



## ***DI-500/510 Series*** *Portable Analog and Digital I/O System*

## ***DI-750/760 Series*** *Desktop/Rackmount Analog and Digital I/O System*

## ***User's Manual*** *Manual Revision F* *Software Release Level 1*

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# 1. Introduction

Congratulations on your purchase of a DI-500/510 or DI-750/760 Series data acquisition/measurement system. These instruments permit data acquisition on IBM personal computers and compatibles from the Windows environment.

This manual describes how to connect and use the DI-500/510 and DI-750/760 Series instruments. From an operational point of view, all of the instruments are approximately the same. Throughout the majority of this manual, enough similarity exists to describe each instrument with the same procedure. The conventions used to describe these universal applications are “DI-500 Series” (which means that the procedure/information applies equally to the DI-500-16, DI-500-32, DI-510-32, DI-510-48, DI-510-64, or any of the channel expansion instruments), “DI-750 Series” (applying to the DI-750-16 and DI-750-32) and “DI-760 Series” (applying to the DI-760-32, DI-760-48, and DI-760-64). In cases where the resemblance is not equal, separate procedures/descriptions exist for each instrument.

## Features

The DI-500/510 and DI-750/760 Series offers the following features:

- Complete portability. Connects to the parallel port of any desktop, transportable, notebook, or laptop PC-compatible computer.
- Per channel software-configurable settings: Input gain; Signal Averaging; Input and output measurement range.
- 250kHz burst sampling to minimize channel skew.
- Eight each digital input and output lines.
- A/D subsystem provides 14-bit resolution.
- D/A subsystem provides 14-bit resolution.
- Programmed I/O (PIO) data transfers.
- Signal averaging of up to 32,768 consecutive readings per channel.





## 2. Specifications

### **Signal Connections**

All portable instruments allow dual-access analog input signal connections. Connect your input signals to the sheathed banana jacks or to the screw terminals. Digital inputs and outputs are accessible from the 37-pin AUXILIARY PORT connector on DI-500-16, DI-750-16, DI-510-48 and DI-760-48 instruments only.

All desktop and rack-mounted instruments support screw terminal input signal connections only (no sheathed banana jacks).

### **Interface Characteristics**

Compatible computer architecture      Any PC architecture. Connects to computer via the parallel (or printer) port. Supports standard, bi-directional, or EPP parallel ports.

### **Analog Channels**

|                       |   |
|-----------------------|---|
| DI-500-16, DI-750-16: | 16 signal-conditioned channels                            |
| DI-500-32, DI-750-32: | 32 high-level channels                                    |
| DI-510-32, DI-760-32: | 32 signal-conditioned channels                            |
| DI-510-48, DI-760-48: | 16 signal-conditioned channels and 32 high-level channels |
| DI-510-64, DI-760-64: | 64 high-level channels                                    |

(Note: all instruments are expandable to 240 channels)

### **All Analog Inputs**

|                               |   |
|-------------------------------|---|
| Analog resolution             | 14-bit, 1 part in 8192                        |
| Sample throughput rate        |   |
| standard parallel port:       | 40,000 samples/second max                     |
| bi-directional parallel port: | 80,000 samples/second max                     |
| enhanced parallel port (EPP): | 250,000 samples/second max                    |
| Gain ranges                   | 1, 2, 4, 8 (software selectable per channel)  |
| Isolation                     | 300V channel-to-channel; 600V input-to-output |

### **High Level Analog Inputs**

|   |   |
|---|---|
| Type                                    | Differential  |
| Measurement range full scale (intended) | $\pm 10\text{VFS}$ @ $A_v=1$                            |
| Maximum analog input without damage     | 30V   |
| Common mode rejection                   | 80 db min @ $A_v=1$                                     |
| Gain accuracy                           | < 0.05%   |
| Input offset voltage                    | $\pm 5$ ADC counts                                      |
| Input settling time                     | 4 $\mu\text{s}$ to 0.01% at all gains                   |
| Input impedance                         | 30k $\Omega$ with power on; 20k $\Omega$ with power off |

### **Signal Conditioned Analog Inputs**

|                                     |   |
|-------------------------------------|---|
| Measurement range full scale        | $\pm 5\text{V}$ if DI-5B module is bypassed - otherwise defined by DI-5B module |
| All other specs                     | Defined by DI-5B modules (module dependent)                                     |
| Maximum analog input without damage | 240V  |

### **Analog Outputs**

|                               |                            |
|-------------------------------|----------------------------|
| Number of channels            | Two                        |
| Resolution                    | 14-bit; 1 part in 8192     |
| Update rate                   | 500,000 samples/second max |
| Output voltage ranges         | ±10V                       |
| Current drive/impedance       | ±5mA/0.3Ω                  |
| Output settling time to 0.01% | 4μs                        |

### **Digital Input/Output**

|                           |                         |
|---------------------------|-------------------------|
| Capacity                  | 8 each input and output |
| Compatibility             | TTL compatible          |
| Max source current        | 0.4mA @ 2.4V            |
| Max sink current          | 8mA @ 0.5V              |
| Digital input termination | 4.7kΩ pull-up to +5VDC  |

### **Input Scan List**

|          |              |
|----------|--------------|
| Capacity | 240 elements |
|----------|--------------|

### **Output Scan List**

|          |             |
|----------|-------------|
| Capacity | 16 elements |
|----------|-------------|

### **Triggering**

|                          |                    |
|--------------------------|--------------------|
| Pre-trigger length       | 64k samples        |
| Post-trigger length      | 64k samples        |
| Trigger channel          | Any channel        |
| Trigger level hysteresis | 8-bit (256 counts) |

### **Power Requirements**

|                                      |  |
|--------------------------------------|--|
| DI-500 and DI-750 Series instruments | 700mA @ 12VDC typical, excluding 5B modules  |
| DI-510 and DI-760 Series instruments | 1000mA @ 12VDC typical, excluding 5B modules |
| Power supply voltage range           | 9 to 36VDC                                   |

### **Physical/Environmental**

|                       |  |
|-----------------------|--|
| Box dimensions        | Portable Models: 15¼"D by 19½"W by 7½"H (500 models)<br>20½"D by 24"W by 8¼"H (510 models) |
|                       | Desktop Models: 16.7"D by 16.88"W by 3.5"H (both models)                                   |
| I/O connector         | 1 male, 1 female 37-pin D-type   |
| Operating environment | Component temperature: 0° to 70° C<br>Relative humidity: 5% to 90% non condensing          |
| Storage environment   | Temperature: -55° to 150° C<br>Relative humidity: 5% to 90% non condensing                 |

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# 3. Getting Started

## Unpacking

The following items are included with a typical DI-500/510 or DI-750/760 Series system. Verify that you have the following:

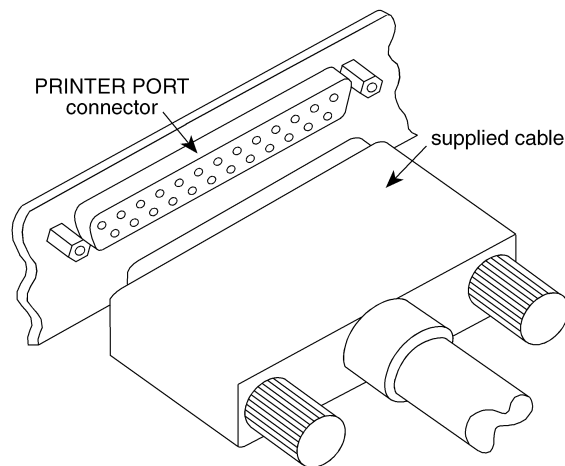
- The DI-500/510 or DI-750/760 Series instrument
- Communications cable assembly designed to connect the instrument to your computer's parallel (or printer) port
- Power adapter and power cord
- ActiveX Control Library with built-in documentation
- This Hardware Manual.

If an item is missing or damaged, call DATAQ Instruments at 330-668-1444. We will guide you through the appropriate steps for replacing missing or damaged items. Save the original packing material in the unlikely event that your unit must, for any reason, be sent back to DATAQ Instruments, Inc.

## Connecting the Instrument to your Computer

DI-500/510 and DI-750/760 Series instruments use your computer's parallel (or printer) port to interface digital and analog signals to your computer. Installation is as simple as connecting the provided communications cable to your computer.

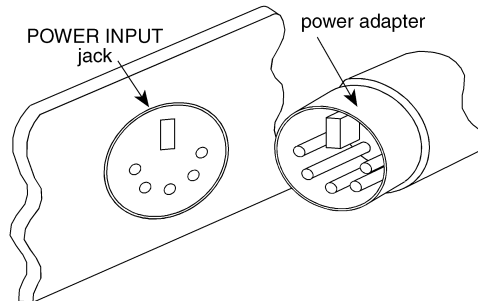
1. Plug the appropriate end of the supplied communications cable to the 25-pin female connector labeled **PRINTER PORT** on the DI-500/510 or DI-750/760 Series instrument.
2. Connect the other end of the cable to your computer's parallel port.



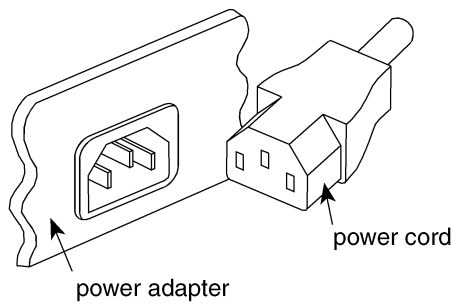
## Applying Power

Use the following procedure to apply power to your DI-500/510 or DI-750/760 Series instrument:

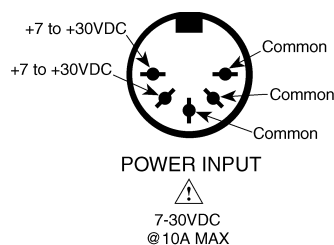
1. Plug the five-pin DIN end of the power adapter to the connector labeled POWER INPUT on the instrument.



2. Plug one end of the supplied power cord into the power adapter and the other end into any standard 120VAC, 60Hz, single-phase outlet.



If an alternate power source is to be used, refer to the following pin-out diagram for power requirements.



3. Turn the POWER SWITCH to ON.

## Connecting Your Signals

On portable DI-500/510 Series instruments, all analog input signal connections are made to the sheathed banana jacks or to the screw terminals. On desktop DI-750/760 Series instruments, all user connections are made to the screw terminals on the back of the instrument.

For bare wire signal leads (such as thermocouples): (1) Insert the bare wire into the desired terminal directly under the screw; (2) Tighten the screw by rotating clockwise with a small screwdriver. Make sure the screw tightens only

against the signal wire and not the wire insulation. Do not overtighten; and (3) Tug gently on the signal lead to ensure that it is firmly secured.

### **Analog Inputs**

DI-500/510 and DI-750/760 Series instruments may be configured to connect 16, 32, 48, or 64 (model dependent) differential analog channels (expandable to 240 channels with optional expansion instruments). Analog signals may be connected to the banana jacks or to the screw terminal connectors. The high level analog inputs are intended for a full scale measurement range of  $\pm 10\text{V}$ ; signal-conditioned inputs are intended for a full scale measurement range of  $\pm 5\text{V}$  (if 5B module socket is bypassed - otherwise the full scale measurement range is determined by the 5B module). The maximum input voltage without damage is 30V.

When needed, per-channel transducer excitation is built-in (5B module dependent), eliminating the need for external power supplies.

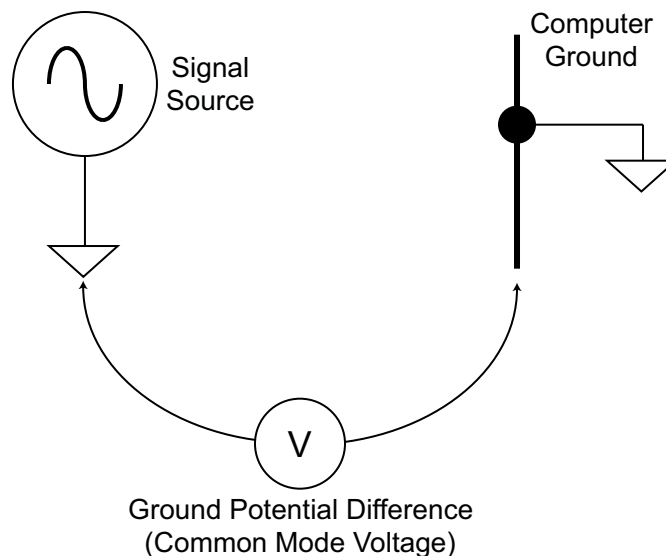
### **Connecting a Differential Amplifier**

Differential inputs allow the DI-500/510 or DI-750/760 Series amplifier to detect the difference in voltage between the high (+) and low (-) inputs. Differential amplifiers have the advantage of reducing common mode voltages (i.e., those appearing simultaneously and in phase on both inputs). This capability may be leveraged to great advantage to reduce noise riding on a signal of interest.

Two signal measurement conditions govern configuration of a differential channel input: (1) The signal to be measured is ground-referenced; or (2) the signal to be measured is isolated from ground. The signal that is isolated from ground requires no special consideration when connecting to a differential amplifier, however the ground referenced signal does.

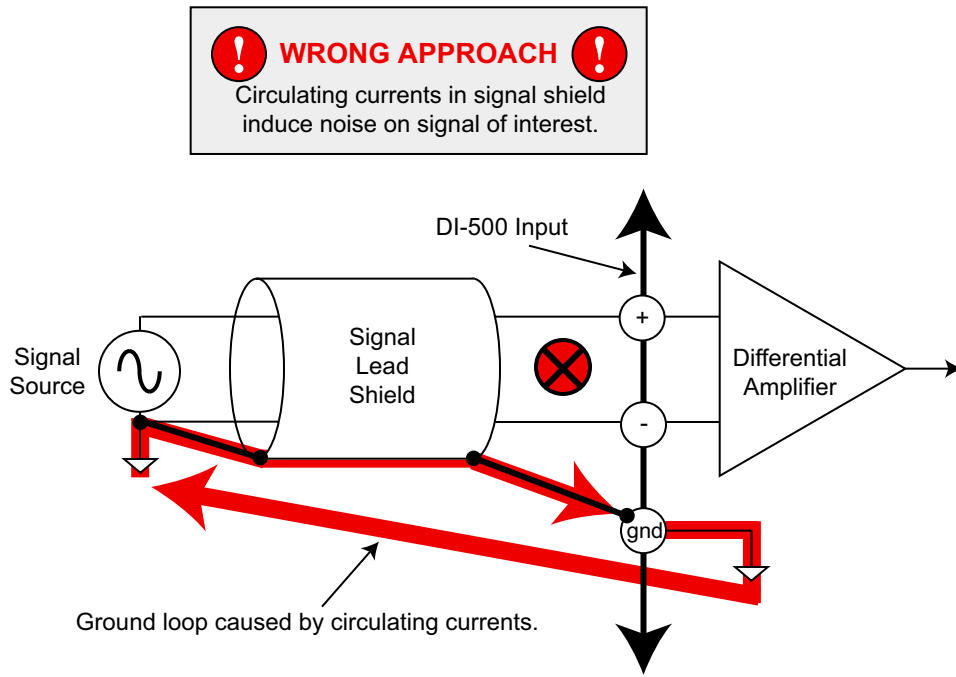
### **Ground-referenced Signal Sources**

A ground-referenced signal source is one with a local ground that may not be (and probably is not) at the same potential as the computer's ground. This potential difference between signal and computer ground is referred to as a common mode voltage and is caused by a number of different factors.

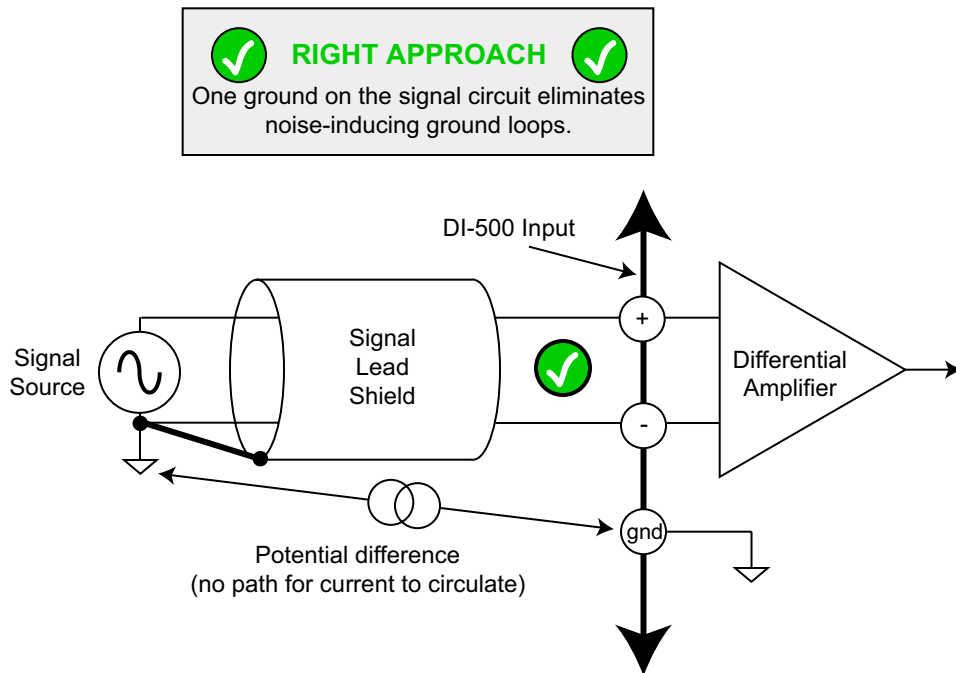


The most common of these is different physical locations of the computer and signal ground points. Since wire is not a perfect conductor (i.e., exhibiting zero resistance regardless of length) a voltage drop, however small, will always

be present. The differential amplifier is unique in its ability to measure signals originating from sources with different ground potentials relative to the computer **providing it is connected properly.**

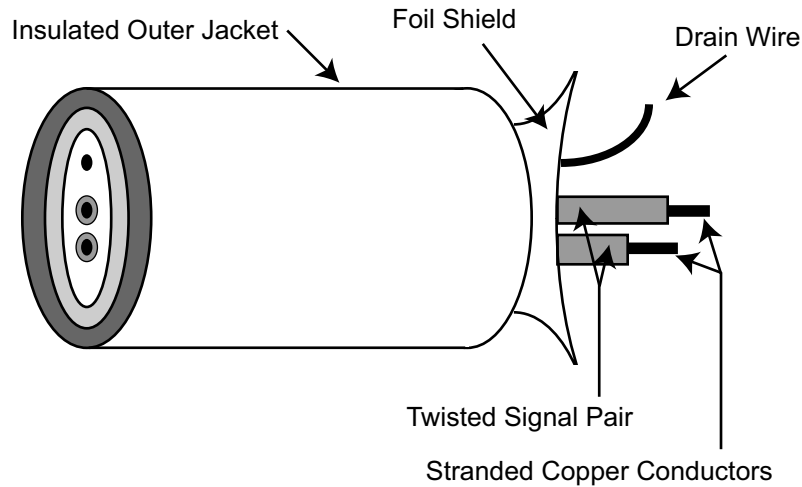


The most common error made in connecting differential amplifiers is the tendency to ground both ends of a signal shield. This causes current to flow through the shield and induces noise on the signal to be measured. This problem is eliminated by ensuring that only one ground exists on the signal circuit.



### Signal Cable and the Differential Amplifier

A quick rule-of-thumb: Any application requiring a differential amplifier also defines a need for quality signal cable. Four elements combine to ensure adequate quality signal cable: a twisted signal pair with low resistance stranded copper conductors; surrounded by a multiple-folded foil shield; with a copper stranded drain wire; all contained within an insulated outer jacket.



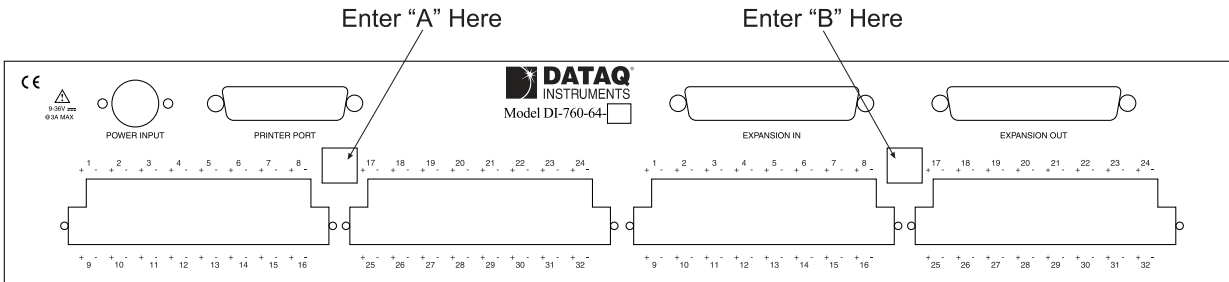
In applications where such signal cable is used, a dramatic decrease in noise pickup will be experienced. The drain wire should be considered as the shield and should be connected as described in the section titled “Connecting a Differential Amplifier” on page 7. Signal cable meeting all four criteria for quality is Belden No. 8641.

### Labeling Analog Input Channels

Depending on the number of analog input channels your instrument has, it may be necessary to label them. For example, say you are using a DI-510-64 or a DI-760-64 to record 64 analog input channels and you want to record the signal connected to channel 28. Looking at the instrument, there are two groups, or “banks,” of 32 inputs. Each bank consists of channels 1 through 32 (64 total inputs). Since there are two channels labeled 28, how will you know which one will be recorded? A small box is provided on the instrument panel to label banks of channels and avoid this problem. In order for you and the software (either WINDAQ or the ActiveX Control Library) to tell these inputs apart, label each bank of 32 inputs with a letter according to the following table (an ordinary pencil is sufficient):

| If you are using this instrument by itself (not multiplexed with other instruments): |           | ...then write this letter in the box on the overlay: |
|--|-----------|--|
| DI-750-16  | DI-500-16 | not required   |
| DI-750-32  | DI-500-32 | “A”  |
| DI-760-32  | DI-510-32 | “A”  |
| DI-760-48  | DI-510-48 | not required   |
| DI-760-64  | DI-510-64 | “A” top 32 channels, “B” bottom 32 channels          |

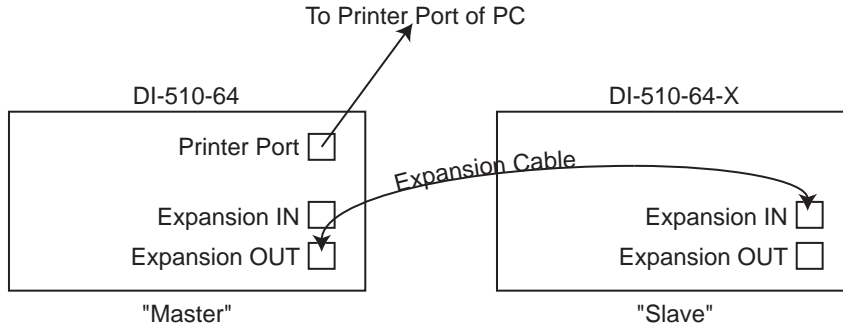
For example, in the previous 64-channel example, the first or top bank of 32 channels now become channels A1 through A32 and the second (the bottom bank on portable models) bank of 32 channels become channels B1 through B32.



The “channel 28” ambiguity disappears, the channel in question is either channel A28 or channel B28. Note that the above table is for stand-alone instruments only. If you have several DI-500/510 or DI-750/760 Series instruments multiplexed together, refer to the following section for labeling information.

### Increasing the Total Analog Input Channel Capacity

The 37-pin connectors (labeled AUXILIARY PORT and EXPANSION on DI-500-16, DI-750-16, DI-510-48, and DI-760-48 instruments, or EXPANSION IN and EXPANSION OUT on all other instruments) are used for system expansion. Additional DI-500/510 and DI-750/760 Series instruments can be “daisy chained” together to increase channel capacity. Up to 240 analog channels can be acquired by connecting combinations of DI-500/510 and DI-750/760 Series instruments together. The following illustration shows a typical 128 channel configuration, consisting of a DI-510-64 (64 input portable instrument) and a DI-510-64-X (64 input portable expansion unit):



When several instruments are connected together, one instrument becomes the “master” instrument and all others become “slave” instruments. The “master” is always defined as the instrument connected directly to the PC. A “slave” is defined as an instrument that is connected to the master (or not connected directly to the PC). Note that it is possible to have any number of slave instruments in a configuration (up to 240 total channels), but always only one master instrument. The expansion cable is always connected from the EXPANSION OUT port to the EXPANSION IN port of the next instrument, moving in a direction away from the PC.

The DI-500-16, DI-750-16, DI-510-48, and DI-760-48 are master instruments only. They can be expanded (by adding slave instruments) but they can never be used as a slave instrument.

All of the expansion instruments in the DI-500/510 and DI-750/760 Series (i.e., DI-510-32-X and DI-760-32-X) are slave instruments. They have no printer port so they can never be configured as a master instrument (connected directly to the PC) and cannot be used alone (they must be connected to a master instrument).

The DI-510-32, DI-760-32, DI-510-64, and DI-760-64 Instruments can be used as masters or as slaves. They can be connected directly to the PC as stand-alone master instruments or they can be connected as slave channel expansion



instruments to other masters. In either case, the expansion cable is connected in the same way; from the EXPANSION OUT port to the EXPANSION IN port of the next instrument, moving in a direction away from the PC.

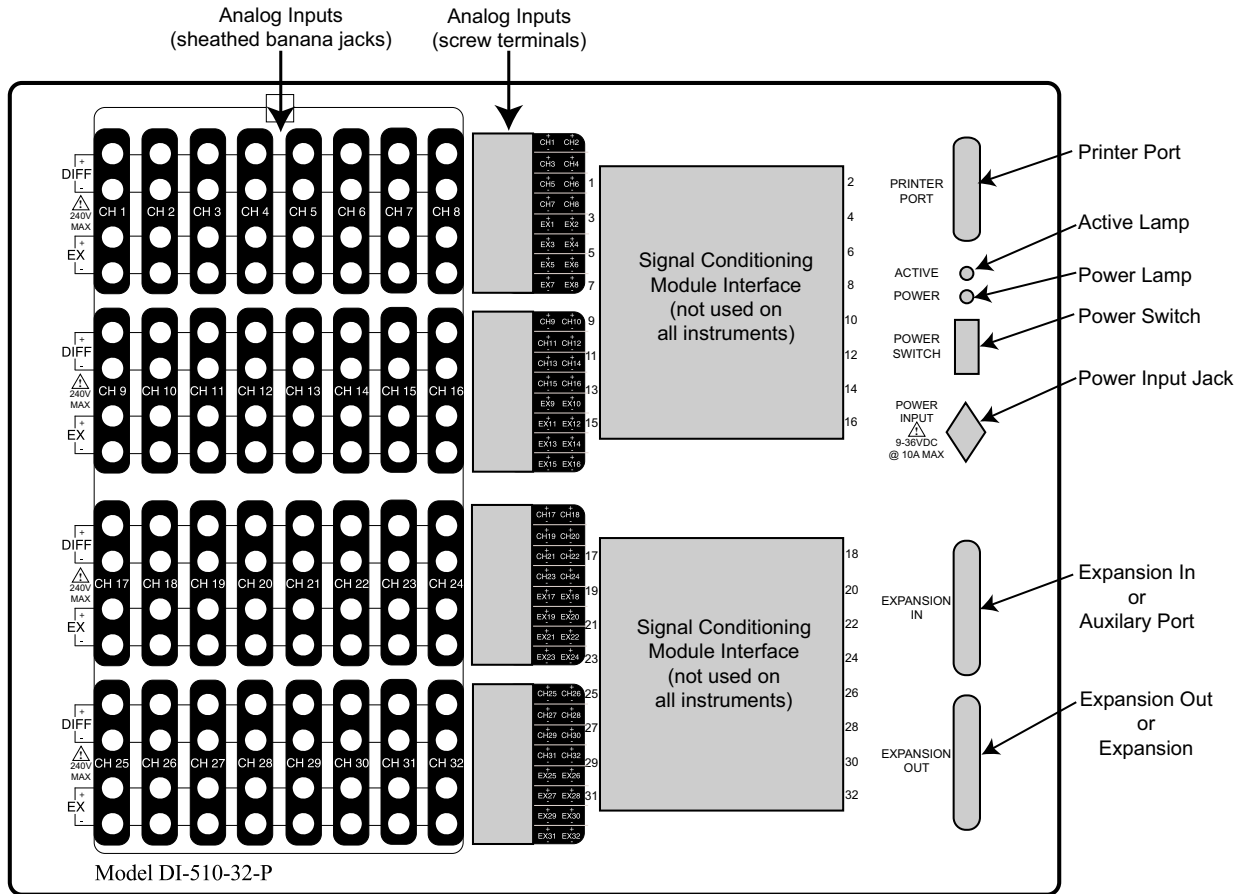
When using several instruments in a master/slave configuration, label the instruments to avoid confusion. Using the same example as above, say you have a DI-510-64 (64 input portable instrument) and a DI-510-64-X (64 input portable expansion unit) multiplexed together and want to record the signal connected to channel 28. Looking at the instruments, there are four groups or “banks” of 32 inputs, each bank consisting of channels 1 through 32 (128 total inputs). Since there are a total of four channels labeled 28, how will you know which one will be recorded? A small box is provided on the instrument panel to label banks of channels and avoid this problem. In order for you and the software (either WINDAQ or the ActiveX Control Library) to tell these inputs apart, label each bank of 32 inputs with a letter according to the following table (an ordinary pencil is sufficient):

| If you are using this instrument as the MASTER instrument: |           | ...then write this letter in the box on the slave instrument(s) overlay for: |                      |                         |
|--|-----------|--|----------------------|-------------------------|
|  |           | the first 32 channels  | the next 32 channels | the next 32 channels... |
| DI-750-16  | DI-500-16 | A  | B                    | C                       |
| DI-750-32  | DI-500-32 | B  | C                    | D                       |
| DI-760-32  | DI-510-32 | B  | C                    | D                       |
| DI-760-48  | DI-510-48 | B  | C                    | D                       |
| DI-760-64  | DI-510-64 | C  | D                    | E                       |

For example, in the previous 128-channel example, the 64 master instrument channels now become channels A1 through A32 and B1 through B32 and the 64 slave instrument channels now become channels C1 through C32 and D1 through D32. The “channel 28” ambiguity disappears, the channel in question is either channel A28, B28, C28 or D28.

## The DI-500 Series Instrument

The following describes the user accessible items on the DI-500/510 or DI-750/760 Series instrument.



Model DI-510-32 shown here, other instruments similar

### ANALOG INPUTS

The analog inputs allow you to connect your input signals to the instrument. All portable instruments in the series allow dual-access connections (either to the sheathed banana jacks or to the screw terminals). All desktop and rack-mounted instruments support only screw terminal signal connections. Refer to the section titled “Connecting Your Signals” on page 6 for more analog input details.

### SIGNAL CONDITIONING MODULE INTERFACE

Allows you to plug DI-5B signal conditioning modules into a channel on the instrument. Each DI-5B module filters, isolates, amplifies, converts, or otherwise conditions your input signal (i.e., the output from a thermocouple, strain gage, LVDT, etc.) so it becomes suitable for A/D conversion by the DI-500/510 or DI-750/760 Series instrument. When a DI-5B module is installed, the input signals are conditioned from either the sheathed banana jacks or the screw terminals.

Note that not all input signals require signal conditioning. On instruments with only high level inputs (such as the DI-500-32 or DI-750-32 and the DI-510-64 or DI-760-64), these signal conditioning module interfaces are not needed and therefore are covered.

## SIGNAL CONDITIONING MODULE CHANNEL REFERENCE

These numbers indicate the channel where the DI-5B module is installed. The channel number is also silk-screened on the board, but when the module is plugged-in, you can no longer read the channel number on the board.

## PRINTER PORT

The printer port connects the DI-500/510 or DI-750/760 Series instrument to your computer. It provides a way to get your signals into your computer. Refer to the section titled “Connecting the Instrument to your Computer” on page 5 for more printer port details.

## STATUS LAMPS

All DI-500/510 and DI-750/760 Series instruments except the expansion instruments have two status lamps:

**POWER**—This indicator glows green when power is applied.

**ACTIVE**—This indicator glows red whenever the computer is actively addressing the instrument. This includes all digital input/output, analog output, and analog input functions.

The expansion instruments in the DI-500/510 and DI-750/760 Series only have the POWER status lamp.

## POWER SWITCH

Controls power to the DI-500/510 and DI-750/760 Series instrument. Refer to the section titled “Applying Power” on page 6 for more power switch details.

## POWER INPUT JACK

Allows you to apply power to the instrument. Power can be applied with the included power adapter or you can use an alternate source, as long as it is suitable for the DI-500/510 or DI-750/760 Series instrument (9-36VDC @ 10A max). Refer to the section titled “Applying Power” on page 6 for more power input jack details.

## EXPANSION IN and EXPANSION OUT or AUXILIARY PORT and EXPANSION Connectors

In addition to channel expansion, the 37-pin connectors (labeled AUXILIARY PORT and EXPANSION on DI-500-16, DI-750-16, DI-510-48, and DI-760-48 instruments, or EXPANSION IN and EXPANSION OUT on all other instruments) also provide access to digital inputs and outputs. Pinout is as follows:

**DI-500-16, DI-750-16, DI-510-48, and DI-760-48 Instruments**    **All other DI-500/510 and DI-750/760 Series Instruments**

| EXPANSION         |    |    | AUXILIARY PORT |    |    | EXPANSION OUT     |    |    | EXPANSION IN      |    |    |
|-------------------|----|----|----------------|----|----|-------------------|----|----|-------------------|----|----|
| +5V PWR           | 1  | 20 | A GND          | 19 | 20 | +5V PWR           | 1  | 20 | A GND             | 19 | 37 |
| Reserved          | 2  | 21 | CH9 IN         | 18 | 21 | Reserved          | 2  | 21 | CH25 IN           | 18 | 36 |
| Reserved          | 3  | 22 | CH10 IN        | 17 | 22 | Reserved          | 3  | 22 | CH26 IN           | 17 | 35 |
| Reserved          | 4  | 23 | CH11 IN        | 16 | 23 | Reserved          | 4  | 23 | CH27 IN           | 16 | 34 |
| Reserved          | 5  | 24 | CH12 IN        | 15 | 24 | Reserved          | 5  | 24 | CH28 IN           | 15 | 33 |
| Remote start/stop | 6  | 25 | CH13 IN        | 14 | 25 | Remote start/stop | 6  | 25 | CH29 IN           | 14 | 32 |
| POWER GND         | 7  | 26 | CH14 IN        | 13 | 26 | POWER GND         | 7  | 26 | CH30 IN           | 13 | 31 |
| Reserved          | 8  | 27 | CH15 IN        | 12 | 27 | Reserved          | 8  | 27 | CH31 IN           | 12 | 30 |
| DAC1              | 9  | 28 | CH16 IN        | 11 | 28 | DAC1              | 9  | 28 | CH32 IN           | 11 | 29 |
| Reserved          | 10 | 29 | DO5            | 10 | 29 | Reserved          | 10 | 29 | Reserved          | 10 | 28 |
| CH32 IN           | 11 | 30 | DAC2           | 9  | 30 | CH32 IN           | 11 | 30 | DAC1              | 9  | 28 |
| CH31 IN           | 12 | 31 | DO6            | 8  | 31 | CH31 IN           | 12 | 31 | Reserved          | 8  | 27 |
| CH30 IN           | 13 | 32 | POWER GND      | 7  | 32 | CH30 IN           | 13 | 32 | POWER GND         | 7  | 26 |
| CH29 IN           | 14 | 33 | DI1            | 6  | 33 | CH29 IN           | 14 | 33 | Remote Start/Stop | 6  | 25 |
| CH28 IN           | 15 | 34 | DI3            | 5  | 34 | CH28 IN           | 15 | 34 | Reserved          | 5  | 24 |
| CH27 IN           | 16 | 35 | DI0            | 4  | 35 | CH27 IN           | 16 | 35 | Reserved          | 4  | 23 |
| CH26 IN           | 17 | 36 | DO3            | 3  | 36 | CH26 IN           | 17 | 36 | Reserved          | 3  | 22 |
| CH25 IN           | 18 | 37 | DI5            | 2  | 37 | CH25 IN           | 18 | 37 | Reserved          | 2  | 21 |
| A GND             | 19 |    | +5V PWR        | 1  |    | CH25 IN           | 18 | 37 | +5V PWR           | 1  | 20 |
|                   |    |    |                |    |    | A GND             | 19 |    | Reserved          | 2  | 20 |

Refer to the section titled “Increasing the Total Analog Input Channel Capacity” on page 10 for more expansion port details.

## Installing the Software

After you have completed the hardware installation, connected your signals, and labeled the input channel(s), you are ready to install and run the software.

There are two software approaches for DI-500/510 and DI-750/760 Series instruments: writing/developing your own acquisition, review, and analysis programs or using WINDAQ software.

For the programmers who will be writing their own acquisition, review, and analysis programs, DATAQ Instruments, Inc. provides an ActiveX Control Library free with every DATAQ Instrument purchased. The ActiveX Control Library is installed automatically when you install any version of WINDAQ software and comes with its own built-in documentation.

For non-programmers, or for those who want convenience, DATAQ Instruments, Inc. provides WINDAQ software. WINDAQ is easy to use, ready-to-run, data acquisition, review, and analysis software for the Windows™ environment.

WINDAQ/Lite recording and playback software is included free with every DATAQ Instrument purchase. WINDAQ/Lite recording software is limited to 16 channels and 240 Hz maximum throughput when you enter the record mode. If you do not want to program and your application does not require more than 16 channels or a recording throughput more than 240 Hz, then you will want to install WINDAQ/Lite software. Find the WINDAQ/Lite software package (manuals and CD-ROM), and proceed with the installation instructions contained therein.

# 4. Enabling Channels for Acquisition

This chapter tells you how to enable analog channels for recording. For example, suppose you have analog signals connected to channels 1 through 16 and you want to record all of them. Use this procedure to enable channels 1 through 16 for recording.

1. To enable channel configuration:

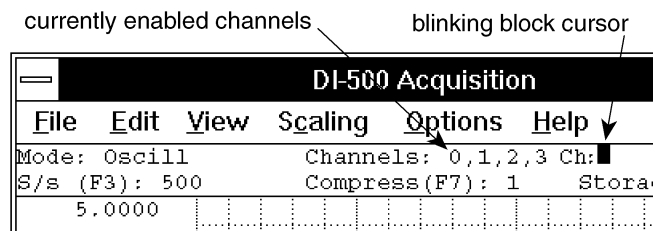


Click on **Channels...** in the **Edit** menu.

**What you see on your monitor depends on which instrument you are using:**

## DI-500-16 and DI-750-16 Instruments Used Alone

The Ch: block cursor will blink in the Channels field on the status bar. The currently active list of enabled channels are displayed in this field, immediately to the left of the cursor (initially, only channel 1 is enabled for recording).

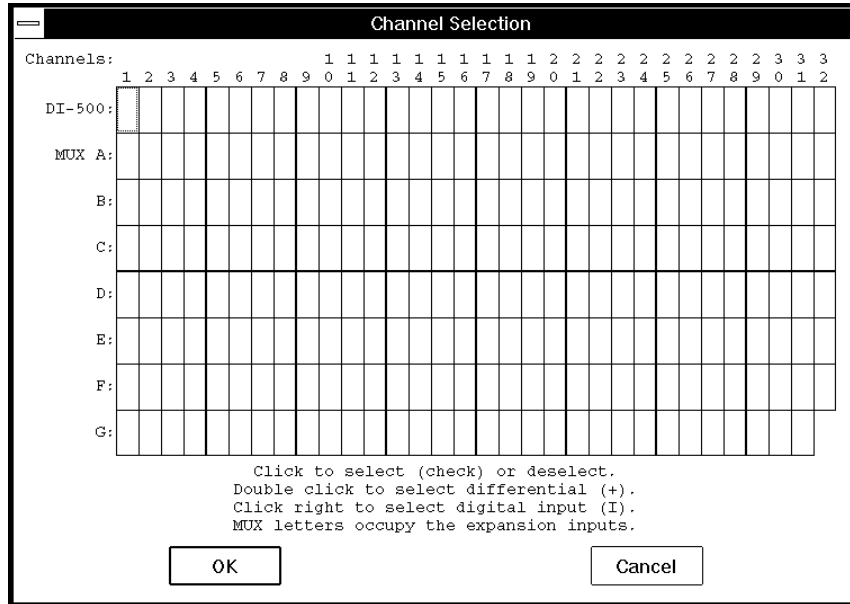


2. Enter the desired channel number and press the ENTER key. Repeat for each desired channel. This causes the channel number to be displayed in the enabled channels row.
3. When all desired channels have been enabled, exit the channel configuration routine by pressing any key other than the letters D and I.

Note that a channel may be removed by typing the channel number preceded by a minus (-) sign. For example, typing “-3” removes channel 3 from the row. Note also that channels may not be added after the RECORD mode has been entered.

## All Other DI-500/510 and DI-750/760 Series Instruments

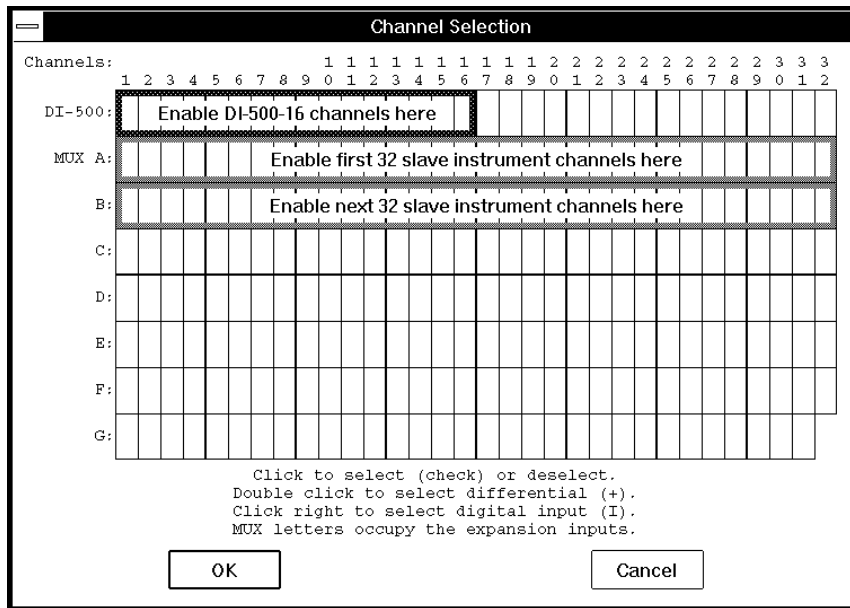
This displays the channel selection grid:



Each box in this grid represents an input channel. An input channel is enabled by clicking the desired box. Where in the grid you click, which mouse button you click with, and how many times you click the mouse button determines whether the input channel is enabled for differential operation, for operation defined by the 5B module (if used), or for differential operation between a pair of channels (automatically defined by the grid). Since there are so many variables, each instrument will be presented individually.

### ***DI-500-16 and DI-750-16 Instruments Used with “Slaves”***

Channels 1 through 16 are enabled on the top row of the grid.



When other instruments are connected as a slave to the DI-500-16, their channels are enabled starting with row “MUX A” (and “B,” etc. when more than 32 channels are multiplexed). Using an ordinary pencil, label all slave

instrument channels by writing the letter from the grid in the box on the instrument panel overlay (i.e., place an “A” in the box to designate slave channels A1 through A32).

If a second DI-500-16 is multiplexed as a slave to the first DI-500-16, enable all 32 channels on the top row of the grid (no other expansion is permitted when two DI-500-16's are multiplexed). In this case, the expansion cable is connected from the EXPANSION connector on the master to the AUXILIARY PORT connector on the slave.



Point to the box in the grid that represents the desired channel and click the left mouse button to enable the channel as a differential input (when not using 5B modules) or as an input defined by the 5B module (when used). A check mark is displayed in the desired channel box, indicating that a differential input (when not using 5B modules) or an input defined by the 5B module (when used) has been enabled. A second activation removes the check mark and thus disables the channel.



Point to the box in the grid that represents the desired channel and double-click the left mouse button to enable a pair of differential channels for differential operation (this allows you to see the difference between 2 differential input channels). A plus sign (+) is displayed in the desired channel box, indicating one differential channel and a minus sign (-) is automatically displayed eight channels away (i.e., channels 1 and 9, 2 and 10, 5 and 13, etc.), indicating the other differential channel. You can select the first or positive channel (from 1 through 8), but the second or negative channel is automatically selected by the software. Clicking the left mouse button on the plus sign removes both plus and minus signs and thus disables the channel pair.

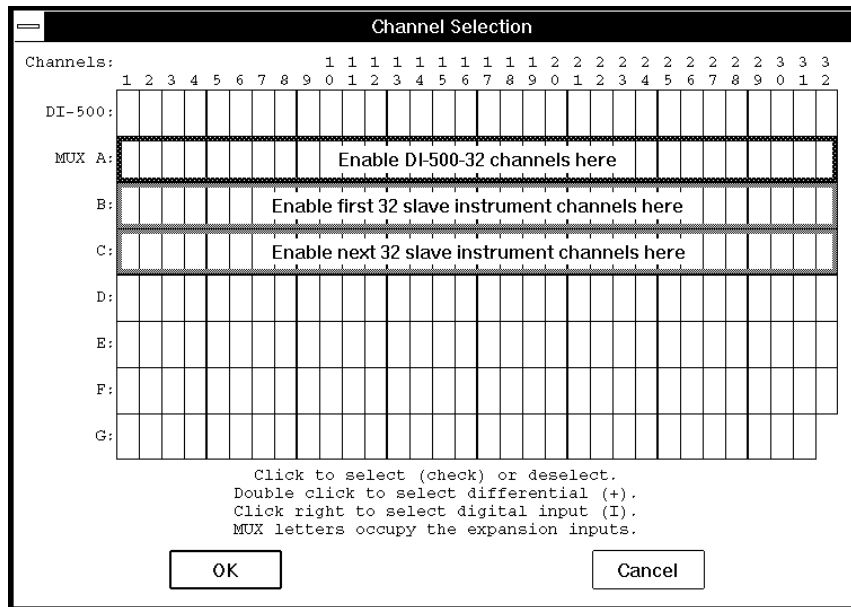
This configuration is useful anytime you need to monitor the difference between two differential input channels. For example, say you are monitoring the temperature of a long, narrow widget. You want the widget to be of uniform temperature throughout its entire length. You could use two thermocouples (one per channel, on each end of the widget) to monitor temperature. The temperature of one end of the widget would be measured by one thermocouple and the temperature of the other end of the widget would be measured by the other thermocouple. However, in the differential channel pair configuration as described above, only the difference between the two thermocouples would be reported by WINDAQ software. This difference in temperature could then be used to control a process (i.e., if one end is 5° hotter than the other, then turn on a heater to evenly distribute the widget temperature).




Point to the box in the grid that represents the desired channel and click the right mouse button to enable the channel as a digital input. An “I” is displayed in the desired channel box, indicating that a digital input has been enabled. Pointing to the “I” and clicking the left mouse button removes the “I” and thus disables the channel. The digital inputs are connected to the 37-pin AUXILIARY PORT connector on the DI-500-16 instrument. Note that when you specify a channel as a digital input in the channel selection grid, you no longer have the ability to connect an analog signal to that channel either at the sheathed banana jacks or at the screw terminals.

### DI-500-32 and DI-750-32 Instruments

Ignore the top row. Channels 1 through 32 are enabled on the second row from the top (row “MUX A”).



When other instruments are connected as a slave to the DI-500-32, their channels are enabled starting with row “B” (and “C,” etc. when more than 32 channels are multiplexed). Using an ordinary pencil, label the DI-500-32 channels by writing the letter from the grid in the box on the instrument panel overlay (i.e., place an “A” in the box to designate channels A1 through A32. Do the same for any slave instruments in your configuration, but use B, C, D, etc.).

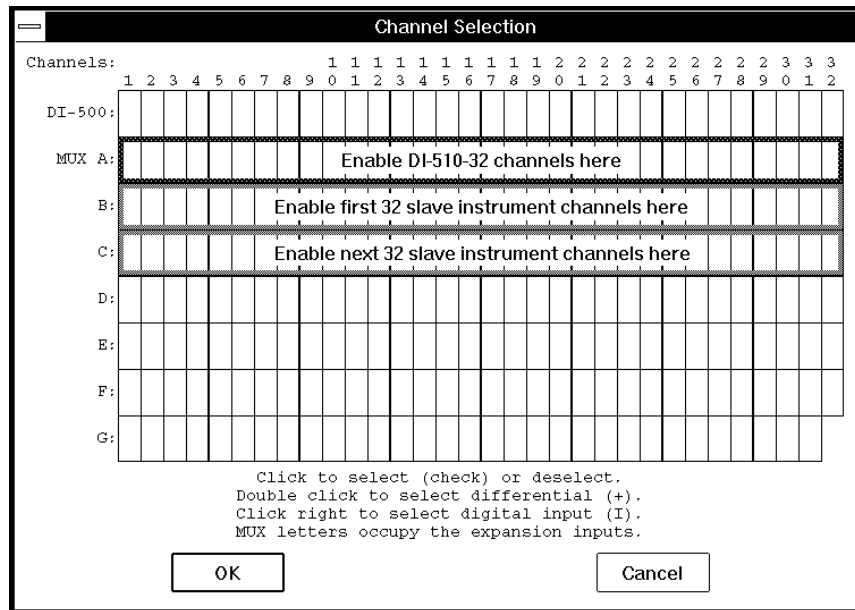
 Point to the box in the grid that represents the desired channel and click the left mouse button to enable the channel as a differential input (when not using 5B modules) or as an input defined by the 5B module (when used). A check mark is displayed in the desired channel box, indicating that a differential input (when not using 5B modules) or an input defined by the 5B module (when used) has been enabled. A second activation removes the check mark and thus disables the channel.

On this instrument, the plus sign (+) and the check mark both mean the channel is enabled as a differential input (when not using 5B modules) or as an input defined by the 5B module (when used). Clicking or double-clicking with the left mouse button accomplishes the same result (differential channel pairs are not supported on this instrument). Digital inputs are not supported on this instrument.



## DI-510-32 and DI-760-32 Instruments

Ignore the top row. Channels 1 through 32 are enabled on the second row from the top (row “MUX A”).



When other instruments are connected as a slave to the DI-510-32, their channels are enabled starting with row “B” (and “C,” etc. when more than 32 channels are multiplexed). Using an ordinary pencil, label the DI-510-32 channels by writing the letter from the grid in the box on the instrument panel overlay (i.e., place an “A” in the box to designate channels A1 through A32. Do the same for any slave instruments in your configuration, but use B, C, D, etc.).

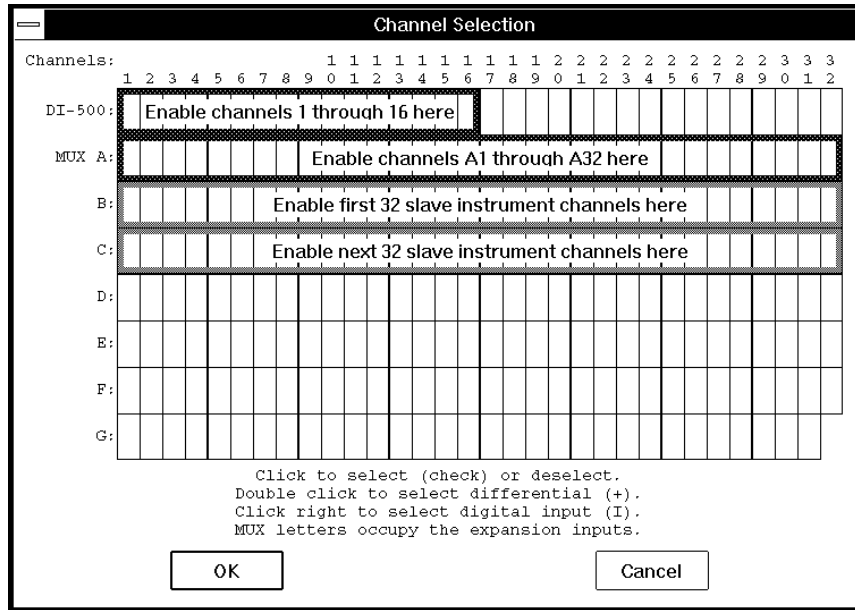


Point to the box in the grid that represents the desired channel and click the left mouse button to enable the channel as a differential input (when not using 5B modules) or as an input defined by the 5B module (when used). A check mark is displayed in the desired channel box, indicating that a differential input (when not using 5B modules) or an input defined by the 5B module (when used) has been enabled. A second activation removes the check mark and thus disables the channel.


On this instrument, the plus sign (+) and the check mark both mean the channel is enabled as a differential input (when not using 5B modules) or as an input defined by the 5B module (when used). Clicking or double-clicking with the left mouse button accomplishes the same result (differential channel pairs are not supported on this instrument). Digital inputs are not supported on this instrument.


### DI-510-48 and DI-760-48 Instruments

Channels 1 through 16 are enabled on the top row of the grid. Channels A1 through A32 are enabled on the second row from the top (row “MUX A”).




When other instruments are connected as a slave to the DI-510-48, their channels are enabled starting with row “B” (and “C,” etc. when more than 32 channels are multiplexed). Using an ordinary pencil, label the expansion channels by writing the letter from the grid in the box on the slave instrument panel overlay (i.e., place a “B” in the box to designate slave instrument channels B1 through B32. Do the same for any more slave instruments in your configuration, using C, D, E, etc.).

 Point to the box in the grid that represents the desired channel and click the left mouse button to enable the channel as a differential input (when not using 5B modules) or as an input defined by the 5B module (when used). A check mark is displayed in the desired channel box, indicating that a differential input (when not using 5B modules) or an input defined by the 5B module (when used) has been enabled. A second activation removes the check mark and thus disables the channel.

 Point to the box in the grid that represents the desired channel and double-click the left mouse button to enable a pair of differential channels for differential operation (this allows you to see the difference between 2 differential input channels). A plus sign (+) is displayed in the desired channel box, indicating one differential channel and a minus sign (-) is automatically displayed eight channels away (i.e., channels 1 and 9, 2 and 10, 5 and 13, etc.), indicating the other differential channel. You can select the first or positive channel (from 1 through 8), but the second or negative channel is automatically selected by the software. Clicking the left mouse button on the plus sign removes both plus and minus signs and thus disables the channel pair.

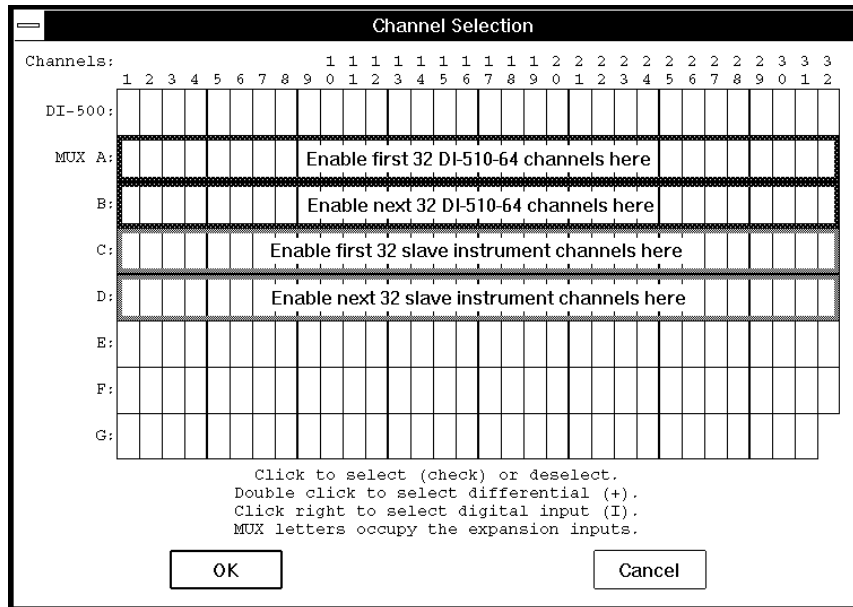
This configuration is useful anytime you need to monitor the difference between two differential input channels. For example, say you are monitoring the temperature of a long, narrow widget. You want the widget to be of uniform temperature throughout its entire length. You could use two thermocouples (one per channel, on each end of the widget) to monitor temperature. The temperature of one end of the widget would be measured by one thermocouple and the temperature of the other end of the widget would be measured by the other thermocouple. However, in the differential channel pair configuration as described above, only the difference between the two thermocouples would be reported by WINDAQ software. This difference in temperature could then be used to control a process (i.e., if one end is 5° hotter than the other, then turn on a heater to evenly distribute the widget temperature).

 Point to the box in the grid that represents the desired channel and click the right mouse button to enable the channel as a digital input. An “I” is displayed in the desired channel box, indicating that a digital input has been enabled. Pointing to the “I” and clicking the left mouse button removes the “I” and thus disables the

channel. The digital inputs are connected to the 37-pin AUXILIARY PORT connector on the DI-510-48 instrument. Note that when you specify a channel as a digital input in the channel selection grid, you no longer have the ability to connect an analog signal to that channel either at the sheathed banana jacks or at the screw terminals.

### DI-510-64 and DI-760-64 Instruments

Ignore the top row. All 64 channels (two rows of 32) are enabled on the second and third rows from the top (rows “MUX A” and “B”).



When other instruments are connected as a slave to the DI-510-64, their channels are enabled starting with row “C” (and “D,” etc. when more than 32 channels are multiplexed). Using an ordinary pencil, label the DI-510-64 channels by writing the letters from the grid in the boxes on the instrument panel overlay (i.e., place an “A” in one box to designate channels A1 through A32, and a “B” in the other box to designate channels B1 through B32. Do the same for any slave instruments in your configuration, but use C, D, etc.).

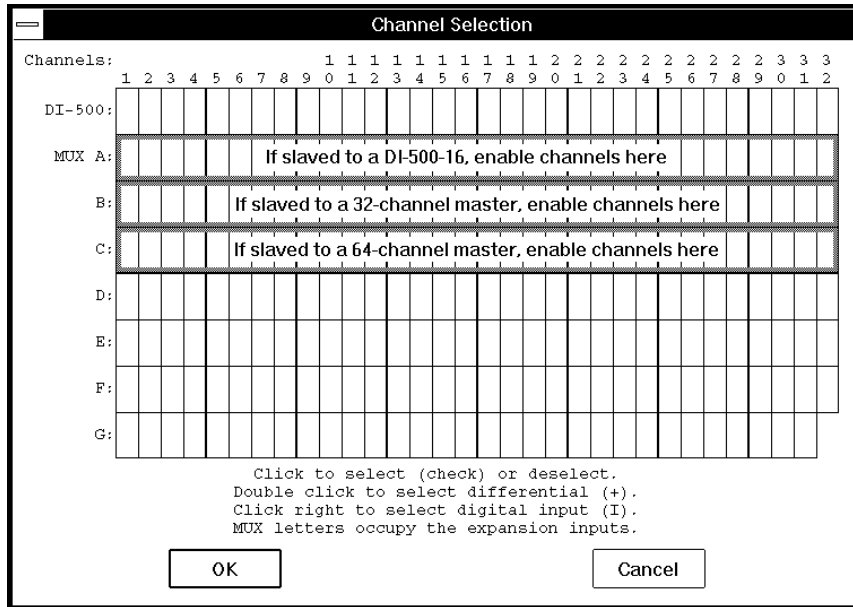


Point to the box in the grid that represents the desired channel and click the left mouse button to enable the channel as a differential input (when not using 5B modules) or as an input defined by the 5B module (when used). A check mark is displayed in the desired channel box, indicating that a differential input (when not using 5B modules) or an input defined by the 5B module (when used) has been enabled. A second activation removes the check mark and thus disables the channel.

On this instrument, the plus sign (+) and the check mark both mean the channel is enabled as a differential input (when not using 5B modules) or as an input defined by the 5B module (when used). Clicking or double-clicking with the left mouse button accomplishes the same result (differential channel pairs are not supported on this instrument). Digital inputs are not supported on this instrument.

### DI-500-32-X and DI-750-32-X Instruments

When using expansion instruments, always enable the master instrument channels first. Channels 1 through 32 of the DI-500-32-X can then be enabled after the master instrument channels. For example, say you are using a DI-510-32 as a master and the DI-500-32-X as a slave. You would enable channels 1 through 32 of the DI-500-32-X on row “B.”



Using an ordinary pencil, label the DI-500-32 expander channels by writing the letter from the grid in the box on the instrument panel overlay (i.e., place a “B” in the box to designate channels B1 through B32).



Point to the box in the grid that represents the desired channel and click the left mouse button to enable the channel as a differential input (when not using 5B modules) or as an input defined by the 5B module (when used). A check mark is displayed in the desired channel box, indicating that a differential input (when not using 5B modules) or an input defined by the 5B module (when used) has been enabled. A second activation removes the check mark and thus disables the channel.

On this instrument, the plus sign (+) and the check mark both mean the channel is enabled as a differential input (when not using 5B modules) or as an input defined by the 5B module (when used). Clicking or double-clicking with the left mouse button accomplishes the same result (differential channel pairs are not supported on this instrument). Digital inputs are not supported on this instrument.

### DI-510-32-X and DI-760-32-X Instruments


When using expansion instruments, always enable the master instrument channels first. Channels 1 through 32 of the DI-510-32 can then be enabled after the master instrument channels. For example, say you are using a DI-510-32 as a master and the DI-510-32-X as a slave. You would enable channels 1 through 32 of the DI-510-32-X on row “B.”

| Channel Selection |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |
|-------------------|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|
| Channels:         | 1  | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 |  |
| DI-500:           |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |
| MUX A:            | If slaved to a DI-500-16, enable channels here         |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |
| B:                | If slaved to a 32-channel master, enable channels here |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |
| C:                | If slaved to a 64-channel master, enable channels here |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |
| D:                |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |
| E:                |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |
| F:                |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |
| G:                |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |

Click to select (check) or deselect.  
 Double click to select differential (+).  
 Click right to select digital input (I).  
 MUX letters occupy the expansion inputs.

OK Cancel

Using an ordinary pencil, label the DI-510-32 expander channels by writing the letter from the grid in the box on the instrument panel overlay (i.e., place a “B” in the box to designate channels B1 through B32).

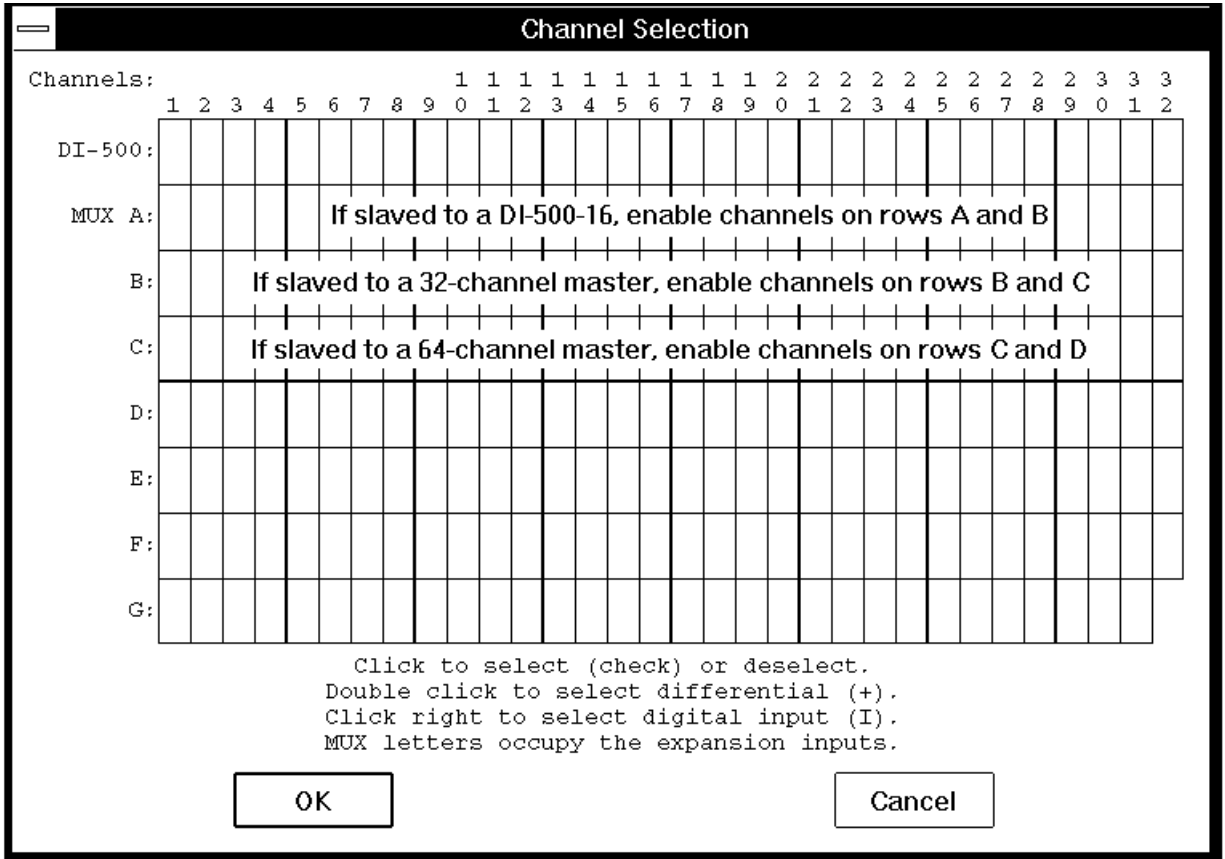
 Point to the box in the grid that represents the desired channel and click the left mouse button to enable the channel as a differential input (when not using 5B modules) or as an input defined by the 5B module (when used). A check mark is displayed in the desired channel box, indicating that a differential input (when not using 5B modules) or an input defined by the 5B module (when used) has been enabled. A second activation removes the check mark and thus disables the channel.

On this instrument, the plus sign (+) and the check mark both mean the channel is enabled as a differential input (when not using 5B modules) or as an input defined by the 5B module (when used). Clicking or double-clicking with the left mouse button accomplishes the same result (differential channel pairs are not supported on this instrument). Digital inputs are not supported on this instrument.


### DI-510-64-X and DI-760-64-X Instruments

When using expansion instruments, always enable the master instrument channels first. All 64 channels (two rows of 32) of the DI-510-64-X can then be enabled after the master instrument channels. For example, say you are using a

DI-510-64 as a master and the DI-510-64-X as a slave. You would enable the first 32 channels of the DI-510-64-X on row “C,” and the second group of 32 channels on row “D.”



Using an ordinary pencil, label the DI-510-64 expander channels by writing the letters from the grid in the boxes on the instrument panel overlay (i.e., place a “C” in one box to designate channels C1 through C32, and a “D” in the other box to designate channels D1 through D32).

 Point to the box in the grid that represents the desired channel and click the left mouse button to enable the channel as a differential input (when not using 5B modules) or as an input defined by the 5B module (when used). A check mark is displayed in the desired channel box, indicating that a differential input (when not using 5B modules) or an input defined by the 5B module (when used) has been enabled. A second activation removes the check mark and thus disables the channel.

On this instrument, the plus sign (+) and the check mark both mean the channel is enabled as a differential input (when not using 5B modules) or as an input defined by the 5B module (when used). Clicking or double-clicking with the left mouse button accomplishes the same result (differential channel pairs are not supported on this instrument). Digital inputs are not supported on this instrument.

# 5. 5B Modules

## DI-5B30/31 Analog Voltage Input Modules, Narrow Bandwidth

### DESCRIPTION

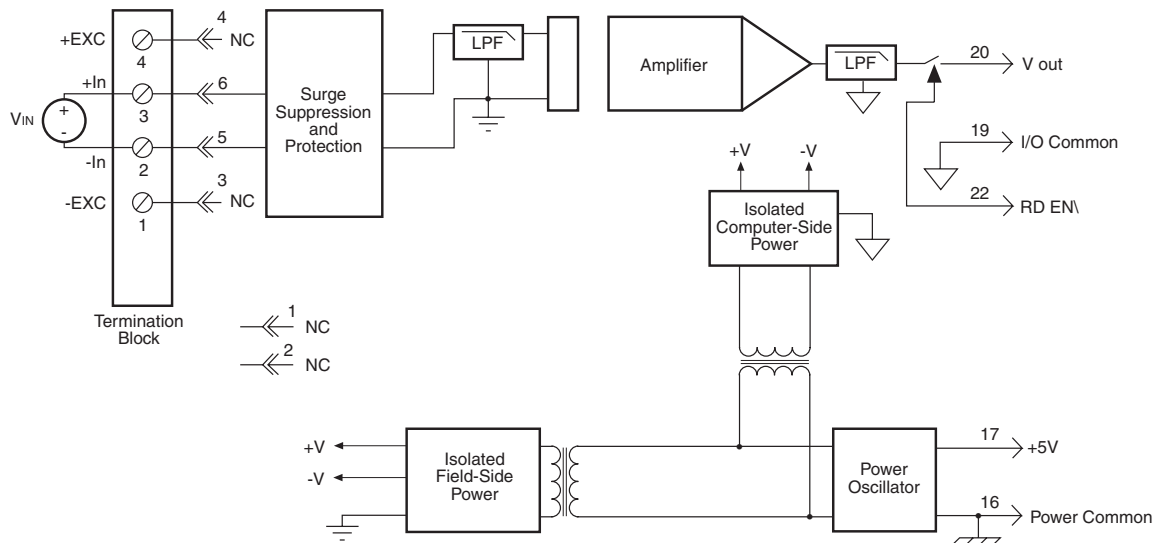
Each DI-5B30 and DI-5B31 voltage input module provides a single channel of analog input which is filtered, isolated, amplified, and converted to a high level analog voltage output (see block diagram). This voltage output is logic-switch controlled, allowing these modules to share a common analog bus without the requirement of external multiplexers.

The DI-5B modules are designed with a completely isolated computer side circuit which can be floated to  $\pm 50\text{V}$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

Signal filtering is accomplished with a six-pole filter which provides 95dB of normal-mode-rejection at 60Hz and 90dB at 50Hz. Two poles of this filter are on the field side of the isolation barrier, and the other four are on the computer side.

After the initial field-side filtering, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC,  $\pm 5\%$ .

A special input circuit on the DI-5B30 and DI-5B31 modules provides protection against accidental connection of power-line voltages up to 240VAC.:



### Ordering Information

| MODEL       | INPUT RANGE      | OUTPUT RANGE |
|-------------|------------------|--------------|
| DI-5B30-01  | -10mV to +10mV   | -5V to +5V   |
| DI-5B30-02  | -50mV to +50mV   | -5V to +5V   |
| DI-5B30-03  | -100mV to +100mV | -5V to +5V   |
| DI-5B31-01  | -1V to +1V       | -5V to +5V   |
| DI-5B31-02  | -5V to +5V       | -5V to +5V   |
| DI-5B31-03  | -10V to +10V     | -5V to +5V   |
| DI-5B31-07* | -20V to +20V     | -5V to +5V   |
| DI-5B31-09* | -40V to +40V     | -5V to +5V   |

\*CSA certification pending.

## DI-5B32 Analog Current Input Modules

### DESCRIPTION

Each DI-5B32 current input module provides a single channel of analog input which is filtered, isolated, amplified, and converted to a high level analog voltage output (see block diagram). This voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

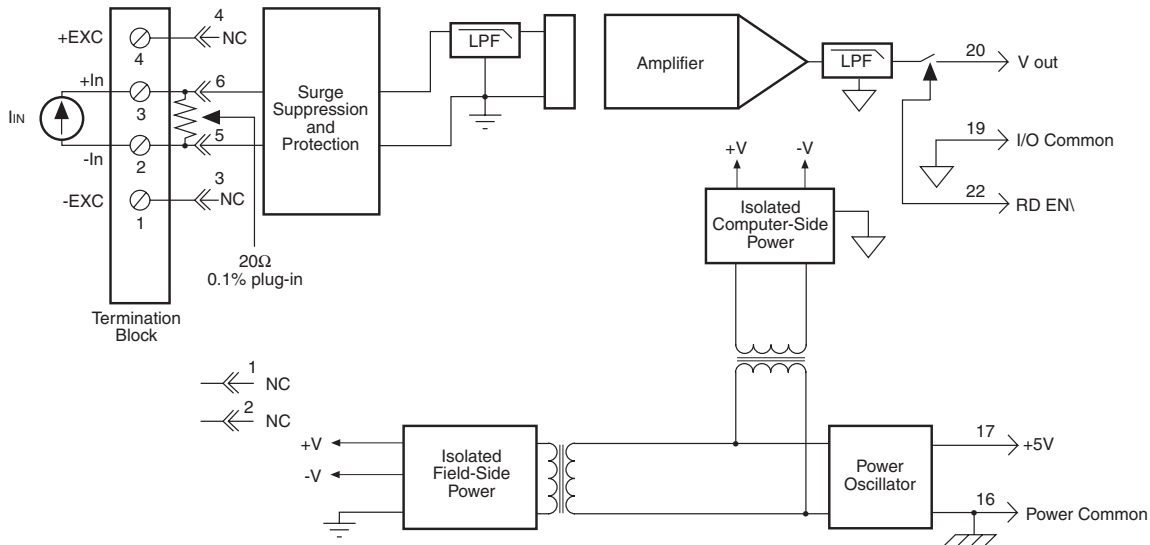
The DI-5B modules are designed with a completely isolated computer side circuit which can be floated to  $\pm 50V$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

A precision 20W current conversion resistor is supplied with the DI-5B32 module (see block diagram for installation details).

Signal filtering is accomplished with a six-pole filter which provides 95dB of normal-mode rejection at 60Hz and 90dB at 50Hz. Two poles of this filter are on the field side of the isolation barrier, and the other four are on the computer side.

After the initial field-side filtering, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC,  $\pm 5\%$ .

A special input circuit on the DI-5B32 modules provides protection against accidental connection of power-line voltages up to 240VAC.



| <b>Ordering Information</b> |             |              |
|-----------------------------|-------------|--------------|
| MODEL                       | INPUT RANGE | OUTPUT RANGE |
| DI-5B32-01                  | 4mA to 20mA | 0V to +5V    |
| DI-5B32-02                  | 0mA to 20mA | 0V to +5V    |



## DI-5B33 Isolated True RMS Input Modules

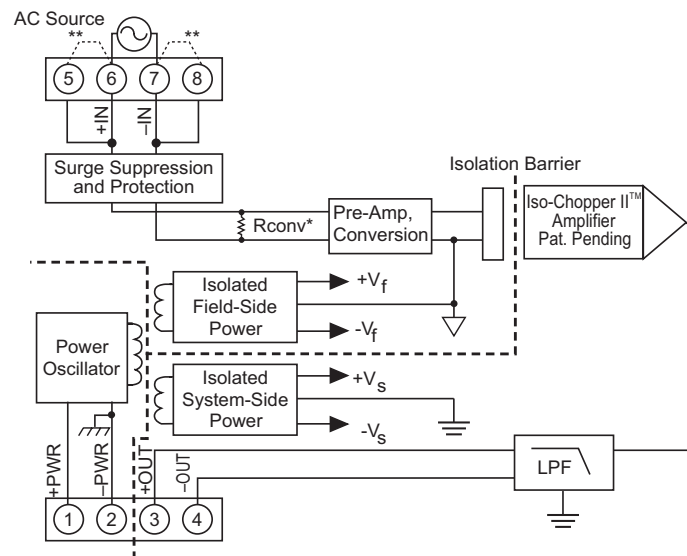
### DESCRIPTION

Each DI-5B33 True RMS input module provides a single channel of AC input which is converted to its True RMS dc value, filtered, isolated, amplified, and converted to a standard process voltage or current output (see block diagram).

The DI-5B modules are designed with a completely isolated computer side circuit which can be floated to  $\pm 50\text{V}$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

The field voltage or current input signal is processed through a pre-amplifier and RMS converter on the field side of the isolation barrier. The converted dc signal is then chopped by a proprietary chopper circuit and transferred across the transformer isolation barrier, suppressing transmission of common mode spikes and surges. The computer side circuitry reconstructs, filters and converts the signal to industry standard outputs. Modules are powered from +5VDC,  $\pm 5\%$ .

For current output models an external loop supply is required having a compliance voltage of 14 to 48VDC. Connection, with series load, is between Pin 20 (+) and Pin 19 (-).



### Ordering Information

| MODEL      | INPUT RANGE | OUTPUT RANGE |
|------------|-------------|--------------|
| DI-5B33-01 | 100mV       | 0V to +5V    |
| DI-5B33-02 | 1V          | 0V to +5V    |
| DI-5B33-03 | 10V         | 0V to +5V    |
| DI-5B33-04 | 150V        | 0V to +5V    |
| DI-5B33-05 | 300V        | 0V to +5V    |

## DI-5B34 Linearized 2- or 3-Wire RTD Input Modules

### DESCRIPTION

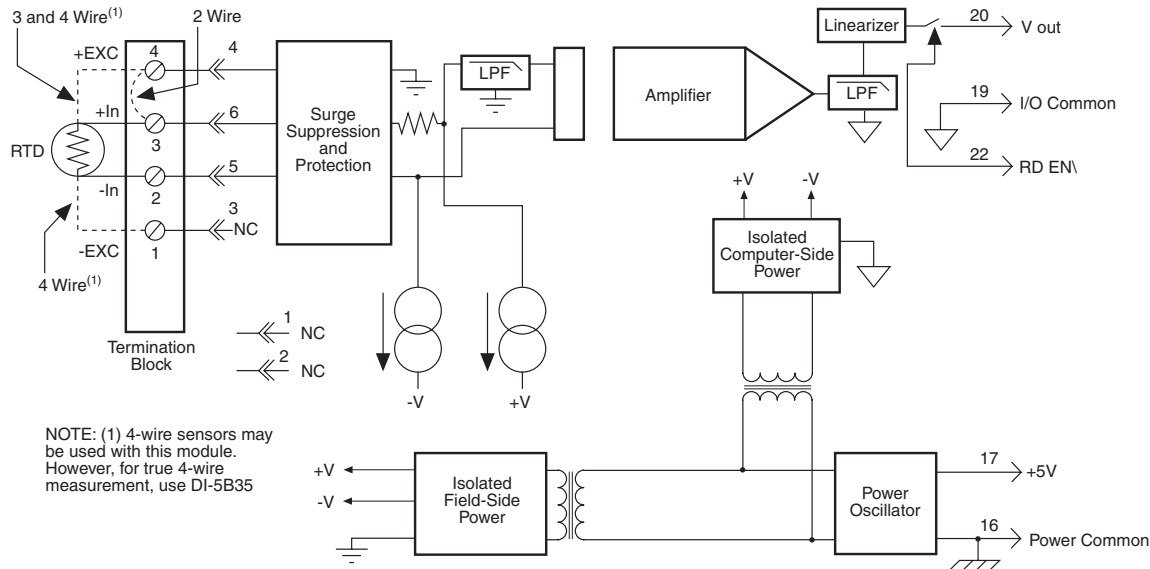
Each DI-5B34 RTD input module provides a single channel of RTD input which is filtered, isolated, amplified, linearized, and converted to a high level analog voltage output (see block diagram). This voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

The DI-5B modules are designed with a completely isolated computer side circuit which can be floated to  $\pm 50V$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

RTD excitation is provided from the module by two matched current sources. When using a three-wire RTD, this method allows an equal current to flow in each RTD lead, which cancels the effects of lead resistances. The excitation currents are very small (0.25mA for 100W Pt and 120W Ni, and 1.0mA for 10W Cu) which minimizes self-heating of the RTD.

Signal filtering is accomplished with a six-pole filter which provides 95dB of normal-mode-rejection at 60Hz and 90dB at 50Hz. Two poles of this filter are on the field side of the isolation barrier, and the other four are on the computer side. After the initial field-side filtering, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC,  $\pm 5\%$ .

A special input circuit on the DI-5B34 modules provides protection against accidental connection of power-line voltages up to 240VAC.



### Ordering Information

| MODEL   | INPUT RANGE                        | OUTPUT RANGE | ACCURACY*                |
|---|------------------------------------|--------------|--------------------------|
| <b>100Ω Pt, <math>\alpha = 0.00385</math></b> |                                    |              |                          |
| DI-5B34-01                                    | -100°C (-148°F) to +100°C (+212°F) | 0V to +5V    | $\pm 0.46^\circ\text{C}$ |
| DI-5B34-02                                    | 0°C (32°F) to +100°C (+212°F)      | 0V to +5V    | $\pm 0.36^\circ\text{C}$ |
| DI-5B34-03                                    | 0°C (32°F) to +200°C (+392°F)      | 0V to +5V    | $\pm 0.46^\circ\text{C}$ |
| DI-5B34-04                                    | 0°C (32°F) to +600°C (+1112°F)     | 0V to +5V    | $\pm 0.88^\circ\text{C}$ |

|   |   |           |         |
|---|---|-----------|---------|
| <b>10Ω Cu, <math>\alpha = 0.004274</math></b> |   |           |         |
| DI-5B34C-01                                   | 0°C (32°F) to +120°C (+248°F) (10Ω at 0°C)  | 0V to +5V | ±0.23°C |
| DI-5B34C-02                                   | 0°C (32°F) to +120°C (+248°F) (10Ω at 25°C) | 0V to +5V | ±0.23°C |
| DI-5B34C-03**                                 | 0°C (32°F) to +160°C (+320°F) (10Ω at 0°C)  | 0V to +5V | ±0.32°C |
| <b>120Ω Ni, <math>\alpha = 0.00672</math></b> |   |           |         |
| DI-5B34N-01                                   | 0°C (32°F) to +300°C (+572°F)               | 0V to +5V | ±0.40°C |

\* Includes conformity, hysteresis and repeatability.

\*\*CSA certification pending.

## DI-5B35 Linearized 4-Wire RTD Input Modules

### DESCRIPTION

In RTD temperature measurement applications requiring a very high level of accuracy, the DI-5B35 4-Wire RTD input module offers a significant advantage over 3-wire measurement techniques (see block diagram). The DI-5B35 measures only the voltage dropped across the RTD and almost completely ignores the resistance or length of the RTD lead wires. The DI-5B34 3-Wire RTD module provides lead resistance compensation, but requires equal lead resistances, while the DI-5B35 does not require matched lead resistances.

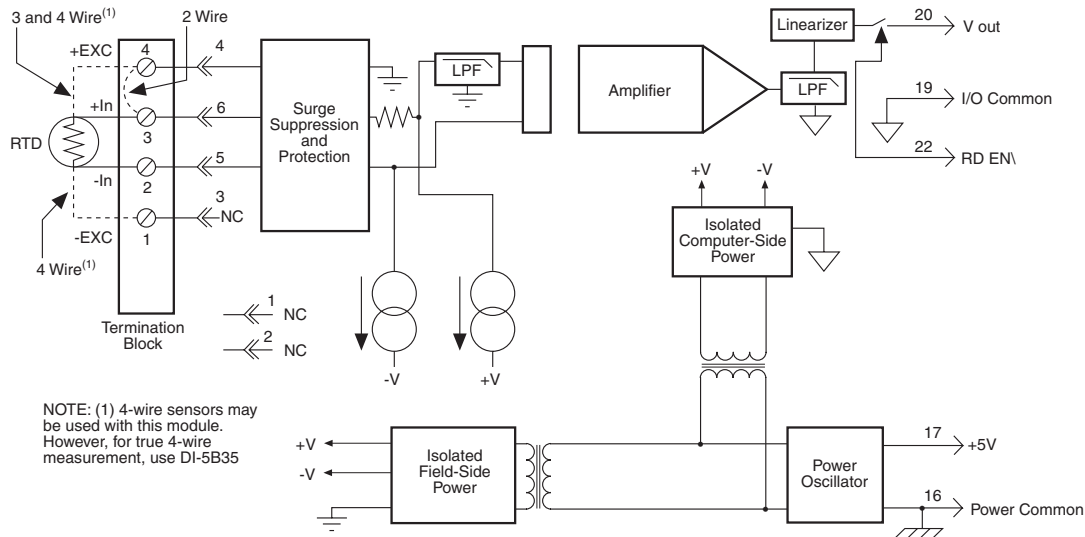
Each DI-5B35 RTD input module provides a single channel of RTD input which is filtered, isolated, amplified, linearized, and converted to a high level analog voltage output. This voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

The DI-5B modules are designed with a completely isolated computer side circuit which can be floated to  $\pm 50V$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

RTD excitation is provided from the module by a precision current source. The excitation current is available on two leads which are separate from the two input signal measuring leads. The excitation current does not flow in the input signal leads, which allows RTD measurement to be totally independent of lead resistance. The excitation current is very small (0.25mA for 100W Pt and 120W Ni, and 1.0mA for 10W Cu) which minimizes self-heating of the RTD.

Signal filtering is accomplished with a six-pole filter which provides 95dB of normal-mode-rejection at 60Hz and 90dB at 50Hz. Two poles of this filter are on the field side of the isolation barrier, and the other four are on the computer side. After the initial field-side filtering, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC,  $\pm 5\%$ .

A special input circuit on the DI-5B35 modules provides protection against accidental connection of power-line voltages up to 240VAC.



| <b>Ordering Information</b>                   |   |              |           |
|---|---|--------------|-----------|
| MODEL   | INPUT RANGE                                 | OUTPUT RANGE | ACCURACY* |
| <b>100Ω Pt, <math>\alpha = 0.00385</math></b> |   |              |           |
| DI-5B35-01                                    | -100°C (-148°F) to +100°C (+212°F)          | 0V to +5V    | ±0.46°C   |
| DI-5B35-02                                    | 0°C (32°F) to +100°C (+212°F)               | 0V to +5V    | ±0.36°C   |
| DI-5B35-03                                    | 0°C (32°F) to +200°C (+392°F)               | 0V to +5V    | ±0.46°C   |
| DI-5B35-04                                    | 0°C (32°F) to +600°C (+1112°F)              | 0V to +5V    | ±0.88°C   |
| <b>10Ω Cu, <math>\alpha = 0.004274</math></b> |   |              |           |
| DI-5B35C-01                                   | 0°C (32°F) to +120°C (+248°F) (10Ω at 0°C)  | 0V to +5V    | ±0.23°C   |
| DI-5B35C-02DI-                                | 0°C (32°F) to +120°C (+248°F) (10Ω at 25°C) | 0V to +5V    | ±0.23°C   |
| 5B35C-03**                                    | 0°C (32°F) to +160°C (+320°F) (10Ω at 0°C)  | 0V to +5V    | ±0.32°C   |
| <b>120Ω Ni, <math>\alpha = 0.00672</math></b> |   |              |           |
| DI-5B35N-01                                   | 0°C (32°F) to +300°C (+572°F)               | 0V to +5V    | ±0.40°C   |

\* Includes conformity, hysteresis and repeatability.

\*\*CSA certification pending.

## DI-5B36 Potentiometer Input Modules

### DESCRIPTION

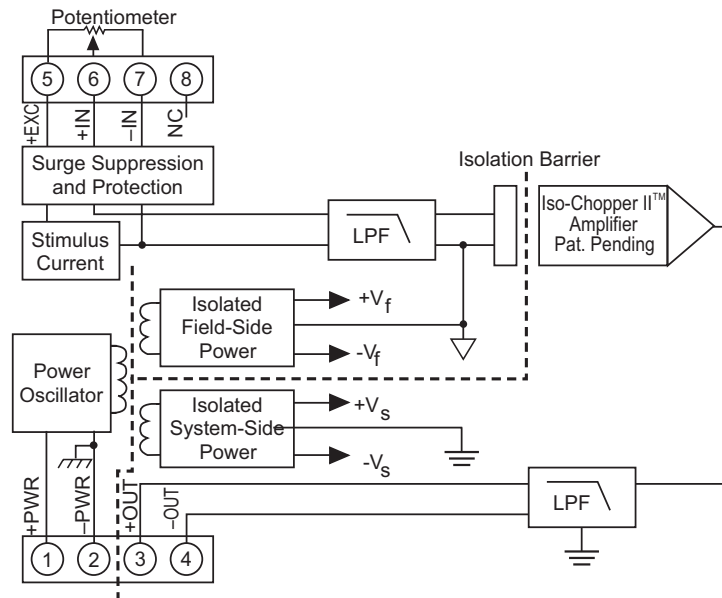
Each DI-5B36 Potentiometer input module provides a single channel of Potentiometer input which is filtered, isolated, amplified, and converted to a high level analog voltage output (see block diagram). This voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

The DI-5B modules are designed with a completely isolated computer side circuit which can be floated to  $\pm 50V$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

Excitation for the potentiometer is provided from the module by two matched current sources. When using a three-wire potentiometer, this method allows cancellation of the effects of lead resistances. The excitation currents are very small (less than 1.0mA) which minimizes self-heating of the potentiometer.

Signal filtering is accomplished with a six-pole filter which provides 95dB of normal-mode-rejection at 60Hz and 90dB at 50Hz. Two poles of this filter are on the field side of the isolation barrier, and the other four are in the output stage. After the initial field-side filtering, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC,  $\pm 5\%$ .

A special input circuit on the DI-5B36 module provides protection against accidental connection of power-line voltages up to 240VAC.



### Ordering Information

| MODEL      | INPUT RANGE       | OUTPUT RANGE |
|------------|-------------------|--------------|
| DI-5B36-01 | 0 to 100 $\Omega$ | 0V to +5V    |
| DI-5B36-02 | 0 to 500 $\Omega$ | 0V to +5V    |
| DI-5B36-03 | 0 to 1k $\Omega$  | 0V to +5V    |
| DI-5B36-04 | 0 to 10k $\Omega$ | 0V to +5V    |

## DI-5B38 Strain Gage Input Modules, Narrow & Wide Bandwidth

### DESCRIPTION

Each DI-5B38 Strain Gage input module provides a single channel of Strain Gage input which is filtered, isolated, amplified, and converted to a high level analog voltage output (see block diagram). This voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

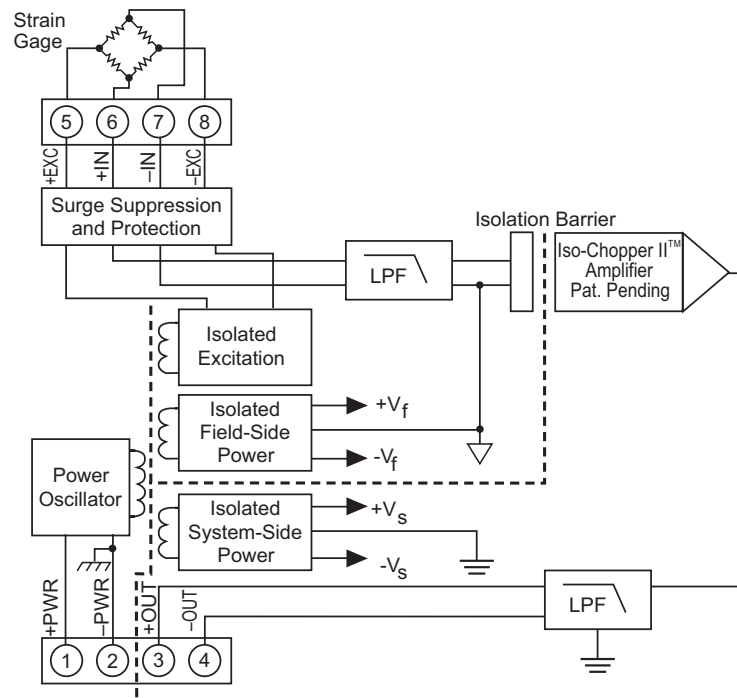
The DI-5B modules are designed with a completely isolated computer side circuit which can be floated to  $\pm 50\text{V}$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

The DI-5B38 can interface to full- or half-bridge transducers with a nominal resistance of  $100\Omega$  to  $10\text{k}\Omega$ . A matched pair of bridge-completion resistors (to  $\pm 1\text{m}\Omega$  at  $+10\text{V}$  excitation) allows use of low cost half- or quarter-bridge transducers. On wide bandwidth modules, the  $10\text{kHz}$  bandwidth allows measurement of high speed processes such as vibration analysis.

Strain Gage excitation is provided from the module by a very stable  $10\text{V}$  or  $3.333\text{V}$  source. The excitation supply is fully isolated, allowing the amplifier inputs to operate over the full range of the excitation voltage. Full scale sensitivities of  $2\text{mV/V}$ ,  $3\text{mV/V}$  or  $10\text{mV/V}$  are offered. With  $10\text{V}$  excitation, this results in a  $\pm 20\text{mV}$ ,  $\pm 30\text{mV}$  or  $\pm 100\text{mV}$  full scale input range.

On wide bandwidth modules, the input signal is processed through a preamplifier on the field side of the isolation barrier. This preamplifier has a gain-bandwidth product of  $5\text{MHz}$  and is bandwidth limited to  $10\text{kHz}$ . On all modules, after initial field side filtering, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from  $+5\text{VDC}$ ,  $\pm 5\%$ .

Special input circuits on the DI-5B38 module provide protection of the signal inputs and the isolated excitation supply up to  $240\text{VAC}$ .



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| <b>Ordering Information</b> |                   |                              |                              |              |
|-----------------------------|-------------------|------------------------------|------------------------------|--------------|
| MODEL                       | INPUT BRIDGE TYPE | INPUT RANGE                  | EXCITATION                   | OUTPUT RANGE |
| DI-5B38-31 or DI-5B38-01    | Full Bridge       | 100 $\Omega$ to 10k $\Omega$ | 3.333V at 3mV/V Sensitivity  | -5V to +5V   |
| DI-5B38-32 or DI-5B38-02    | Full Bridge       | 300 $\Omega$ to 10k $\Omega$ | 10.0V at 3mV/V Sensitivity   | -5V to +5V   |
| DI-5B38-33 or DI-5B38-03    | Half Bridge       | 100 $\Omega$ to 10k $\Omega$ | 3.333V at 3mV/V Sensitivity  | -5V to +5V   |
| DI-5B38-34 or DI-5B38-04    | Half Bridge       | 300 $\Omega$ to 10k $\Omega$ | 10.0V at 3mV/V Sensitivity   | -5V to +5V   |
| DI-5B38-35 or DI-5B38-05    | Full Bridge       | 300 $\Omega$ to 10k $\Omega$ | 10.0V at 2mV/V Sensitivity   | -5V to +5V   |
| DI-5B38-36 or DI-5B38-06    | Full Bridge       | 100 $\Omega$ to 10k $\Omega$ | 3.333V at 10mV/V Sensitivity | -5V to +5V   |
| DI-5B38-37 or DI-5B38-07    | Full Bridge       | 300 $\Omega$ to 10k $\Omega$ | 10.0V at 10mV/V Sensitivity  | -5V to +5V   |



## DI-5B40/41 Analog Voltage Input Modules, Wide Bandwidth

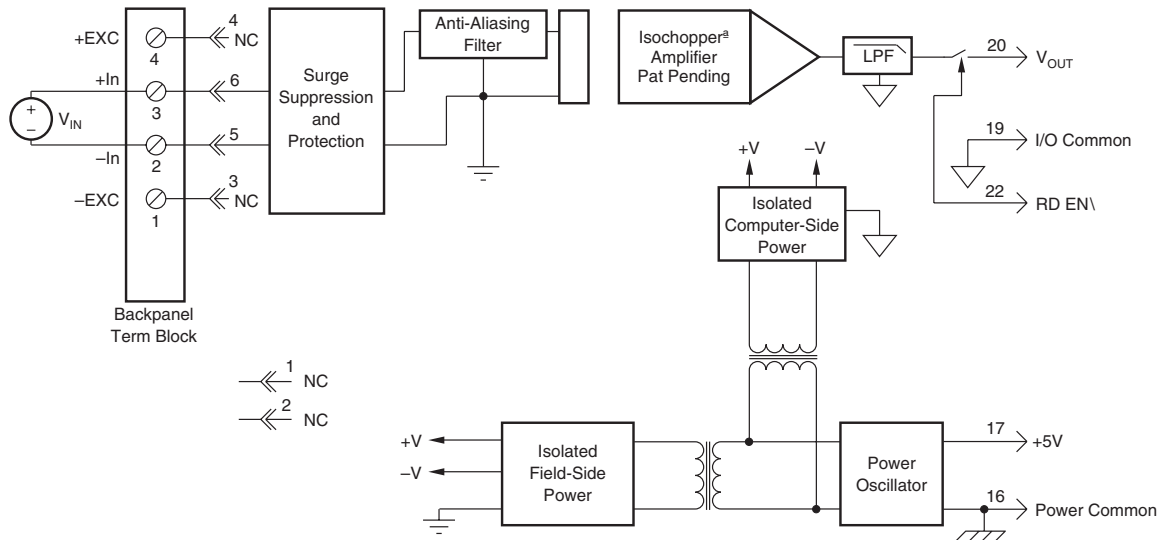
### DESCRIPTION

Each DI-5B40 and DI-5B41 wide bandwidth voltage input module provides a single channel of analog input which is amplified, isolated, and converted to a high level analog voltage output (see block diagram). This voltage output is logic-switch controlled, allowing these modules to share a common analog bus without the requirement of external multiplexers.

The DI-5B modules are designed with a completely isolated computer side circuit which can be floated to  $\pm 50\text{V}$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

The input signal is processed through a preamplifier on the field side of the isolation barrier. This preamplifier has a gain-bandwidth product of 5MHz and is bandwidth limited to 10kHz. After amplification, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC,  $\pm 5\%$ .

A special input circuit on the DI-5B40 and DI-5B41 modules provides protection against accidental connection of power-line voltages up to 240VAC.



### Ordering Information

| MODEL         | INPUT RANGE      | OUTPUT RANGE |
|---------------|------------------|--------------|
| DI-5B40-01    | -10mV to +10mV   | 0V to +5V    |
| DI-5B40-02    | -50mV to +50mV   | 0V to +5V    |
| DI-5B40-03    | -100mV to +100mV | 0V to +5V    |
| DI-5B40-1042* | -1V to +1V       | 0V to +5V    |
| DI-5B41-01    | -1V to +1V       | 0V to +5V    |
| DI-5B41-02    | -5V to +5V       | 0V to +5V    |
| DI-5B41-03    | -10V to +10V     | 0V to +5V    |
| DI-5B41-07**  | -20V to +20V     | 0V to +5V    |
| DI-5B41-09**  | -40V to +40V     | 0V to +5V    |

\*Required for DI-500-HV high voltage option.

\*\*CSA certification pending.

## DI-5B42 2-Wire Transmitter Interface Modules

### DESCRIPTION

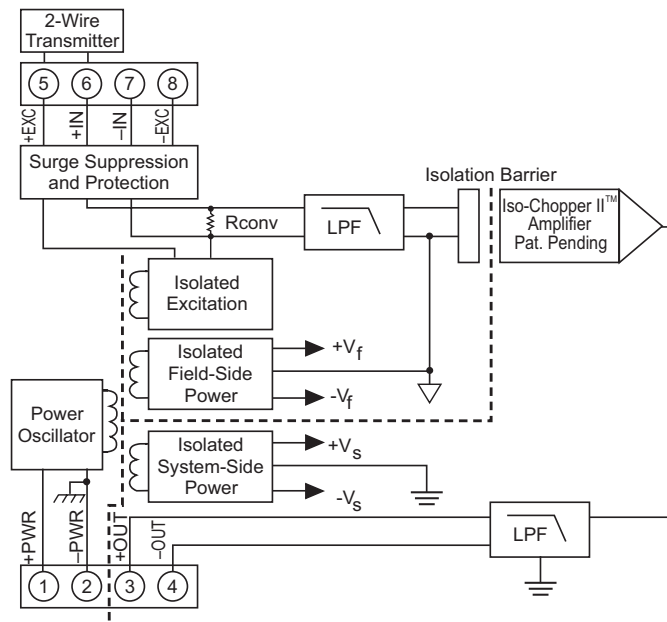
Each DI-5B42 2-wire transmitter interface module provides a single channel which accepts a 4 to 20 mA process current input and provides a standard +1 to +5V output signal (see block diagram). An isolated +20VDC regulated power supply is provided to power the current transmitter. This allows a 2-wire loop powered transmitter to be directly connected to the DI-5B42 without requiring an external power supply. The regulated supply will provide a nominal +20VDC at a loop current of 4mA to 20mA.

The DI-5B42 will provide a 1500V isolation barrier for non-isolated 2-wire field transmitters. It can also be used when additional isolation is required between an isolated 2-wire transmitter and the input stage of the control room computer.

The voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

The DI-5B modules are designed with a completely isolated computer side circuit which can be floated to  $\pm 50V$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

A precision 20W current conversion resistor is supplied with the module. All field inputs are fully protected from accidental connection of power-line voltages up to 240VAC. The module has a 3dB bandwidth of 100Hz. Signal filtering is accomplished with a six-pole filter, with two poles on the field side of the isolation barrier, and the other four on the computer side.



| <b>Ordering Information</b> |             |              |
|-----------------------------|-------------|--------------|
| MODEL                       | INPUT RANGE | OUTPUT RANGE |
| DI-5B42-01                  | 4mA to 20mA | +1V to +5V   |

## DI-5B43 Isolated DC Transducer Amplifier Input Module

### DESCRIPTION

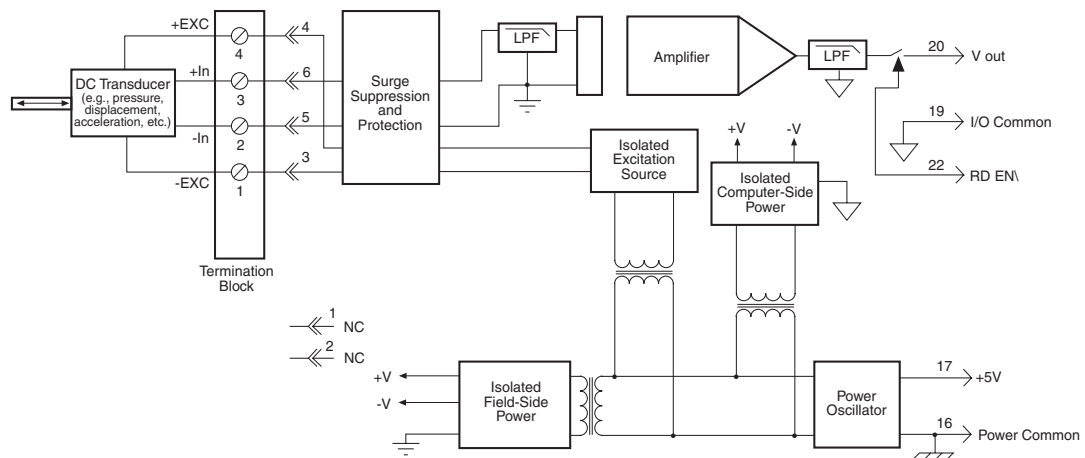
Each DI-5B43 displacement transducer module provides a single channel of displacement transducer input which is filtered, isolated, scaled, and converted to a high level analog voltage output (see block diagram). This voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

The DI-5B modules are designed with a completely isolated computer side circuit which can be floated to  $\pm 50\text{V}$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

The DI-5B43 can interface to DC displacement transducers and other devices which require a precision 10VDC supply and produce a high level output. The 1kHz bandwidth significantly reduces ripple and noise inherent in these devices.

Transducer excitation is provided from the module by a very stable 10V source. The excitation supply is fully isolated, allowing the amplifier inputs to operate over the full range of the excitation voltage. This feature offers significant flexibility in real world applications. Ten full scale input ranges are provided, from  $\pm 1\text{V}$  to  $\pm 10\text{V}$ , producing  $\pm 5\text{V}$  full scale output.

The input signal is processed through a preamplifier on the field side of the isolation barrier. This preamplifier has a gain-bandwidth product of 5MHz and is bandwidth limited to 1kHz. After amplification, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC,  $\pm 5\%$ . Special input circuits on the DI-5B43 module provide protection of the signal inputs and the isolated excitation supply up to 240VAC.



### Ordering Information

| MODEL*      | MAXIMUM INPUT   | EXCITATION     |
|-------------|-----------------|----------------|
| DI-5B43-01  | $\pm 1\text{V}$ | +10.0Vdc @ 40m |
| DI-5B43-02A | $\pm 2\text{V}$ | +10.0Vdc @ 40m |
| DI-5B43-03  | $\pm 3\text{V}$ | +10.0Vdc @ 40m |
| DI-5B43-04A | $\pm 4\text{V}$ | +10.0Vdc @ 40m |
| DI-5B43-05  | $\pm 5\text{V}$ | +10.0Vdc @ 40m |

|             |           |                |
|-------------|-----------|----------------|
| DI-5B43-06  | $\pm 6V$  | +10.0Vdc @ 40m |
| DI-5B43-07A | $\pm 7V$  | +10.0Vdc @ 40m |
| DI-5B43-08A | $\pm 8V$  | +10.0Vdc @ 40m |
| DI-5B43-09  | $\pm 9V$  | +10.0Vdc @ 40m |
| DI-5B43-10  | $\pm 10V$ | +10.0Vdc @ 40m |

\*CSA certification pending.

## DI-5B45 Frequency Input Modules

### DESCRIPTION

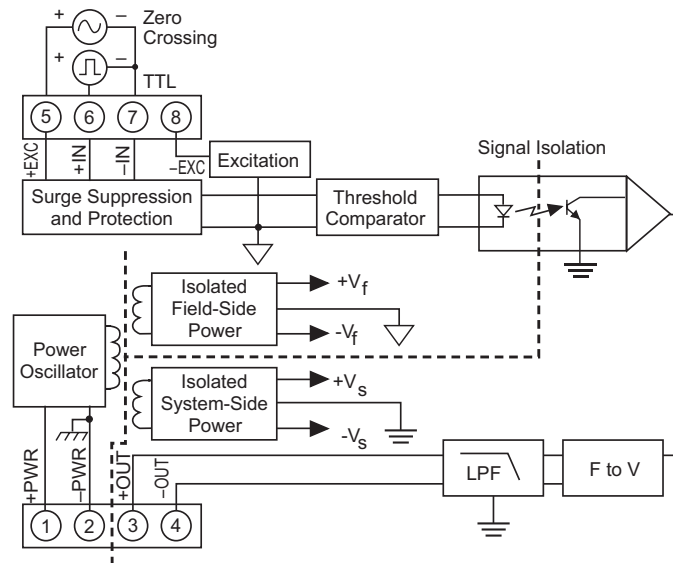
Each DI-5B45 frequency input module provides a single channel of frequency input which is isolated and converted to a high level analog voltage output. This voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers (see block diagram).

The frequency input signal can be a TTL level signal or a zero-crossing signal. Terminal 3 (+In) on the field-side terminal block is the “common” or ground connection for input signals. A TTL signal is connected from terminal 2 (-In) to terminal 3 (+In), while a zero-crossing signal is connected from terminal 4 (+EXC) to terminal 3 (+In). Input circuitry for each of the signal types has hysteresis built in. An input signal must cross entirely through the hysteresis region in order to trigger the threshold comparator.

A 5.1V excitation is available for use with magnetic pickup or contact-closure type sensors. The excitation is available on pin 1 (-EXC) and the excitation common is pin 3 (+In).

The DI-5B modules are designed with a completely isolated computer side circuit which can be floated to  $\pm 50\text{V}$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

A special circuit in the input stage of the module provides protection against accidental connection of power-line voltages up to 240VAC.



### Ordering Information

| MODEL      | INPUT RANGE | OUTPUT RANGE | EXCITATION    |
|------------|-------------|--------------|---------------|
| DI-5B45-01 | 0 to 500Hz  | 0 to +5V     | +5.1Vdc @ 8mA |
| DI-5B45-02 | 0 to 1kHz   | 0 to +5V     | +5.1Vdc @ 8mA |
| DI-5B45-03 | 0 to 3kHz   | 0 to +5V     | +5.1Vdc @ 8mA |
| DI-5B45-04 | 0 to 5kHz   | 0 to +5V     | +5.1Vdc @ 8mA |
| DI-5B45-05 | 0 to 10kHz  | 0 to +5V     | +5.1Vdc @ 8mA |
| DI-5B45-06 | 0 to 25kHz  | 0 to +5V     | +5.1Vdc @ 8mA |
| DI-5B45-07 | 0 to 50kHz  | 0 to +5V     | +5.1Vdc @ 8mA |
| DI-5B45-08 | 0 to 100kHz | 0 to +5V     | +5.1Vdc @ 8mA |

## DI-5B47 Linearized Thermocouple Input Modules

### DESCRIPTION

Each DI-5B47 thermocouple input module provides a single channel of thermocouple input which is filtered, isolated, amplified, linearized and converted to a high level analog voltage output (see block diagram). This voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

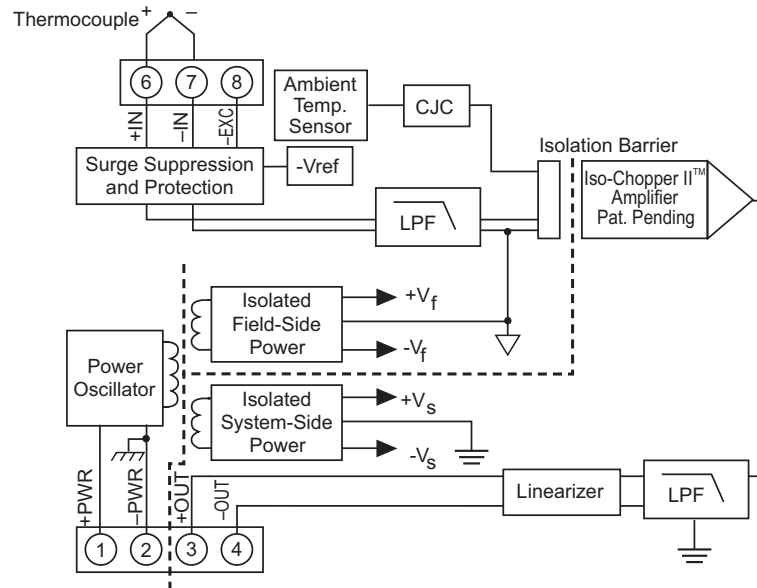
The DI-5B modules are designed with a completely isolated computer side circuit which can be floated to  $\pm 50V$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

The DI-5B47 can interface to eight industry standard thermocouple types: J, K, T, E, R, S, N, and B. Its corresponding output signal operates over a 0 to +5V range. Each module is cold-junction compensated to correct for parasitic thermocouples formed by the thermocouple wire and screw terminals on the mounting hardware. Upscale open thermocouple detect is provided by an internal pull-up resistor. Downscale indication can be implemented by installing an external 47M $\Omega$  resistor,  $\pm 20\%$  tolerance, between screw terminals 1 and 3.

Signal filtering is accomplished with a six-pole filter which provides 95dB of normal-mode-rejection at 60Hz and 90dB at 50Hz. Two poles of this filter are on the field side of the isolation barrier, and the other four are on the computer side.

After the initial field-side filtering, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC,  $\pm 5\%$ .

A special circuit in the input stage of the module provides protection against accidental connection of power-line voltages up to 240VAC.



### Ordering Information

| MODEL       | TYPE   | INPUT RANGE                         | ACCURACY*                |
|-------------|--------|-------------------------------------|--------------------------|
| DI-5B47J-01 | Type J | 0°C to +760°C (+32°F to +1400°F)    | $\pm 0.61^\circ\text{C}$ |
| DI-5B47J-02 | Type J | -100°C to +300°C (-148°F to +572°F) | $\pm 0.32^\circ\text{C}$ |

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|               |        |                                       |         |
|---------------|--------|---------------------------------------|---------|
| DI-5B47J-03   | Type J | 0°C to +500°C (+32°F to +932°F)       | ±0.36°C |
| DI-5B47J-12** | Type J | -100°C to +760°C (-148°F to +1400°F)  | ±0.70°C |
| DI-5B47K-04   | Type K | 0°C to +1000°C (+32°F to +1832°F)     | ±0.80°C |
| DI-5B47K-05   | Type K | 0°C to +500°C (+32°F to +932°F)       | ±0.38°C |
| DI-5B47K-13** | Type K | -100°C to +1350°C (-148°F to +2462°F) | ±1.20°C |
| DI-5B47K-14** | Type K | 0°C to +1200°C (+32°F to +2192°F)     | ±0.96°C |

\*Includes conformity, hysteresis and repeatability. Does not include CJC accuracy.

\*\*CSA certification pending.









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