



Your TDC Package Should Contain:

The TDC Controller

The TDC User's Manual

This manual (Part No. 150657-00) is essential. You cannot install or program the TDC without it. If it is missing, call the number below.

The Getting Started Manual
(Part No. 150603-00)

Problems?

If your TDC package is incomplete, or if you have problems getting started, call:

(507) 354-1616

About This Manual

This manual is designed to help you install the TDC 100 or TDC 200 Controller for the first time. It tells you where to look in the *TDC User's Manual* for information on installing, wiring, and setting up the TDC Controller.

This manual will guide you step by step through the initial power-up and connection of the TDC Controller. It is not a definitive guide for TDC use, but it is the fastest way to get started configuring the TDC for your application. It covers the following topics:

- Introduction to the TDC unit
- AC power connection
- Mounting
- DC connections
- Connecting Interlock, Access, and Limit Inputs
- Transducer connection
- Setting calibration parameters
- Setting servo loop parameters
- Servo command output connection
- Enable output connection
- Jogging the system and general check-out

A box is provided for each step. By checking off each box, you can be sure you've completed all of the necessary steps.

WARNING

Do not make connections, adjustments, or alter the jumper settings while power is applied to the TDC Controller. Failure to heed this warning can damage the TDC Controller and void its warranty.

- You can find a map of jumper locations in the Introduction chapter of the *TDC User's Manual* (in the Section "Internal Adjustments") or inside the front cover of the TDC Controller.

WARNING

Do not apply power to the TDC or to the actuator (servovalve, valve driver, or servo drive) except when this manual specifically instructs you to do so. Applying power at the wrong time or under the wrong conditions can damage equipment and cause a safety hazard.

Introducing the TDC

TDC User's Manual Chapter: 1. Introduction (read all sections of this chapter)

- The Introduction chapter of the *TDC User's Manual* will help you become familiar with the keypad, the LCD display screen, and general operation of the TDC Controller.

Connecting AC Power

TDC User's Manual Chapter: 2. Installation
Section: AC Power Connections

Procedure: Follow the instructions in the above section of the *TDC User's Manual*, taking these steps:

- Connect power to the Controller. Perform the Power-up Test.
 - Remove power from the Controller before proceeding.
 - Do not apply power to the actuator at this time.
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Mounting

TDC User's Manual Chapter: 2. Installation
Section: Mounting

- Using the dimensions and instructions in the above section of the *TDC User's Manual*, mount the Controller. Remember to allow enough space around the Controller for wiring connections and harnesses.

Connecting DC Power

TDC User's Manual Chapter: 2. Installation
Section: DC Connections

- The *TDC User's Manual* tells you whether you need external power for
 - Limits/enables (voltage other than 15 V)
 - Servo outputs (if isolation is required, or if maximum voltage between 10 V and 24 V is required)
 - Programmable I/O (if isolation is required, if current greater than 25 mA is required, or if voltage between 15 V and 24 V is required)
 - Transducers (if isolation is required)

If external dc power is required, connect it as explained in the above section of the TDC User's Manual.

Connecting Inputs

TDC User's Manual Chapter: 2. Installation
Section: Connecting Inputs

The *TDC User's Manual* explains how to connect the following inputs:

- Interlock Input: When this input is OFF, the Enable and Ready inputs are off, program execution is halted, and the Servo command output is zero.
- Access Input: This allows access to the Controller Program and Setup menus (regardless of their status in the Setup Access menu).
- Limit Inputs: Turns off Enable output and zeroes Servo command when connection is open to ground.

- Connect the Interlock, Access, and Limit inputs.
- Test for accurate connection of these inputs by powering up the Controller. At power-up, the LCD screen displays a version number, then an error message. Press the Mode key to see other error messages.

These inputs are incorrectly connected if any of the following error messages appears:

x:error	y:error
Interlock	Interlock

x:error	y:error
+ Limit	+ Limit

x:error	y:error
- Limit	- Limit

- Remove power from the Controller before proceeding.

Connecting Transducers

TDC User's Manual

Chapter: 2. Installation

Section: Connecting Temposonics II Transducers

or

Appendix G: Connecting Temposonics I Transducers

- Follow the instructions in the *TDC User's Manual* to connect a Temposonics transducer for the X axis or Y axis.

The TDC is designed for connection to a Temposonics I or Temposonics II Transducer.

- Test for accurate connection of the transducer by powering up the Controller. At power-up, the LCD screen displays a version number, then an error message. Press the Mode key to see other error messages.

A problem is indicated by the following error messages:

x:error	y:error
Tempo fail	Tempo fail

The problem may be a faulty transducer connection or an incompatible DIB. Detailed troubleshooting steps are given in the *TDC User's Manual*, Chapter 9: Troubleshooting.

- Remove power from the Controller before proceeding.

Setting up Calibration Parameters

TDC User's Manual Chapter: 3. Setup

Section: Setting up Calibration Parameters

- Calibration parameters control the scale and movement of the actuator. It is important that you be able to set these parameters correctly for your application. Read the above section of the *TDC User's Manual* carefully before proceeding.
- Power up the Controller. Press the Mode key until the top line of the display reads SETUP. Then press the ▼ or ▲ key until the second line of the display reads [X: CALIB] or [Y: CALIB]. Then press the F1 (EDIT) key to begin editing calibration parameters for the X or Y axis. Follow the editing instructions in the TDC User Manual to set the calibration parameters.

Setting up Servo Loop Parameters

TDC User's Manual Chapter: 3. Setup

Section: Setting up Servo Loop Parameters

- Servo Loop parameters include the proportional gain (K_p) and excess error (EX ERROR) of the Controller. It is important that you be able to set these parameters correctly for your application. Read the above section of the *TDC User's Manual* carefully before proceeding.
- Power up the Controller. Press the Mode key until the top line of the display reads SETUP. Then press the ▼ or ▲ key until the second line of the display reads [X: LOOP] or [Y: LOOP]. Then press the F1 (EDIT) key to begin editing servo loop parameters for the X or Y axis. Follow the editing instructions in the *TDC User's Manual* to set the servo loop parameters as follows:
 - Set proportional gain (K_p) to 1.00
 - Set excess error (EX ERROR) to an acceptable value (this value depends on the scale value set earlier).
 - Set all other servo loop parameters to 0.
- Remove power from the Controller before proceeding.

Servo Command Output Connections

TDC User's Manual Chapter: 2. Installation

Section: Servo Output Connections

- Connect the servo command output as described in the above section of the *TDC User's Manual*.
- Check that the servo command output of the TDC matches that required by your application. The standard (factory-set) configuration for the servo command output is 50 mA current.

NOTE

Refer to the manufacturer's specification for your particular servovalve, driver card, or servo drive for the required current or voltage. If your application requires a command output other than 50 mA, you must make jumper changes (and in some cases, component changes) on the TDC. If your application requires a voltage output, the cabling is different

- If jumper or component changes are necessary, remove power from the Controller before proceeding. Then remove the Controller front cover as described in the *TDC User's Manual*, Chapter 2.: Installation, Internal Adjustments. The locations of jumpers and components are described in this same section.

Connecting Enable Outputs

TDC User's Manual Chapter: 2. Installation

Section: Connecting Outputs

- Read the above section of the *TDC User's Manual* before connecting enable outputs.

The enable output for an axis should be used if the servovalve, valve driver card, or servo drive has an enable input. The enable output functions to prevent movement of the axis during a Fault or Excess Error condition.

- Check that the enable input of the servovalve, valve driver card, or servo drive is compatible with the TDC Controller enable output. The TDC Controller enable is factory configured as ON=low. To set it for ON=high, jumper changes are necessary.
 - Before changing jumpers or making connections, make sure that power is removed from the Controller.
 - Before making connections, be sure that power is removed from the actuator.
 - If the servovalve, valve driver card, or servo drive has no enable input, you must make other provisions to ensure that actuator will not "run away" during a Fault or Excess Error condition. You can do this by installing the Model 475.71c Command Enable module (see Appendix F).
 - Connect the enable outputs for Axes X (and Y, if Y is used). Do not apply power to the actuator at this time.
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Jogging the Axis

TDC User's Manual Chapter: 5. Running

Section: How to Jog the Axis

- Read the above section of the *TDC User's Manual* before jogging each active axis.
- Power up the TDC Controller. No error messages should appear on the screen. The red fault LED should remain OFF.
- If an error message appears, refer to the *TDC User's Manual*, Chapter 9: Troubleshooting for an explanation of that error and troubleshooting information.
- Apply power to the actuator.
- If an Excess Error message appears, disconnect power from the actuator first and then from the Controller

The probable cause of this failure is incorrect phasing of the servo command output to the actuator. Refer to the *TDC User's Manual*, Chapter 2: Installation, Servo Output Connections.

- For a current source configuration, swap the X Out connection with the X Return connection, or
 - For a voltage output configuration, swap the X Out/X Return connection with the Ext Sup Gnd connection.
- Press the Mode key until the top line of the display reads RUN MODE, then follow the directions in the above section of the *TDC User's Manual* to jog the axis.

If the actuator movement is sluggish, breaks into oscillation, or an Excess Error fault occurs after the actuator begins to move, the problem may be incorrectly set proportional gain (Kp). Refer to the *TDC User's Manual*, Chapter 3: Setup, Setting up Servo Loop Parameters.

- Setting Kp too low results in sluggish movement or an Excess Error after the actuator begins to move.
 - Setting Kp too high results in oscillation or erratic movement.
- When the actuator jogs satisfactorily in both directions, the initial setup is complete. Now you can return to the *TDC User's Manual* to learn how to tailor the TDC configuration and programming for your application.

