USER MANUAL

SixTRAK®

Modular DIN Rail I/O

Installation and Maintenance

Contents at a Glance:

This manual applies to:
SixTRAK I/O Modules (part number ST-##-###-##M)
SixTRAK I/O wiring bases (part number ST-##-###-##B)
SixTRAK I/O Module & Base Assemblies (part number ST-##-###-##U, F, H or D)

Sixnet Technology Park • 331 Ushers Road • Ballston Lake, NY 12019 USA • +1 (518) 877-5173 • support@sixnet.com

PROTECTED TECHNOLOGY POLICY

Sixnet protects your investment in Sixnet systems with long-term planned technology and our unique Protected Technology Policy. We will continue to support the specified capabilities of standard Sixnet products for at least five years. We plan each product improvement and new feature to be upward compatible with existing designs and installations. Our goals are to make each new software release bring new power to your Sixnet systems and have every existing feature, applications program and data file continue to work.

We protect your investment even further with a liberal five-year trade-in policy. Exchange standard products for upgraded versions of the same product to take advantage of new features and performance improvements at any time for five years. A prorated trade-in allowance will be given for your existing equipment.

Sixnet protects your long-term productivity with state-of-the-art planned technology and continued support.

STATEMENT OF LIMITED WARRANTY

Sixnet, manufacturer of SixTRAK, VersaTRAK, RemoteTRAK and EtherTRAK products, warrants to Buyer that products manufactured by Sixnet will be free from defects in material and workmanship. Sixnet's obligation under this warranty will be limited to repairing or replacing, at Sixnet's option, the defective parts within 1 year of the date of installation, or within 18 months of the date of shipment from the point of manufacture, whichever is sooner. Products may be returned by Buyer only after permission has been obtained from Sixnet. Buyer will prepay all freight charges to return any products to the repair facility designated by Sixnet.

This limited warranty does not cover losses or damages that occur in shipment to or from Buyer or due to improper installation, maintenance, misuse, neglect or any cause other than ordinary commercial or industrial applications, This limited warranty is in lieu of all other warranties whether oral or written, expressed or implied. Sixnet's liability shall not exceed the price of the individual unit which is the basis of the claim. In no event shall Sixnet be liable for any loss of profits, loss of use of facilities or equipment or other indirect, incidental or consequential damages.

INSTALLATION AND HAZARDOUS AREA WARNINGS

These products should not be used to replace proper safety interlocking. No software-based device (or any other solid-state device) should ever be designed to be responsible for the maintenance of consequential equipment or personnel safety. In particular, Sixnet disclaims any responsibility for damages, either direct or consequential, that result from the use of this equipment in any application.

All power, input and output (I/O) wiring must be in accordance with Class I, Division 2 wiring methods and in accordance with the authority having jurisdiction.

WARNING – EXPLOSION HAZARD – SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS 1, DIVISION 2.

WARNING – EXPLOSION HAZARD – WHEN IN HAZARDOUS LOCATIONS, DISCONNECT POWER BEFORE REPLACING OR WIRING MODULES.

WARNING – EXPLOSION HAZARD – DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NONHAZARDOUS.

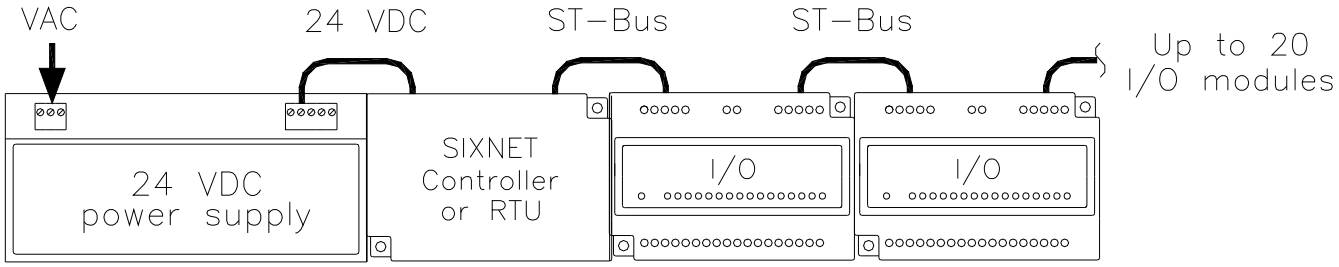
Note: All information in this document applies to SixTRAK I/O, except where otherwise noted. Refer to the Sixnet I/O Tool Kit software online help system for detailed product specifications and configuration settings.

Section 1 Overview

Introduction

SixTRAK is DIN rail mounted I/O that provides direct field wiring connections to a wide variety of industry devices. **SixTRAK** I/O and Windows software form a high performance, flexible I/O system.

A typical **SixTRAK** station consists of a DC power supply; a Sixnet controller or RTU, and I/O modules. The I/O modules connect through a daisy-chained "ST-Bus" cable. (See Section 3.)

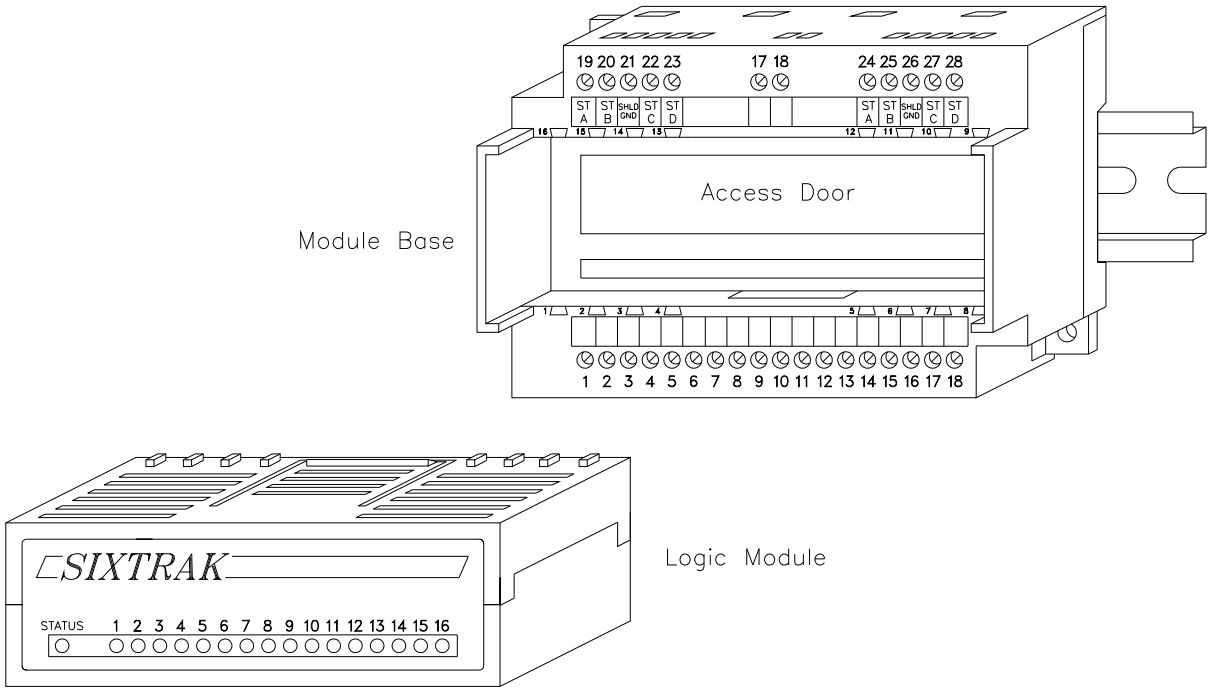


Typical SixTRAK Components

I/O Module Components

A **SixTRAK** I/O module consists of a base assembly and a removable logic module. All base assemblies have a hinged door that is accessible when the logic module is removed. In 4-20 mA analog input modules the hinged door provides access to jumpers and/or 100 ohm replaceable shunts.

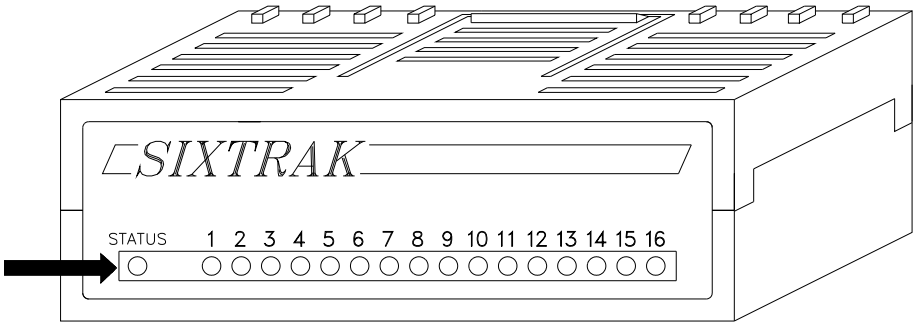
A logic module may be removed by lightly squeezing the top and bottom locking tabs and pulling the logic module straight out. To reinstall, insert the logic module into the base and press firmly until it snaps into place. The logic module is fully seated when the innermost row of ventilation slots is just covered by the top surface of the base cover.



SixTRAK Assembly – I/O Module and Wiring Base

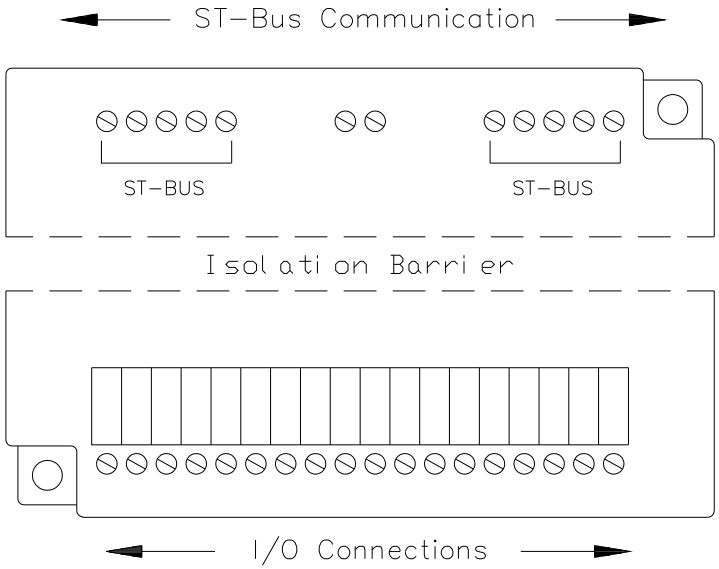
Status LED

Each **SixTRAK** module has a status LED that indicates configuration and communication status by blinking in different ways. The status LED is documented fully in Section 9.



Isolation

Every **SixTRAK** I/O module is isolated from ground and other modules for fault-free operation. Additional levels of isolation are provided with some modules. Refer to the product specifications in the Sixnet I/O Tool Kit online help system for more information.



Sixnet Software Tools

Sixnet supplies the "mission oriented" tools you need for every step of your project from the initial specification, through startup, and years of trouble free operation. Configuration information flows between **Sixnet** Windows, saving you time (you don't have to enter data multiple times) and dramatically reducing data entry errors. Refer to the on-line help in each program for complete details.

Sixnet I/O Tool Kit

The Sixnet I/O Tool Kit is a configuration, calibration and maintenance tool for **Sixnet** I/O. Use the I/O Tool Kit to configure I/O features, perform channel-by-channel calibrations in meaningful engineering units, and perform live diagnostics at each station.

Sixlog Data-logging

Sixlog is datalogging software for Sixnet gateways, controllers, and RTUs. Data is logged into protected memory in the unit. Then Sixlog uploads the data files and saves them into ASCII format files that are easy to import into databases, spreadsheets and other Windows applications. Access the Sixlog functions from within the Sixnet I/O Tool Kit.

Getting Started With SixTRAK Hardware

Following these steps will make installation and start-up easier.

❶ Mount the Hardware

If you purchased a TrakPak packaged system, the complete enclosure is ready for installation on any flat surface. If you purchased individual **SixTRAK** components, refer to Section 2 for information on installing them into an enclosure.

❷ Install ST-BUS Wiring Between Modules

Make ST-BUS wiring connections between the **SixTRAK** modules. Refer to Section 3 for ST-BUS wiring guidelines. If you have a TrakPak packaged system, this has already been done for you.

❸ Connect Power and I/O Wiring to the Modules

Connect AC power to the **SixTRAK** power supply. Make DC power connections from the power supply to the Sixnet gateway, controller, or RTU and the I/O modules. Make field wiring connections to the **SixTRAK** I/O modules and any peripheral equipment. Refer to the individual module sections for connection details.

❹ Install Communication Cabling

If you did not purchase a factory communication cable, fabricate and install an RS232 cable between your computer and the Sixnet gateway, controller, or RTU. See Section 9. If you have a TrakPak packaged system, a factory cable has been supplied.

Fabricate and install RS232, RS422 and RS485 cables as needed. See Section 9. If you are using Ethernet units, install the correct cabling and peripherals. Refer to the documentation for your Ethernet communication devices for details.

❺ Apply Power

Power up the **SixTRAK** I/O and related peripherals. Observe the status LED on each module. The normal conditions are as follows:

Module Type	LED, Normal Indication
Controller/RTU in TrakPak enclosure	Power and Status LEDs On
I/O modules in TrakPak enclosure	Status LEDs On

Refer to Section 9 if a Power or Status LED is not lit as shown above.

❻ Configure Using the Sixnet I/O Tool Kit

Refer to the steps on the next page to create a hardware configuration for each **Sixnet** station. Refer to the on-line help in the I/O Tool Kit for details.

❼ Test the Hardware

Use the Test I/O window in the I/O Tool Kit program to verify proper I/O operation in all **Sixnet** stations. Refer to the I/O Tool Kit on-line help system.

❽ Configure Your PC Software to Communicate with the Sixnet station(s)

Refer to the documentation for your software.

❾ If You Have Difficulty

If you experience startup trouble, refer to Section 9. The diagnostic procedures in this section may help point you to the source of the problem.

Using Sixnet Windows Software

Note: An expanded version of this page has been provided as on-line help. To access it, click on the Getting Started icon in the I/O Tool Kit online help.

Run the Sixnet I/O Tool Kit program and create your panel layouts. Then configure operating parameters for the Sixnet Controller/RTU and I/O modules, including channel tag names. Save this information to a project file. Link the expansion I/O modules (if any) and load your configuration to the Controller/RTU. Using the Test I/O function, verify that you can read and write your I/O. Then exit the Sixnet I/O Tool Kit.

Note: Set tag name restrictions in the Sixnet I/O Tool Kit program before creating tag names to ensure compatibility when exporting them for usage in other Windows applications.

Your SixTRAK I/O is now ready to run. If you will be running a Windows application that requires an I/O driver such as Control Room, then continue with the following steps.

Open the Test I/O window and verify that your I/O is being read and written. Then exit the Test I/O window.

Your computer is now ready to exchange I/O data with your Windows applications. (Refer to the "How to Access **Sixnet** I/O From a Windows Application" topic in the Sixnet I/O Tool Kit online help.)

Some Windows applications, such as ISaGRAF, Citect and Intellution FIX, can import **Sixnet** tag names. If your Windows application supports this feature, run the Sixnet I/O Tool Kit and open your project file. Export your tag names to a file using the appropriate format.

Note: If you are exporting tag names for ISaGRAF, Citect or Intellution, you must create, or already have, a project to export tag data into.

Sixlog

If you will be logging data in the Sixnet Controller/RTU, then create the appropriate datalog configuration(s) and load them into the unit. Refer to the Sixlog topics in the Sixnet I/O Tool Kit online help for details.

If you are using the ISaGRAF IEC1131 programming software, refer to the **Sixnet ISaGRAF** on-line help for additional information.

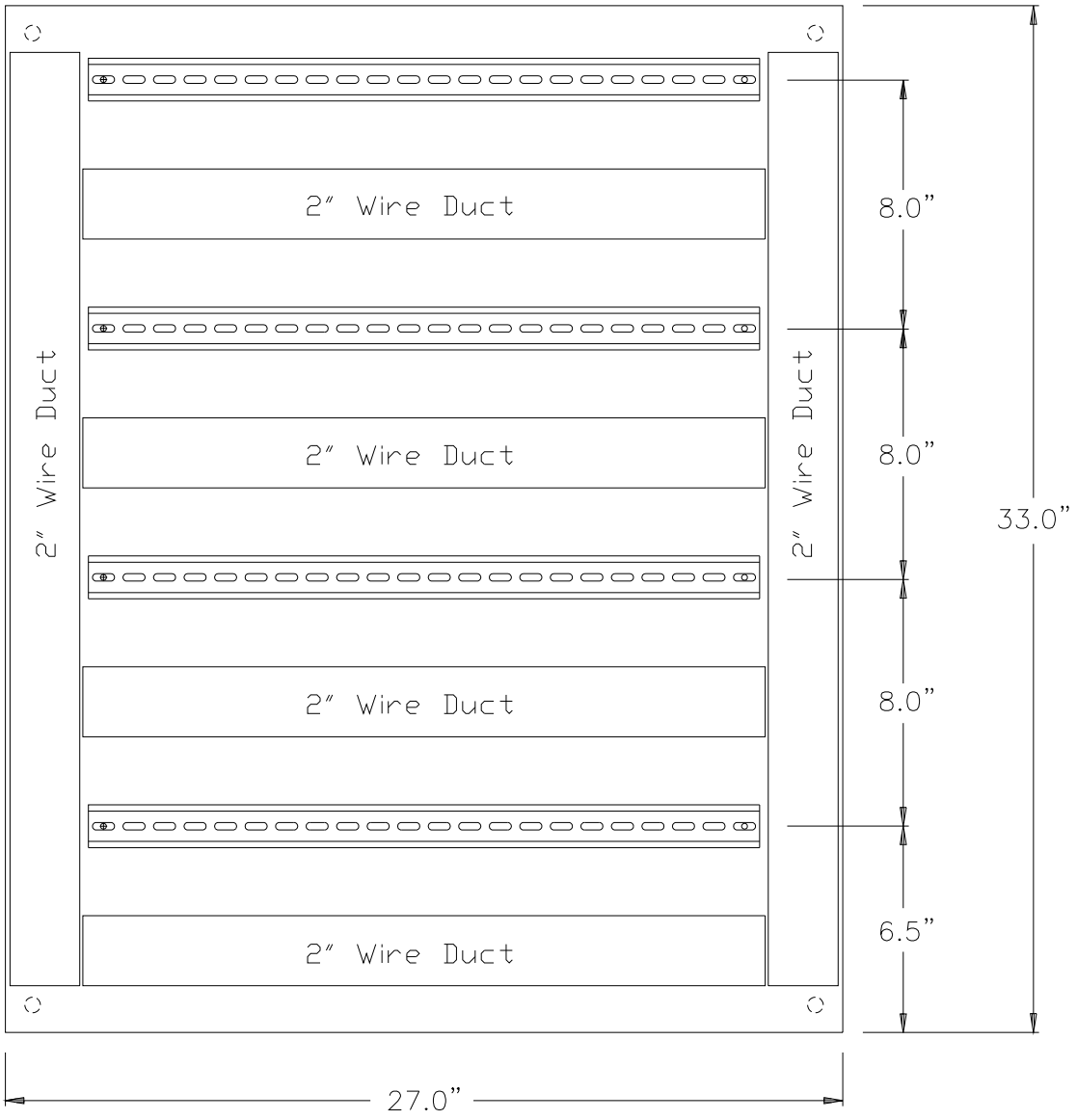
Section 2 Assembly and Installation

SixTRAK Panel Assembly

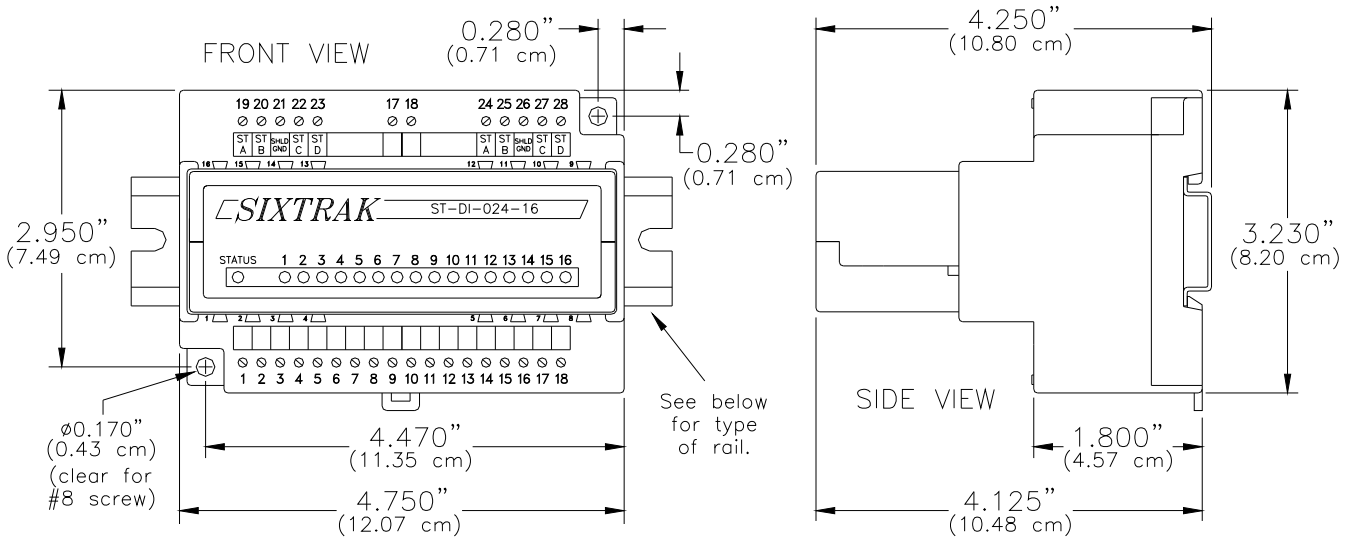
SixTRAK I/O snaps onto DIN rail strips fastened to the subpanel. Figure 2-1 shows a sample panel with DIN rail strips and wire duct attached. Recommended DIN rail spacing is 8 inches. This spacing allows room for wire duct to be installed without obstructing field wiring installation.

The **SixTRAK** modules are typically installed against one another, but space may be left between modules to accommodate other DIN rail mounted components such as terminal blocks and fuse holders. End clamps are recommended to restrict side-to-side movement. Figures 2-2 through 2-5 show the physical dimensions of the **SixTRAK** components.

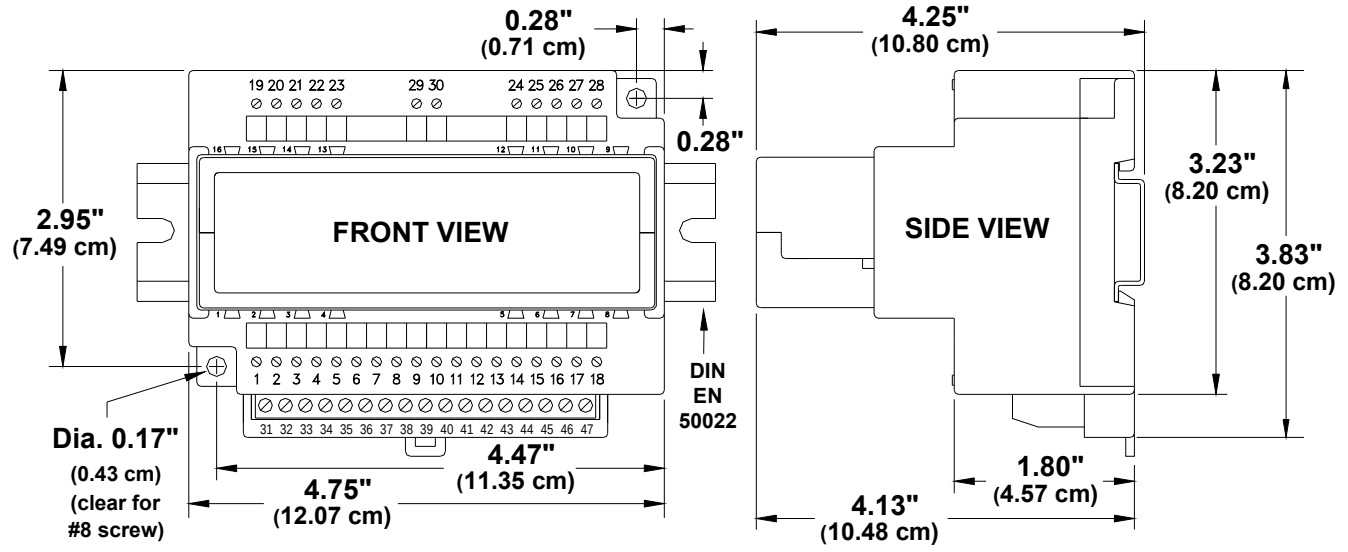
SixTRAK modules can be installed in any orientation and order on your panel. The modules are electrically interconnected using ST-Bus wiring, beginning with the Sixnet controller. Refer to Section 3 for more information on ST-Bus wiring.



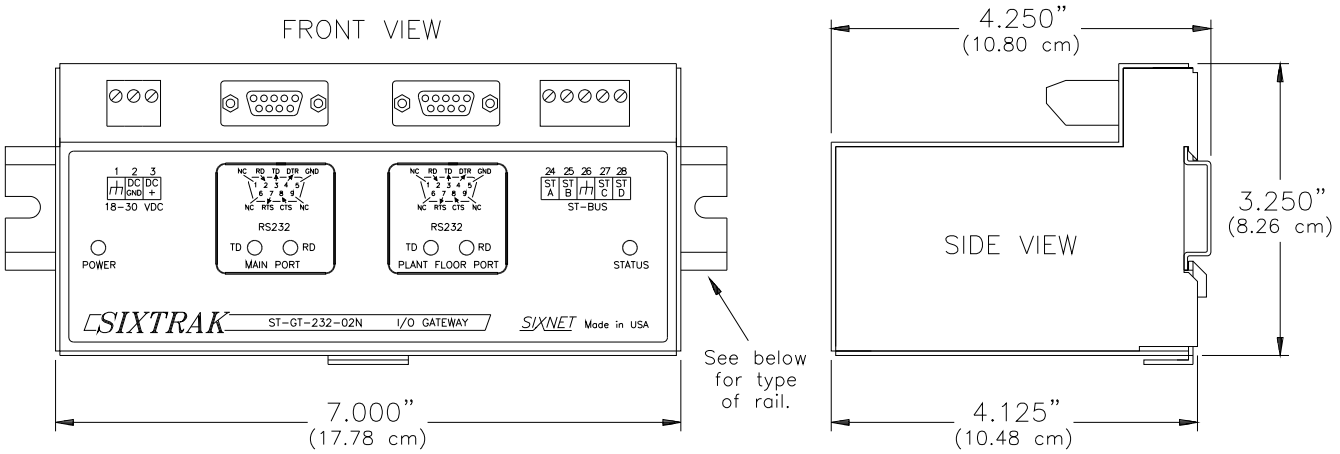
Sample Layout For a 36” x 30” Enclosure (Figure 2-1)



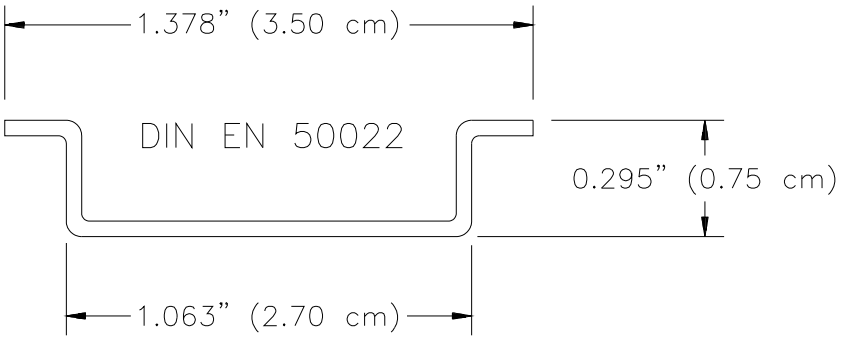
I/O Modules with up to 16 I/O Channels
Figure 2-2A



I/O Modules with 32 I/O Channels
Figure 2-2B



SixTRAK Power Supply Dimensions
Figure 2-3



DIN EN 50022 Suppliers

Manufacturer	**Type**
Altech	PR30
Entrelec	TS35
Phoenix	NS35/7.5
Wago	TS35
Weco	H-35
Weidmuller	TS35
Wieland	TS35

EN50022 DIN Rail Dimensions
Figure 2-4

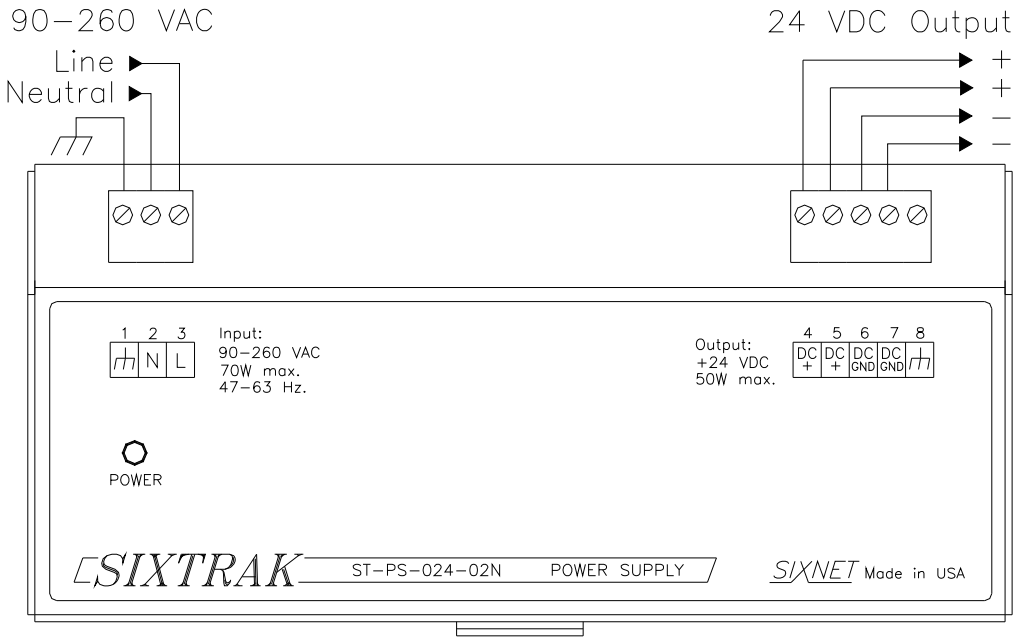
Section 3 Power and ST-Bus Wiring

Power Requirements

SixTRAK I/O modules accept 24 volt DC power from a **SixTRAK** power supply (ST-PS-024-02N) or from a user DC power source. **SixTRAK** I/O modules are typically powered directly through the ST-Bus wiring but this depends on the Sixnet controller and module. Refer to the appropriate controller user manuals for details.

AC Power Wiring

The optional **SixTRAK** power supply operates on 90V to 260V sinusoidal AC power at 47 to 63 Hz. AC power is connected to terminals 2 and 3 on the power supply. Refer to Figure 3-1. Tighten these screw terminals to a maximum of 3.48 in-lbs.



AC Power Connections to the ST-PS-024-02N
Figure 3-1

DC Power Wiring (ST-PS-024-02N)

Most Sixnet units and user instrumentation loops may be powered from the ST-PS-024-02N **SixTRAK** power supply. Refer to Figure 3-2 for typical DC power connections. The ST-PS-024-02N supplies 24 volts DC at a maximum of two amps.

DC Power Wiring (User DC Source)

Most Sixnet units and user instrumentation loops may be powered from a single DC source. Refer to Figure 3-2 for typical DC power connections.

All **SixTRAK** I/O modules with 16 I/O channels or less will operate on 18 – 30 VDC.
All **SixTRAK** I/O modules with 32 I/O channels will operate on 10 – 30 VDC.

Current Requirements

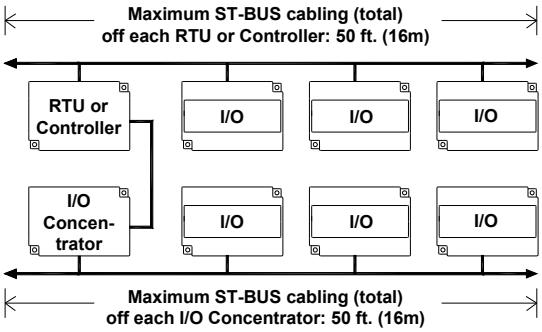
To calculate the current requirements, add the wattage required for the **SixTRAK** modules in use, then divide the total wattage by the DC power source voltage. Then add any current needed for user instrumentation loops.

Note: Not all SixTRAK I/O Modules require power to be applied to terminals 17 and 18. Some modules get all their power through the ST-BUS. Refer to each module's specs.

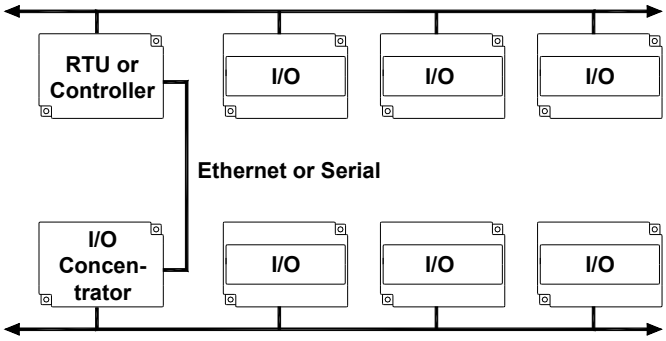
ST-Bus Wiring Guidelines

ST-Bus wiring connects the **SixTRAK** I/O modules and to a Sixnet controller. Follow the upcoming guidelines for reliable performance.

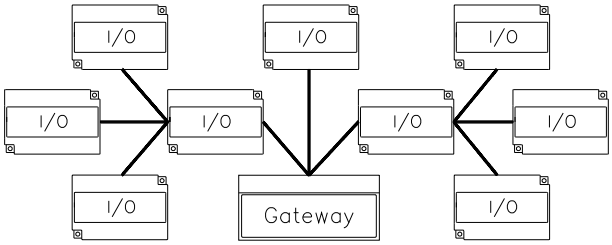
Max. modules controlled by one Sixnet controller or RTU 20
Note: Use an ET-GT-ST-# I/O Concentrator to interface more than 20 modules.
Required cable type…….Any with 2 individually shielded pairs, 22AWG min.
Recommended cables……Alpha 2466C, Belden 8723, Carol C1352
Max. cabling off each controller or RTU .....50 ft. (16M)



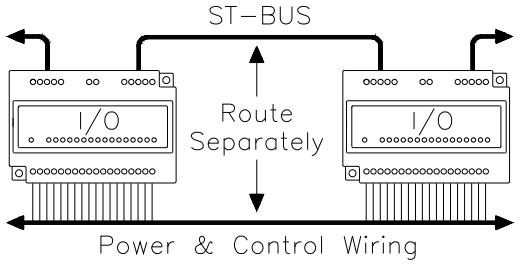
Connect up to 20 I/O modules with a maximum total cabling of 50 feet per RTU, controller or I/O concentrator.



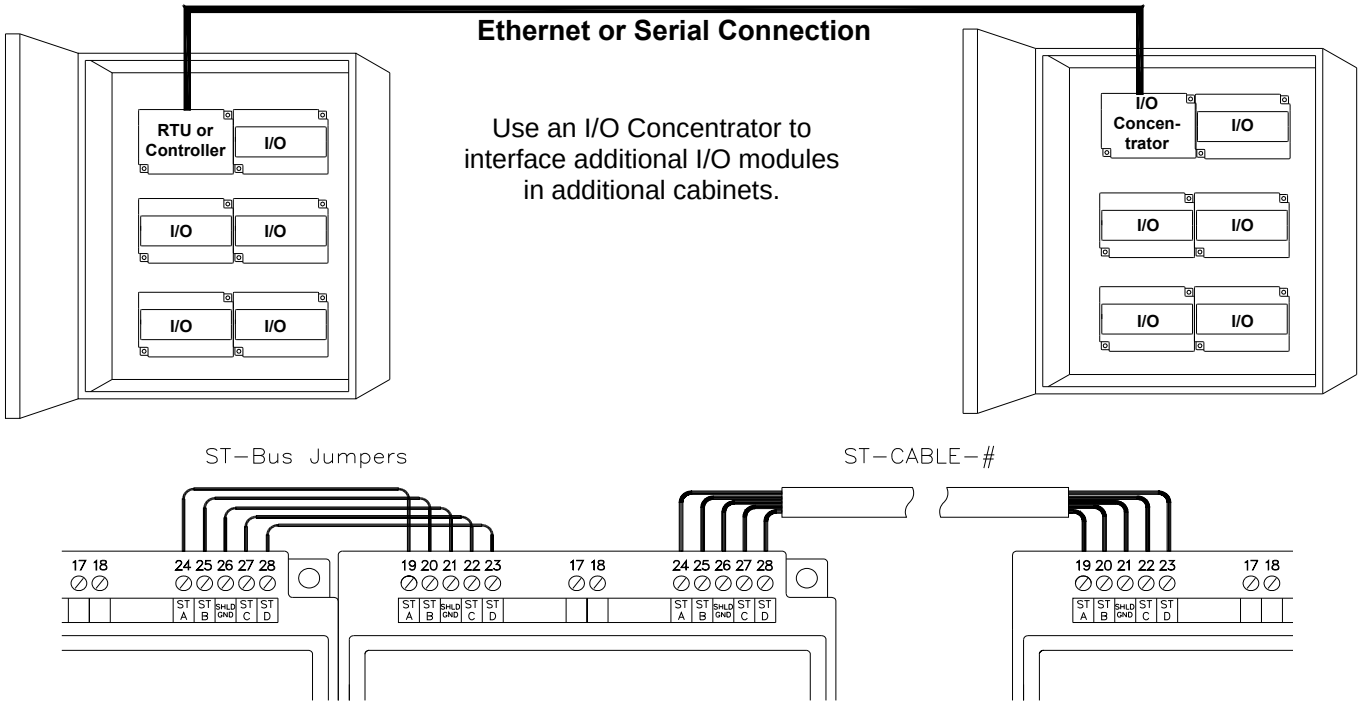
Use an ET-GT-ST-# I/O Concentrator to interface to more than 20 I/O modules.



ST-Bus may form star configurations without restrictions.



Route ST-Bus wiring away from power wiring and sources of electrical interference.



Use the supplied ST-Bus jumpers between adjacent SixTRAK components. Otherwise, use the recommended cable.

Section 4 Discrete Input Modules

Applicable Part Numbers

This section documents the following modules:

ST-DI-005-08x	**ST-DI-024-08x**	**ST-DI-048-08x**	**ST-DI-120-08x**
ST-DI-240-08x	**ST-DI-024-16H**	**ST-DI-024-32D**	**ST-DI-CNT-08U**

8 Channel Input Modules

SixTRAK eight channel discrete input modules incorporate one of two module base styles. These base styles and other features are detailed below.

Field Wiring Base

With the Field Wiring (F) base, one terminal from each channel is connected to an internal common bus. A single user power connection to the module allows up to eight input devices to be connected in sourcing or sinking configurations using two wires each. This is the most common wiring configuration. Refer to the upcoming pages for sample wiring connections.

Universal Wiring Base

With the Universal Wiring (U) base, each discrete input has two independent screw terminals to provide point to point isolation. Sample wiring is shown on the next page

Input Isolation

All discrete inputs are optically isolated from the **SixTRAK** circuitry, regardless of the module base style. If the Universal (U) base is used, the discrete inputs will be channel to channel isolated as well.

Sinking or Sourcing Wiring

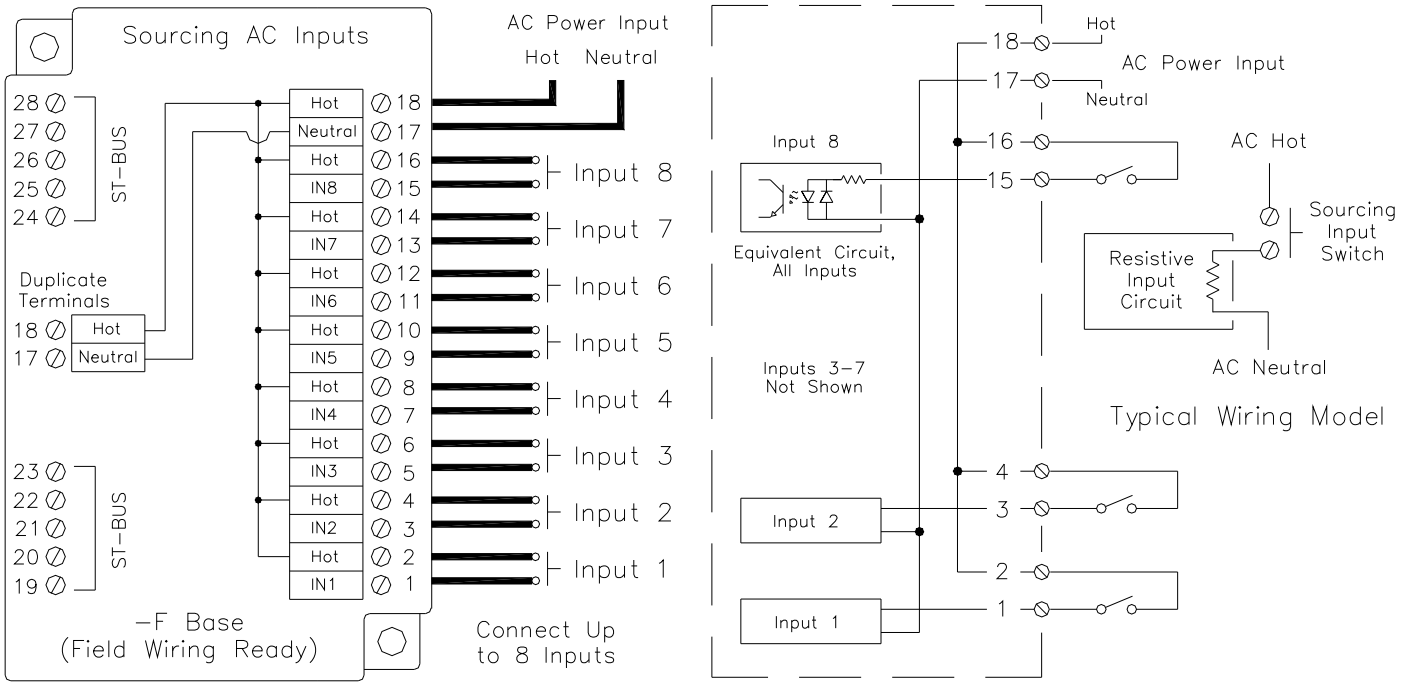
AC inputs should be wired in a sourcing configuration as shown on the next page. All DC input modules (except the ST-DI-120-08) will read either DC sinking or sourcing wiring. Just reverse the power input wires (terminals 17 and 18) to configure sinking or sourcing DC wiring.

Counter Feature

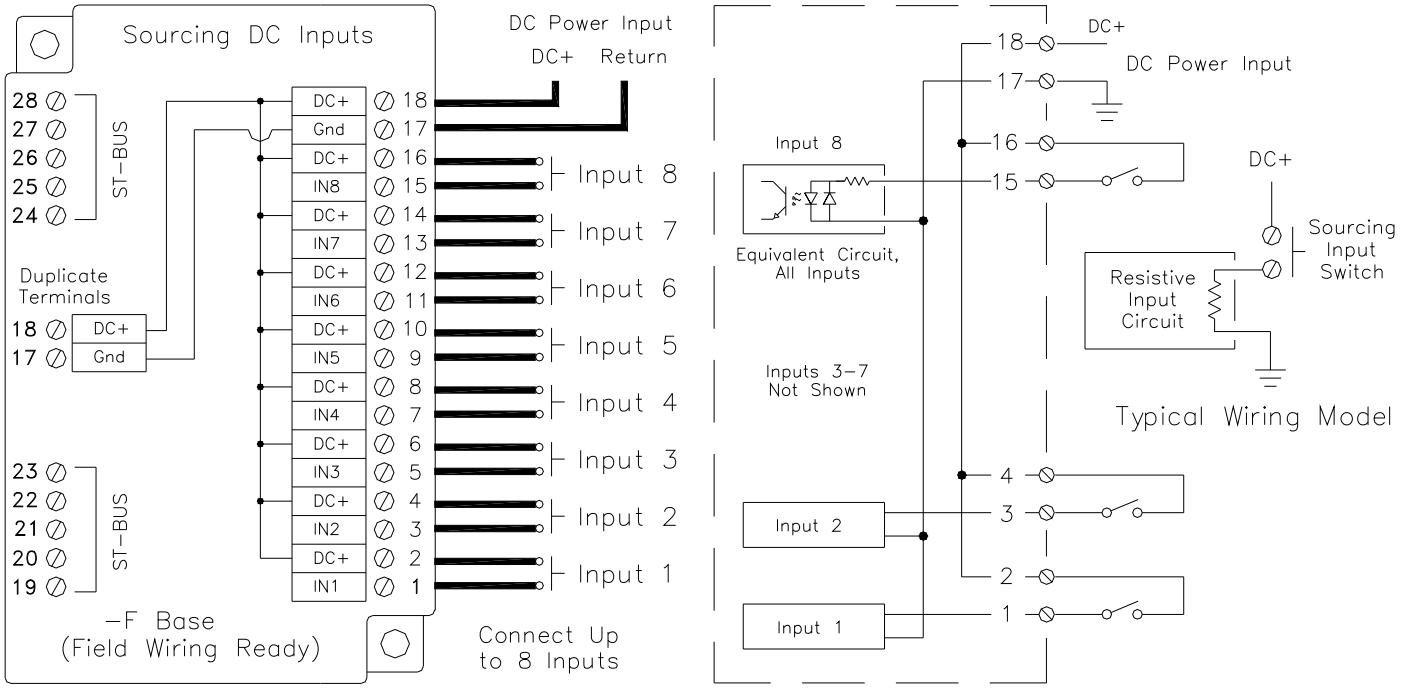
All eight channel discrete input modules have an input count accumulator feature. If this feature is enabled (in the I/O Tool Kit program), an analog input register will report a unipolar (unsigned) 16-bit count value that increments on each OFF to ON transition of the corresponding input. The maximum count input rate is 100 Hz (6000 pulses/min). These accumulations initialize at zero each time power is cycled. They cannot be reset under software control.

Each Field Wiring Ready Base reduces or eliminates the need for extra screw terminals by internally connecting the instrumentation power or return wire to each input channel.

For AC applications with inputs on a single AC service:

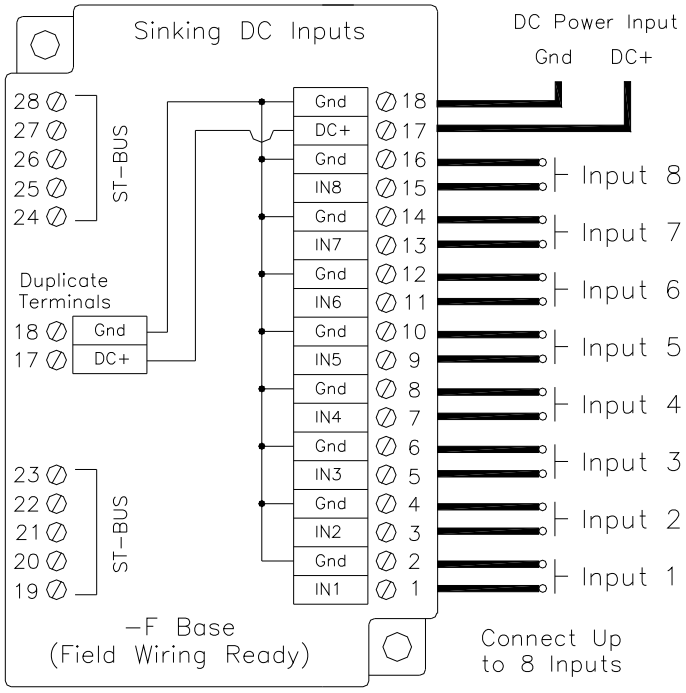


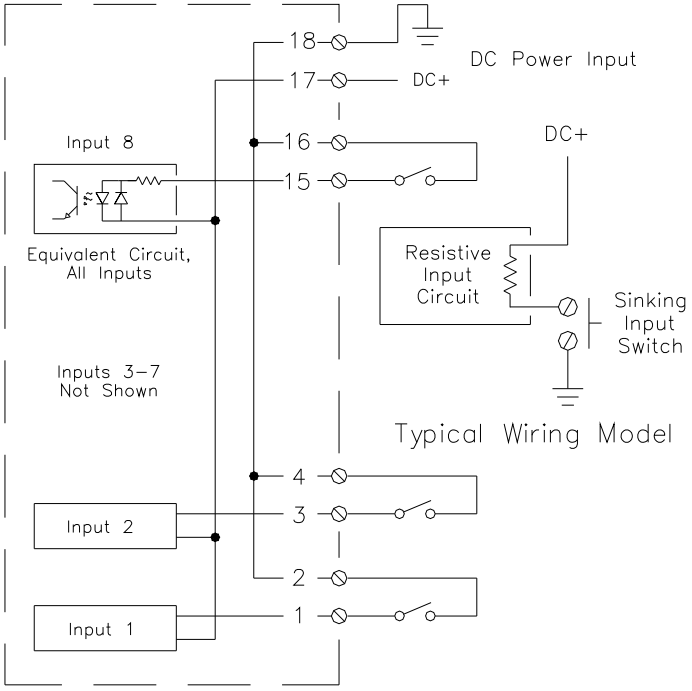
For most DC applications:



Sixnet Technology Park • 331 Ushers Road • Ballston Lake, NY 12019 USA • +1 (518) 877-5173 • support@sixnet.com

For special inputs from grounded switch closures: **(except ST-DI-120-08F)**

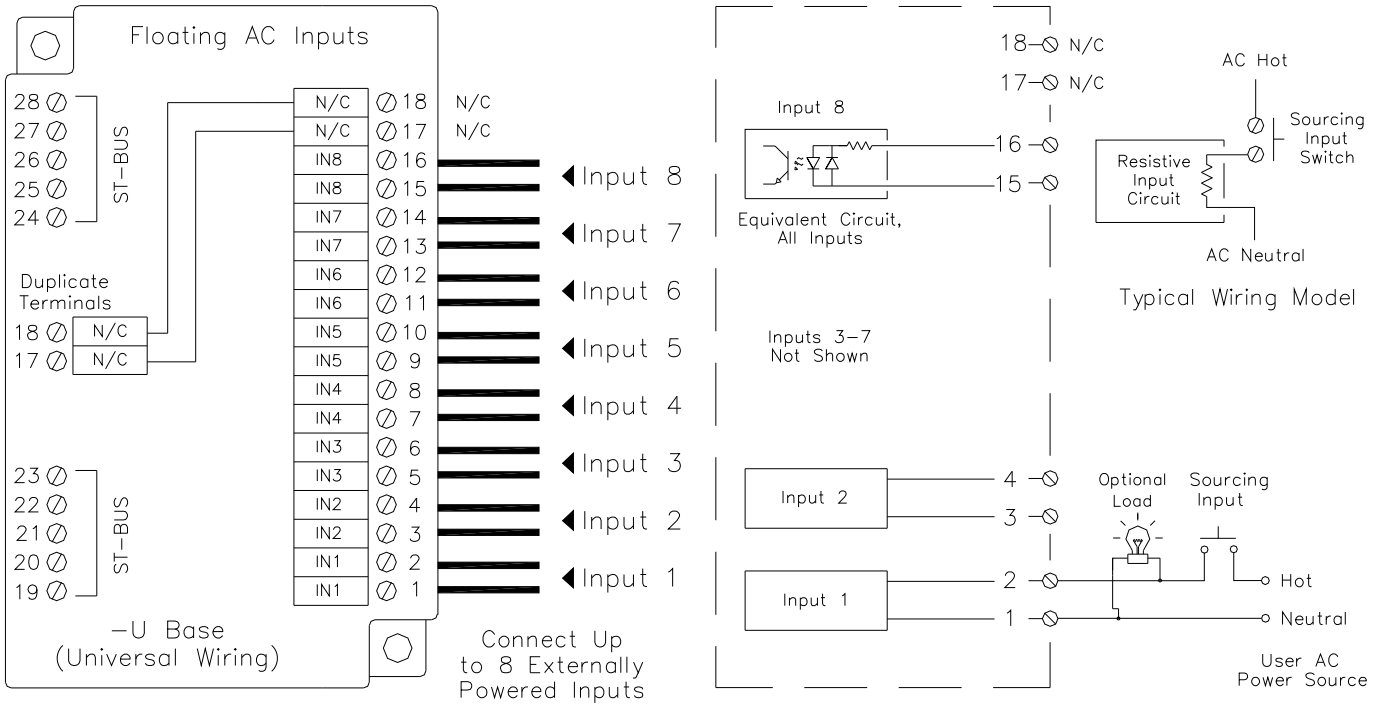




Sixnet Technology Park • 331 Ushers Road • Ballston Lake, NY 12019 USA • +1 (518) 877-5173 • support@sixnet.com

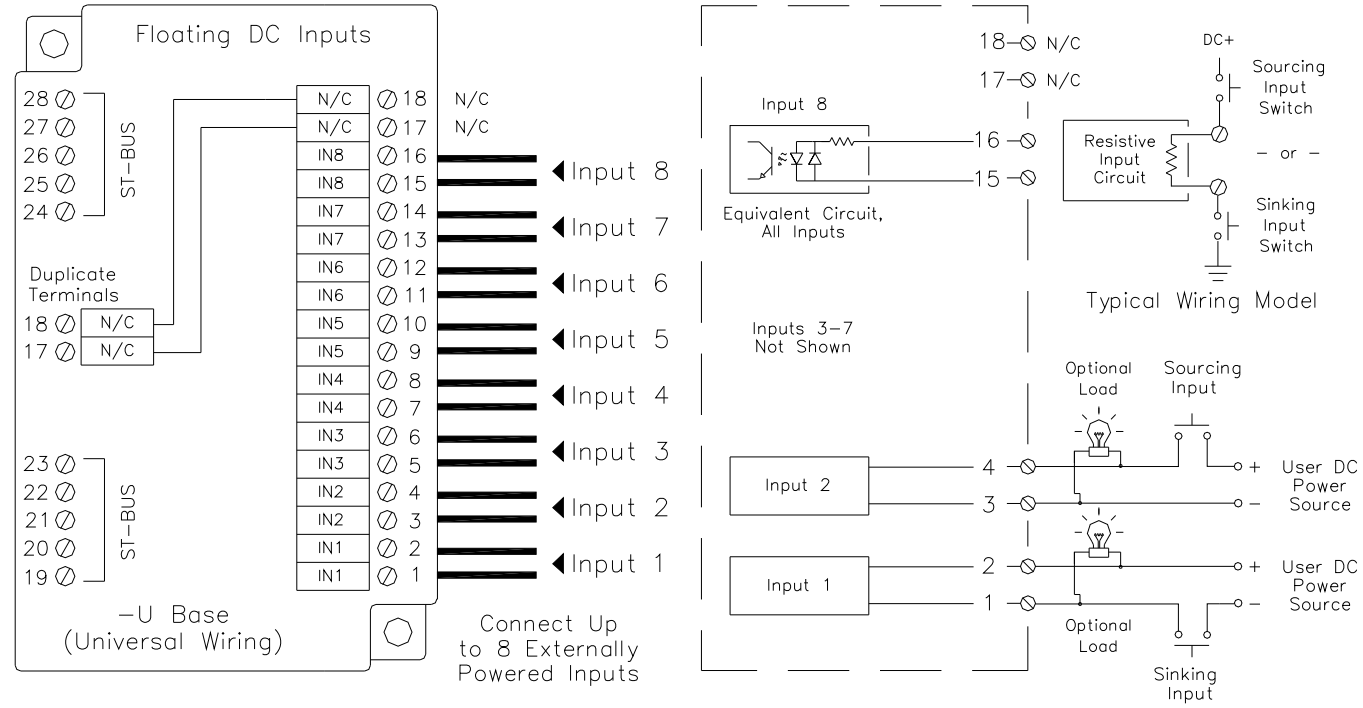
Each Universal Wiring Base provides channel-to-channel isolation by supplying two screw terminals for each input channel. This allows input signals from different power sources to be wired to the same base.

For AC applications with inputs from different AC sources:



Note: *In AC applications, each input can be wired to independent AC sources or line phases.*

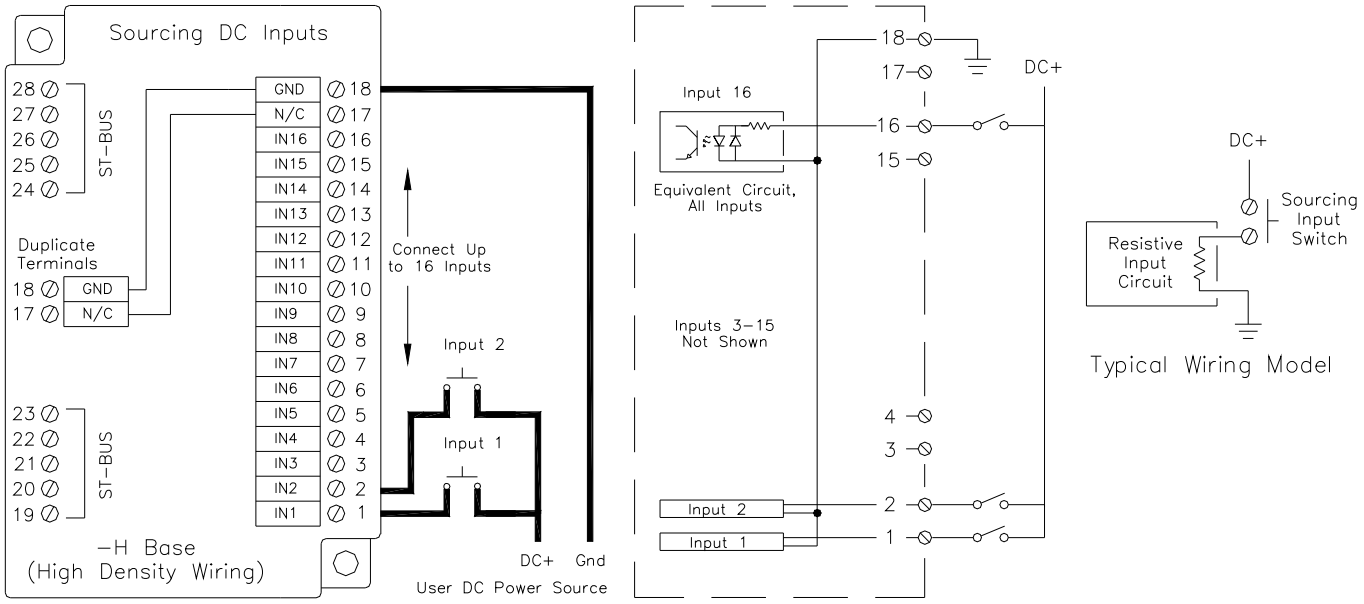
For DC applications with inputs from different DC sources:



Sixnet Technology Park • 331 Ushers Road • Ballston Lake, NY 12019 USA • +1 (518) 877-5173 • support@sixnet.com

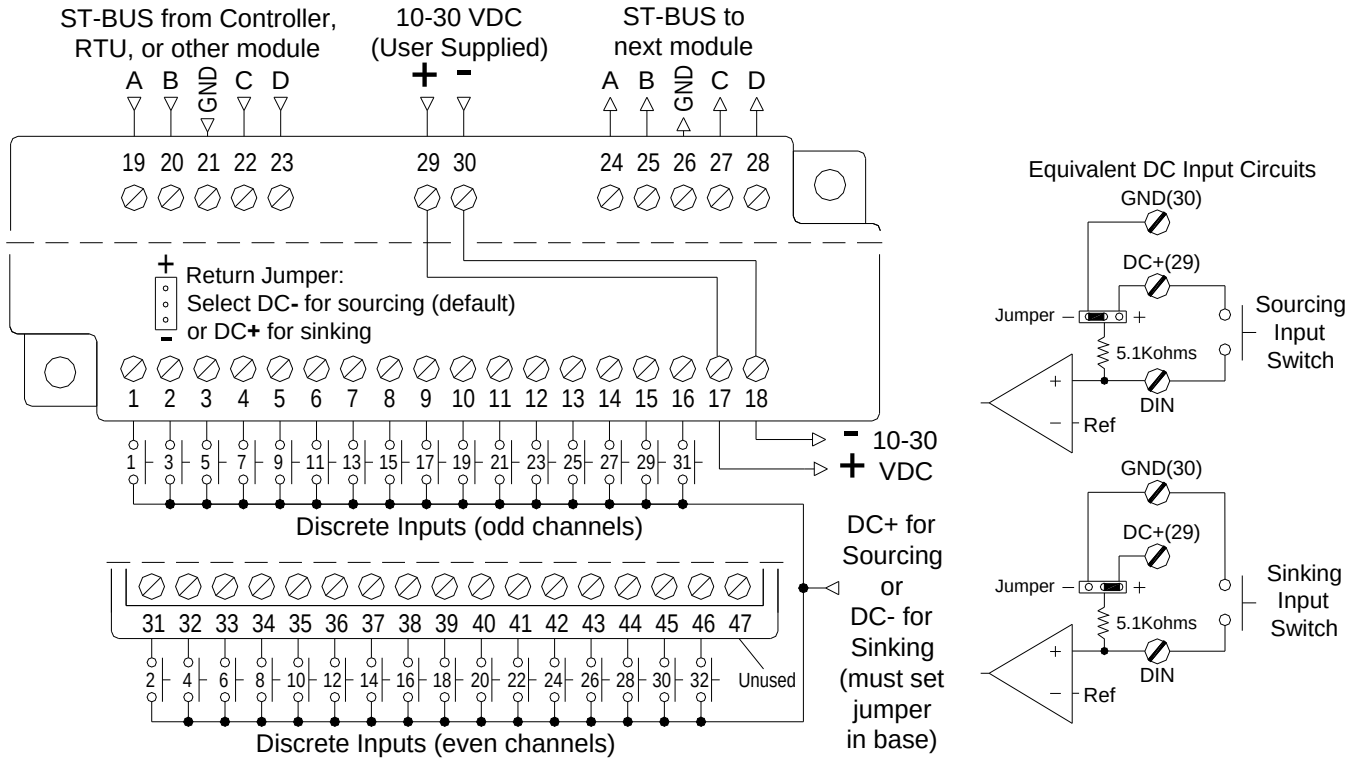
ST-DI-024-16H High density Input Module

This high density discrete input module has 16 channels that accept inputs from 10 to 32 volts DC. Connect your input signals to terminals 1 through 16. Connect the return from your DC power source to terminal 18. Externally distribute the (+) DC power to your field devices.



ST-DI-024-32D Double density Input Module

This double density discrete input module has 32 channels that accept inputs from 10 to 30 volts DC. Connect your input signals to terminals 1 through 16 (odd numbered channels) and 31 through 46 (even numbered channels). Connect the return from your DC power source to terminal 18. Externally distribute the (+) DC power to your field devices for sourcing inputs, or (-) DC power for sinking inputs. There is a Return Jumper beneath the access door in the base assembly. This jumper must be set to match the wiring (sourcing or sinking).



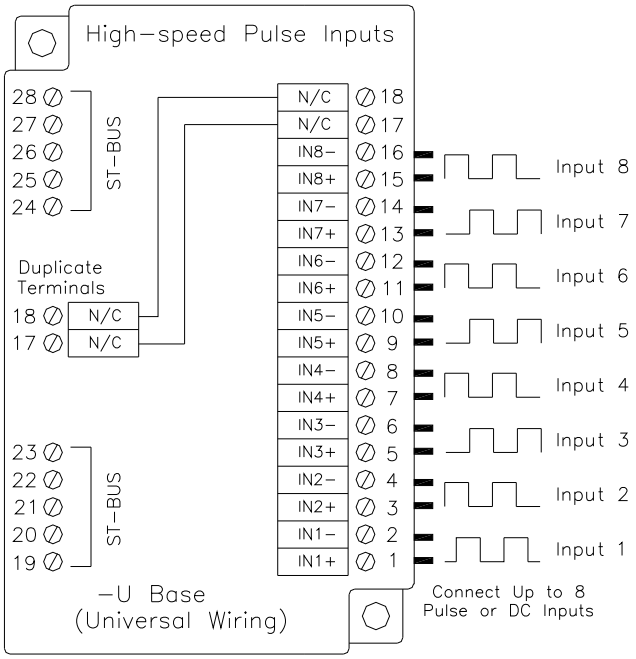
Sixnet Technology Park • 331 Ushers Road • Ballston Lake, NY 12019 USA • +1 (518) 877-5173 • support@sixnet.com

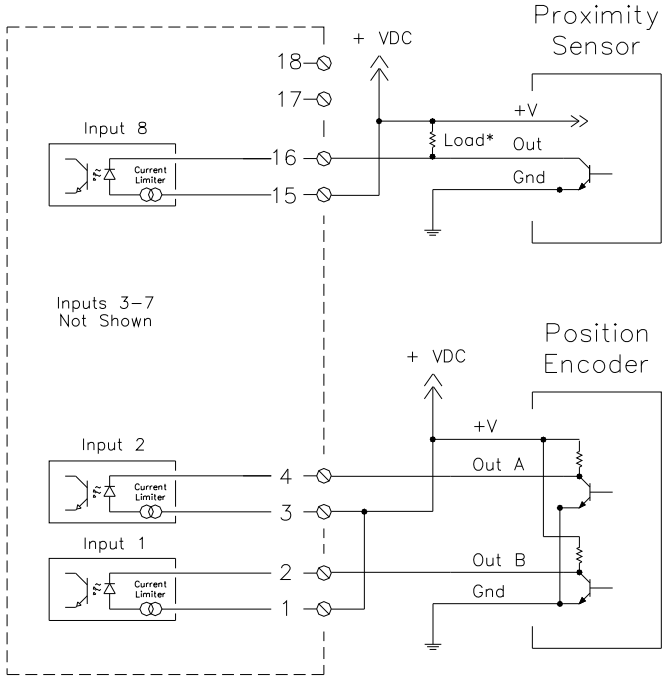
ST-DI-CNT-08U High-Speed Counter Module

This high-speed counter module has eight isolated circuits that accept pulse inputs from a variety of sources, including quadrature and incremental encoders. Count values are reported in 16 bit analog input registers, with 32 bit results available by cascading two adjacent I/O channels to report total counts. The states of the counters are also reported as discrete inputs. Pulse rates up to 50 kHz are supported. The counters may be reset by toggling discrete output bits. Counter modes are selected using the I/O Tool Kit program. Refer to the online help.

Input Wiring

Screw terminal assignments are shown below. For best noise immunity, connect input signals using twisted wire pairs. To maintain the best differential noise rejection, do not connect (-) screw terminals together at the I/O base.

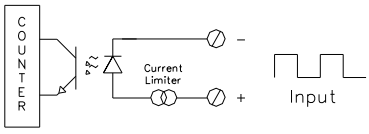




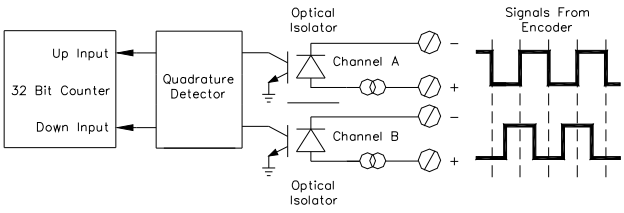
* Populate the appropriate load resistor, unless your sensor does not require one.

Typical Wiring Models

Typical Count/Rate Input Circuit



Typical Position Input Circuit



Sixnet Technology Park • 331 Ushers Road • Ballston Lake, NY 12019 USA • +1 (518) 877-5173 • support@sixnet.com

Section 5 Discrete Output Modules

Applicable Part Numbers

This section documents the following modules:

ST-DO-DC1-08x **ST-DO-AC1-08x** **ST-DO-AC2-08x**
ST-DO-DC2-16H **ST-DO-RLY-06U**

8 Channel Output Modules

SixTRAK eight channel discrete output modules incorporate one of two module base styles. These base styles and other features are detailed below.

Field Wiring Base

With the Field Wiring (F) base, one terminal from each channel is connected to an internal common bus. A single user power connection to the module allows up to eight output devices to be connected in sourcing or sinking configurations using two wires apiece. This is the most common wiring configuration. Refer to the next page for sample wiring connections.

Universal Wiring Base

With the Universal Wiring (U) base, each discrete output has two independent screw terminals to provide point to point isolation. Sample wiring is shown on the next page.

Output Isolation

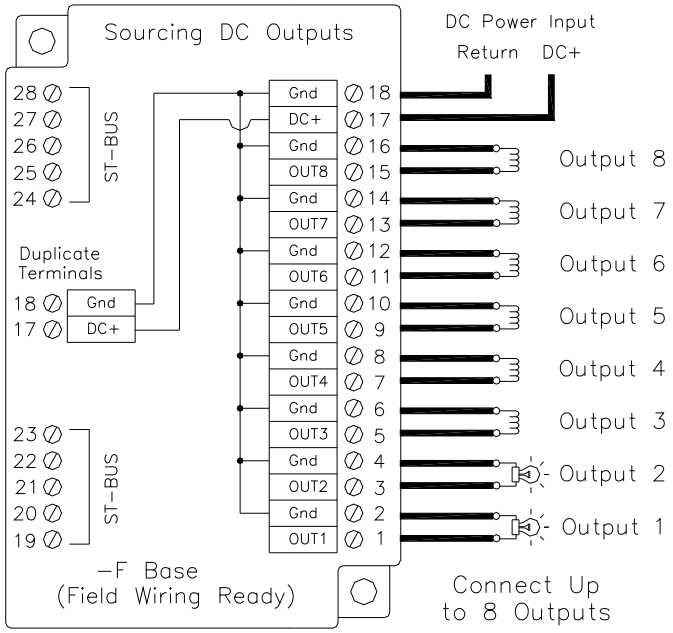
All discrete outputs are optically isolated from the **SixTRAK** circuitry, regardless of the module base style. If the Universal (U) base is used, the discrete outputs will be channel to channel isolated as well.

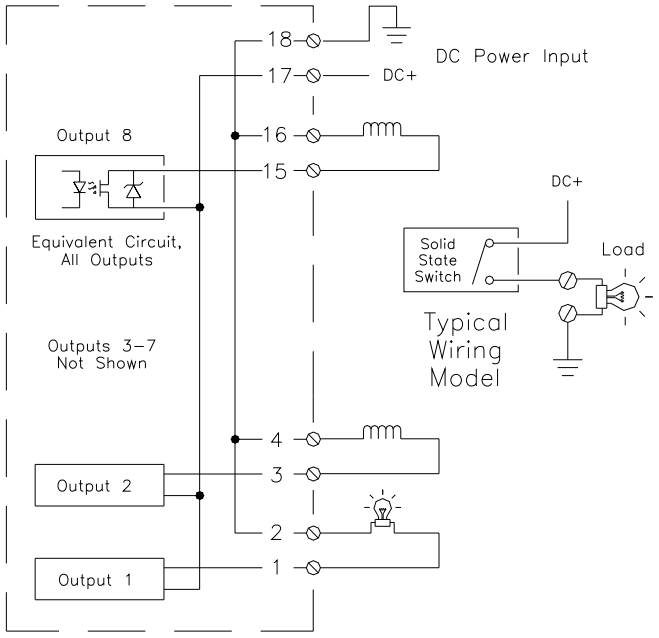
Watchdog Output Feature

The first DC output channel may be configured (using the I/O Tool Kit program) as a watchdog output. If this feature is selected, the output will be on when there is good command activity from the Sixnet gateway, controller, or RTU. The output will no longer be controlled as a discrete output. The corresponding register will be unused.

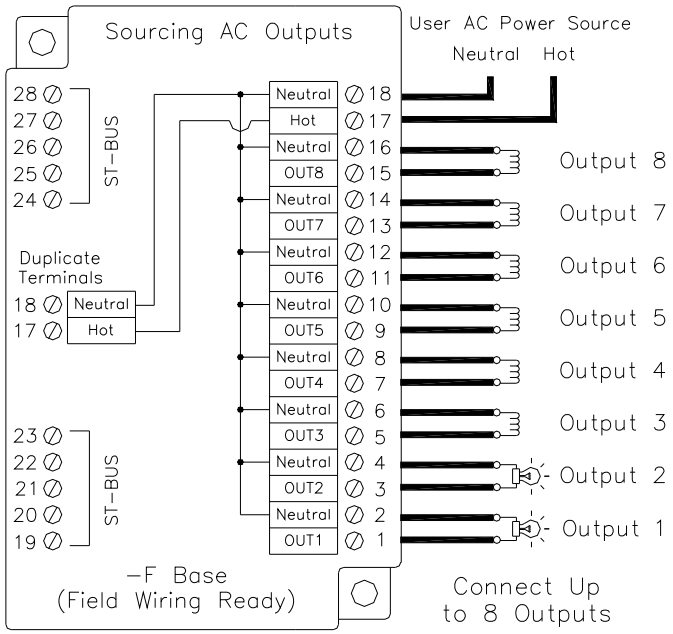
Each Field Wiring Ready Base reduces or eliminates the need for extra screw terminals by internally connecting the instrumentation power or return wire to each output channel.

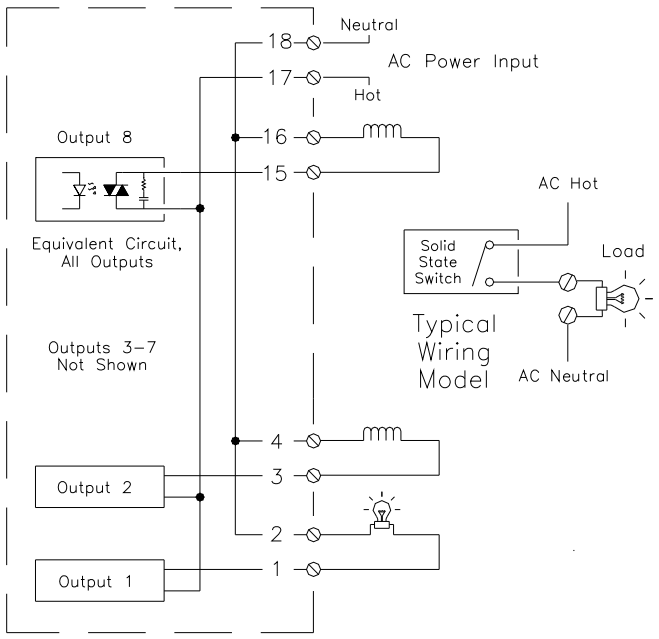
Sourcing DC outputs:





Sourcing AC outputs:

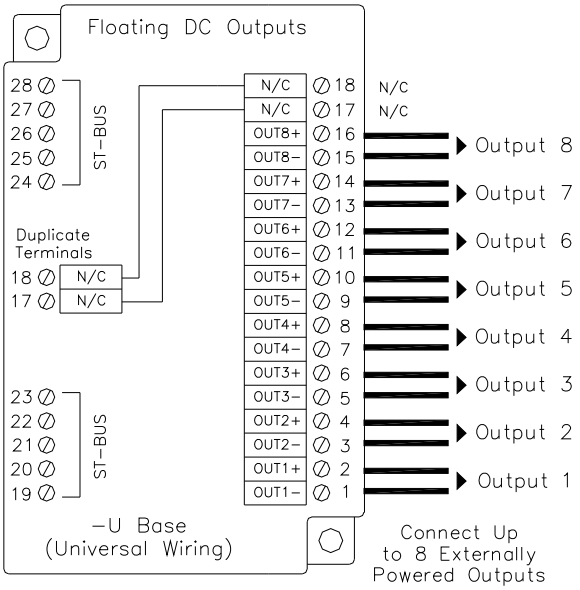


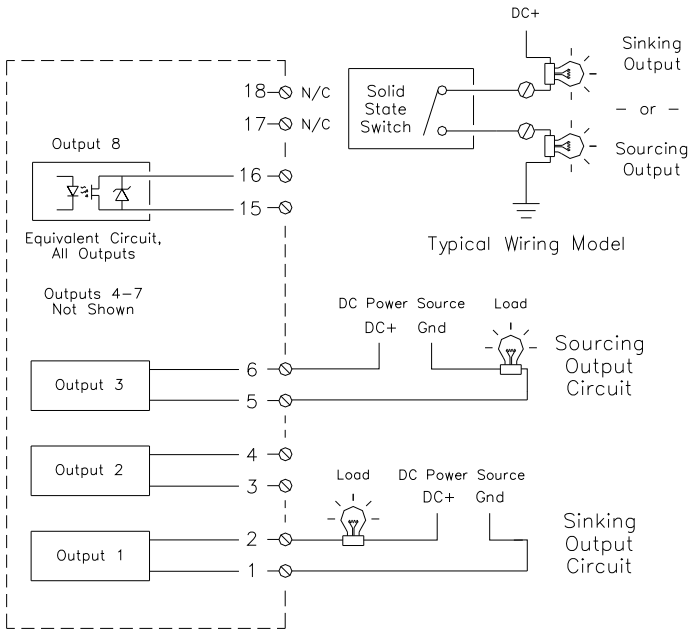


Sixnet Technology Park • 331 Ushers Road • Ballston Lake, NY 12019 USA • +1 (518) 877-5173 • support@sixnet.com

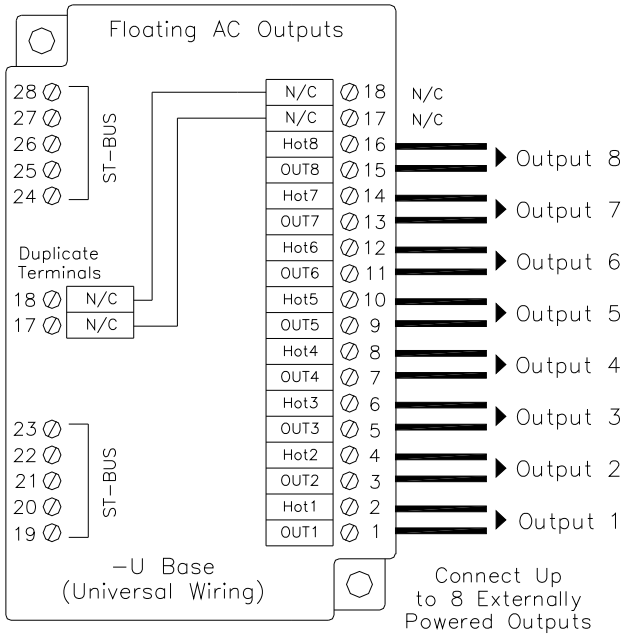
Each Universal Wiring Base provides channel to channel isolation by supplying two screw terminals for each output channel. This allows outputs on the same module to be switching different AC or DC power sources.

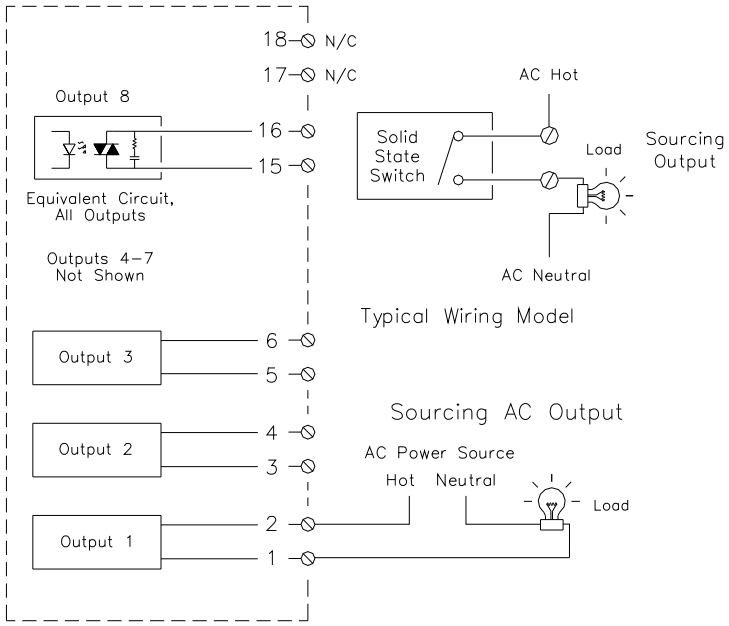
For DC applications:





For AC applications:





Sixnet Technology Park • 331 Ushers Road • Ballston Lake, NY 12019 USA • +1 (518) 877-5173 • support@sixnet.com

ST-DO-DC2-16H High density Output Module

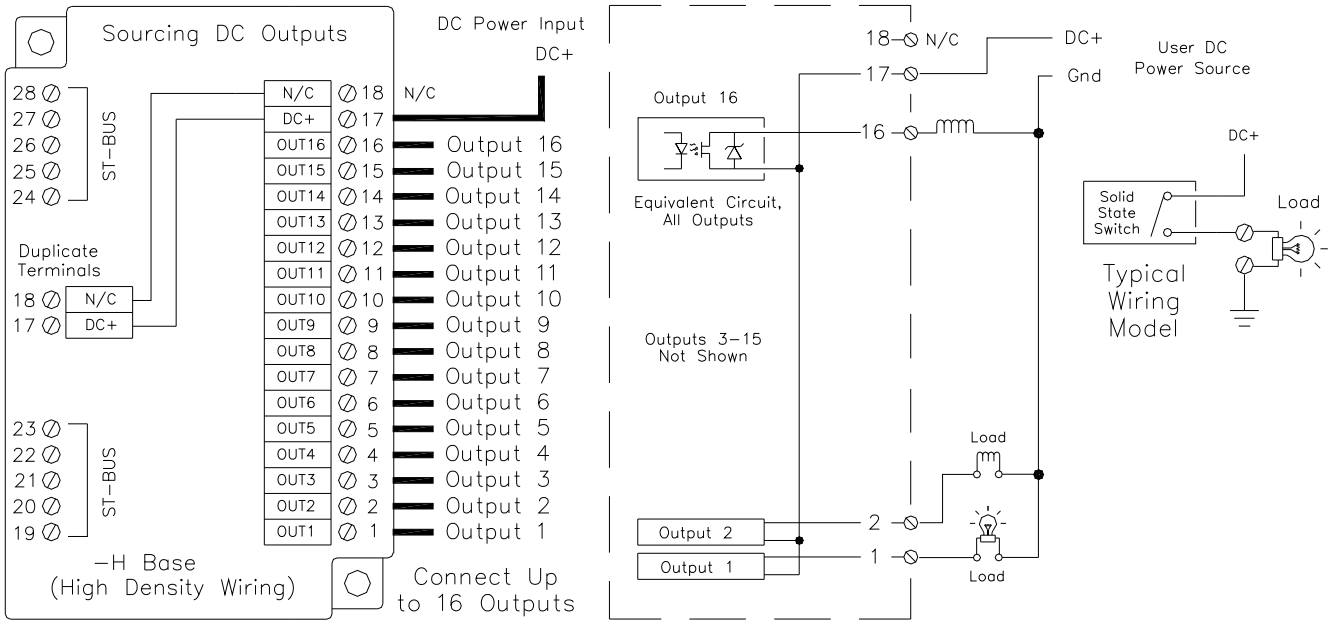
This high density discrete output module has 16 channels that source 10 to 32 volts DC to the field devices. The current rating for each output channel is 1 mA to 500 mA (0.5A). One screw terminal is provided for the (+) user DC power source.

High Density Wiring Base

With the High Density Wiring (H) base, one screw terminal is provided for the output wire to each of the sixteen field devices. One screw terminal is provided for the user DC power (+). Refer to the figure below for sample wiring connections. Connect your output wires to terminals 1 through 16. Connect your DC (+) to terminal 18. You will need to externally distribute the DC power return to your field devices.

Watchdog Output Feature

The first DC output channel may be configured (using the I/O Tool Kit program) as a watchdog output. If this feature is selected, the output will be on when there is good command activity from the Sixnet gateway, controller, or RTU.



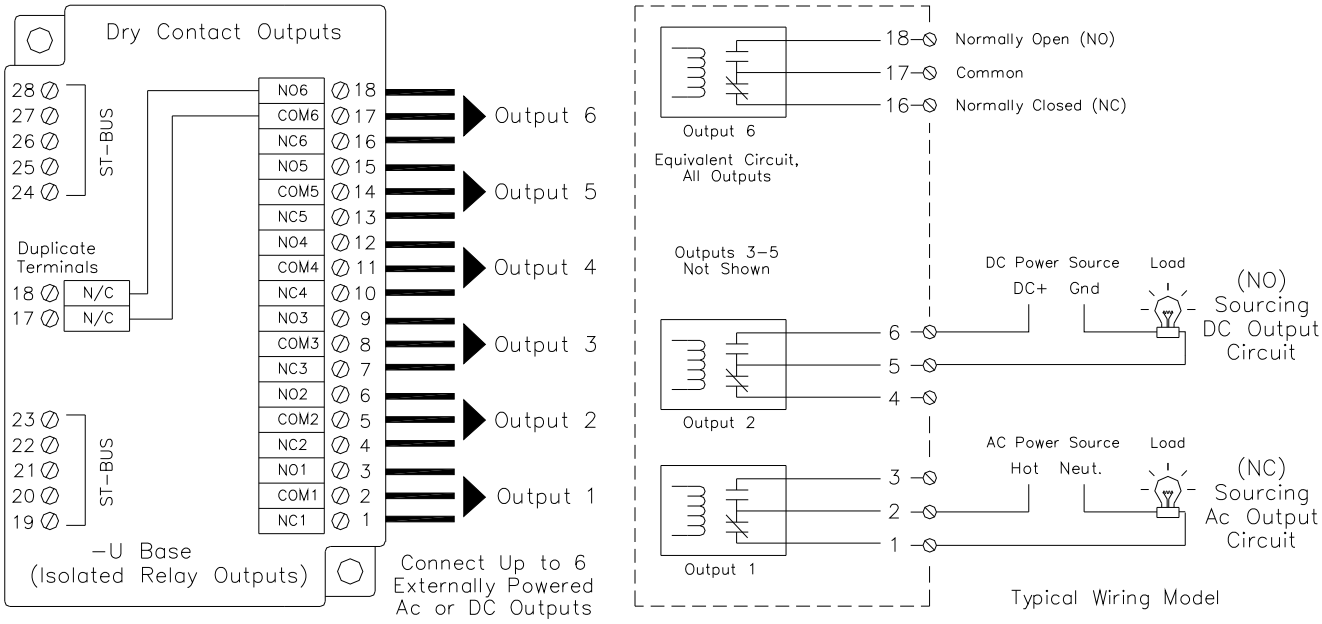
Sixnet Technology Park • 331 Ushers Road • Ballston Lake, NY 12019 USA • +1 (518) 877-5173 • support@sixnet.com

ST-DO-RLY-06U Dry Contact Relay Module

This discrete output module has six Form C relay output channels that switch DC or AC power to the field devices. The current rating for each output channel is 0.1 mA to 2 amps DC, or 0.1 mA to 500 mA (0.5A) AC. Screw terminals are provided for the normally closed and normally open outputs.

Watchdog Output Feature

The first DC output channel may be configured (using the I/O Tool Kit program) as a watchdog output. If this feature is selected, the output will be on when there is good command activity from the Sixnet gateway, controller, or RTU.



Sixnet Technology Park • 331 Ushers Road • Ballston Lake, NY 12019 USA • +1 (518) 877-5173 • support@sixnet.com

Section 6 Analog Input Modules

Applicable Part Numbers

This section documents the following modules:

ST-AI-INS-08U	**ST-AI-20M-08F**	**ST-AI-20M-16H**
ST-CL-20M-16H	**ST-AI-10V-08F**	**ST-AI-RTD-06U**

Power Requirements

The internal analog input circuitry is powered by the Sixnet gateway, controller, or RTU through the ST-Bus wiring. External power is required only for 4-20 mA loop signals coming from an unpowered source. All TrakPak Packaged Systems provide 24 VDC to power your external circuitry.

Analog Isolation

The ST-Bus wiring between **SixTRAK** modules is isolated to a rating of 1,200 volts. Therefore, all **SixTRAK** modules are isolated from one another. In addition, the ST-AI-INS-08 module provides 50 volt channel to channel isolation.

4-20 mA Input Circuit Jumpers

The ST-AI-INS-08 module has jumpers for connecting or disconnecting 100 ohm current shunts from each input circuit. The ST-AI-20M-08 module has jumpers for providing 24 VDC loop power or instrumentation ground to each field device. The jumpers are located behind the access door inside the module base. To gain access to them, unplug the logic module from the base and open the access door. Refer to the upcoming pages for more information on these jumpers.

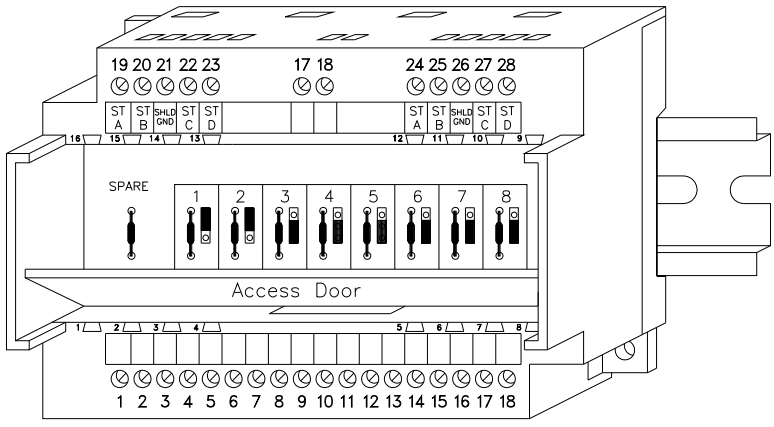
These jumpers must be set to match the corresponding input signal type, regardless of software range selection. Improper jumper selection could result in damage to the input circuitry.

Replaceable Current Shunts

SixTRAK modules that support 4-20 mA inputs have a 100 ohm replaceable shunt for each channel. These shunts are enabled by jumper settings, and are replaceable if damaged by an equipment failure or wiring error.

These high precision shunts are located behind the access door inside the analog input module's base. A spare shunt is provided in the base assembly for your convenience. These shunts are illustrated within the diagrams of the applicable analog input modules.

If factory supplied shunts are used for replacements, recalibration of the input channels will not be necessary.



Module Base

ST-AI-INS-08U Instrumentation Input Module

This instrumentation analog input module has eight isolated input channels that accept signals from a wide variety of field devices. Two screw terminals are provided for each input signal.

Thermocouple Burnout Detection

This module has upscale or downscale burnout detection, which is enabled from within the I/O Tool Kit program. If the thermocouple resistance exceeds approximately 10 kilohms, the channel reading will be reported as plus or minus full high temperature or low temperature if upscale or downscale burnout is selected.

Autopolarity Feature (4-20 mA)

If the polarity on a 4-20 mA input is reversed, the value will still be reported properly.

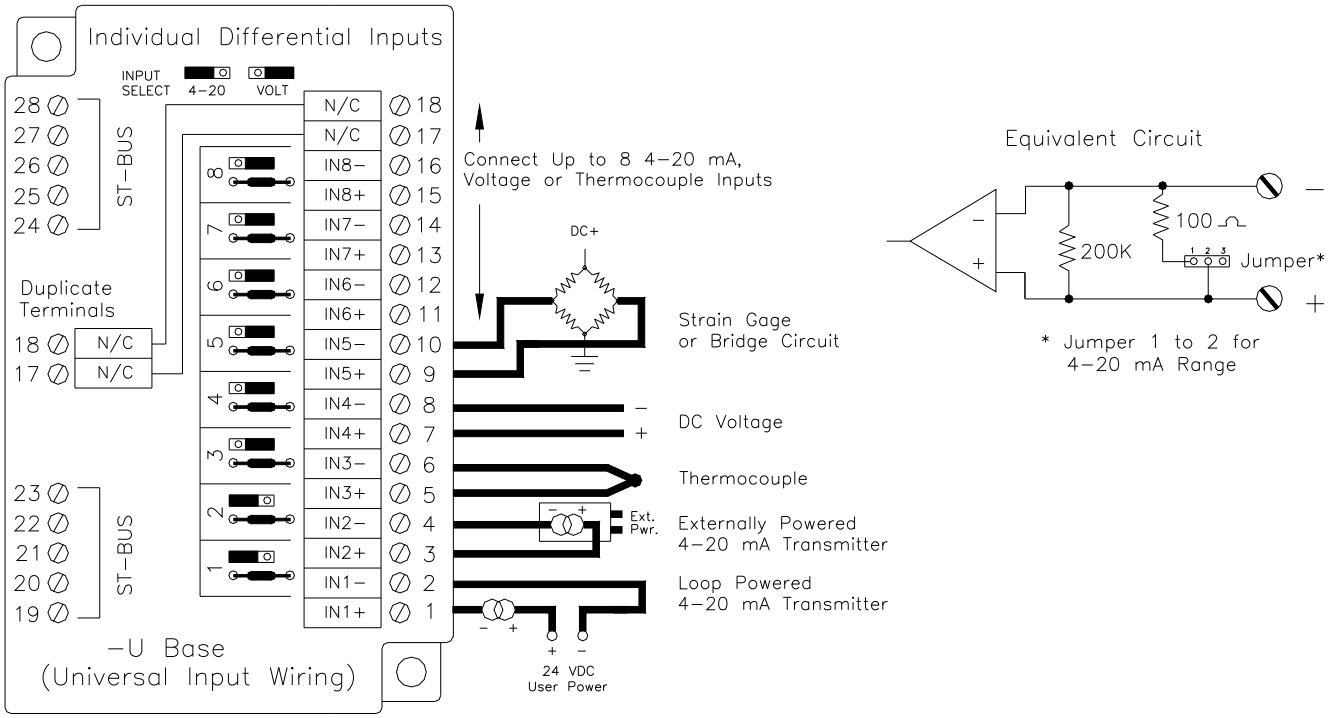
4-20 mA Input Enable Jumpers

This module has a 4-20 mA input enable jumper for each channel. Set each jumper to match the desired input as shown in the diagram below. The jumper setting must match the range selection in the I/O Tool Kit program.

Note: Access these jumpers by removing the plug-in logic module and opening the access door in the base.

Analog Input Scaling

Thermocouple inputs are automatically linearized and cold junction compensated. Values are reported as degrees F, degrees C or 0.1 degrees C. Other types of inputs are reported as unscaled values from -32768 to 32767. Refer to the I/O Tool Kit online help system for more information.



Sixnet Technology Park • 331 Ushers Road • Ballston Lake, NY 12019 USA • +1 (518) 877-5173 • support@sixnet.com

ST-AI-20M-08F 4-20 mA Input Module

This 4-20 mA analog input module has eight channels that accept 4-20 mA signals from self powered or loop powered devices. Two screw terminals are provided for each input channel. The return screw terminals are tied through movable jumpers to +24 volts DC or to instrumentation ground.

Open Loop Detection Feature

The I/O Tool Kit configuration program provides a selection that allows inputs below 4 mA to be reported as zero, or be reported as negative values to detect loop failure.

Replaceable Current Shunts

This module base has replaceable 100 ohm current shunts, should a faulty field device or wiring error cause the original shunt to overheat. To access these shunts, unplug the logic module from the base and open the access door. A spare shunt is provided.

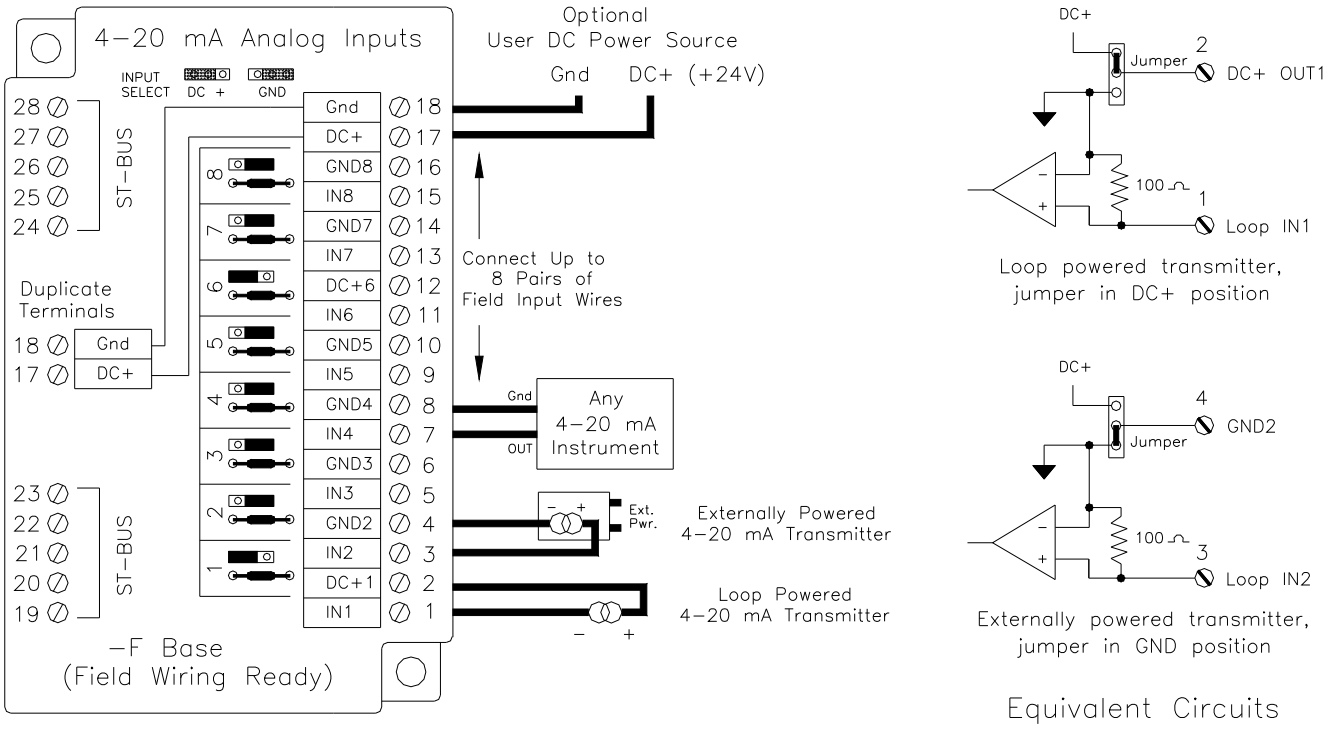
4-20 mA Input Scaling

Current inputs are reported as unscaled values from 0 to 32767. Refer to the I/O Tool Kit online help system for more information.

Loop Power Jumpers

If any of your 4-20 mA transmitters require loop power, connect 24 VDC to terminals 17 and 18 of the module base as shown below. (The 24 VDC may come from an external DC power source, or from the ST-PS-024-02N power supply.) Then set the loop power jumper for each unpowered loop input channel to the DC+ position. For all self-powered 4-20 mA input field devices, set the loop power jumper to the GND position to provide a ground reference for the input channel.

The loop power jumpers are located inside the module base, and may be accessed by removing the plug-in logic module and opening the access door.



Sixnet Technology Park • 331 Ushers Road • Ballston Lake, NY 12019 USA • +1 (518) 877-5173 • support@sixnet.com

ST-AI-20M-16H High Density Input Module

This high density 4-20 mA analog input module has 16 input channels that accept 4-20 mA signals from a wide variety of field devices. One screw terminal is provided for the instrumentation ground, and one screw terminal is provided for each input signal.

Open Loop Detection Feature

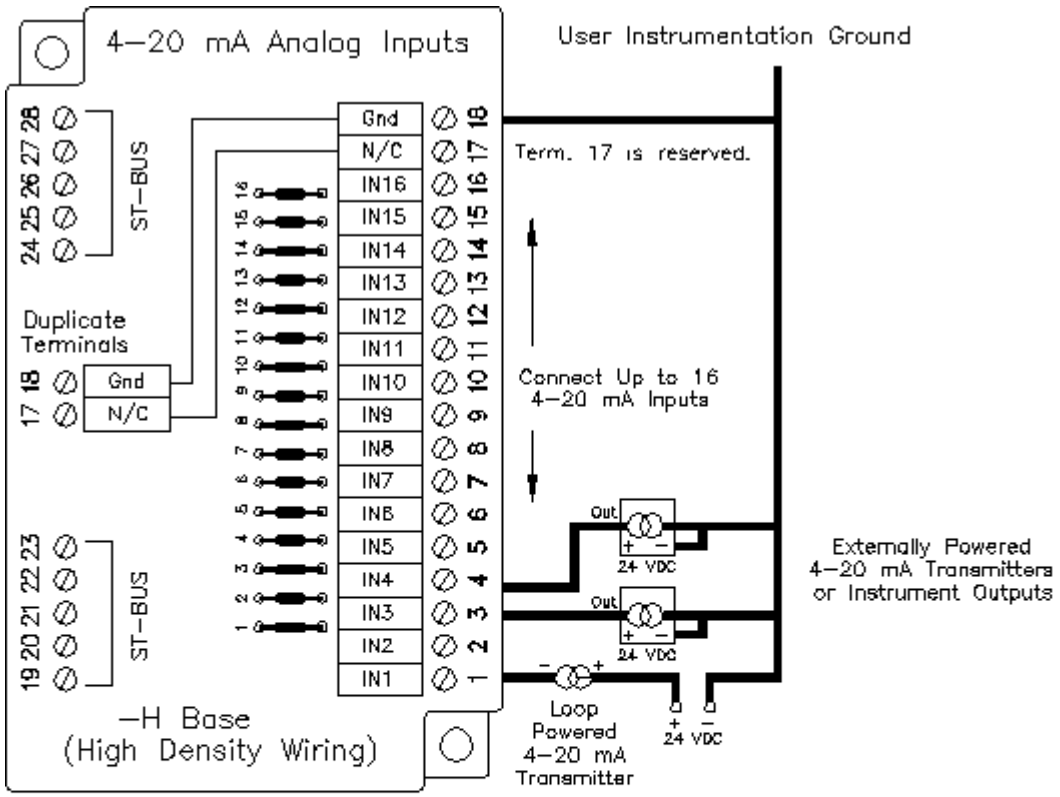
The I/O Tool Kit configuration program provides a selection that allows inputs below 4 mA to be reported as zero, or be reported as negative values to detect loop failure.

Replaceable Current Shunts

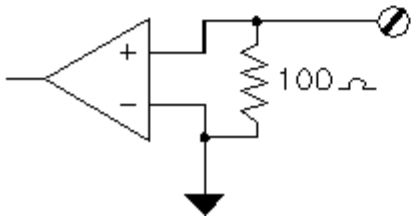
This module base has replaceable 100 ohm current shunts, should a faulty field device or wiring error causes the original shunt to overheat. To access these shunts, unplug the logic module from the base and open the access door. A spare shunt is provided.

4-20 mA Input Scaling

Current inputs are reported as unscaled values from 0 to 32767. Refer to the I/O Tool Kit online help system for more information.



Equivalent Circuit



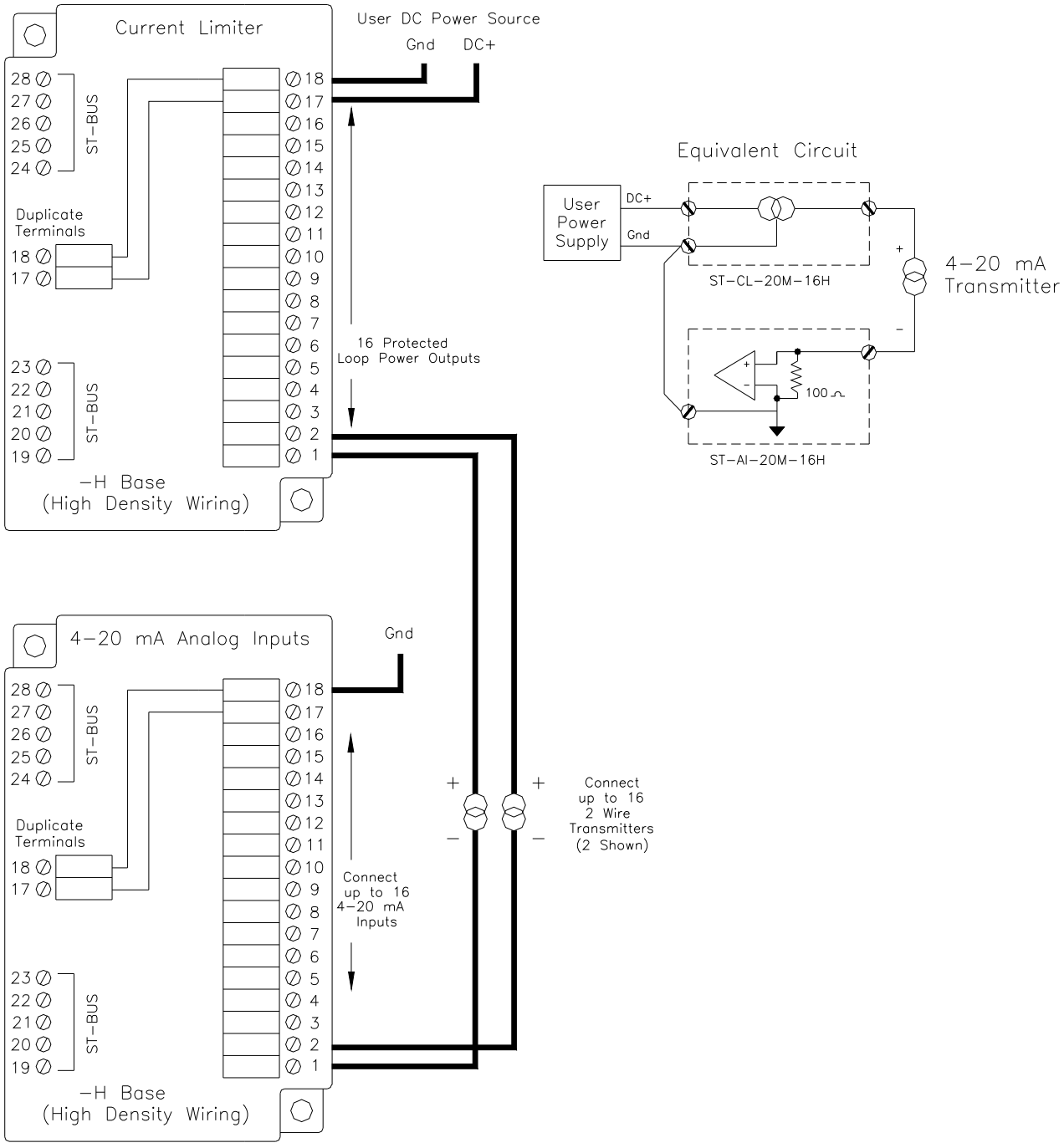
Sixnet Technology Park • 331 Ushers Road • Ballston Lake, NY 12019 USA • +1 (518) 877-5173 • support@sixnet.com

ST-CL-20M-16H 4-20 mA Loop Current Limiter

This optional 4-20 mA current limiter module provides overcurrent protection when connected in series with loop powered 4-20 mA analog devices. One pair of screw terminals is provided for the loop power source, and one terminal is provided for each of the sixteen protected loops. Refer to the diagram below for sample wiring connections.

Overcurrent LEDs

A status LED will be lit if the 4-20 mA loop current for that channel exceeds 25 mA.



Sixnet Technology Park • 331 Ushers Road • Ballston Lake, NY 12019 USA • +1 (518) 877-5173 • support@sixnet.com

ST-AI-10V-08F Voltage Input Module

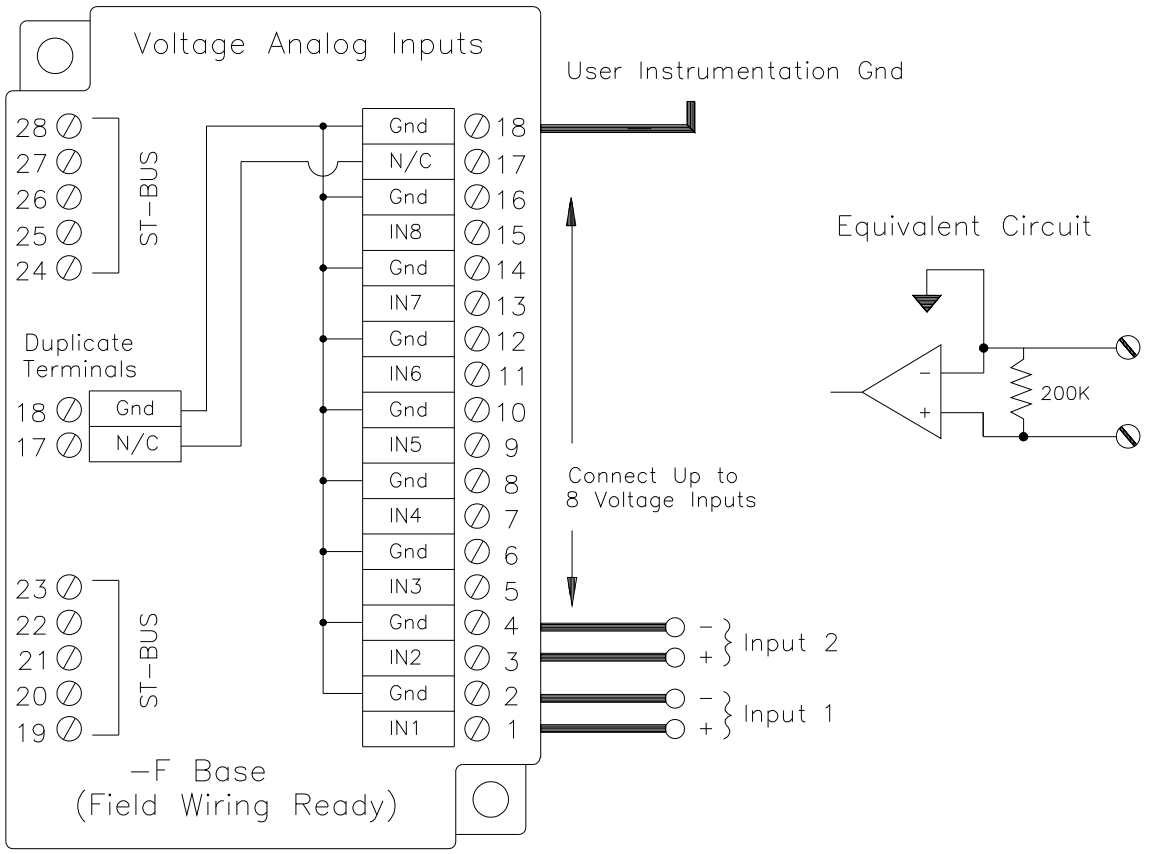
This voltage analog input module has eight channels that accept high level voltage signals from a wide variety of field devices. Two screw terminals are provided for each input channel. The return screw terminals are bussed internally.

Range Selection

This module supports voltage signals from +/- 1 volt to +/- 10 volts. Range selection is performed using the I/O Tool Kit configuration utility. Refer to the I/O Tool Kit online help system for information on selecting voltage ranges.

Voltage Input Scaling

Voltage inputs are reported as unscaled values from -32768 to 32767. Refer to the I/O Tool Kit online help system for more information.



Sixnet Technology Park • 331 Ushers Road • Ballston Lake, NY 12019 USA • +1 (518) 877-5173 • support@sixnet.com

RTD Input Modules

Each RTD input module has six channels that accept either 100 ohm platinum RTD inputs (ST-AI-RTD-06U) or 10 ohm copper RTD inputs (ST-AI-RTC-06U). Three screw terminals are provided for each input channel, to support two, three or four wire RTD connections.

Applicable Part Numbers

This section documents the following modules:

ST-AI-RTD-06U **ST-AI-RTC-06U**

Pulsed Current Feature

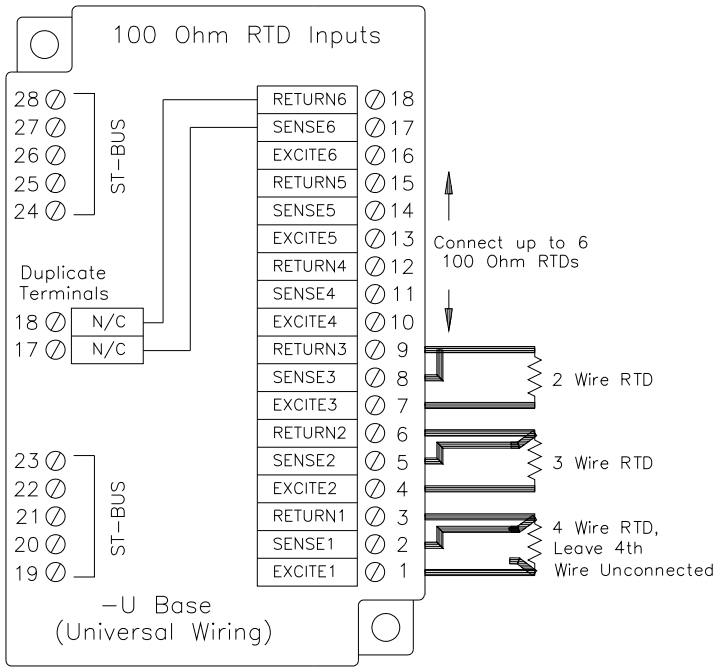
To minimize self heating of the RTD, the measurement current is pulsed on during the measurement period only.

RTD Linearization

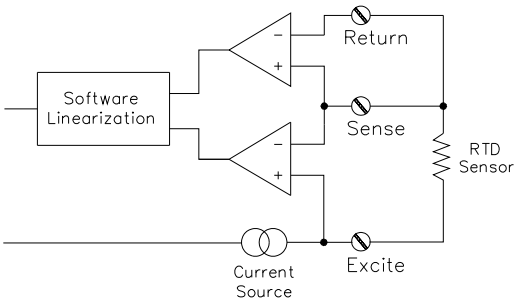
RTD linearization is performed in the Sixnet gateway, controller, or RTU firmware. Both American and European linearization standards are supported, and are selectable in the I/O Tool Kit program.

RTD Input Scaling

All 100 ohm platinum RTD inputs are reported as unscaled values from -2000 to 8500 (-200 to 850 ºC), with a resolution of 0.1 degrees C. All 10 ohm copper RTD inputs are reported as unscaled values from -2000 to 2600 (-200 to 260 ºC), with a resolution of 0.1 ºC.



Equivalent Circuit



Section 7 Analog Output Modules

Applicable Part Numbers

This section documents the following modules:

ST-AO-20M-04F **ST-AO-20M-08F** **ST-AO-10V-08F**

Analog Output Wiring

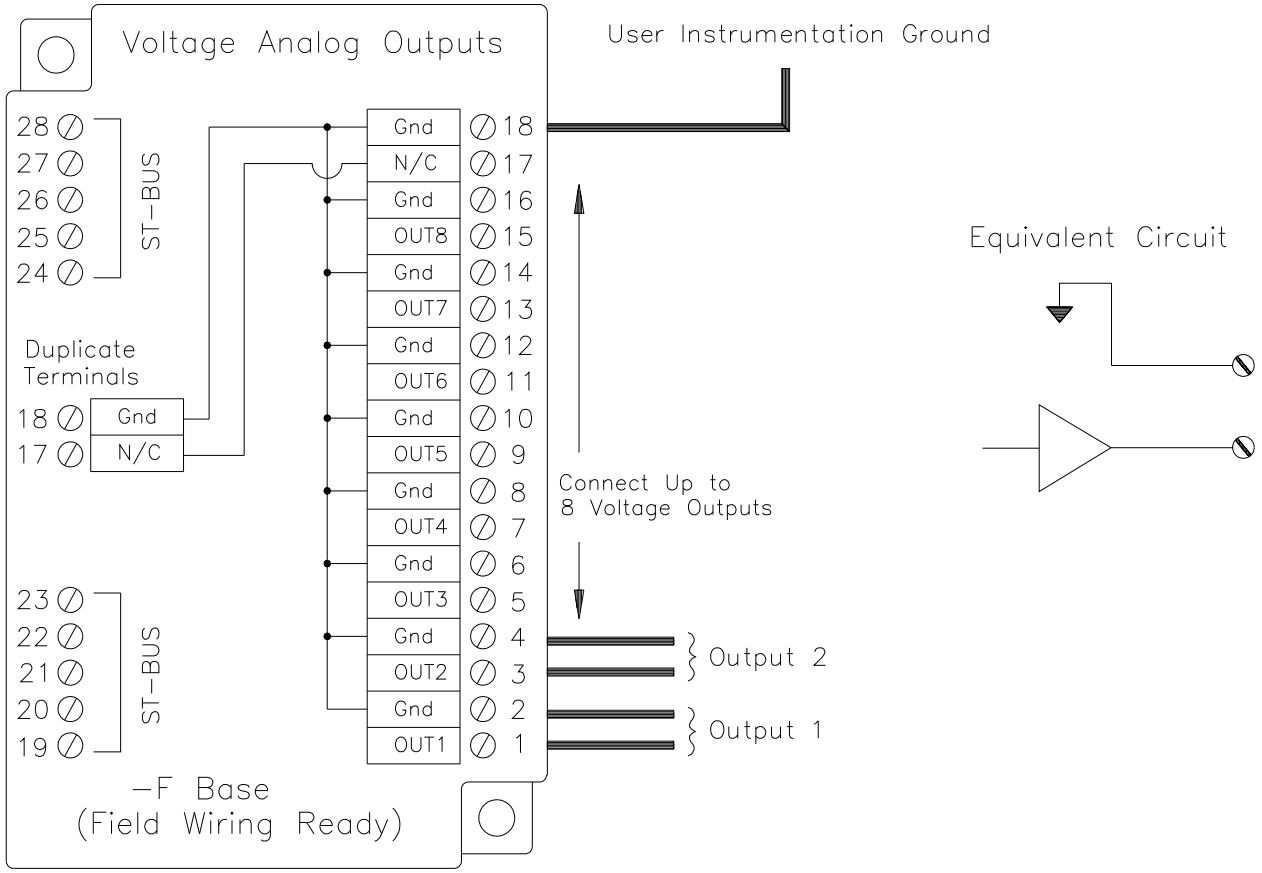
SixTRAK analog output modules are supplied with the Field Wiring (F) base. The return screw terminals in this base are bussed internally. A single user power connection or instrumentation ground connection to the module allows up to eight output devices to be connected using two wires apiece. Refer to the upcoming diagrams for sample wiring connections.

ST-AO-10V-08F Voltage Output Module

This analog output module has eight channels that provide 5 volt or 10 volt unipolar or bipolar analog output signals. Two screw terminals are provided for each output channel. The return screw terminals to instrumentation ground are bussed internally.

Power Requirements

Voltage analog outputs are powered by the analog output module. No external power is required.



Sixnet Technology Park • 331 Ushers Road • Ballston Lake, NY 12019 USA • +1 (518) 877-5173 • support@sixnet.com

ST-AO-20M-08F 4-20 mA Outputs

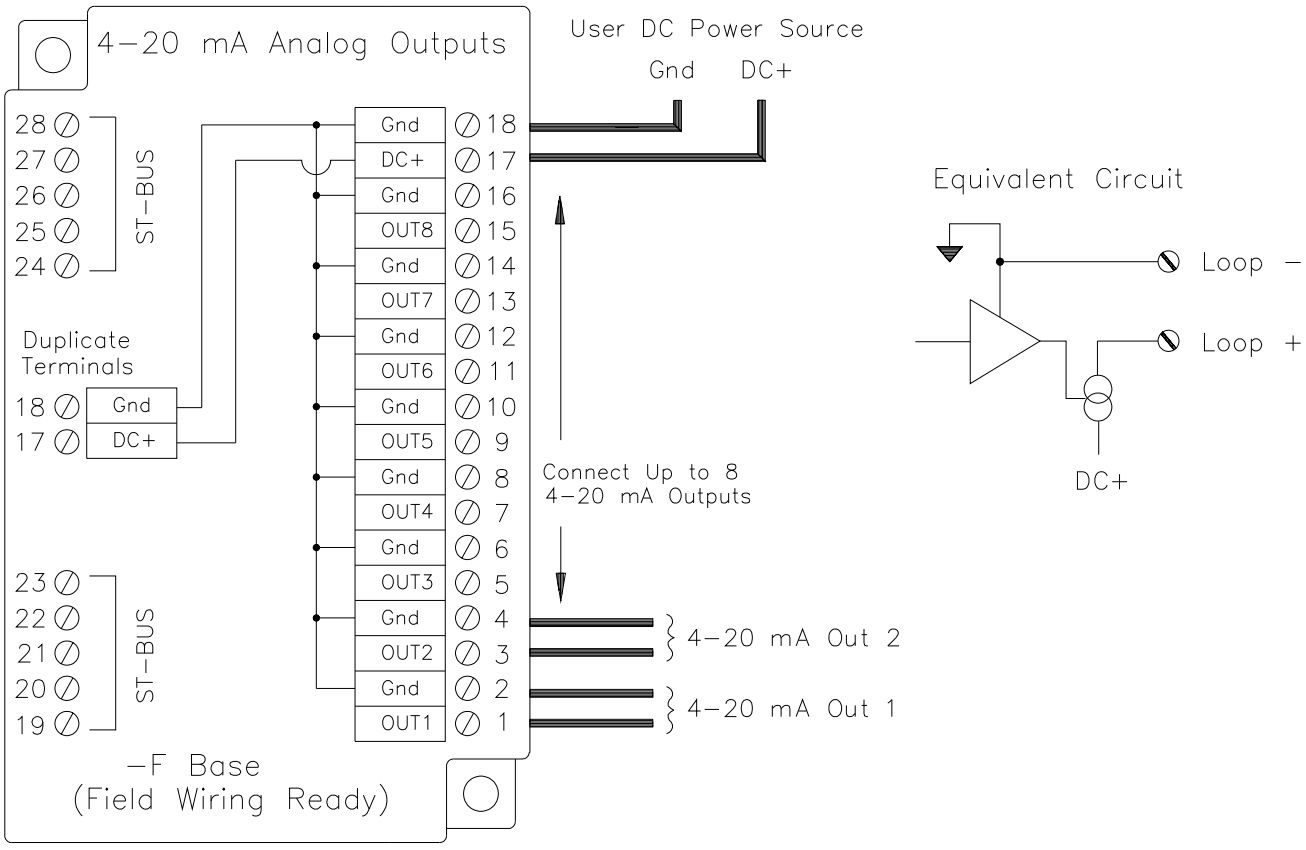
This analog output module has eight channels that provide 4-20 mA analog output signals. Two screw terminals are provided for each output channel. The return screw terminals are bussed internally.

ST-AO-20M-04F 4-20 mA Output Module

This analog output module has four channels that provide 4-20 mA analog output signals. Two screw terminals are provided for each output channel. The return screw terminals are bussed internally.

Power Requirements

External 24 VDC power is required for 4-20 mA analog outputs. All TrakPak Packaged Systems provide 24 VDC to power 4-20 mA outputs and your external circuitry.



Sixnet Technology Park • 331 Ushers Road • Ballston Lake, NY 12019 USA • +1 (518) 877-5173 • support@sixnet.com

Section 8 Combination I/O Modules

Applicable Part Numbers

This section documents the following modules:

ST-MIX16880-D
ST-MIX12884-D

Overview

The ST-MIX16880-D and ST-MIX12884 are high density combination I/O modules that will accept **10 – 30 VDC**. It can easily provide a solution for an application requiring a mix of discrete and analog, inputs and outputs. These modules can replace several I/O specific modules thus saving space & money.

Discrete Inputs

The ST-MIX16880-D has 16 discrete inputs and the ST-MIX12884 has 12 discrete inputs.

Sinking or Sourcing Discrete Inputs

(First four on ST-MIX12884 or all sixteen on the ST-MIX16880)
This group of inputs may be configured as sourcing inputs (ON when positive voltage is applied) or sinking inputs (switch closures to ground). There is a selection jumper in the module's base that is easily accessed by unplugging the logic module and opening the hinged door. You must also make a similar selection in the Discrete Options window in the I/O tool Kit software. The module performs a check to verify that the hardware and software selections match. Refer to the wiring diagrams on the next page for more information.

Sourcing Discrete Inputs

(Second group of eight discrete inputs on the ST-MIX12884 only)
This group of eight discrete inputs on the ST-MIX12884 is sourcing only with the standard 10 – 30 volt range. The input will be ON when a positive voltage is applied to the terminal.

Adjustable Threshold Voltage

(First four discrete inputs on ST-MIX12884 only)
This group of inputs may be modified to transition at a threshold voltage lower than the factory setting. This is accomplished by soldering a resistor into the base at the indicated location, according to the following chart. Please note that this resistor is only creating a reference voltage and therefore only needs to be rated for 1/8 Watt or less:

For this range:	Install this resistor:
9 volts	standard range – no additional resistor required
7 volts	9.3K
5 volts	2.4K
3 volts	1.1K

Desired ON Voltage	Hysteresis – channel 1 & 2 only (High speed counter)		Base Resistor value	Equivalent paralleled value
	Actual ON	Actual OFF		
9 (Default)	-	-	None	3.65K
7	5.3	4.2	9.3K	2.62K
5	3.3	2.1	2.4K	1.42K
3	2.0	0.8	1.1K	845 ohms

Discrete Input Counter Feature

The first eight discrete inputs can be configured as counters with a flexible choice of modes. These counters report their values in corresponding 16-bit analog input registers. Options for fast (5 mS) or slow (25 mS for contact bounce filtering) response providing a maximum count rate of 100 Hz or 20 Hz counting, respectively. The 1st channel is a high speed counter and can count up to 20 KHz. Available counter modes are pulse, rate and run-time. See the I/O Tool Kit help for more information on these modes. Note: These counters initialize at zero each time power is cycled. They cannot be reset under software control.

Discrete Outputs

The eight discrete output channels in each combination I/O module can source 10 to 30 volts DC to each load. All of the outputs return to a common ground (terminal 18). Refer to the wiring diagrams on the next page for more information.

Watchdog Output

The first discrete output can be configured to be a watchdog output. This system performance monitor will be ON if the output module is functioning normally, the gateway is functioning normally or the ST-Bus communications are occurring normally.

4-20 mA Analog Inputs

There are eight analog input channels available in each combination I/O module that will accept 4-20 mA signals from a wide variety of field devices. One screw terminal is provided for each input signal. The inputs all return to a common ground (terminal 18). Refer to the wiring diagrams on the next page for more information.

Open Loop Detection Feature

This module can detect and report an open instrumentation loop on its analog inputs. By allowing the module to report a negative value if the current falls below 4 mA, low limit logic in your DCS, PLC, RTU or computer can signal the loss of current. To enable this feature, select the "Go Negative Below 4 mA" software setting for each channel in the I/O Tool Kit software.

Self-resetting Current Shunts

Each 4-20 mA input channel has a 100 ohm, high precision (0.1 percent) shunt across its input to develop a 2 volt signal when a full scale 20 mA input is applied. Each shunt is located in the module's base, assuring a continuous circuit even if the logic module is removed from the base. If excessive voltage is applied to an input, a self-resetting fuse will open to help prevent the shunt from overheating.

4-20 mA Input Scaling

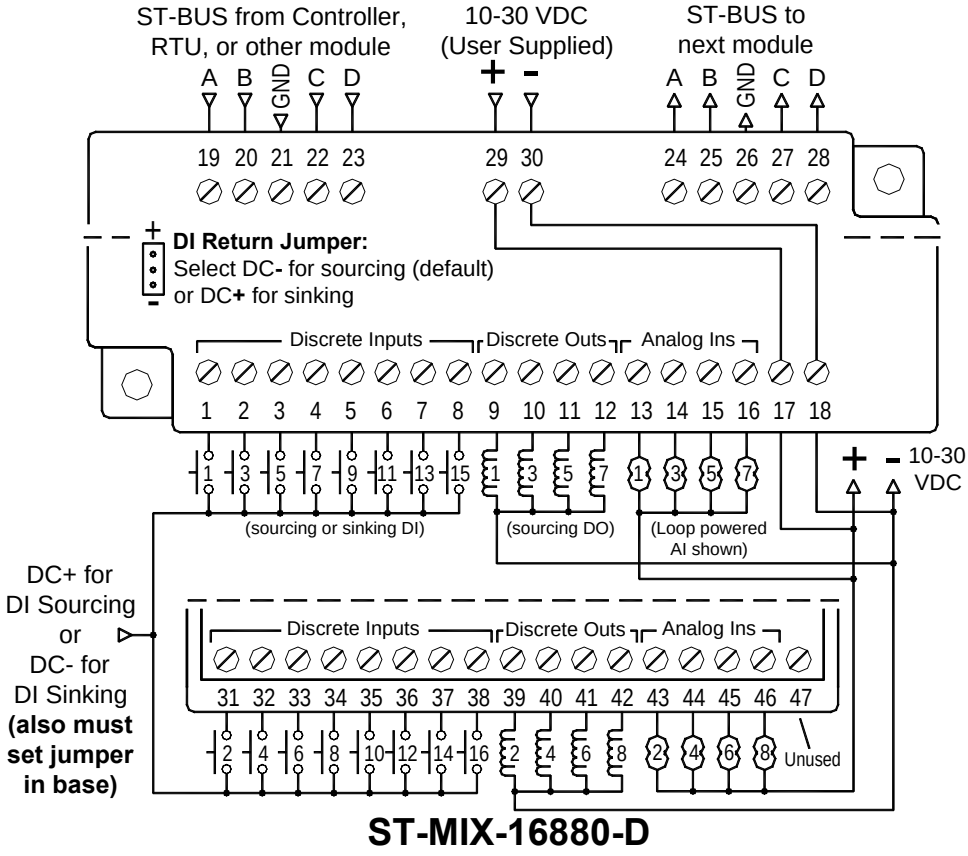
Current inputs are reported as unscaled values from 0 to 32767. Refer to the I/O Tool Kit online help system for more information.

Reading Voltage Analog Inputs

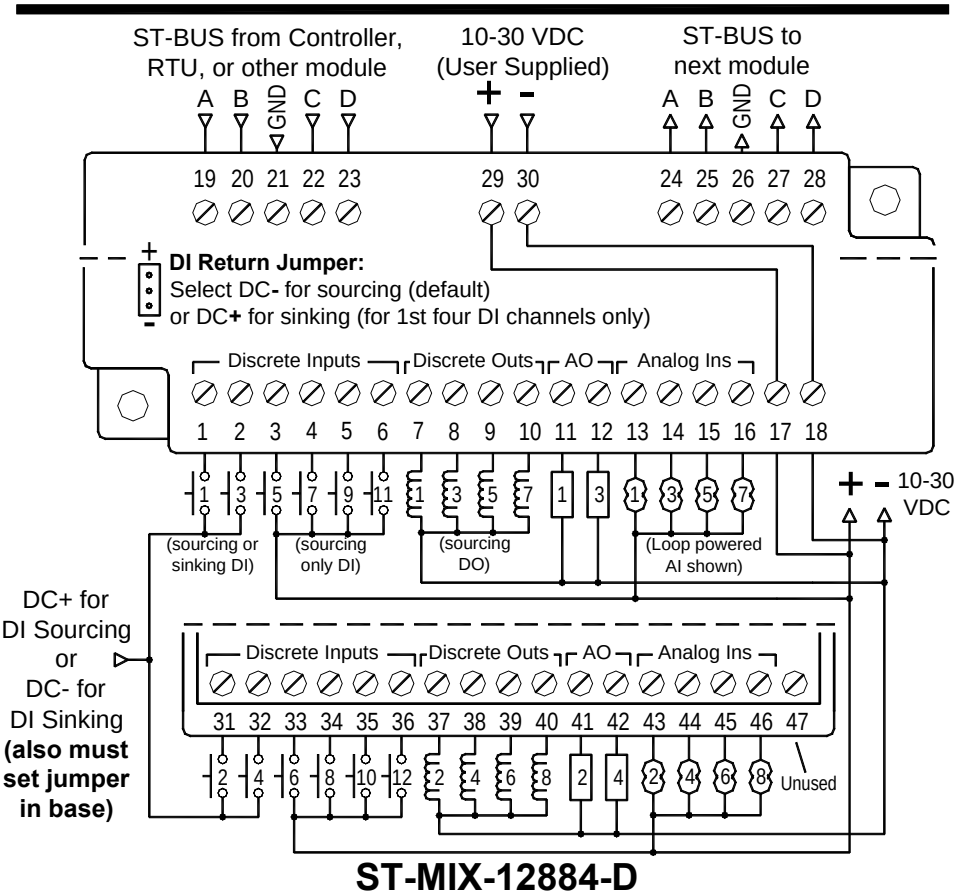
As an option, a voltage divider may be factory populated to replace the 20 mA (100 ohm) shunt of one or more input channels. These alterations are made in the wiring base, so they may be tailored for particular installations. (The logic modules are not altered so they remain interchangeable!) Voltage operation may be configured in the I/O Tool Kit by selecting the appropriate range for the corresponding input. Consult Sixnet for ordering instructions.

4-20 mA Analog Outputs

There are four 4-20mA Analog Outputs in the ST-MIX12884, providing 16 bits of resolution at each channel. A single terminal is provided for each output channel. Care must be taken to provide a suitable instrumentation ground for these output circuits. Refer to the wiring diagram for more information.

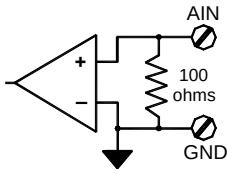


ST-MIX-16880-D

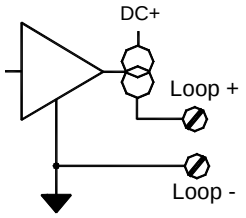


ST-MIX-12884-D

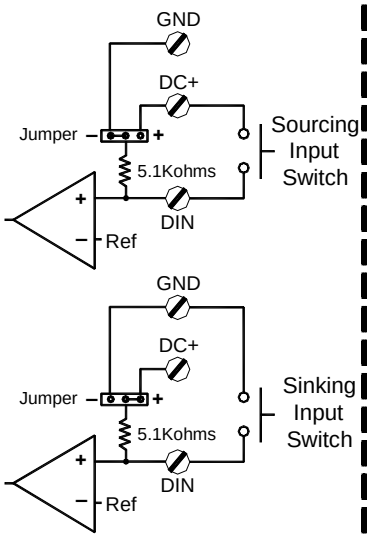
Equivalent Analog (4-20 mA) Input Circuit



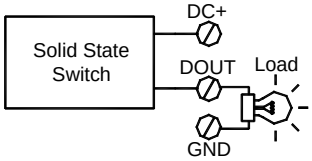
Equivalent Analog (4-20 mA) Output Circuit



Equivalent DC Input Circuits



Equivalent DC Output Circuit
(sourcing only)



Section 9 Maintenance Information

Local Diagnostics

Local diagnostics can be performed through any available port of the controller, even while it is responding to messages on another port. Diagnostic software, such as the I/O Tool Kit, can be used to display the status of the I/O registers.

Status LED

The "Status" LED on each module may be observed in one of five states:

ON
The module is configured properly and communicating with the controller.

OFF
There is no power to the module, or the status LED is being turned off intentionally by the I/O Tool Kit during the module linking operation

LONG BLINK
.75 sec. ON, .25 sec. OFF
Long blinking indicates one of two conditions. Either the module has lost communication with the Sixnet controller for more than 10 seconds, or the module has not received configuration data yet. Upon initial system startup (no configuration) this should be the observed LED state on each module.

SHORT BLINK
.25 sec. ON, .75 sec. OFF
Short blinking indicates a failure of the module self test upon powerup.

WINKING
10 blinks/ sec.
A status LED may be winked by the I/O Tool Kit utility to bring attention to the module. This winking occurs during module linking procedure. Refer to the online help in the I/O Tool Kit for more information.

Hot Swap Feature

I/O modules may be unplugged from their bases, even in live systems. **SixTRAK** I/O modules automatically self-configure from system memory. Analog I/O logic modules will automatically upload and self-adjust to user calibration settings (if any are present) from the module base.

Calibration

All **SixTRAK** analog I/O logic modules are factory calibrated over all supported ranges using a regularly maintained set of standards. Factory calibration data is stored in permanent memory in the logic module, and cannot be altered. User recalibration may be performed, but is necessary only if inaccuracy in your field device is observed, or if any of the 100 ohm input shunts are replaced with low tolerance resistors. Each analog channel has span and offset calibration settings. Span is the "range" or "gain" of the channel. Offset is the "zero" setting. Each reported analog I/O value is the product of the factory calibration value times the user calibration value. The user calibration value is defined as: **(user span value * raw value) + user offset**. The user span is a unity value (1) by default. The user offset is zero by default.

Note: All factory and user calibrations are performed in software. There are no adjustment potentiometers inside the logic modules.

User calibrations are performed using the I/O Tool Kit utility. Refer to the I/O Tool Kit on-line help system for information on calibrating **SixTRAK** analog I/O.

4-20 mA Shunt Replacement
Many **SixTRAK** 4-20 mA input channels feature a 100 ohm field replaceable shunt for each channel. These high precision shunts are located behind the access door inside the analog input module's base. A spare shunt is provided for your convenience. If factory supplied shunts are used for replacements, recalibration will not be necessary.

Replacing Analog I/O Modules
Note: It is not necessary to recalibrate analog I/O if a logic module is replaced.
Analog logic modules may be hot swapped and will not require recalibration. User calibration data is stored in system memory outside of the analog module. Factory calibration data is stored in memory in the plug-in logic module. Since all logic modules are calibrated to the same factory standards, recalibration is not necessary if logic modules are moved or replaced.

Section 10 Service Information

Product Support

To obtain support for **Sixnet** products, call **Sixnet** and ask for Applications Engineering. Our phone numbers are:

Phone: +1 (518) 877-5173
Fax: +1 (518) 877-8346
E-mail: support@sixnet.com
Visit us on the Web: www.sixnet.com

Our mailing address:
Sixnet Technology Park
331 Ushers Road
Ballston Lake, NY 12019

Warranty

The warranty for **SixTRAK** products is stated earlier in this manual.

Service Information

We sincerely hope that you never experience a problem with any **Sixnet** product. If you do need service, call **Sixnet** at (518) 877-5173 and ask for Applications Engineering. A trained specialist will help you to quickly determine the source of the problem. Many problems are easily resolved with a single phone call. If it is necessary to return a unit to us, an RMA (Return Material Authorization) number will be given to you.

Sixnet tracks the flow of returned material with our RMA system to ensure speedy service. You must include this RMA number on the outside of the box so that your return can be processed immediately.

The applications engineer you are speaking with will fill out an RMA request for you. If the unit has a serial number, we will not need detailed financial information. Otherwise, be sure to have your original purchase order number and date purchased available.

We suggest that you give us a repair purchase order number in case the repair is not covered under our warranty. You will not be billed if the repair is covered under warranty.

Please supply us with as many details about the problem as you can. The information you supply will be written on the RMA form and supplied to the repair department before your unit arrives. This helps us to provide you with the best service, in the fastest manner. Normally, repairs are completed in two days. Sometimes difficult problems take a little longer to solve.

If you need a quicker turnaround, ship the unit to us by air freight. We give priority service to equipment that arrives by overnight delivery. Many repairs received by mid-morning (typical overnight delivery) can be finished the same day and returned immediately.

We apologize for any inconvenience that the need for repair may cause you. We hope that our rapid service meets your needs. If you have any suggestions to help us improve our service, please give us a call. We appreciate your ideas and will respond to them.

For Your Convenience:
Please fill in the following and keep with your **Sixnet** system for future reference:

P.O. #:_____ Date Purchased: _____

Purchased From:_____