OPERATING INSTRUCTIONS

NATIONAL INSTRUMENTS

FP-TB-1/2/3

FieldPoint Terminal Bases

FieldPoint

These operating instructions describe the installation, features, and characteristics of the FP-TB-1, FP-TB-2, and FP-TB-3.

Features

The FP-TB-1, FP-TB-2, and FP-TB-3 are FieldPoint terminal bases with the following features:

- FP-TB-1 and FP-TB-2 work with all FieldPoint I/O modules (FP-TB-3 works with all except those that require external power)
- V and C terminals provide external supply voltages common to all channels
- DIN-rail mounting or panel mounting
- 32 terminals available for field connections (16 for FP-TB-3)
- Available with screw terminals (FP-TB-1 and FP-TB-3) or spring terminals (FP-TB-2)
- Isothermal construction (FP-TB-3) minimizes temperature gradients when using thermocouples
- –40 to +70 °C operation

The FP-TB-1, FP-TB-2, and FP-TB-3 terminal bases provide the intra-system communication link between FieldPoint I/O modules and network modules, provide a means for wiring field connections, and provide the mounting mechanism. The choice of terminal base depends on the type of field wiring terminal preferred: screw terminal or spring terminal.

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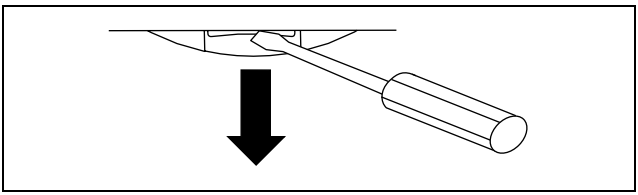
DIN Rail Mounting

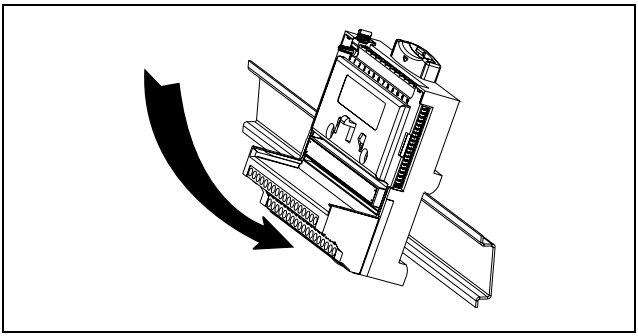
Caution Before connecting a terminal base to a network module, the network module *must* be powered off.

The FieldPoint terminal bases have simple rail clips for mounting reliably onto a standard 35 mm DIN rail. To install the terminal base to the DIN rail, follow these steps:

1. With a flat-bladed screwdriver, open the rail clip to the unlocked position.

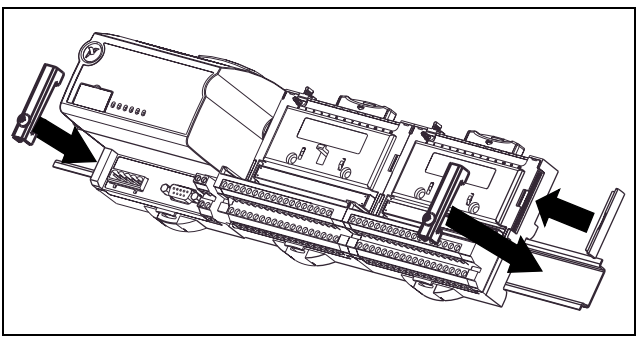


2. Hook the lip on the rear of the terminal base onto the top of a 35 mm DIN rail and rotate the terminal base down onto the DIN rail.



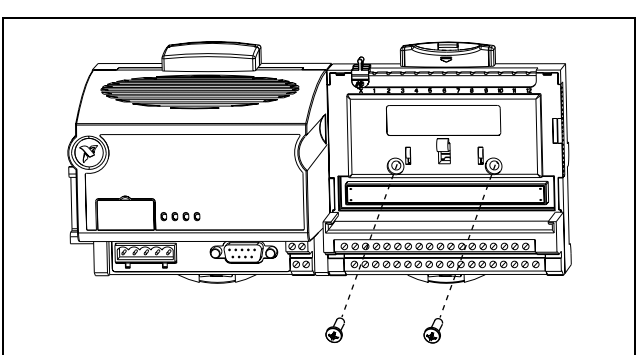
3. Slide the terminal base along the DIN rail until its local bus connector mates with the connector of the terminal base or network module adjacent to it.
4. Lock the terminal base to the DIN rail by pushing the rail clip in.

5. Continue adding as many terminal bases as you need to the DIN rail (up to nine for each network module in most cases), making sure to mate the local bus connectors.
6. Place the protective cover over the local bus connector of the last terminal base. The following figure shows an installed terminal base.



Panel Mounting

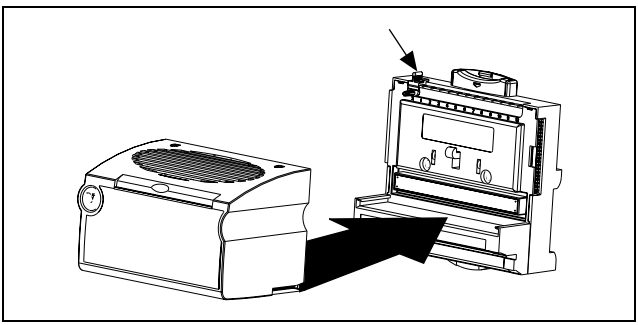
The terminal bases may be directly mounted to a wall or panel, instead of onto a DIN rail. Use the mechanical dimensions drawing at the end of this document as a guide to locating mounting holes on your panel. Place the protective cover over the local bus connector of the last terminal base in the stack.



I/O Module Installation and Removal

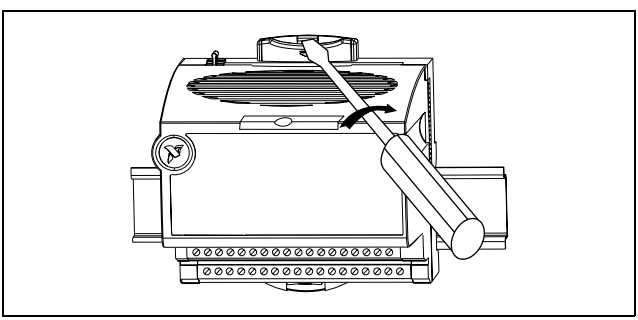
To install an I/O module onto a terminal base, refer to the following figure and follow these steps.

1. Slide the key to the appropriate position for the I/O module. The position marked X is a universal position that works for all modules.



2. Position the I/O module with its alignment slots aligned with the guide rails on the terminal base.
3. Press firmly to seat the I/O module on the terminal base. The terminal base latch locks the I/O module into place when the module is firmly seated.

To remove an I/O module, insert a 1/4 in. flat-bladed screwdriver behind the ejector button and twist, as shown. This motion unlatches the I/O module, which can then be lifted off of the terminal base.

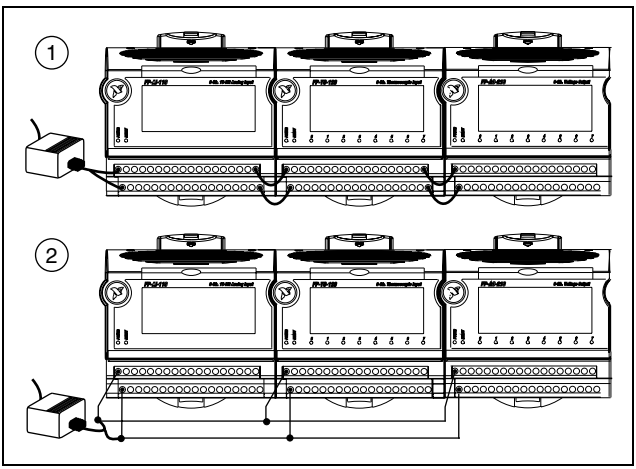


Field Wiring

The FP-TB-1 and FP-TB-2 provide four dedicated terminals and 32 numbered terminals defined by the I/O module. The four dedicated terminals are two V and two C terminals, one of each at each end of the terminal base. The two V terminals are internally connected by the terminal base, as are the two C terminals. Generally, these terminals are intended to connect external power supplies to field devices. Refer to the appropriate I/O module operating instructions for details on the use of these terminals and the additional 32 terminals. The FP-TB-3 provides two dedicated C terminals and 16 numbered terminals defined by the I/O module.

The following figures show how you can wire power to your FieldPoint bank. Consider these points when wiring your system.

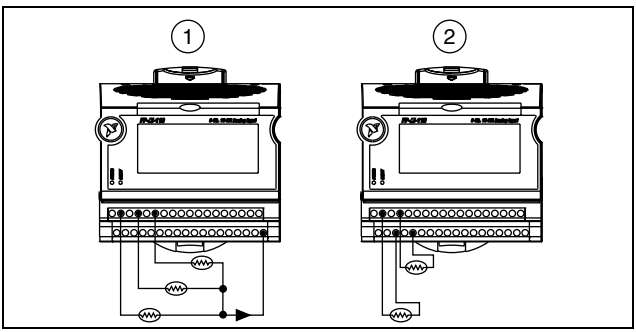
- The total current flowing through the V and C terminals must be limited to 10 A. If you have a single external supply for the field devices of more than one module, then wire the supply to the V and C terminals as shown in following figure.



1	When total current draw is less than 10 A	2	When total current draw is greater than 10 A

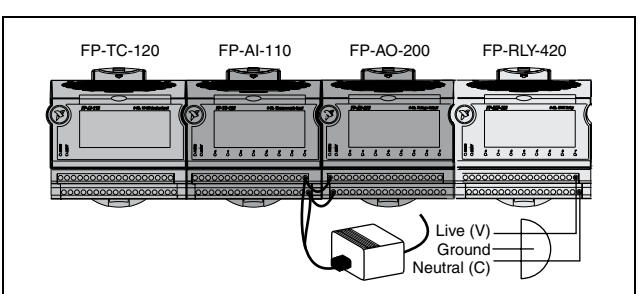
Caution Cascading power from neighboring bases or network modules defeats isolation between cascaded modules.

- When total current draw is less than 3 A, you can use a single terminal for the return path. If the total current draw is greater than 3 A, you should use separate C terminals, as shown in the following figure.



1	When total current draw is less than 3 A	2	When total current draw is greater than 3 A

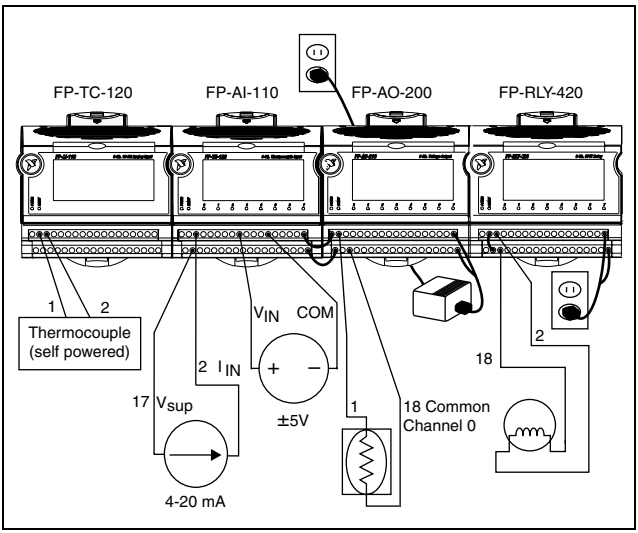
- You need to wire power to the terminal bases only if you want to use the terminal bases to route power to your field devices or if the I/O module requires it. FieldPoint I/O modules get their power from the network module through the backplane, and in most cases require no external power for proper operation. Refer to your I/O module operating instructions for details.



In the figure, shades of gray indicate differing voltage potentials.

Caution Cascading power from neighboring bases or network modules defeats isolation between cascaded modules.

- You may want to use separate power supplies for I/O modules both to prevent power dips caused by field devices from disrupting the operation of the network module, and to maintain the isolation barrier between the I/O modules and the network module.



Caution Cascading power from neighboring bases or network modules defeats isolation between cascaded modules.

Thermocouple Wiring

The FP-TC-120 thermocouple input module has the ability to measure the temperature of the terminals on any of the FieldPoint terminal bases. This measurement is called the *cold junction temperature* and indicates the temperature of the junctions between your thermocouple wire and the screw terminals. This measurement is used internally by the FP-TC-120 to correct for the thermoelectric voltages that are generated at these junctions.

Heat dissipated by adjacent modules (or other nearby heat sources) can cause errors in thermocouple measurements by heating up the terminals so that they are at a different temperature than the sensor used to measure the cold junction. The thermal gradient generated

across the terminals can cause the terminals of different channels to be at different temperatures, and so the resulting measurement creates not only errors in absolute accuracy but also in the relative accuracy between channels. The accuracy specifications for the FP-TC-120 include the errors caused by a 0.2 °C (0.36 °F) gradient. The actual gradient you can expect to encounter depends on the terminal base you use and the details of your installation. Guidelines for estimating these gradients, as well as for minimizing them, are provided here.

Thermal Gradients with the FP-TB-3 Isothermal Terminal Base

The FP-TB-3 is designed with *isothermal* construction to keep the terminals at the same temperature. It is the terminal base recommended for the best accuracy of thermocouple measurements. Adjacent FieldPoint modules (either network modules or I/O modules) create a thermal gradient across the terminals of the FP-TB-3, which you can estimate by dividing the larger of the amounts of heat dissipated by each of the adjacent modules by 20 Watts/°C (11 Watts/°F). For example, if the FP-TB-3 is between an analog input module dissipating 0.35 W and a discrete output module dissipating 3 W, the thermal gradient would be 3 W ÷ 20 W/ °C = 0.15 °C.

Thermal Gradients with the FP-TB-1 or FP-TB-2 Terminal Bases

The lack of isothermal construction in the FP-TB-1 and FP-TB-2 terminal bases makes them more susceptible to errors caused by thermal gradients. These terminal bases are recommended for use with thermocouple measurements only where these errors are acceptable or where precautions can be taken to minimize them (refer to the next section, *Minimizing Thermal Gradients*). Adjacent FieldPoint modules (either network modules or I/O modules) create a thermal gradient across the terminals of the FP-TB-1, which you can estimate by dividing the larger of the amounts of heat dissipated by each of the adjacent modules by 1 Watt/°C (0.6 Watts/°F). For example, if the FP-TB-1/2 is between an analog input module dissipating 0.35 W and a discrete output module dissipating 3 W, the thermal gradient would be 3 W ÷ 1 W/°C = 3 °C. The typical thermal gradient created by the FP-TC-120 mounted on an FP-TB-1 (neglecting any adjacent modules) is about 0.2 °C.

Minimizing Thermal Gradients

The most common source of thermal gradients, particularly for the FP-TB-1 and FP-TB-2, is the heat generated by adjacent modules. For example, placing an FP-TB-1 next to an FP-1000 network module can create more than a 1 °C thermal gradient. Mounted thermocouple modules can be separated from the higher-power modules by the lowest-power modules in your system or by the FieldPoint Bus Extender Cable (part number 185576-14). This precaution is generally not necessary with the FP-TB-3.

Air drafts (either hot or cold) can be another source of thermal gradients. It is usually best to avoid having air blowing directly on the terminals, although circulating air around other nearby components may help them dissipate their heat and cause them to be less of a source of thermal gradients on the terminal base.

Thermocouple wire also has the potential to be a significant source of thermal gradients. Even the FP-TB-3 can be susceptible to these errors. Heat (or cold) may be directly conducted to the terminal junction by the thermocouple wire. If the thermocouple wires, or objects they are in contact with (such as wiring ducts), near the terminal base are at a different temperature than the terminals, the wires transfer heat to or from the terminals and cause thermal errors. To minimize these errors, use small gauge thermocouple wire (to reduce their ability to transfer heat), run thermocouple wiring together near the terminal base (to keep the wires at the same temperature), and avoid running the thermocouple wire near hot or cold objects.

Specifications

Operating temperature ..... –40 to +70 °C

Storage temperature ..... –55 to +100 °C

Relative humidity ..... 5 to 90% non-condensing

Weight

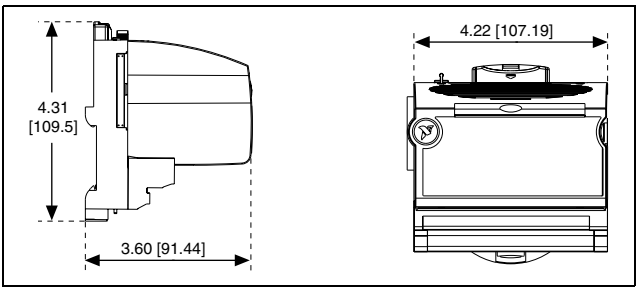
FP-TB-1 ..... 210 g (7.4 oz.)

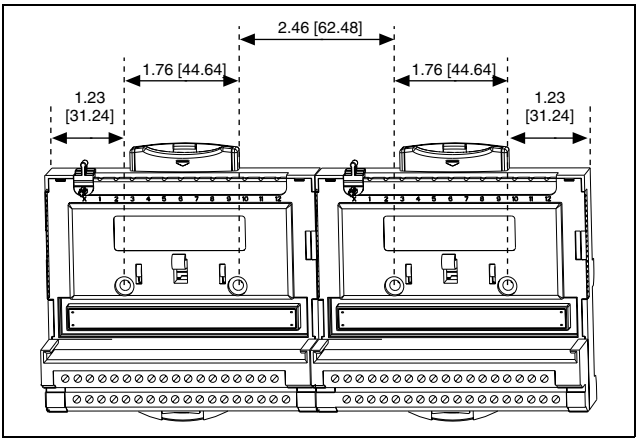
FP-TB-2 ..... 160 g (5.7 oz.)

FP-TB-3 ..... 240 g (8.5 oz.)

Mechanical Dimensions

The following figures show the mechanical dimensions of the FP-TB-1/2/3 with an I/O module installed, and two terminal bases connected. Dimensions are given in inches [millimeters].





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