Pin 5 SD +
INPUT 3 Pin 16	Pin 4 DIR -
INPUT 2 Pin 15	Pin 3 DIR +_
INPUT 1 Pin 14	Pin 2 STEP -
	Pin 1 STEP +

SS-IO/SS-IO-6 Cables

IDC Cable P/N: SS-IO/SS-IO-6								
Pin	Impulse Signal	Wire Color	Pin	Impulse Signal	Wire Color	Pin	Impulse Signal	Wire Color
1	STEP +	Brown	10	COM	Gray	19	COM	Black/White
2	STEP -	Red	11	COM	White	20	Reserved	Red/Black
3	DIR +	Orange	12	Reserved	Black	21	Reserved	Orange/Black
4	DIR -	Pink	13	Reserved	Brown/White	22	COM	Yellow/Black
5	SD +	Yellow	14	INPUT 1	Red/White	23	Output 1	Green/Black
6	SD -	Green	15	INPUT 2	Orange/White	24	Reserved	Gray/Black
7	FAULT +	Light Green	16	INPUT 3	Green/White	25	Reserved	Pink/Black
8	FAULT -	Blue	17	INPUT 4	Blue/White	**Note:** Cable SHIELD is internally connected to the DB25 metal housing.		
9	Drain	Violet	18	COM	Violet/White			

Impulse-Applicable IDC Motors

S12 Hybrid Step Motor
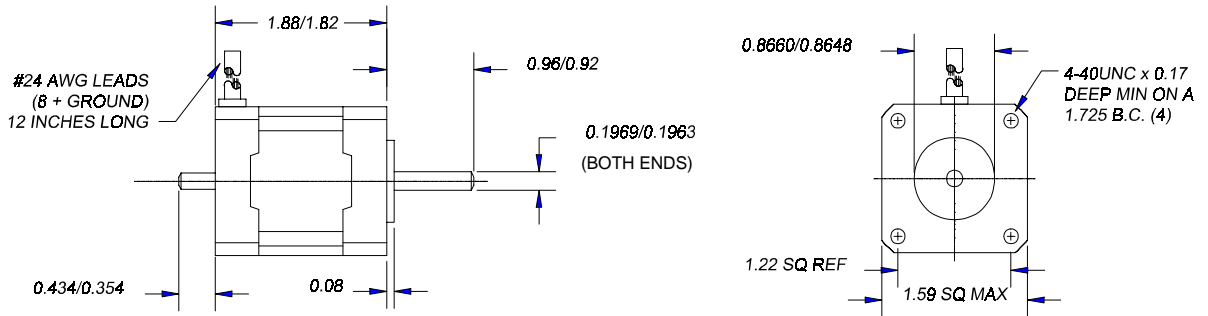
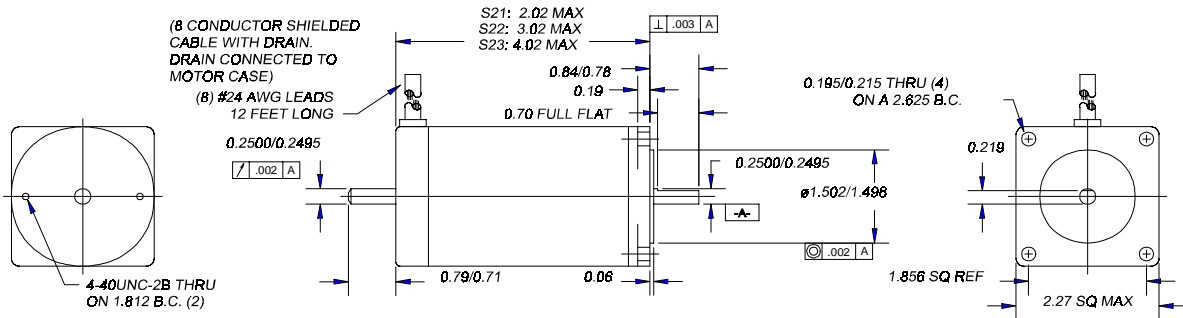| Electrical Specs.		S12T
Continuous Stall Torque	oz-in [N-m]	35 [0.25]
Recommended Current/Phase	Amps	1.0
Winding Resistance @ Ambient	Ohms	5.52
Inductance	mH	8.8
Max. Winding Temperature	°F [°C]	212 [100]
Mechanical Specs.		**S12T**
Rotor Inertia	oz-in-s^2 [kg-m^2]	5.1×10^{-4}
Axial Shaft Load	lbs [N]	10 [45]
Radial Shaft Load @ 0.5 inches	lbs [N]	5 [22]
Motor Weight	lbs [kg]	0.66 [0.3]
Step Angle (full step)	degrees	1.8

Note:

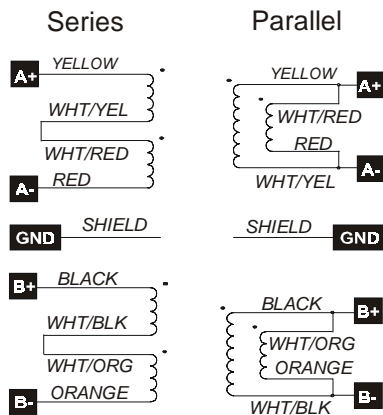• IDC step motors require a torque safety margin of at least 30%.

IDC Motor Wiring

Series
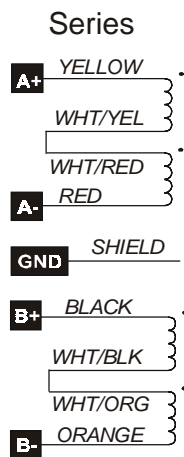
S21, S22, S23 Hybrid Step Motor Specifications

| Electrical Specs.		S21T	S21V	S22T	S22V	S23T	S23V
Continuous Stall Torque	oz-in [N-m]	65 [0.46]		100 [0.71]		125 [0.88]	
Recommended Current/Phase	Amps	1.05	2.1	1.5	3.0	1.75	3.5
Winding Resistance @ Ambient	Ohms	5.4	1.35	4.8	1.2	4.4	1.1
Inductance	mH	18	4.5	18	4.5	18	4.5
Max. Winding Temperature	°F [°C]	212 [100]		212 [100]		212 [100]	
Mechanical Specs.		**S21T**	**S21V**	**S22T**	**S22V**	**S23T**	**S23V**
Rotor Inertia	oz-in-s^2 [kg-m^2]	$1.66\times10^{-3}[1.17\times10^{-5}]$		$3.31\times10^{-3}[2.34\times10^{-5}]$		$4.97\times10^{-3}[3.51\times10^{-5}]$	
Axial Shaft Load	lbs [N]	25 [111]		25 [111]		25 [111]	
Radial Shaft Load @ 0.5 inches	lbs [N]	5.6 [25]		5.6 [25]		5.6 [25]	
Motor Weight	lbs [kg]	1.6 [0.73]		2.4 [1.1]		3.2 [1.5]	
Step Angle (full step)	degrees	1.8		1.8		1.8	

IDC Motor Wiring

Notes:
- T = Series   V = Parallel

- Parallel (V) wiring: 50% duty cycle max above 5 rps (300 rpm).

- IDC step motors require a torque safety margin of at least 30%.
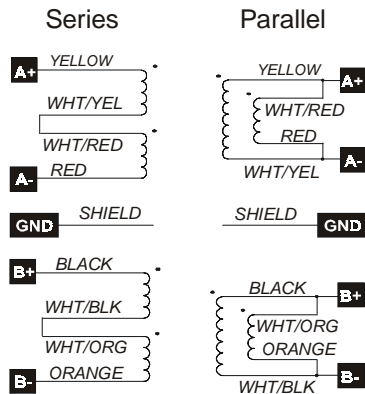
S32, S33 Hybrid Step Motor Specifications
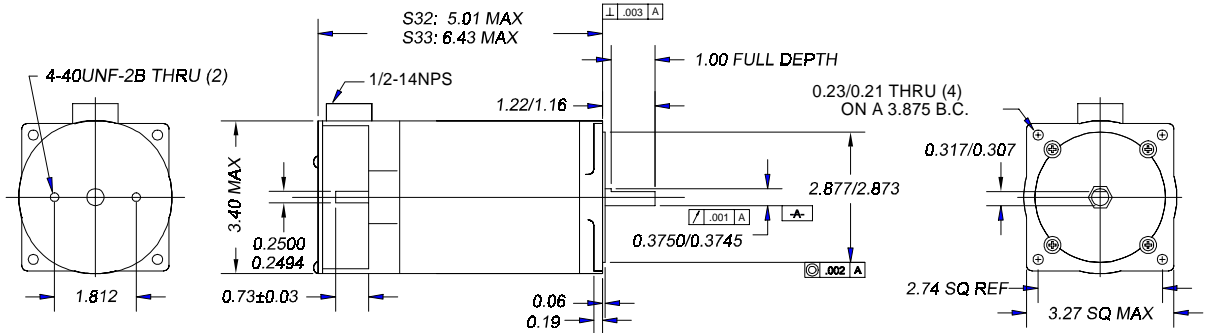
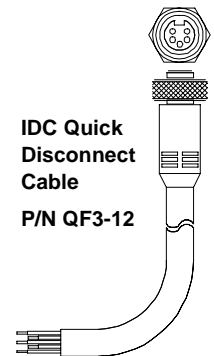| Electrical Specs.		S32T	S33T
Continuous Stall Torque oz-in [N-m]		300 [7.1]	400 [5.3]
Recommended Current/Phase Amps		2.8	3.5
Winding Resistance @ Ambient Ohms		1.03	.96
Inductance mH		10	10
Max. Winding Temperature °F [°C]		212 [100]	212 [100]
Mechanical Specs.		S32T	S33T
Rotor Inertia oz-in-s^2 [kg-m^2]		0.017 [3.51x10^{-5}]	0.0265 [3.51x10^{-5}]
Axial Shaft Load lbs [N]		50 [222]	50 [222]
Radial Shaft Load @ 0.5 inches lbs [N]		14.5 [64.4]	14.5 [64.4]
Motor Weight lbs [kg]		5.1 [2.3]	8.3 [3.8]
Step Angle (full step) degrees		1.8	1.8

Notes:
- T = Series   V = Parallel
- Parallel (V) wiring: 50% duty cycle max above 5 rps (300 rpm).
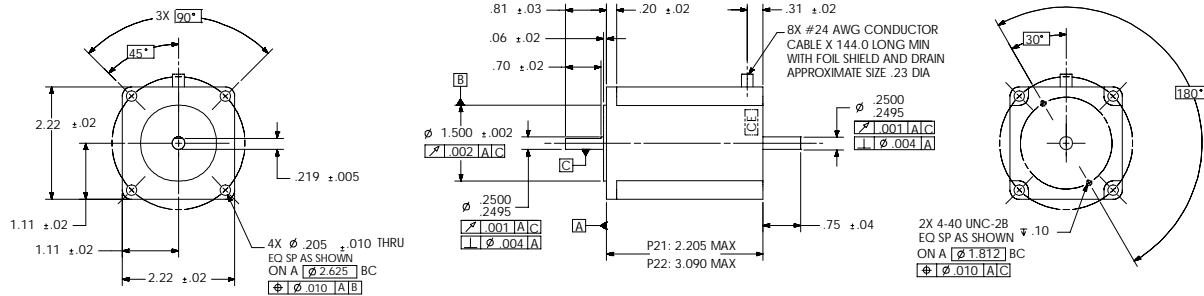- IDC step motors require a torque safety margin of at least 30%.

IDC Motor Wiring

Series

Parallel

| Wire Color on Quick Disconnect Cables	Drive Connection
Red w/ Black	B-
Red w/ White	B+
Green	*GND
Red w/ Yellow	A-
Red	A+
*Gray-colored Quick Disconnect Cables are shielded - connect shield to GND.	

IDC Quick Disconnect Cable

P/N QF3-12

P21, 22 Hybrid Step Motor Specifications

Note: Specs. apply to parallel (120 VAC) connections.

Electrical Specs.		P21V	P22V
Continuous Stall Torque	oz-in [N-m]	100	200
Recommended Current/Phase	Amps	1.3	2.0
Winding Resistance @ Ambient	Ohms	4.7	3.7
Inductance	mH	20	16
Max. Winding Temperature	°F [°C]	248 [120]	
Mechanical Specs.		**P21V**	**P22V**
Rotor Inertia	oz-in-s^2 [kg-m^2]	0.0035 [2.48x10^{-5}]	0.0061 [4.32x10^{-5}]
Axial Shaft Load	lbs [kg]	10 [44]	
Radial Shaft Load @ 0.75 inches [19mm]	lbs [kg]	15 [66]	
Motor Weight	lbs [kg]	1.9 [0.86]	2.7 [1.23]
Step Angle (full step)	degrees	1.8	

IDC Motor Wiring

Parallel
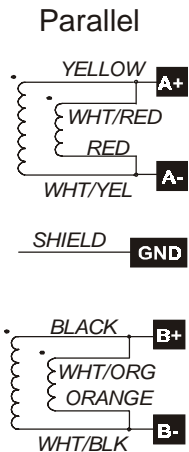
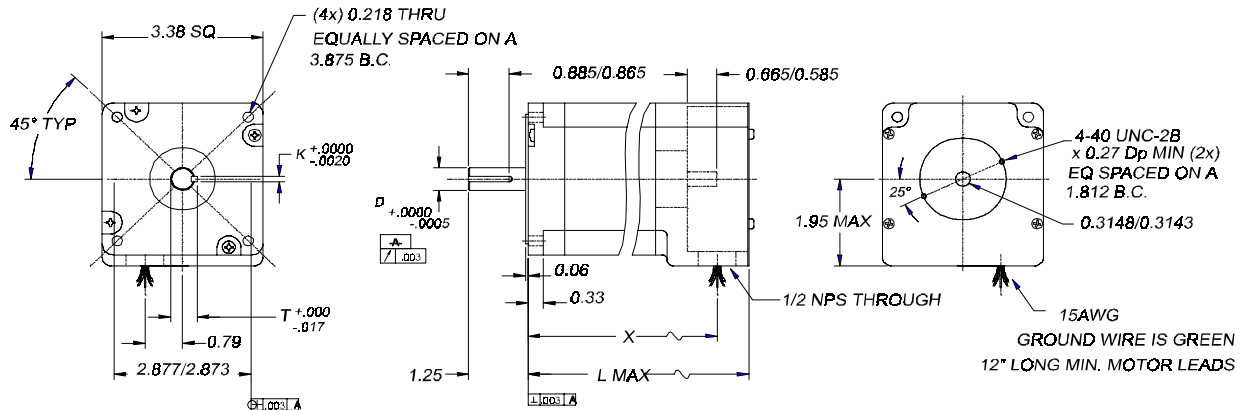**Note:**
- IDC step motors require a torque safety margin of at least 30%.

P/K 31, 32, 33Step Motor Specifications

Electrical Specs.		P31V	P32V	P33V
Continuous Stall Torque	oz-in [N-m]	450 [3.2]	920 [6.5]	1260 [8.9]
Recommended Current/Phase	Amps	2.9	3.3	4.0
Inductance	mH	14	30	25
Max. Winding Temperature	°F [°C]	212 [100]	212 [100]	212 [100]
Mechanical Specs.		**P31V**	**P32V**	**P33V**
Rotor Inertia	oz-in-sec	.0202	.038	.0567
Axial Shaft Load	lbs [N]	305 [1350]	305 [1350]	305 [1350]
Radial Shaft Load @ 0.5 inches	lbs [N]	665 [285]	665 [285]	110 [489]
Motor Weight	lbs [kg]	5	8.4	11.9
Step Angle (full step)	degrees	1.8	1.8	1.8

EQ and EM Encoder Cables

Signal	*Pin	Color
A+	B	Red
A-	C	Pink/Purple
B+	N	Green
B-	P	Blue
Z+	M	Yellow
Z-	U	Orange
+5V	K	White
COM	T	Black
Shld	---	---
*EQ Cable only.		Brown-NC

Quick Disconnect Motor Cable

Wire Color	Signal
Red w/ Black	B-
Red w/ White	B+
Green	*GND
Red w/ Yellow	A-
Red	A+
*Connect shield of gray QF3-12 cable to GND.	

Motor Dimensions

Motor	D	K	T	X	LMAX
P31	.5000	.1250	.555	(3.70)	4.44
P32	.5000	.1250	.555	(5.22)	5.96
P33	.6250	.1875	.705	(6.74)	7.48

IDC Motor Wiring

EQ Encoder Cable

IDC Quick Disconnect Cable P/N QF4-12 (18AWG)
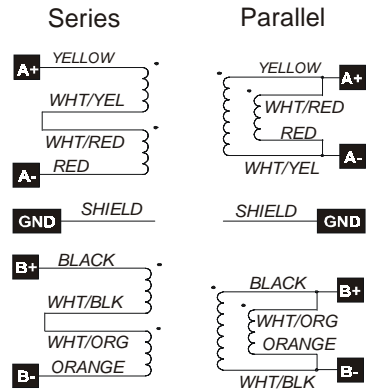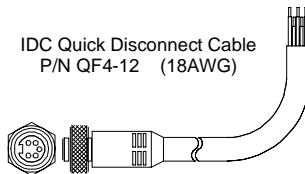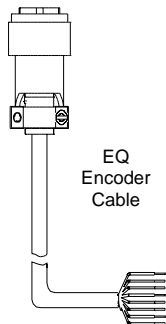
Chapter 7 - Troubleshooting the Impulse

This chapter covers common faults, their possible causes and remedies. Also include in this chapter are Impulse Limits Tables for a variety of operational parameters, e.g. the Acceleration/Deceleration/Velocity Limits Table.

The Impulse drive detects and resolves fault conditions. Faults are signaled by either a steady red or flashing red LED on the front panel. A solid green LED indicates normal operation. Most faults are cleared by either 1) cycling power, 2) sending a RESET command via the serial port or configurable logic input, or 3) probing the motor if the LED is steady red.

Read the CAUTION below before troubleshooting your Impulse.

CAUTION!

- **Always use caution** when working with mechanical systems. Gears and screw-driven cylinders are capable of exerting tremendous force against an obstruction.

- **Always ensure that power to your system is OFF** before performing any maintenance activity, or making any connections or adjustments.

- **Do not insert objects into the Impulse drive**. High voltages could cause personal injury, and equipment could be damaged beyond repair.

- **Do not open the Impulse drive.** The factory warranty will be voided if the drive is opened.

Troubleshooting Table

This table provides possible remedies to other problems you might have with your application.

Symptom	Possible Causes	Possible Remedies
Motor moves the wrong distance	Wrong gear ratio.	Check distance units.
	Motor stalled or slipping.	Check motor current anti-resonance settings.
	Control and drive resolutions don't match.	Check Speed Torque requirements of move. Decrease acceleration.
Motor stalls (1 LED flash)	Acceleration and/or velocity are too high.	Reduce acceleration and/or velocity.
	Motor configured incorrectly.	Check motor current, inductance, anti-resonance settings.
Motor moves the wrong direction	The motor phases are mis-wired.	Check per manual, or swap A+ with A-.
	The system's direction is opposite the configured drive direction.	Change the control's direction parameter.
The controller does not respond to keypad input.	The keypad has been disabled.	Check the DIP switch settings on the back of the keypad.
	Incorrect unit address.	Change the unit address.

Symptom	Possible Causes	Possible Remedies
The keypad is blank, but the backlight is on.	You have an older keypad that requires new firmware. The Impulse requires a keypad with Version 3.00 firmware or higher.	Call IDC for a free firmware upgrade to your keypad.
The keypad is blank and the backlight is off.	The keypad is not receiving a good +5VDC signal.	Check wiring, verify that the +5VDC is between 4.8 and 5.2V.
It is difficult to read the display	The contrast potentiometer needs adjustment	Adjust the contrast with the pot on the back of the keypad.
Can't Communicate over RS232, but keypad works.	If the keypad works, the Impulse RS232 port is working. Something else is configured wrong (i.e. wiring, configuration, address).	Refer to Chapter 5, RS232 Troubleshooting, for help on this subject.
Can't Communicate over RS232, and keypad does NOT work.	Impulse is configured as RS485.	Check the label to make sure you don't have an RS485 version. Either connect to RS485 or call IDC (or your distributor) to exchange units.
	The keypad is disabled.	Enable keypad through DIP switch on back of keypad and try again.
	The serial port is not working.	Call IDC (or your distributor) for application assistance.
Steady Red LED	Motor not probed.	If using Application Developer, use the Project Wizard or select Run > Probe Motor from the main menu. If using a keypad, select RUN > PROBE.
1 LED Flash (Stall)	Motor stalled.	Motor may not produce enough torque for the application.
	"Nuisance fault" - using a non-IDC motor.	Call IDC for assistance.
2 LED flashes (Undervoltage Fault)	Indicates that the high-voltage power-er supply has fallen below 110 VDC for more than 3 seconds. This prevents the drive from trying to operate a motor with insufficient power to meet speed-torque performance objectives.	Verify power supply voltage integrity.
3 LED flashes (Overvoltage Fault)	Bus voltage is too high. This is usually caused by a regeneration event that overwhelms the internal power-dump circuit. It can also be caused by high line voltage or voltage spikes.	Eliminate the regen event by reducing the load or make the move less aggressively by reducing the commanded acceleration or velocity. Check your AC line voltage to verify it is within the Impulse's limits.
4 LED flashes (Over Current Fault)	The motor is mis-wired or internally shorted. The Impulse is protected against such shorts, but you will need to correct the problem to prevent the fault.	With power off recheck connections. Check Impulse current setting to make sure you did not accidentally damage a winding by using a higher current than the motor is rated for. Check to see the motor phases are not shorted to one another or to the case of the motor. The resistance in each phase should be about the same; only a few ohms. If the phases are open or have large resistances, the motor is probably damaged and should be replaced.
5 LED flashes (Interlock Fault)	Motor connector does not contain an interlock jumper, motor has been disconnected, or interlock jumper is loose.	Ensure interlock jumper is securely wired into motor connector. Ensure motor connector is securely plugged into the motor jack on the drive.

Symptom	Possible Causes	Possible Remedies
6 LED flashes (Over Temperature Fault)	Internal Fan or Heatsink Tunnel is clogged or restricted (internal temp. has exceeded 68° C (154° F).	Remove obstruction (clean by blowing shop air through the tunnel.
	Ambient air in cabinet is too hot.	The Impulse can produce 20 Watts of heat. If multiple units are installed next to each other, the cabinet must be adequately ventilated to remove heat.
	The cooling fan is not turning.	Cooling fan is inoperable. Return unit to factory for repair.
7 LED Flashes (EEPROM Checksum Fault)	At power-up the drive tests the integrity of its non-volatile memory by computing a checksum. This fault indicates an abnormal or defective condition in the drive. An error occured during download or EEPROM write.	The fault can be cleared by issuing a default configuration from Application Developer and then reconfiguring the drive for the target motor. If the fault recurs, the drive is definitely defective. The user should not be able to cause this fault inadvertently through any combination of commands or actions.

Limits Tables

Velocity Limits at ALL RESOLUTIONS are:
Min = 0.00002 RPS
Max = 100 RPS

Acceleration and Deceleration Limits are the following:

Step Resolution	Accel/ Decel Limits	
	Min (RPS^2)	Max (RPS^2)
200	0.001	1000000
400	0.001	500000
1000	0.001	200000
2000	0.001	100000
5000	0.001	40000
10000	0.001	20000
18000	0.001	11110
25000	0.001	8000
25400	0.001	7874
25600	0.001	7812
36000	0.001	5555
50000	0.001	4000
50800	0.001	3937
100000	0.001	2000

Chapter 8 - Product Support

Factory Authorized Distributors

IDC has more than 45 factory-trained and authorized automation technology distributors located throughout North America, Western Europe, and the Pacific Rim. Each has been selected for their technical expertise, their local market knowledge, and exemplary business practices. They are ready to assist you in applying Industrial Devices' systems, as well as other complementary equipment. Contact us at (800) 747-0064 or (707) 789-1000 (from outside the U.S.) for the name of the distributor in your area.

Regional Offices

IDC Distributors are supported by local, direct IDC Regional Managers. IDC Regional Managers are available to assist with unusually demanding applications, present on site customer seminars, determine custom product needs, or respond to high volume requirements.

Toll Free Technical Support

Industrial Devices employs a large staff of mechanical and electrical engineers, whose full time responsibility is to help you select the proper system, install it correctly, and get it up and operating to your satisfaction. The Applications Engineering department is open from 6am to 5pm Pacific Time, Monday through Friday. The toll free number is (800) 747-0064. Outside of the United States call (707) 789-1000. The technical support fax number is (707) 789-0175. Email should be directed to: support@idcmotion.com.

CAD Library

IDC actuator, motor, and gear-motor CAD drawings (in .dxf format) are available to save you valuable design time and prevent transcription errors. Low volume requests are complimentary. Check the web site for CAD drawings that may be downloaded.

Web Site

Check us out at www.idcmotion.com for information on our products and support.

Warranty & Repairs

Industrial Devices Corporation (IDC) warrants this product to be free of defects in material and workmanship for a period of two (2) years from the date of shipment to the end user. Products that have been improperly used or damaged, in the opinion of IDC, are not subject to the terms of this warranty.

IDC maintains a repair facility at its factory in Petaluma, California for products manufactured by IDC. Prior approval by IDC is required before returning any product for any reason. All returned packages must be accompanied by an RMA# (Return Material Authorization number).

To obtain return authorization, contact your local IDC distributor or IDC. Please note the following procedure:

1. Obtain the model and serial number of the defective unit.

2. Prepare a purchase order for possible repair cost, in the event that the unit is not warranted.

3. Contact your IDC distributor or IDC (1-800-747-0064) for an RMA#.

4. Provide information describing the nature of the failure. The better the information, the faster we'll have your problem resolved.

5. Ship unit prepaid to the address below (be sure to include your RMA # on the shipping label):

> Attn: Repair Department
> RMA# _ _ - _ _ _
> Industrial Devices Corporation, LLC
> 3925 Cypress Drive
> Petaluma, CA 94954

Appendix A: Recommended Wiring Practices for IDC Controls

When configuring your Impulse please follow the wiring practices listed below:

- Earth ground your machine at one point using a star configuration (shown at right). Multiple earth grounds can cause a ground loop (see Preventing Ground Loop below).

- Avoid long cable runs. The longer the cables, the lower the signal-to-noise ratio in your application.

- Use shielded motor and encoder cables along the entire cable run.

- Separate the signal wires (I/O, encoder, etc.) from the motor wires, AC power wires, and other sources of noise in your application.

- Avoid extending cables in the field via junction boxes, terminal strips, or Molex connectors. These types of connectors are typically unshielded (as is wire going into and out of the connector) and are places where noise may be injected into the system.

- Connect cable shields at the control end of your machine. Connect the motor cable shield to GND, and connect the encoder shield to COM on the control.

- Do not connect the logic common (COM) of the IDC control to earth ground on your machine or to the GND terminal on the control/drive. Separating earth ground from logic common minimizes the potential for ground loops.

- Use shielded cables inside your panel (if control is panel or cabinet-mounted) for I/O and encoder wiring.

- Use differential, line-driven encoders with shielded, twisted-pair encoder cables. Single-ended TTL encoders are susceptible to noise and should be avoided.

- For optimum noise immunity use IDC motors and encoders with IDC controls.

Preventing a Ground Loop

Insert an ungrounded adapter to break the ground loop.

Do Not Connect Pig-tail Wire

Possible Ground Loop
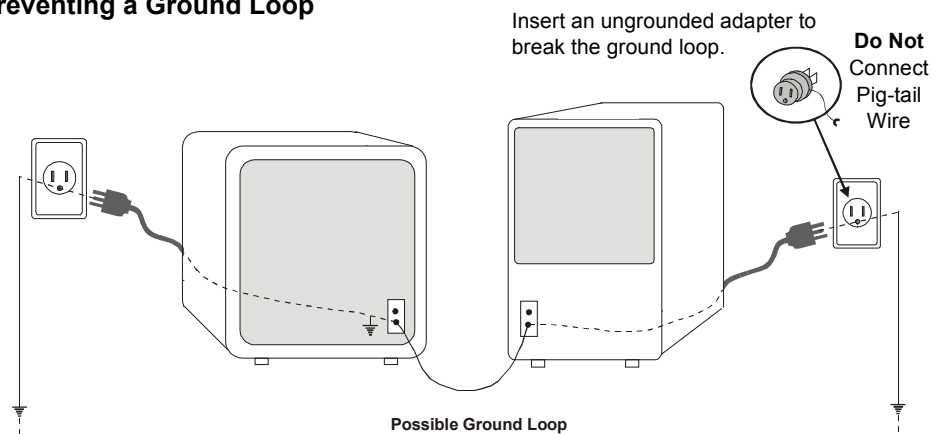
Additional Wiring Practices When Connecting an IDC Control to a PLC

- Connect the PLC logic common and the IDC COM terminals together.

- Disconnect the jumper between Pull-Up (or P-Up) and +12 VDC on the IDC control. Connect the positive terminal of the PLC power supply to Pull-Up (or P-Up), and connect the Power Supply common to the COM terminal on the IDC control, or to the PLC logic common (these should both be at the same potential).

- IDC **inputs** are **Sourcing**, so PLC outputs connected to IDC inputs should be Sinking.

- IDC **outputs** are **Sinking**, so PLC inputs connected to IDC ouputs should be Sourcing.

Appendix B - Impulse Advanced Programming

The purpose of this section is to provide the information necessary for the user to communicate with an Impulse drive over a serial connection without using *IDC Application Developer.* Since the Impulse communications protocol is not ASCII character based, the terminal window in *IDC Application Developer* and terminal emulation programs such as Windows™ HyperTerminal are not compatible for use with the Impulse drive. Therefore, the topics covered here are considered advanced and require the user to understand how to directly interface with a PLC or PC serial port through programming (i.e. C or C++) or a MMI / soft PLC software package.

Communications Protocol

Transmission Frame

The Impulse drive does not use the ASCII character set for encoding and parsing serial data but rather transmits actual numeric data in the form of bytes. This convention allows for faster and more efficient serial communications by reducing the number of bytes required for data transmission and eliminating the need to convert ASCII character strings into raw data. Therefore, data references from this point forward represent actual numbers <u>not</u> ASCII text. For example, a '1' means a value of 1 not the ASCII text character '1'.

The core of the Impulse communication protocol consists of a series of bytes called the *transmission frame.* The structure of the *transmission frame* is as follows:

BYTE #1	BYTE#2	BYTE#3…#n	BYTE #n+1	BYTE #n+2
Unit Address	Parameter Index	Data Bytes	Checksum Lower Byte	Checksum Upper Byte

Unit Address

This byte specifies the address of the unit for which this transmission frame is intended. The valid range for the unit address is 1 to 255 and the factory default address is 1.

Parameter Index

This byte specifies the index of the parameter to be written to or read from. Parameter reads and writes are determined by the state of the most significant bit of the parameter index byte. If the bit is zero, the transmission frame is designated as a write. If the bit is one, the transmission frame is designated as a read. The valid range for the parameter index is 1 to 127 for writes and 129 to 255 for reads. For example, if BYTE #2 in the transmission frame equals 5, this would define a write to parameter index #5 however, if BYTE #2 equals 133, this would define a read from parameter index #5. A parameter index can be converted to a read by simply taking the index and adding 128, thus setting the most significant bit to 1.

Data Bytes

These bytes specify the data to be written to or read from the parameter index. All parameter index data is in word format (2 bytes) with the least significant byte preceding the most significant byte. Therefore, the smallest number of data bytes is 2.

Checksum Bytes

These bytes contain the unsigned sum of the Unit Address, Parameter Index and Data Bytes. These bytes are using for transmission integrity verification.

Byte Receive Time Out

Since there is no end of transmission frame deliminator, the Impulse assumes if no bytes are received for 60 ms, the transmission is complete. The receive time out is reset on every byte received therefore, the host system must insure that the latency between transmitted bytes is less than 60 ms.
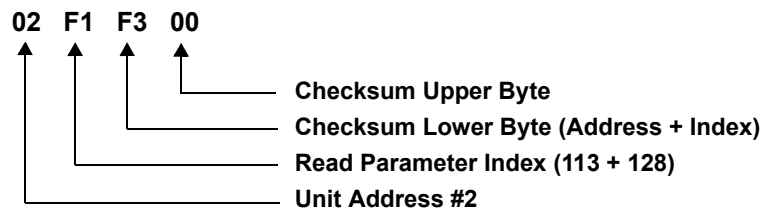
Receive Buffer Overrun

The Impulse receive buffer is 25 bytes however, there are no valid transmission frames of this length.
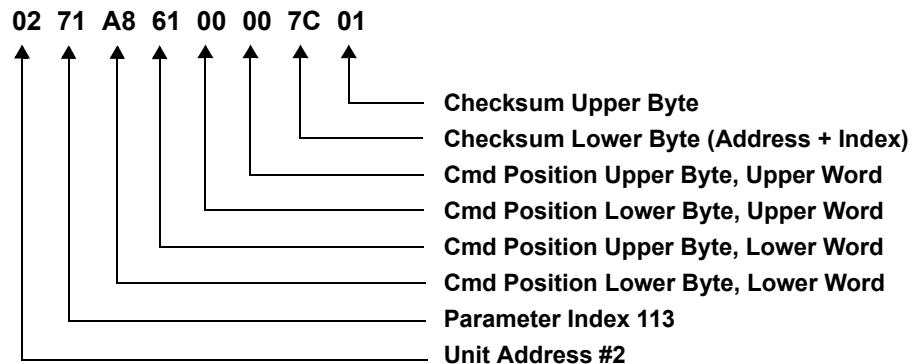
Reading and Writing Parameter Data

The Impulse does not support continuous data streaming due to its condensed receive buffer. Therefore, the host system must wait for a drive response before sending additional read or write transmission frames.

Read Queries

The following example illustrates a read request of parameter index #113 (Commanded Position) from unit #2. Bytes are shown in hexadecimal format.

02 F1 F3 00

- **Checksum Upper Byte**
- **Checksum Lower Byte (Address + Index)**
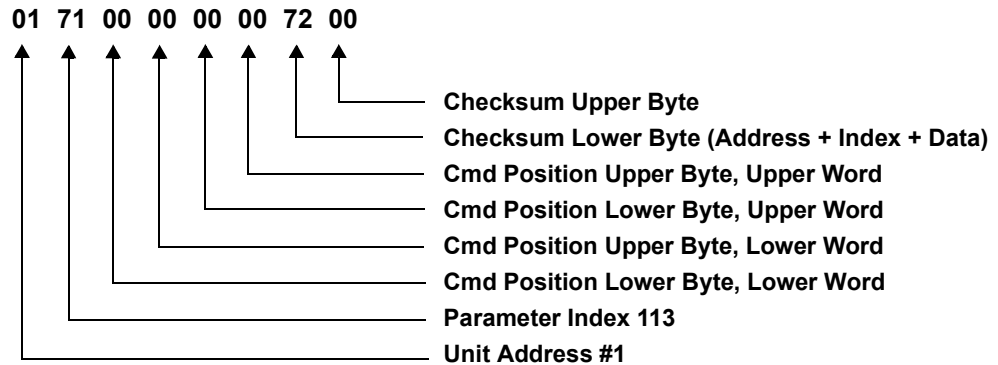- **Read Parameter Index (113 + 128)**
- **Unit Address #2**

After sending the read request, the host system would need to wait for the drive to respond before sending another read query or write request. The drive responds to a read with unit address, parameter index, data and checksum. Assuming the commanded position is 25000 steps, the response would be as follows:
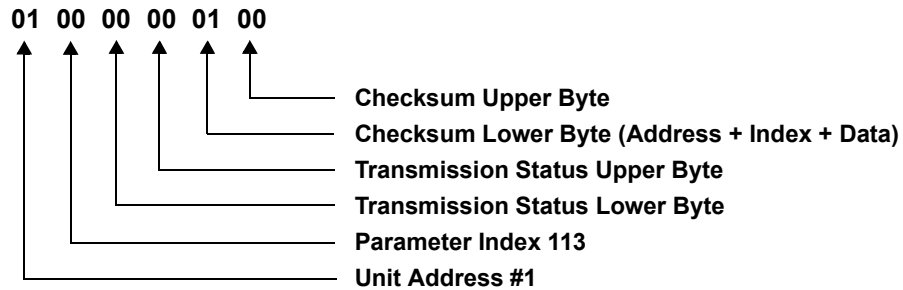
02 71 A8 61 00 00 7C 01

- **Checksum Upper Byte**
- **Checksum Lower Byte (Address + Index)**
- **Cmd Position Upper Byte, Upper Word**
- **Cmd Position Lower Byte, Upper Word**
- **Cmd Position Upper Byte, Lower Word**
- **Cmd Position Lower Byte, Lower Word**
- **Parameter Index 113**
- **Unit Address #2**

Since Commanded Position is a 32-bit value, the data field in the transmission frame is 4 bytes (2 words).

Write Requests

The following example illustrates a write request of zero to parameter index #113 (Commanded Position) to unit #1. Bytes are shown in hexadecimal format.

01 71 00 00 00 00 72 00

- **Checksum Upper Byte**
- **Checksum Lower Byte (Address + Index + Data)**
- **Cmd Position Upper Byte, Upper Word**
- **Cmd Position Lower Byte, Upper Word**
- **Cmd Position Upper Byte, Lower Word**
- **Cmd Position Lower Byte, Lower Word**
- **Parameter Index 113**
- **Unit Address #1**

After sending the write request, the host system would need to wait for the drive to respond before sending another read query or write request. The drive responds to a write with a standard frame of unit address, a parameter index of zero, data and checksum. A successful write response is as follows:

01 00 00 00 01 00

- **Checksum Upper Byte**
- **Checksum Lower Byte (Address + Index + Data)**
- **Transmission Status Upper Byte**
- **Transmission Status Lower Byte**
- **Parameter Index 113**
- **Unit Address #1**

A non-zero transmission status indicates an error has occurred. Interpreting the transmission status is covered in the next topic.

Interpreting the Transmission Status Response

Whenever an error occurs during a transmission received by the drive, the drive reports the error in the Transmission Status Response. Error response are defined as follows:

0	No Error
4	Receive Checksum Error
8	Invalid Parameter Data Field Length

User Accessible Parameters

Serial Jog Velocity (RAM Only)

Description: Velocity value for the serial jog velocity in RPS.

Parameters & Defaults

Parameter	Parameter Description	Default Value
SerJogV_H	Serial Jog Velocity Upper Word	0 (0h)
SerJogV_L	Serial Jog Velocity Lower Word	0 (0h)

Formulas

Parameter	Formula
SerJogV_H	$SerJogV\_H = INT[(VelocityRPS)(50x10^{-6})(StepResolution)(65535)]$
SerJogV_L	$SerJogV\_L = INT[FRAC[(VelocityRPS)(50x10^{-6})(StepResolution)(65535)]]$

Index

Index	Parameter Description
31	SerJogV_H; SerJogV_L

Transmission Frame

Unit Address	31	SerJogV_H LSB	SerJogV_H MSB	SerJogV_L LSB	SerJogV_L MSB	CkSum LSB	CkSum MSB

Jog Acceleration Rate

Description: Determines the acceleration rate value in RPS^2.

Parameters & Defaults

Parameter	Parameter Description	Default Value
JogAcel_H	Jog Acceleration Rate Upper Word	81 (51h)
JogAcel_L	Jog Acceleration Rate Lower Word	60210 (EB32h)

Formulas

Parameter	Formula
JogAcel_H	$JogAcel\_H = INT[(AccelRPS^2)(50x10^{-6})^2(StepResolution)(65535)]$
JogAcel_L	$JogAcel\_L = INT[FRAC[(AccelRPS^2)(50x10^{-6})^2(StepResolution)(65535)](65535)]$

Index

Index	Parameter Description
34	JogAcel_H; JogAcel_L

Transmission Frame

Unit Address	34	JogAcel_H LSB	JogAcel_H MSB	JogAcel_L LSB	JogAcel_L MSB	CkSum LSB	CkSum MSB

Stored Move Profiles #1 - #7 for Acceleration, Velocity, Deceleration

Description: Determines Move Profiles #1 through #7 (acceleration, velocity and deceleration) for the internal move engine as selected by the move selection inputs or over RS232/485.

Parameters & Defaults

Parameter	Parameter Description	Default Value
StMvAIncH	Acceleration Upper Word	40 (28h)
StMvAIncL	Acceleration Lower Word	62873 (F599h)
StMvVIncH	Velocity Upper Word	0 (0h)
StMvVIncL	Velocity Lower Word	0 (0h)
StMvDIncH	Deceleration Upper Word	40 (28h)
StMvDIncL	Deceleration Lower Word	62873 (F599h)

Formulas

Parameter	Formula
StMvAIncL	$StMvAIncH = INT[(AccelRPS^2)(50x10^{-6})^2(StepResolution)(65535)]$
StMvAIncL	$StMvAIncL = INT[FRAC[(AccelRPS^2)(50x10^{-6})^2(StepResolution)(65535)](65535)]$
StMvVIncH	$StMvVIncH = INT[(VelocityRPS)(50x10^{-6})(StepResolution)]$
StMvVIncL	$StMvVIncL = INT[FRAC[(VelocityRPS)(50x10^{-6})(StepResolution)](65535)]$
StMvDIncH	$StMvDIncH = INT[(DecelRPS^2)(50x10^{-6})^2(StepResolution)(65535)]$
StMvDIncL	$StMvDIncL = INT[FRAC[(DecelRPS^2)(50x10^{-6})^2(StepResolution)(65535)](65535)]$

Index

Index (XX)	Parameter Description
61	Stored Move Profile #1
62	Stored Move Profile #2
63	Stored Move Profile #3
64	Stored Move Profile #4
65	Stored Move Profile #5
66	Stored Move Profile #6
67	Stored Move Profile #7

Transmission Frame

Unit Address	XX (see Mem. Map Index)	StMvAIncH LSB	StMvAIncH MSB	StMvAIncL LSB	StMvAIncL MSB	SDtMvVIncH LSB	SDtMvVIncH MSB

StMvVIncL LSB	StMvVIncL MSB	StMvDIncH LSB	StMvDIncH MSB	StMvDIncL LSB	StMvDIncL MSB	CkSum LSB	CkSum MSB

Stored Move Profile #1 - #7 for Move Type, Move Distance, Deceleration Distance

Description: Determines Move Profiles #1 through #7 (move type, move acceleration and deceleration distances) for the internal move engine as selected by the move selection inputs or over RS232/485.

Parameters & Defaults

Parameter	Parameter Description	Default Value
StMvMT	Move Type/Acceleration Ratio	0 (0h)
StMvMDH	Move Distance Upper Word (Steps)	0 (0h)
StMvMDL	Move Distance Lower Word (Steps)	0 (0h)
StMvADH	Acceleration Distance Upper Word	0 (0h)
StMvADL	Acceleration Distance Lower Word	0 (0h)
StMvDDH	Deceleration Distance Upper Word	0 (0h)
StMvDDL	Deceleration Distance Lower Word	0 (0h)

Formulas

Parameter	Formula
Incremental Moves	$StMvMT = 0$
Homing Moves	$StMvMT = -1$
Absolute Moves	$StMvMT = INT\left[\left[\left[\dfrac{Decel\ RPS^2}{\left(Accel\ RPS^2 + Decel\ RPS^2\right)}\right](32767)\right] + 0.5\right] + 1$
All Moves	$StMvMDx = Move\ Distance\ Steps$
	$StMvADx = \left[\dfrac{(Move\ Velocity\ RPS)^2}{(2)(Move\ Acceleration\ RPS^2)}\right](Step\ Resolution)$
	$StMvDDx = \left[\dfrac{(Move\ Velocity\ RPS)^2}{(2)(Move\ Deceleration\ RPS^2)}\right](Step\ Resolution)$

Index

Index (XX)	Parameter Description
68	Stored Move Profile #1
69	Stored Move Profile #2
70	Stored Move Profile #3
71	Stored Move Profile #4
72	Stored Move Profile #5
73	Stored Move Profile #6
74	Stored Move Profile #7

Transmission Frame

Unit Address	XX (see Mem. Map Index)	StMvMT LSB	StMvMT MSB	StMvDH LSB	StMvDH MSB	SDtMvDL LSB	SDtMvDL MSB

StMvADH LSB	StMvADH MSB	StMvADL LSB	StMvADL MSB	StMvDDH LSB	StMvDDH MSB	StMvDDL LSB	StMvDDL MSB

CkSum LSB	CkSum MSB

Serial Port Stored Move Selection (RAM Only)

Description: Selects stored moves 1-7.

Parameters & Defaults

Parameter	Parameter Description	Default Value
SerMvSel	Stored Move Selection	0 (0h)

Formulas

Parameter	Formula
SerMvSel	*SerMvSel = Stored Move Number*

Index

Index	Parameter Description
75	SerMvSel

Transmission Frame

Unit Address	75	SerMvSel LSB	SerMvSel MSB	CkSum LSB	CkSum MSB

Commanded Velocity (RAM Only)

Description: Determines the commanded velocity based on the input step frequency.

Parameters & Defaults

Parameter	Parameter Description	Default Value
CmdVel	Commanded Velocity	N/A

Formulas

Parameter	Formula
CmdVel	$$VelocityRPS = \frac{\left(\frac{CmdVel}{0.0064}\right)}{25600}$$

Index

Index	Parameter Description
104	CmdVel

Transmission Frame

Unit Address	104	CmdVel LSB	CmdVel MSB	CkSum LSB	CkSum MSB

Stored Drive Faults (Reserved EEPROM Parameter)

Description: Determines the last 8 drive faults.

Parameters & Defaults

Parameter	Parameter Description	Default Value
StoredFlt1	Store Faults #1 - #4 (Newest Fault in LS Nibble)	N/A
StoredFlt2	Store Faults #5 - #8 (Oldest Fault in MS Nibble)	N/A

Formulas - N/A

Index

Index	Parameter Description
105	StoredFlt1; StoredFlt2

Transmission Frame

Unit Address	105	StoredFlt1 LSB	StoredFlt1 MSB	StoredFlt2 LSB	StoredFlt2 MSB	CkSum LSB	CkSum MSB

Commanded Position Counter (RAM Only)

Description: Determines the accumulated commanded position in motor steps.

Parameters & Defaults

Parameter	Parameter Description	Default Value
StepCnt_h	Commanded Motor Steps Upper Word	0 (0h)
StepCnt_l	Commanded Motor Steps Lower Word	0 (0h)

Formulas - N/A

Index

Index	Parameter Description
113	StepCnt_h; StepCnt_l

Transmission Frame

Unit Address	113	StepCnt_l LSB	StepCnt_l MSB	StepCnt_h LSB	StepCnt_h MSB	CkSum LSB	CkSum MSB

EEPROM Enable Switch

Description: Determines if parameter writes are updated to the EEPROM or are only altered in RAM. If EEPROM is disabled, all parameter changes are lost on power cycle or system reset.

Parameters & Defaults

Parameter	Parameter Description	Default Value
EE_Enable	EEPROM Enable Value	1 (1h)

Formulas

Parameter	Formula
EE_Enable	*EE_Enable = 0 EEPROM Disabled (Parameter changes are written to RAM only)*
	EE_Enable = 1 EEPROM Enabled (Parameter changes are written to EEPROM)

Index

Index	Parameter Description
115	EE_Enable

Transmission Frame

Unit Address	115	EE_Enable LSB	EE_Enable MSB	CkSum LSB	CkSum MSB

System Status (RAM Only)

Description: Determines the operational status of the drive.

Parameters & Defaults

Parameter	Parameter Description	Default Value
SysStatus	System Operational Status	0 (0000h)

Formulas

Bits 3 - 0	
Status Value	**Drive Status**
Bit 0	Input #1 Status
Bit 1	Input #2 Status
Bit 2	Input #3 Status
Bit 3	Input #4 Status
Bits 7 - 4	
Bit 4	Output #1 Status
Bit 5	Motion Node Option
Bit 6	Shutdown Status
Bit 7	[Reserved]
Bits 8 - 11	
Bit 8 - Bit 11	[Reserved]
Bits 12 - 15	
0h	No Faults
1h	Stall Detection Fault
2h	Undervoltage Fault
3h	Overvoltage Fault
4h	Overcurrent Fault
5h	Interlock Fault
6h	Overtemperature Fault
7h	EEPROM Checksum Fault
8h	Motor Characteristic Fault
9h - Fh	[Reserved]

Index

Index	Parameter Description
116	SysStatus

Transmission Frame

Unit Address	116	SysStatus LSB	SysStatus MSB	CkSum LSB	CkSum MSB

Unit Address

Description: Sets the unit address for RS232 / RS485 communications.

Parameters & Defaults

Parameter	Parameter Description	Default Value
UnitAddr	Unit Address Number	1 (1h)

Formulas

Parameter	Formula
UnitAddr	*Value from 1 to 255*

Index

Map Index	Parameter Description
118	UnitAddr

Transmission Frame

Unit Address	118	UnitAddr LSB	UnitAddr MSB	CkSum LSB	CkSum MSB

Software Shutdown (RAM Only)

Description: Software override of the shutdown input.

Parameters & Defaults

Parameter	Parameter Description	Default Value
ShutDwn	Shutdown Override	0 (0h)

Formulas

Parameter	Formula
ShutDwn	*ShutDwn = 0 GUI Shutdown Override Disabled (Shutdown input in control)*
	EE_Enable = 1 GUI Shutdown Override Enabled (Drive is disabled regardless of shutdown input state)

Index

Index	Parameter Description
119	ShutDwn

Transmission Frame

Unit Address	119	ShutDwn LSB	ShutDwn MSB	CkSum LSB	CkSum MSB

Appendix C - Using Non-IDC Motors with the Impulse

The Impulse drive is an advanced microstepper that employs special digital control techniques to effect Open Loop Stall Detect™, Multi-Stepping™, Dynamic Smoothing™, Extreme Smoothing™, and anti resonance control. Although these features can be applied to virtually any step motor, there are a number of parameters which must be determined for a given motor design in order to get these processes to work properly. These parameters include such elements as optimum current vector amplitude, saturation current, rotor inertia, and various electrical model parameters which are determined by proprietary means.

IDC-supplied motors have been analyzed and modeled for use with the Impulse drive. If you select a non-IDC motor, there will likely be some degree of difficulty with Open Loop Stall Detect™, and anti-resonance control. The optimum parameters cannot generally be determined in the field. Contact your distributor for factory assistance in characterizing non-IDC motors. The remaining option for those using non-IDC motors is to use the Impulse as a standard drive by disabling the stall detection and anti resonance features.

ID's S-Series motors have custom windings to provide optimum dynamic performance with the Impulse. If you use another manufacturer's motor, it should meet the following guidelines:

1. 2 phase, hybrid, permanent magnet step motor.

2. 4, 6, or 8 lead motor.

3. Series or parallel inductance rating between 2 - 80 mH. Higher inductance motors will not damage the drive, but they will have limited dynamic performance.

4. A minimum high-pot test rating of 500 VDC.

If possible, use the manufacturer's 160 VDC, bipolar current rating. With **4-lead motors**, the manufacturer's (bipolar) current rating translates directly to the Impulse current setting.

Bifilar wound, 8-lead motors afford the opportunity to connect phase windings in series or parallel. The parallel connection uses twice the current required by the series connection. There is no industry standard color code for stepper phase leads (consult motor manufacturer). There are several pitfalls that users should be aware of: (1) Do not configure the drive to supply the parallel current level into a series-wired motor (this will damage motor windings). (2) The small dots in the motor wiring diagrams indicate phasing. Windings must be connected in series-aiding or parallel-aiding configurations as shown below. If a phase is connected in opposition, the circuit will have no net inductance and will cause an overcurrent fault in the drive. The same relationship applies to resistance. (3) Mixing connections (e.g. A to B) will cause an overcurrent fault in the drive.

6-lead motors may be used with the Impulse drive by leaving center-taps unconnected and using the two outside conductors of each phase. Do not connect the center-tap of a 6-lead motor to the Impulse. This will result in an overcurrent fault.

Motor Wiring
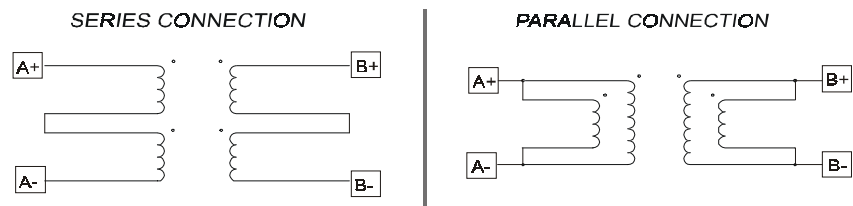
Custom or User-Defined Motors

This section applies to users of non-IDC motors or those who would like to modify an existing motor file.

Note: *All motor characteristics must be entered in the text input boxes* before the **Advanced** tuning feature will be available.

- Click on the **Add Custom Motor** button and the **Motor Editor** will appear.
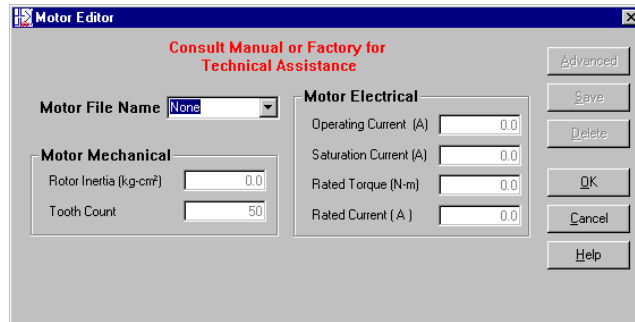
- Enter a file name for your custom motor in the **Motor File Name** text-entry box. File names may be up to eight (8) characters in length (all keyboard characters are valid). This also applies if you are editing an existing IDC motor file.

- Enter the Mechanical characteristics of your custom motor.
  Rotor Inertia in kg-m^2
  Tooth Count in number of teeth on the rotor

- Enter the Electrical characteristics of your custom motor.
  Operating Current is the current-magnitude command to the drive in Amps (it is not RMS). The value entered represents the peak amplitude of the phase currents.

  Saturation Current (in Amps) is critical for the implementation of the Impulse's exclusive Open Loop Stall Detect^{TM} feature. Saturation Current has been pre-configured under laboratory conditions for IDC motors, but cannot be accurately determined in the field for custom motors. If an incorrect Saturation Current is entered, the Open Loop Stall Detect (OLSD) feature may be ineffective. Contact your distributor or IDC Applications Engineering for assistance.

  In the absence of an accurate Saturation Current, you have three options: 1) enter an estimated value based on the characteristics of a similar type of motor, 2) enter the same value as the Operating Current, or 3) disable the OLSD feature (see Application Developer **Setup > Axis > Advanced** tab to disable Stall Detection).

  Rated Torque is the rated torque (N-m) of the manufacturer's motor at the rated current. This may be set to zero (0) if unknown and it will have no effect on the drive. This number is used by the Speed Torque Curve utility and is numerically equal to the quotient of the manufacturer's specified 2-phase resting torque divided by the specified current (Nm/Amp). Always convert torque to Newton-meters.

  Rated Current is the amplitude of the current generated when the windings are shorted and the motor's rotor is back-driven (forced to move). This short-circuit current is of constant amplitude for speeds above 2 RPS. Determining **Rated Current** in the field is very diffi-

cult, requiring special test equipment and fixtures. Contact your distributor or IDC Applications Engineering for assistance.

Press **Save** if you intend to use the Advanced Tuning feature building a custom motor file. Press **OK** if you want to save the file and return to the Project Wizard.

Note: A user-defined motor file may be deleted by selecting the file and pressing the **Delete** button. IDC motor files cannot be deleted.

5. Advanced Tuning

   Motor Editor - Advanced is used only for building a custom motor file. All motor file parameters are editable using text input boxes. **Note**: This feature is typically used to build motor files for non-IDC motors. Only motors with characteristics matching those of IDC motors will benefit from the advanced features of the Impulse drive (i.e. X-Smoothness™, Dynamic Smoothing™).

   • Click the **Advanced** button and the Advanced tuning window will appear as shown.

Test Speeds 1, 2, 3

• Enter the recommended values. These values will be used by the **X-Smoothness** feature of the Axis Setup menu.

X-Smoothness L1 and L2

• Depending on the Mechanical and Electrical parameters entered previously in the Motor Editor, there may or may not be X-Smoothness values in these text input boxes. Existing values may be changed or left as is. These values will be used in the **X-Smoothness** feature of the Axis Setup menu.

Dynamic Smoothing

Note: If Gain is reduced by a factor (K), Feed Forward should be reduced by factor (K^2).

• **Gain** - Enter the recommended value. Note: the default value is 2621. Generally, the smaller the value, the more aggressive the smoothing action. The maximum gain is 20.

• **Feed Forward -** Enter the recommended value or leave blank. Note: default value is 3641.

Anti -Resonance

- **Damping Gain 1** - Enter the recommended value.

- **Damping Gain 2** - If a value is present you may leave it as is or enter a value according to the table:

Damping Gain 2	
Motor Frame Size	**Enter This Value**
17	6.0
23	4.0
34	2.0

  Note: Both Damping Gains (1 and 2) must be configured.

- Click **OK** and you will return to the Motor Editor.

- Click **OK** or **Save** in the Motor Editor window. You will be prompted to overwrite an existing file.

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