



The TransPortTM System



Innovation in Industrial Computer I/O

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Introduction to Transition Technology Inc.

Transition Technology Inc. manufactures a complete line of products that make up an Input/Output System called the TransPort System. The TransPort System consists of Discrete Input and Output Modules, Analog Input and Output Modules, Power Supplies, Termination Bases, Computer Interfaces, Communication, and Software.

The TransPort System provides the intelligent interface between the industrial automation computer and field mounted sensors and actuators. The TransPort System modules provides for easy hardware and software interfacing with a wide variety of computers used in industrial automation.

The TransPort System accurately monitors all the measurements necessary to control the batch process and/or automated machinery found in industrial production and process facilities in the chemical, food, pharmaceutical, textile, metals, power, water and waste treatment, etc. industries. The applications include the monitoring and control of temperature flow, fluid levels, pressures, sequence, logic, position, motions, etc.

The TransPort System controls and monitors your system with input/output modules that have the ability to solve common application problems. The intelligence in each module, combined with a high speed serial bus, allows the computer to perform high speed logic and analog control simultaneously. This is accomplished without adding additional specialized operating systems or software programs. This analog and discrete capability allows the computer to operate as both a programmable logic controller and a process controller without the loss of speed normally associated with the mixing of logic and analog control.

The Transition Technology product line also includes interfaces to several different types of computers, including Digital Equipment Corporation VAX and MicroVAX, Motorola's VME systems, Intel's Bitbus systems, Intel's Multibus 1, Intel's SBX ports, STD bus computers, Modicon and Allen-Bradley programmable logic controllers, etc.

The communications bus, the I/O modules, the power supply modules, and the termination bases are identical in all systems regardless of the host computer. The only change, when applying the TransPort System to your specific computer control system, is the computer interface board and the specific software operating system and application software.

Introduction to the Manual

Transition Technology Inc. designed this manual to help you understand the basic concepts of the TransPort System, install your system and use the TransPort System software to set up and configure your modules. The manual was designed to help you perform the functions in the system. Detailed drawings, charts and examples of software screens are included to help you visualize the concepts of the system. An appendix is included in the back of the manual listing additional detailed information in chart format.

Introduction

Customer Support

Transition Technology Inc. designed the TransPort System to be easy to use. However, if you have any questions about the TransPort System, a Transition Technology Inc. representative is available to answer your questions. If you encounter any problems, please try the following:

1. Read the section of the manual that contains information about the procedure you are trying to perform.
2. Use the help functions designed in the TransPort Setup and Configuration System.
3. Write down the procedure you tried to follow.
4. Try to be at your computer when you place your call.
5. It would also be helpful if you have the following information completed:

TransPort System Setup and Configuration Software

Software Version:	_____
Computer Make and Model:	_____
Amount of Memory (RAM):	_____
Type of Monitor	_____
Type of Printer	_____
DOS Version	_____

Module Information

<u>Model Number of Module(s):</u>	<u>Serial Number of Module(s)</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Interface

Software Version:

Computer Make and Model

Port Address

Memory Address

Interrupt Request

Dip Switch Settings

The Transition Technology support number is:

1-800-535-7075

FAX: 508-388-5317

The TransPort System Theory of Operations

Introduction

The TransPort System was designed to interface with the host computer and third party software that is best suited for your application needs. This section explains, in detail, information to operate the TransPort System. However, all you need to do is configure the TransPort System using the TransPort Setup and Configuration Software and install the system as outlined in the installation sections of this manual.

How to use this Section of the Manual

This section of the manual was designed to help you understand the basic concepts and components of the TransPort System. The section is divided into two main areas. The first area is a brief overview of the components. The second area covered is a more detailed look at the components of the TransPort System.

The TransPort System Major Component Overview

The **TransPort System** is a distributed and intelligent input/output (I/O) system designed to interface with almost any industrial automation computer and the factory sensors and actuators used for control and monitoring. The TransPort System consists of the following major components:

Software:	The Input/Output driver application software (or third party software) and the TransPort System Setup and Configuration Software , which initiates and controls the TransPort System .
Hardware:	The Intelligent Input/Output Processor (interface), which interfaces between the host computer and Input/Output System.
TransNet or Communications Network	Which is the network that allows for communication between the host computer interface and the Input/Output modules.
Input/Output Modules:	Provides the connection between the factory environment and the TransNet Communications Network.
Power Supply or Power Supply Adaptor	Which provides the power for each module, and
Computer:	Which is responsible for controlling the entire TransPort System process.

Application Software

The host computer application software performs the control/monitoring functions required to control the process. The control functions are provided in one of three types of packages:

- Third party software packages,
- Hardware/software solutions; or
- Custom software packages.

NOTE: The host computer can also be used to configure the TransPort System using the TransPort System Setup and Configuration Software.

The third party software packages are offered by a variety of companies which specialize in complete, integrated control packages. These packages provide the control functions, and the operator interface. Most of these packages also provide functions for data logging, alarming, and trending.

Transition Technology Inc. has worked closely with each software vendor to ensure that the driver linking the third party software package to the TransPort System has been properly defined and implemented. In most cases, before a driver is released, it is qualified by both Transition Technology Inc. and the vendor. This list continues to grow as the system is ported to many different software packages and computer platforms.

The hardware/software solutions provide specialized hardware platforms, which are co-processors, and execute their control programs independent of the host CPU. These solutions were designed to provide high performance and repeatable, predictable operations, which would not be affected by the host computer interrupts or other periodic host requirements.

Custom software solutions are used when the requirements for controlling the process cannot be met by standard software packages. These solutions require the use of the Transition Technology Inc. Software Tool Kits, which are available for the Microsoft "C", and Turbo "C".

The TransPort System Setup and Configuration Software

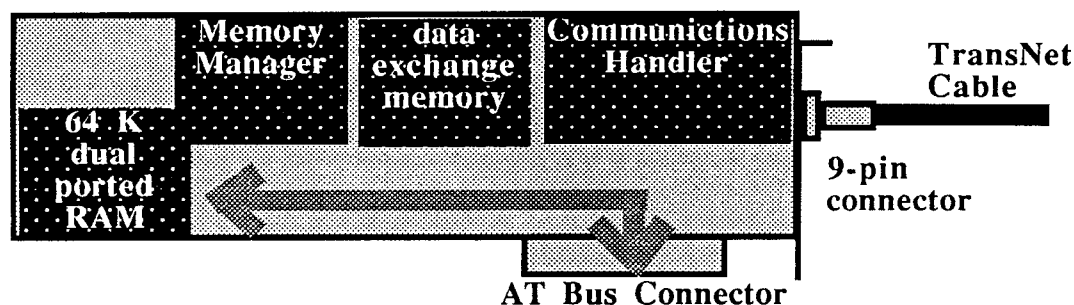
The TransPort System Setup and Configuration Software provides the user with a simple, easy to use interface for configuring and documenting the TransPort System. Through the use of "pop-up" menus, help windows, and selection windows, the user is guided through the operations and parameters required to be entered to make the TransPort System operational.

The TransPort Setup and Configuration software is divided into sections dedicated to a specific type of operation. For instance, there is a section devoted to setting the system parameters, a section for configuring the Input/Output modules, and a section for configuring the characteristics of each channel on a module. Each section contains context specific help screens, field selection windows, and documentation features.

The Intelligent Input/Output Processor (interface)

The Intelligent Input/Output Processor (interface) is the interface between the host computer and the Input/Output system. The interface controls the communication on the TransNet Network, stores the input data (received from the input modules) in memory accessible by the host, collects and sends to the output modules the data written by the host and interprets and executes any system commands issued by the host. The interface makes the operation of the TransPort System transparent to the host computer and the applications program running on the host computer.

To provide the flexibility and control required for the TransPort System, each interface has been designed with two micro-processors, each with a dedicated set of responsibilities. The following diagram illustrates the architecture and the data flow of the IBM PCAT interface.



The TransNet Communications Network

The TransNet Communication Network provides the communications link between the interface and the Input/Output modules. The TransNet Communication Network consists of the physical cable (twinaxial) and the TransNet Network protocol. The cabling can be installed with up to one mile in two directions of cable from the host computer. The cables listed below are recommended for use:

Manufacture	Cable No.	Size (AWG)	Loss/100 ft. (db @ 2Mhz)	Impedance (ohm's)
Belden	9182	22	0.41	150
Belden	9860	16	0.37	125
Alpha	9823	22	0.51	150

The TransNet Network operates at 375 Kbaud with frequency shift keying between 1.5 Mhz and 2.0 Mhz. The protocol is a time slot protocol which is synchronized by a signal from the interface sent to the transmit/receive timers in each module. During the configuration process, each module is given a time slot on the network during which the module will transmit and receive data to and from the interface. This synchronization/time division approach to communications allows the high throughput rate of the network. Each message transmitted contains the following format:

slave address - command-module status - data - CRC16

In addition to the CRC16 error checking, the system also checks the integrity of each character frame received. The CRC error checking decreases the probability of undetected errors to one every two million years in the presence of an error rate of $10E-6$.

Network Topology

The TransNet Network has been designed to allow a flexible and easy to install system. As the physical media is a coaxial, no expensive taps or splitters are required and no special skills are needed to install the cable. The TransNet Network can be installed in a variety of configurations to meet the requirements of the application. The following network topologies are supported:

Direct Connect

Each module is connected directly to the main line.

Multi-Drop

Each module is connected to the main line via a drop line.

Clusters

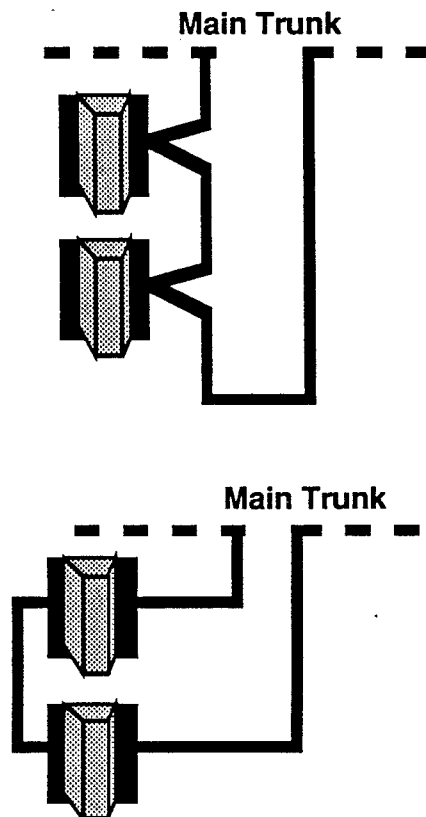
A group (cluster) of modules are connected to a single drop line which is connected to the main line.

The maximum drop length for multi-drop and cluster topologies is 16 feet.

The TransNet Network cabling is connected to the I/O module termination base. The termination bases are designed to provide a continuous communications path, there are no active components within the termination bases which affect communications. Each set of terminals for the TransNet Network are connected within the base via copper circuits. The TransNet Network does not support ring, star, or tree configurations.

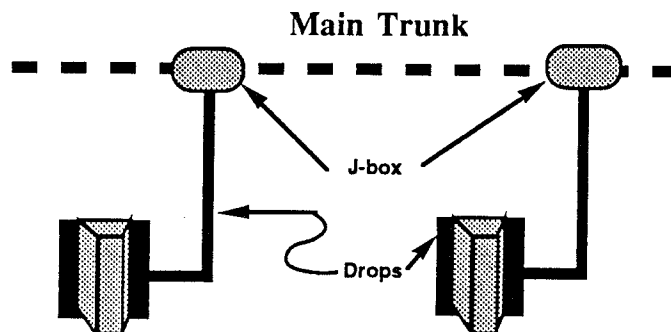
Direct Connect

As shown in the following diagram, the main line is brought in on one set of terminals on the termination base. The main line is brought out on a second set of terminals. There is a terminating resistor at the physical ends of the TransNet Network.



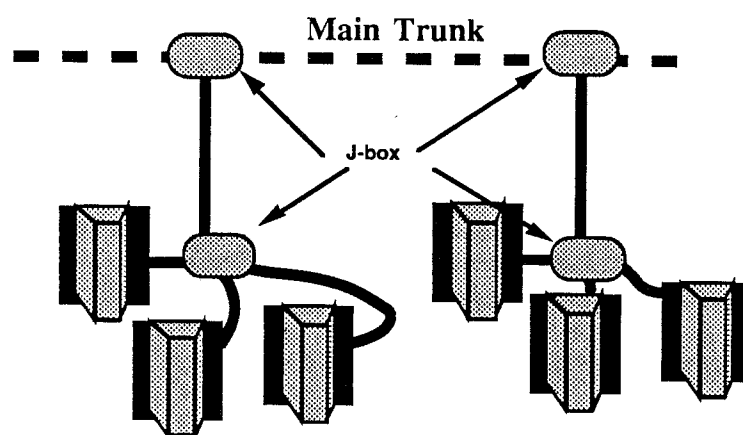
Multi-Drop

As shown in the diagram, the modules are connected to the main line via short (16 feet) lengths of cable. The connections to the main line consist of simple screw terminal strips. The module is connected to the drop cable via the termination base connection. There are no terminating resistors required at the drops, however, the physical ends of the main line are terminated.



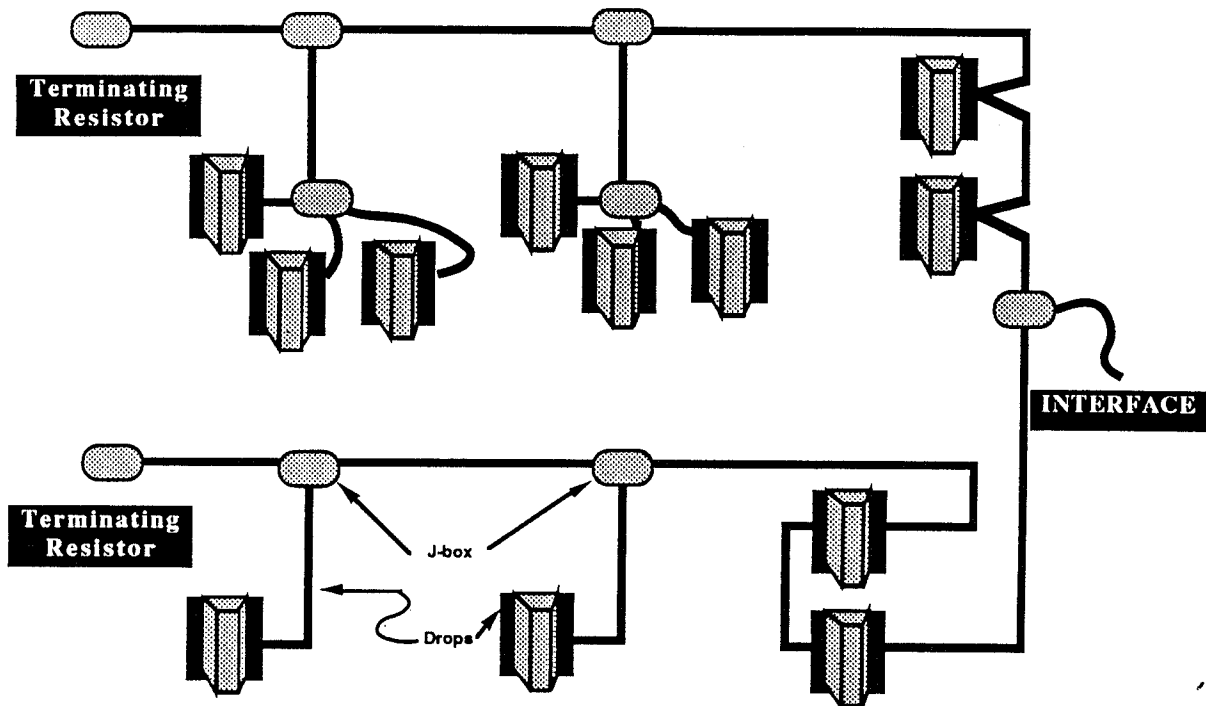
Clusters

Cluster topologies are a variation to the multi-drop topology. The difference being that multiple I/O modules are connected to a single drop cable, via a screw terminal connection. This type of configuration provides a simple and cost effective means of connecting a group of modules to the main line. There are no restrictions as to the number of I/O modules within a cluster. However, the maximum cable distance between any module and the main line must be less than 16 ft. and there must be only one cluster per drop.



Theory

The following drawing shows all three topologies.



The Input/Output Modules

Input/Output modules are available in different signal values and types to meet the requirements of most applications. Modules are available in 8, 16, and 32 channel configurations. The input modules convert the field signals into digital values, which are sent to the host computer (via the interface). Conversely, output modules receive data from the host computer, via the interface, and convert the data to signals to drive field devices. Each I/O module plugs into a termination base, where the field wiring and communications wiring is connected. The modules can be removed from the bases without disconnecting or disturbing the power or field wiring. This is called Hot Swapping the Modules.

The **TransPort System** Input/Outputs consist of a termination base and an electronics module. The termination base provides a means of wiring field devices and the TransNet Network to the I/O module. Each I/O channel connection is made to terminals on the termination base, each terminal is capable of holding two 14 gauge wires by means of captive screw terminals. Each termination base has an EARAM (non-volatile memory), which contains the channel configuration data. This information is down loaded to each module by the **TransPort System** Setup and Configuration Software. This allows the modules to be hot swapped without re-configuring the module.

The Power Supply

The power supply provides the power required for the electronics of the Input/Output modules. The power supply connects directly to the TransNet Network cable. The power required by the modules varies according to the type of module. Refer to the Appendix for the power requirements of each type of module. Since the power is supplied over the communication cable, there will be an IR drop (voltage drop) due to the resistance and distance of the cable between the power supply and the module. The modules operate on voltages from 15 VDC to 35 VDC. Module power may be derived in two ways:

- Individual 20 watt power supplies
- Power Supply Adaptor for 100 watt supplies

Individual Power Supply

The PS-01 power supply provides 20 watts of power and can power a few modules, up to 6 depending upon the type of module. The PS-01 is a convenient means of powering a small system or drop. Multiple PS-01 power supplies may be connected on the system. The PS-01 are not isolated from each other and will load share.

Power Supply Adaptor

The PSC24 Power Supply Adaptor interfaces standard regulated power supplies to the TransPort System. The Power Supply Adaptor includes filters and noise suppression components which prevent the communication signal on TransNet from going out on the incoming power lines and rejects noise coming in on the incoming power lines. Each Power Supply adaptor is capable of 100 watts of power for the modules. Multiple Power Supply Adaptors may be connected on the system with each supply isolated from the other. The PSC24 Power Supply Adaptor has provisions for switching back up power supplies including battery back-up if desired.

Details of the TransPort System

This portion of the Theory of Operations will now take a more detailed look at the components of the TransPort System.

The TransPort System Setup and Configuration Software

The TransPort System Setup and Configuration Software is designed to prompt you, step by step, from selections on a main menu to configure your modules without any prior computer experience. Through the use of "fill-in-the-blanks" and listed selections on "pop-up" windows, you can easily set the parameters of your computer to match the settings you selected when you installed your interface into your computer.

You can also configure your modules by simply typing in module specific information as you install each module onto the TransPort System. For example, you can assign a discrete input module to the system; then configure the module for input filter time constants, capture and latching momentary contacts, and selection of an input channel as a counter. The TransPort System allows you to store this information in an on-line or off-line mode of operation, until you are ready to reconfigure your modules. The TransPort System also allows you to print out, save or store module specific information by either writing to a file or printing out the information on your printer.

The "C" Tool Kit

The TransPort System "C" Tool kit is offered for those customers who prefer or wish to develop their own, control/monitoring programs. The "C" Tool kit is written for the Microsoft C Compiler (Version 6.0).

The "C" Tool kit is available as a library file. The functions provided allow the user to access the interface Input/Output tables without concern for memory locations and handshaking. Each function uses module addresses and channels as parameters. The functions take care of the housekeeping associated with the TransPort System, such as resetting of latches, and obtaining module status information. The following functions are provided in the "C" Tool kit:

discrete channel	write discrete channel
read discrete group	write discrete group
read discrete module	write discrete module
read analog channel	write analog channel
read analog module	reset analog max channel
read counter	reset analog min channel
read analog max channel	reset counter
read analog min channel	get module status
read analog max module	start module
read analog min module	load and start interface with file
start interface with address	
start interface	
stop interface	

Most functions have the following format:

function (board number, module address, channel number, buffer, type);

The functions return either the number of bytes of data transferred or if an error occurred, a negative error code.

The Intelligent Input/Output Processor (Interface)

The interface consists of:

- 64 K bytes of dual ported RAM
- Memory Manager CPU
- Communications Handler CPU

The TransPort System has two modes of operation controlled by the interface:

Mode 1 - Broadcast Mode

Mode 2 - Command/Response Mode

Mode 1 (Broadcast Mode) is the normal run mode and provides the high speed communications for real time control. In this mode, the interface automatically collects, stores and writes I/O data.

Mode 2 (Command/Response) is used for configuring I/O modules, and is interleaved with the broadcast mode to allow module specific data to be read and reset, i.e., obtaining analog peaks and valleys, resetting of latches and input counters.

The Memory Manager Operations

The interface memory manager is responsible for the following functions:

- Dual Port Memory Access by host
- Storing of input data in data table
- Retrieving and building output data messages
- Configuration Control
- Validation of CRC-16 checks on received messages
- Control of Communications Handlers Operation
- Interface Diagnostics

The memory manager executes its program in parallel with the communications handler. While the communications handler is sending/receiving data on the TransNet Network, the memory manager is validating and storing the data received from the last I/O scan and building output messages to be used the next I/O scan. This processing allows the TransPort System to obtain the high speed throughput necessary for real-time control.

Communications (Comm) Handler Operations

The communications handler is responsible for the transmitting and receiving of data to and from the modules. Included in the reception of data is the calculation of the CRC-16 checksum. There are two types of functions in the Communications handler: Standard and Command Response.

Standard Functions

When the memory manager sets the communications mode to be broadcast, the communications handler operates in the following manner.

- Transmit broadcast command
- Receives data from all I/O modules
- Transmits output data from buffer loaded by memory manager
- Exchanges buffers with the memory manager
- Repeats operation

Command Response Functions

- Command response functions allow the user to collect/reset module specific data which is not available as part of the normal communication sequence. Retrieving analog input peaks and valleys is a typical example of an advanced function.
- These functions require that commands and module addresses be loaded into the command buffer and the memory manager notified that a new command is pending. The memory manager will issue the command during the next I/O scan and place the response to the command in the response buffer.
- These commands for the most part are part of the driver functions for supported software packages. They are also included in the Driver Toolkits.

I/O Modules Operations

Each Input/Output module contains its own CPU, which has four tasks. The CPU in the module handles the communications, (on a time slot basis), reads and writes the inputs/outputs, processes the inputs and outputs, and performs diagnostics.

The reading and writing of I/O channels is the primary task, which is executed continuously and asynchronously to the communications and other modules. This task is responsible for the filtering and latching of input data, linearization and scaling of the analog data. For output modules, this task writes the output states (values) to the output channels, monitors the outputs (monitoring modules only) for being in the correct state, and controls the channel LED indicators. After each I/O scan, the module CPU runs a portion of its diagnostic routine to verify the integrity of the hardware and software.

The communications task is executed on a time slot basis. Each time the interface transmits a broadcast command, the modules set their transmit and receive timers (timer values are down loaded by the TransPort System Setup and Configuration Software). For input modules, when the transmit timer expires, an interrupt is issued and the CPU starts transmitting the latest I/O data. For output modules, when the receive timer expires, an interrupt is issued and the CPU reads in its output data. For combination modules, both of these operations occur. These operations are synchronous and each module on the TransNet Network transmits and/or receives data at a predefined time interval.

Operation of the Input Modules

Discrete Input Modules

The discrete input module converts the voltage signals generated by factory sensors, such as push buttons, pressure switches, etc., into useable data for the host computer. The conversion process requires that the input voltage must be above the threshold voltage of the particular module and the voltage must be applied for a time period longer than the filtering time specified when configuring the module.

The module software filters out (deglitches) the electrical noise generated by factory environment allowing the true state of the input to be determined. When the state has been stable for the filtering time specified, that value is stored in the memory of the module and retrieved by the interface.

The filtering times are set by the user in the TransPort Setup and Configuration Software. Filter times tell the module how long an input signal must be stable before it is accepted. The impact of the filter time is equivalent to a resistor/capacitor network in electronics. The advantage of being able to set the filter time by using the TransPort Setup and Configuration Software allows the user to create custom R/C time constants for each channel.

The input module latches operate in the same manner as conventional hardware latches. When an input is above a specified level for a specified period of time, the output of the latched status is turned on. This latch state remains on until a reset line of the hardware latch is turned on.

The operation occurs within the input module except the operation is performed in the software. Once an input that is configured for latching operations is ON, the module will continue to send an ON state to the interface until it receives a reset command. The input can turn OFF or can cycle ON and OFF, but the state will always be ON as seen by the interface. This allows the capture of the input signals, which may be on for only short time periods, and ensures that the application program "sees" that signal. If filtering times are not specified, DC module inputs must be on for a minimum of 400 microseconds and AC module inputs must be on for one cycle of the line frequency (50 - 60 hz).

Counter modules are identified with a C suffix (in the product name), for example, DI2432C. These modules have the ability to record the number of times an input changes state for the first four inputs. The user can select whether the count will be incremented on the rising (positive transition) or falling (negative transition) edge of the signal. Each time the input changes state in the configured direction, the count for that input will be incremented. The maximum count rate is 450hz with a minimum ON time of 400 microseconds and minimum OFF time of 400 microseconds. The channel counter will count up to 64K (65533) and roll over.

The operation of the counters is independent of the latches. If one of the first four inputs is configured for latching operations and the input cycles while the latch state is ON, the counter will record those transitions.

Analog Input Modules

The analog input modules convert an analog field signal to a 16 bit value. The 1-5Vdc inputs are represented by 6552 to 32,760. Examples of field devices that generate analog signals are thermocouples, pressure transmitters, flow transmitters, potentiometers, etc. The signals accepted by the input module are common plant floor signals such as millivolts, 0 to 5 volts, 1 to 5 volts, 4 to 20 ma, and thirteen different types of thermocouples.

Inputs are filtered using software filters with user-configured filtering times. Thermocouple signals are linearized to present temperature. Peaks and valleys can be enabled to allow the modules to record the highs and lows for each channel.

The TransPort Setup and Configuration Software can be used to configure each individual channel. Parameters that can be configured are channel type, filter time, burn-out state for thermocouples on a per channel basis. Peak and valley can be configured on a per module basis.

Operation of Output Modules

Discrete Output Modules

The discrete output modules convert the digital data, generated by the applications program and transmitted by the computer interface board, into voltage levels usable by factory devices. For example, these signals can be used to drive solenoids, or lights directly, or, through power contactors or interposing relays, drive high power devices such as heaters, indirectly.

Output modules are available with 16 channels, and are capable of driving 2 amps each with a maximum of 20 amps per module.

Each output channel is protected against current surges and voltage spikes generated when turning ON/OFF inductive loads. Each output channel also has removable fuses. The output modules are capable of being HOT SWAPPED (replacing the module without removing power). This allows a failed module to be replaced without shutting down the control system or disturbing the field wiring. Each module configuration is stored in non-volatile memory in the termination base. The user has the ability to configure each channel of the output module for the following operations:

- Power-up default state
- Communications failure default state
- Filter times for modules with output monitoring

These features are set by the user in the TransPort System Setup and Configuration Software.

Power-up Defaults

The user can set the power-up defaults to be either ON or OFF (OFF is the default setting). When a module has completed a power-up cycle (module power not field power) each output channel is set to the power-up default state.

Communications Defaults

The user can set the communications defaults to either ON, OFF or hold last state (set to OFF from the factory). When an output module has had either a communications time-out (no communications) or detected five consecutive communications errors, the module will illuminate its FAULT and COMM ERROR LED's and set its outputs to their configured communication fault default states.

Filter Times

For output modules with monitoring capabilities (i.e. DO0216M) the user can set the filter time for each channel. The filter time is used in monitoring to determine the time in which the output should have changed state. If the output has not changed to the correct state within this time, an output mismatch error is declared. Under this condition, an error is reported to the computer interface board and the module starts flashing its FAULT LED and the appropriate channel indicated LED in unison.

The monitoring of outputs is accomplished by detecting the presence or absence of current flow. If the current flow is greater than 40 Amps, then the output is detected as ON, less the 40 Amps if OFF. This detected state is compared against the state the output was set to. The differences between the two, after the filter time has elapsed, results in the declaration of a mismatch.

Typically outputs fail OFF (open circuit). For example, when fuses blow, wires break or actuators fail. In the rare event that an output fails OFF (short circuit), the module would have to be replaced.

Analog Outputs

The analog output modules convert a 12 bit number (but setup as +15 bits) to an analog signal used to control field devices. Examples of field devices that can be controlled are valves, dampers, speed controllers or any device that accepts a 0 to 20 ma signal or 4 to 20 ma signal.

Each channel can be configured so that on a loss of communications, the output either holds its previous value, goes to low scale, or goes to high scale, or an intermediate preset value. Also the channel can be configured so that during power-up, the output goes to low scale or high scale, or an intermediate preset value.

Power Supply

Power supplies are connected to the TransNet cable to provide DC power to the I/O modules on the TransNet Network. Multiple power supplies or multiple isolators can be used to supply adequate power to the TransNet Network. The power supply can be a PS01 or third party supply using a PSC24 isolator.

The PS01 Power Supply

This power supply provides 20 watts @ 30VDC of unregulated, unfiltered power. The I/O modules have internal regulators and filters. The PS01 accepts either 120 or 240 VAC line voltage. It uses the TE04 mounting base which has two line fuses and one DC fuse. A green power LED indicates if DC power is present.

The PSC24 Power Supply Adaptor

As an option, a third party power supply can be used if the PSC24 Power Supply Adaptor is used. The Power Supply Adaptor is required to separate DC voltage from the data signal. The power supply can be 16 to 35 VDC, unregulated and unfiltered, with no ripple at 1.5 to 2.0 Mhz. For example, two car batteries can be used. The current supplied is designed to run at 3 amps.

System Performance and Components Affecting Performance

The following components affect the TransPort System performance.

- Applications Program
- Module Latency (I/O update rate)
- Transport time (communications time)
- Interface Data transfer time

The applications program and the CPU speed of the host computer will have the largest single contribution to the overall system performance and system response time. The TransPort System is designed to run at maximum efficiency, independent of the host, and should provide the I/O response needed for most applications. For the purpose of this discussion, the system performance is defined as the time required to read and store all input data and write all output data (I/O scan time).

Initial System Start-Up

There are five easy steps for starting up the TransPort System for the first time:

- 1) Power Supplies for the system
- 2) Communications and Module Wiring
- 3) Setup & Configuration of the System
- 4) Installing the Interface for Configuration
- 5) Plugging in the Modules

Step 1- Power Supplies for the System

There are two methods of powering the TransPort System:

- 1) The PS01 Power Supply and TE04 Power Supply Base
- 2) The PSC24 Power Supply Adaptor

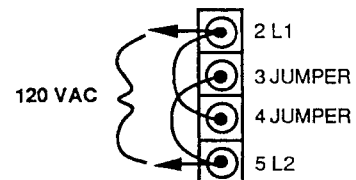
Using the PS01 & TE04 Power Supply and Termination Base

The PS01/ TE04 Power Supply is capable of providing approximately 20 watts of power. Multiple PS01/ TE04's will be required if the module power requirement is greater than 20 watts.

The PS01/ TE04 Power Supply requires jumpers to configure the use of the power supply with 120Vac or 220 Vac source power.

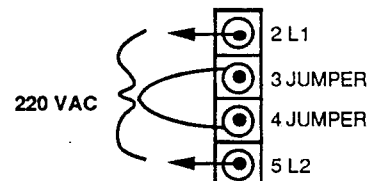
For the 120 Vac, the jumpers are set as follows:

- Connect Terminals 2 to 4 with a jumper
- Connect Terminals 3 to 5 with a jumper
- Connect the 120 Vac source to Terminals 2 and 5
- 16 guage wire (2580 circular mills)



For the 220 Vac, the jumpers are set as follows:

- Connect Terminals 3 to 4 with a jumper
- Connect the 220 Vac source to Terminals 2 and 5
- 16 guage wire (2580 circular mills)



Quick Reference

Using the PSC24 Power Supply Adaptor

The PSC24 Power Supply Adaptor allows the use of any commercial power supply that delivers between 16 and 35 VDC to power the TransPort System. The Power Supply Adaptor is capable of delivering a maximum of 100 watts of power at the appropriate voltages. Multiple PSC24's will be required if the module power requirement is greater than 100 Watts.

The connections of the DC power supply to the PSC24 are marked "MAIN IN":

- A The terminal marked (+) is the connection for the positive leg of the power supply
- B The terminal marked (-) is for connection of the negative leg of the power supply
- C The terminal marked  is for connection of earth ground.

The connections marked "MAIN OUT" are parallel connections to the "MAIN IN" power input terminals.

- A The terminal marked (+) is the connection for the positive leg of the power supply
- B The terminal marked (-) is for connection of the negative leg of the power supply
- C The terminal marked  is for connection of earth ground.

The PCS24 may utilize a back up power supply that will be switched automatically should the Main power supply fail. The connections for the back up power supply are Marked "BACKUP IN".

The connections marked "BACKUP IN" are for the backup power supply.

- A The terminal marked (+) is the connection for the positive leg of the power supply
- B The terminal marked (-) is for connection of the negative leg of the power supply
- C The terminal marked  is for connection of earth ground.

The voltage for the BACKUP power supply should be set 1.5 VDC below the MAIN IN power supply voltage because the second supply is connected through diodes.

The connections marked "RELAY, N.O., N.C." are for the Main supply indicating relay. These terminals are connected to the normally open, normally closed and common terminals of a relay that actuates upon loss of DC power at the MAIN IN.

The power for the modules is carried over the same twisted, shielded pair of wires used for communications to the modules. The wire is connected to the (+) and (-) terminals of the power supply or power supply adaptor. The shield should be connected to the (S) terminal.

Step 2-Communications & Module Wiring

Communications

The TransPort System communicates over twisted shielded pair of wires.
The recommended cables are as follows:

- Belden 9182- 150Ω
- Belden 9860- 125Ω
- Alpha 9823- 150Ω

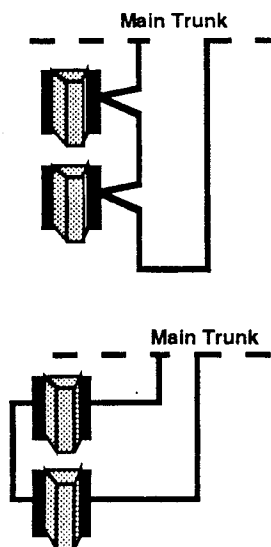
Each cable is capable of supporting distances of up to one mile in two directions from the interface (total of two miles end to end maximum). For very high module count (greater than 75 modules) and distances of one mile in two directions, lower attenuation cable must be used- consult factory for the vendor catalog numbers.

The cable connection to the module termination bases is recommended as either:

- Point to Point
- Multiple Drop

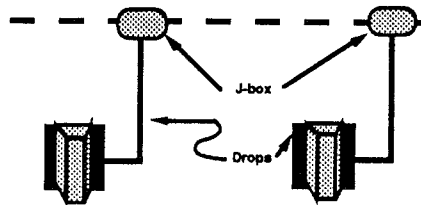
Point to Point Wiring

The termination bases show the communication connections as positive (+), negative (-), Shield (S), and $\oplus$. All the termination bases have two sets of terminals for the communications connections. These sets of terminals are connected in the termination base allowing one set to be used for connecting the communication input to the module and the other set of terminals for continuation of the communications signal to the next module. The connections for the communications is (+) to (+), (-) to (-), S to S.



Multi Drop

The communications system may be wired using multiple drops from a main trunk. The length of wire from the main trunk to the module should be as short as possible, and should not exceed 16 feet maximum.



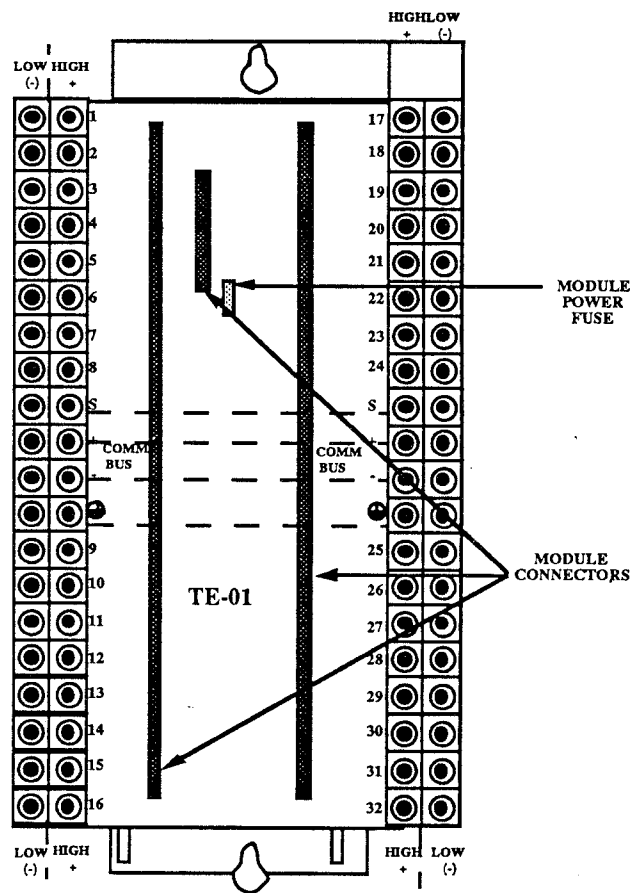
Terminating Resistors- depending upon the impedance of the cable you have chosen, the appropriate (100 Ω , 125 Ω , or 150 Ω) termination resistor must be installed at each end of the communication line. The computer or host is not necessarily at the end.

DO NOT PLUG IN MODULES YET

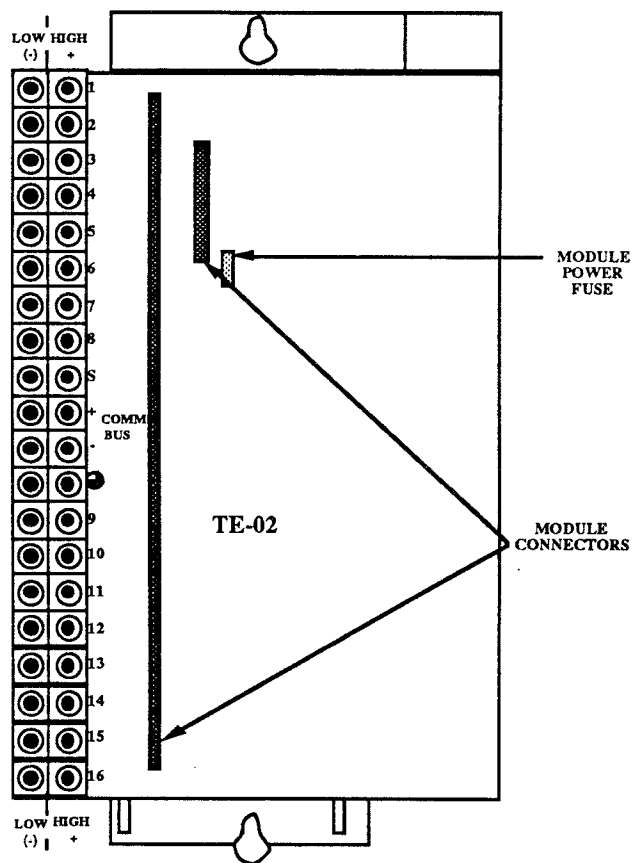
DO NOT PLUG IN MODULES YET

Module Wiring

Consult the appropriate Termination Base for the wiring of the signal inputs or outputs. The wiring diagrams may be generated from the Set Up & Configuration program.

TE-01

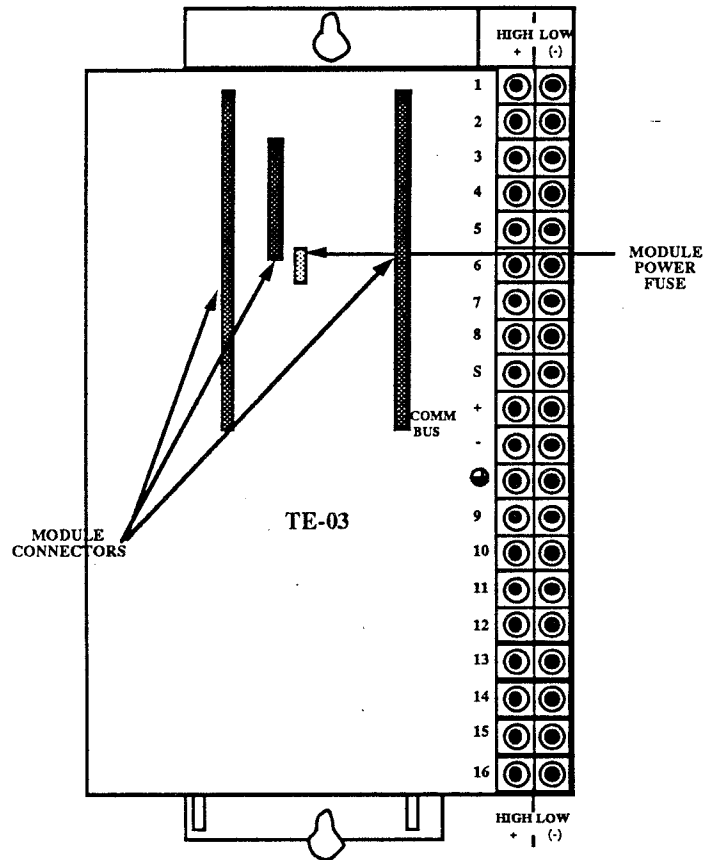
TE-02



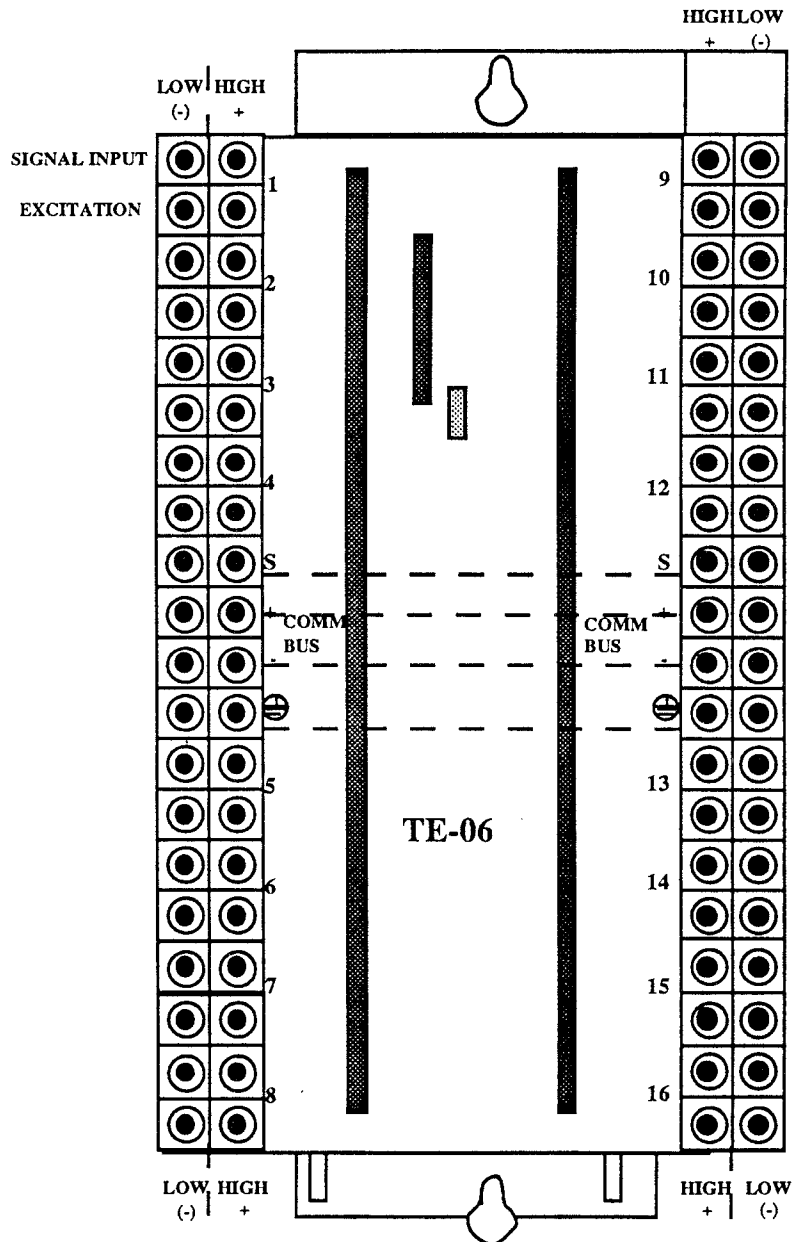
DO NOT PLUG IN MODULES YET

DO NOT PLUG IN MODULES YET

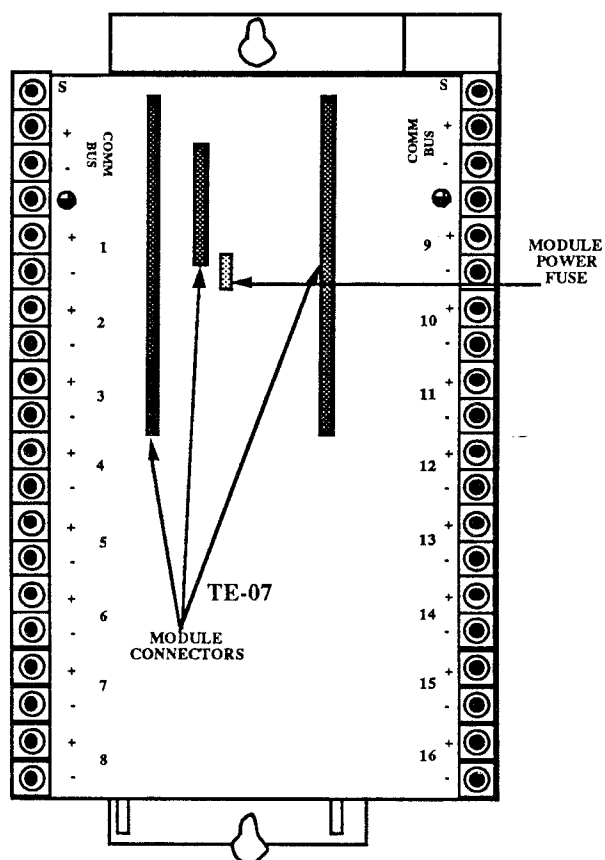
TE-03



TE-06



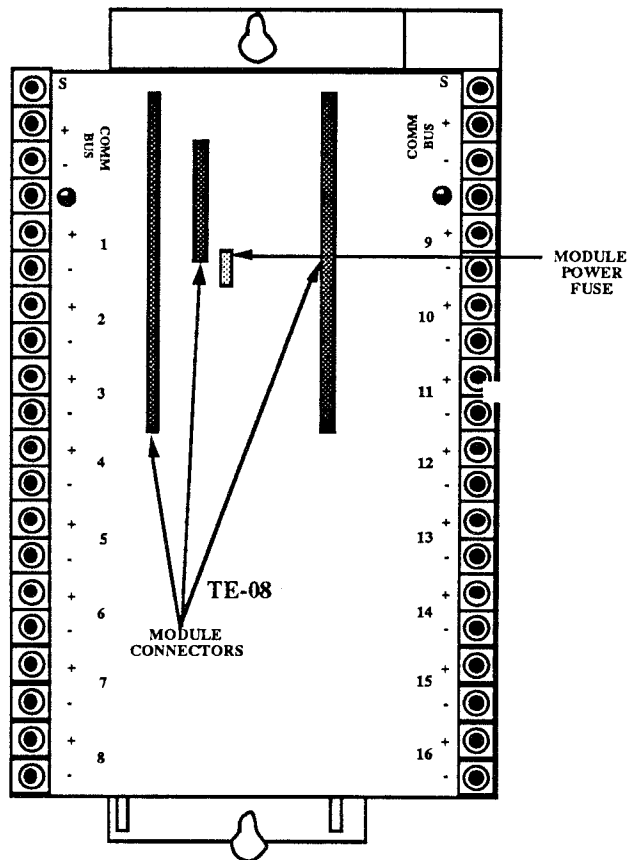
TE-07



DO NOT PLUG IN MODULES YET

DO NOT PLUG IN MODULES YET

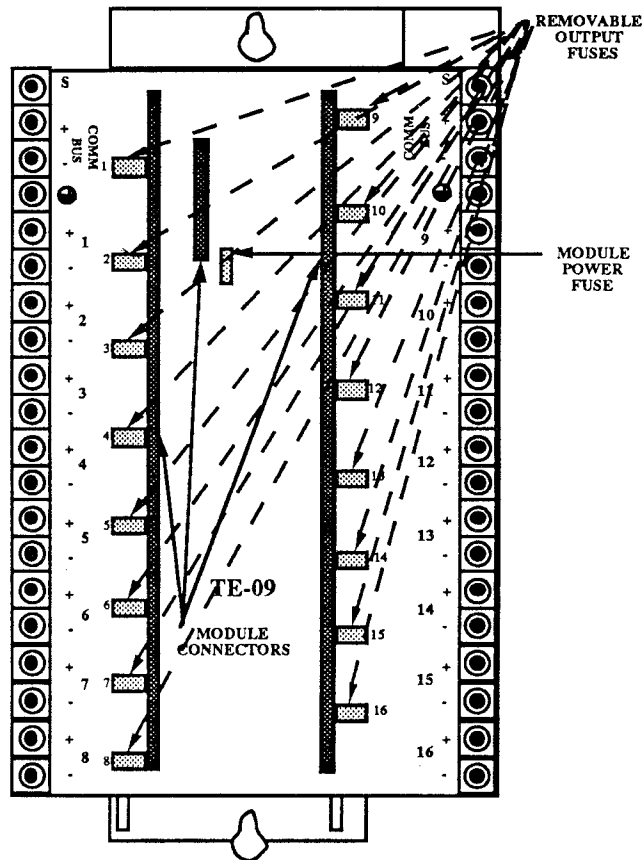
TE-08



DO NOT PLUG IN MODULES YET

DO NOT PLUG IN MODULES YET

TE-09



DO NOT PLUG IN MODULES YET

DO NOT PLUG IN MODULES YET

Step 3- Set Up & Configuration of the System

A Setup & Configuration software disc (available in either 5.25" or 3.5" format) is included in with the IBM PC AT TransPort interface co-processor board. This disc should be copied onto the hard disc. The disc is not copy protected. At the DOS prompt (or C>) a directory should be created (- ie The directory used by Transition Technology Inc. is TSCS). Change to the directory just created.

Change to the drive that the disc is installed in. Type

Install C: (and press the return key)

If the software has been installed correctly, C: \TSCS will be displayed. Type

SETUP (and press the return key)

to start the Setup & Configuration program. If there are any questions, consult the README.COM file found on the disc.

Example

```
MD C:\TSCS
CD C:\TSCS
A:
INSTALL C:
```

The TransPort page is followed (by hitting the SPACE bar) by several pages of text until the page with the Main Menu is reached. The Main Menu allows the following selections:

Main Menu

```
Initialize Board
Set System Parameters
Configure Modules
File Utilities
Advanced User Mode
Exit System
```

The Setup & Configuration program selections may be made either by using the cursor keys to move to the desired selection, or by entering the highlighted letter of the desired selection.

Press ENTER or RETURN and the desired selection is opened.

Function Keys

Set Up & Configuration uses the F1 to F10 Function Keys as aids to programming.

F1 key is the built in Help key which will explain the meaning of the field highlighted by the cursor.

F9 key will give you the selections available for the field highlighted by the cursor.

Initialize Board

The interface board is factory set for Memory Address **D**, and Port location **300**. If these locations are utilized by other applications, reassign the interface board to another location.

Set System Parameters

When using the system, we recommend that the Module Restart Parameter be set to Automatic.

D
O
N
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Step 4- Configure Modules

The system may be programmed Offline for the specific configuration that you desire by using the F9 selection key. If you program the system Offline and later install the interface and switch to Online, the program will automatically search for modules and assign the module to the correct address. If you have several modules of the same type, the program will automatically ask you which module address the new module should be.

You may also program the system from the Configure Modules mode by plugging in the Modules into an active system with the interface board installed. The system will automatically recognize each new module and assign it to the next available address.

**MODULES MUST RECEIVE
A NEW SOFTWARE ADDRESS
THE FIRST TIME USED IN THE SYSTEM**

**PLUG IN MODULES ONE
AT A TIME**

&

**ENTER ADDRESS INTO CONFIGURATION
PROGRAM
BEFORE ADDING NEXT MODULE**

All modules are shipped from the factory at address 121. If more than one factory set module is on the system at the same time, the system can not properly communicate.

Module Termination Bases

The following table summarizes termination base information.

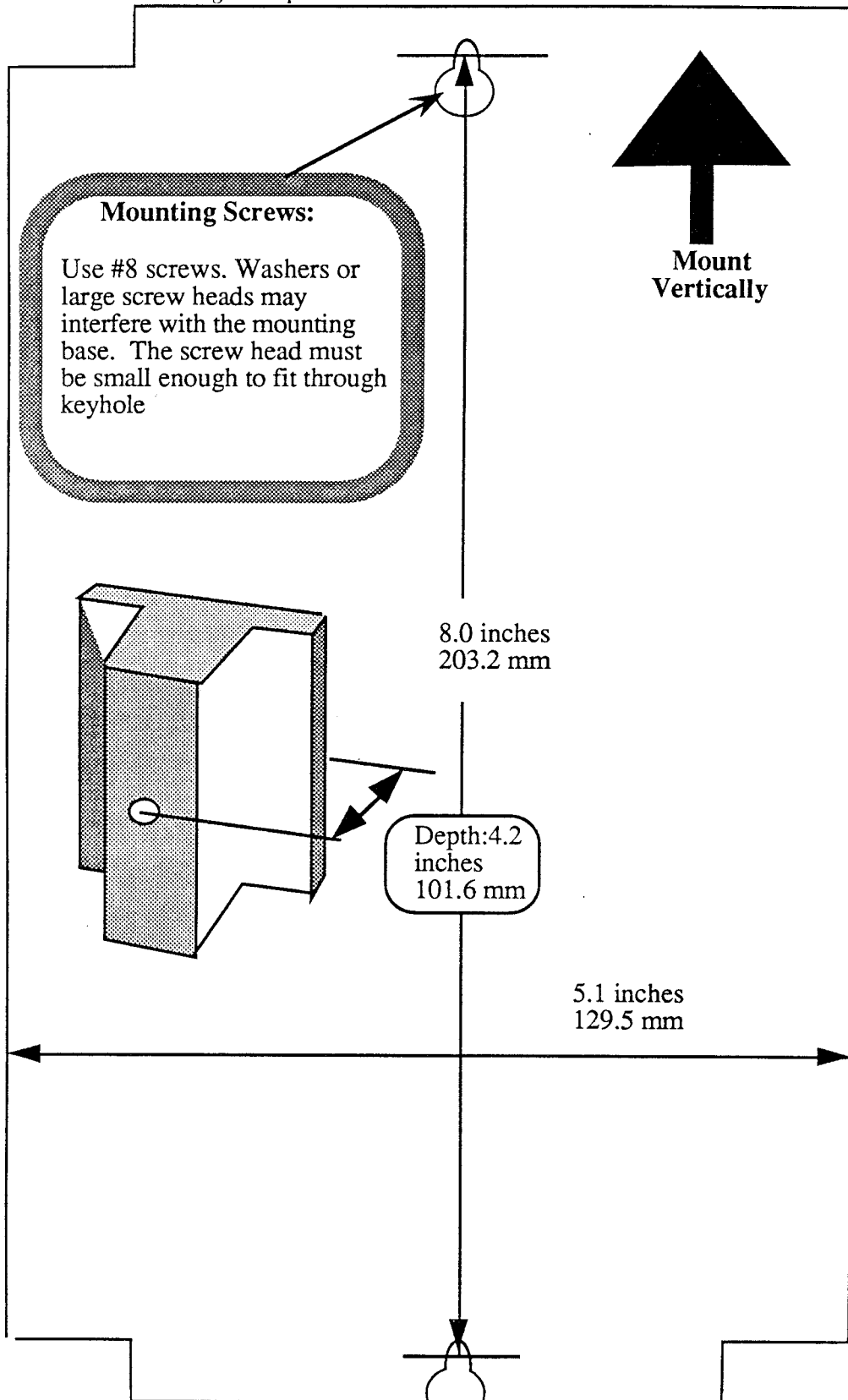
<u>Base</u>	<u>Channels</u>	<u>Module</u>
TE01	32 in	Discrete Input
TE02	16 in	Discrete Input
TE03	16/8 out	Analog Output
TE04	N/A	Power (1)- PS01
TE06	16/8 in	RTD
TE07	16/8 in	Analog & Thermocouple Universal Input
TE08	16/8 in	High Level Analog Input
TE09	16 out	Discrete Output

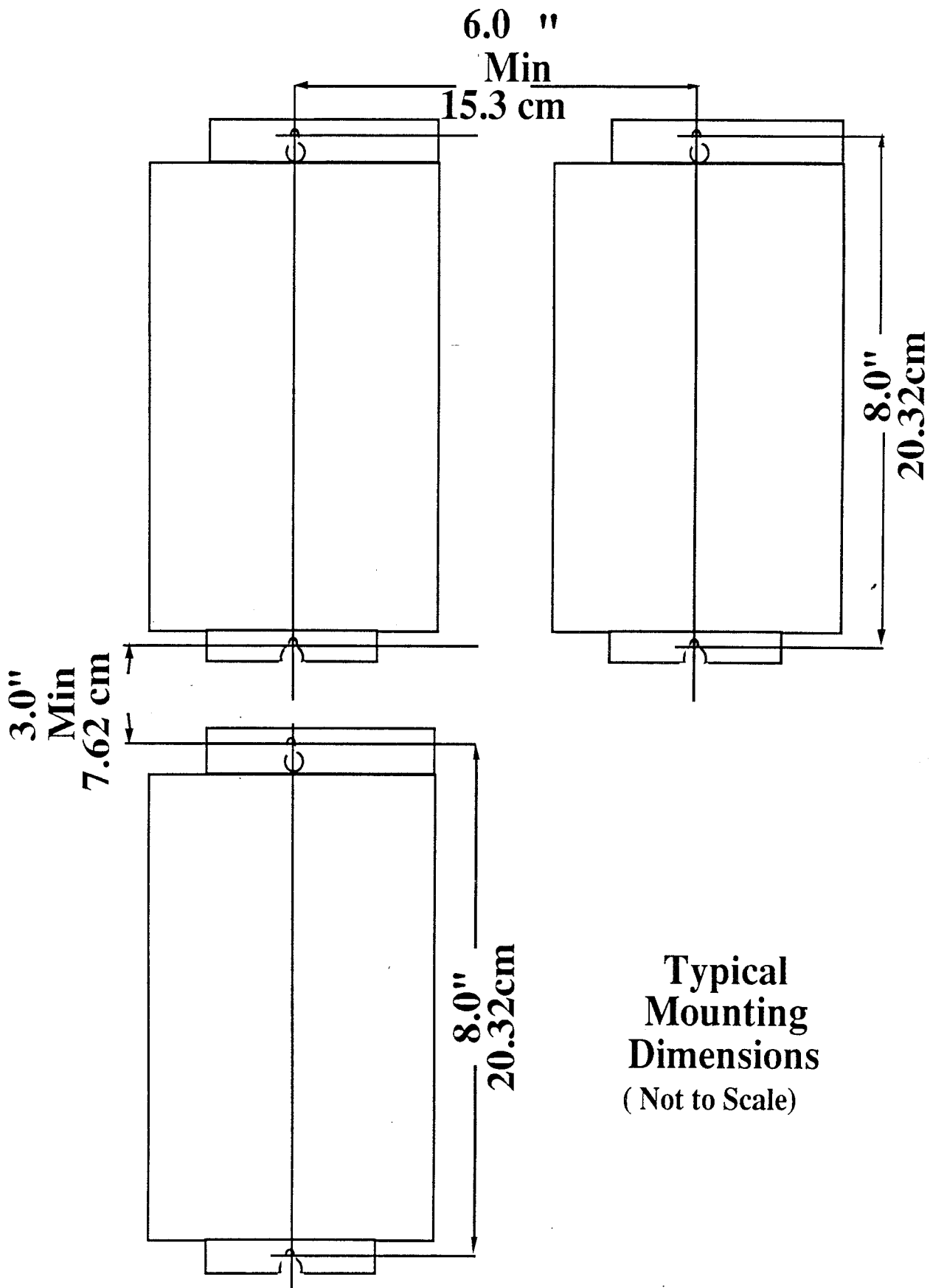
NOTE: (1) the TE04 is only for mounting power supply modules.

Each input/output channel connection is capable of holding two or more 14 gauge wires at each screw terminal. Each terminal base stores Input/Output configuration data in EAROM (non-volatile memory), allowing the "hot swapping" of modules without the need to re-configure. The TE09 termination base has locations for fuses. See How to Replace Fuses for a diagram of these locations.

Mounting Termination Base

Termination Base Mounting Template





Mounting Termination Base

How to Mount and Wire the Module Termination Bases

IMPORTANT: Avoid locations that will cause excessive vibrations. Do not mount modules where the ambient temperatures are higher than 140°F (60 °C). Do not mount modules where any type of corrosive chemicals or fluids can come in contact with the modules.

The following information is needed to mount your modules:

- Where the termination bases are located,
- How many and what type of modules are needed for each configuration, and
- The wiring diagrams (Section "**Connecting Module Field Wiring**").

Included in the module shipping box is a template for mounting the module termination bases. The same template is also included in this section of the manual . Use the template as a guide and measure and mark the two mounting hold locations.

Install two number 8 (41.656 millimeters) screws (user supplied), leaving approximately 3/8-in. (10 mm) clearance between the head of the screw and the mounting surface for the module termination base.

IMPORTANT: Modules must be mounted vertically for power dissipation at the specified temperatures and current ratings.

With the module termination base in the upright position, place the base over the mounting screws; then slide downward onto the cutouts. Tighten screws so bolt heads just contact termination base. If necessary, replace jumpers with fuses. See wiring diagrams for optional fuse locations. Wire your module termination bases according to the diagrams in Section - "**Connecting Module Field Wiring**".

IMPORTANT: All electrical wiring must be installed according to local electrical codes and requirements.

Cover wiring connections with terminal strip covers.

The TransPort System Module Installation

How to use this Section of the Manual

The following pages of this manual describes the different types of modules available in the TransPort System. This section is also designed to tell you how and where to mount the module termination bases, how to connect your field wiring to the module termination bases, how to mount the modules to the termination bases, how to safely maintain your modules, and finally how to complete your TransPort System Setup and Configuration Software.

Introduction

The TransPort System provides an interface between the "real world" (Field devices) and the host computer. Through the use of the TransNet Network and the Intelligent Input/Output Processor (IIOP) installed in your computer, the input modules monitor field devices and transmit field status information to the host computer. Output modules convert values from the host computer into signals to control field devices.

The module termination bases easily attach on or near field devices. All field wiring connects directly to the terminal blocks located on the termination bases. The input and output modules are designed to mount directly onto these termination bases.

Once the IIOP is installed and the TransPort System is fully wired, modules are then configured by using the TransPort System Setup and Configuration Software. This module configuration information is stored in Electrically Alterable Read Only Memory (EAROM) and may be "hot-swapped" without the need to re-wire, re-configure, or power-down the TransPort System or the field devices.

Module Types

This section outlines the following module types:

- Discrete Input
- Discrete Output
- Analog Input
- Analog Output, and
- Power supplies

Connecting Module Field Wiring

Discrete Input Modules

A discrete input is a "device" that converts an ON/OFF field signal into an intelligible signal that is sent to the host computer. A discrete input module can be used to monitor ON/OFF field devices, such as a limit switch, a flow switch, or motor status, etc.

Channel Isolation

Each channel is totally isolated, from each other and from the ground. Each channel can use a different power source and does not need to be grounded.

- Channel to Channel isolation - 1500 V rms
- Channel to Ground - 1500 V rms
- Channel to Communications - 1500 V rms
- Meets IEEE 472 Surge Withstand Test - 3,000 peak
- U. L. listed at 300 volts continuous

Module Number	OFF Voltage	ON Voltage	Switch Voltage	Input Z(on)	Mounting Base
DI11516	0 - 30	90 - 130	65	25k	TE01 or TE02
DI11532	0 - 30	90 - 130	65	25k	TE01
DI23016	0 - 60	180 - 260	130	90k	TE01 or TE02
DI23032	0 - 60	180 - 260	130	90k	TE01
DI2416	0 - 5	18 - 35	11.5	2.3k	TE01 or TE02
DI2416C	0 - 5	18 - 35	11.5	2.3k	TE01 or TE02
DI2432	0 - 5	18 - 35	11.5	2.3k	TE01
DI2432C	0 - 5	18 - 35	11.5	2.3k	TE01
DI4816	0 -10	36 - 70	23	11k	TE01 or TE02
DI4832	0 -10	36 - 70	23	11k	TE01
DI0516	0 - 1	2.4 - 15	2.2	.73k	TE01 or TE02
DI0516C	0 - 1	2.4 - 15	2.2	.73k	TE01 or TE02
DI0532	0 - 1	2.4 - 15	2.2	.73k	TE01
DI0532C	0 - 1	2.4 - 15	2.2	.73k	TE01

Discrete Input Module With Counters

A discrete input module with counters is a discrete input module with counting capability on the first four channels. The accumulated counts are then sent to the host computer. The host computer can reset the counters as required. Module catalog numbers ending in "C" are counter modules; for example "DI2416-C".

Discrete Output Modules

A discrete output module is a "solid state relay contact" or a switch that is controlled by the host computer. A discrete output can be used to control motor starters, relays, indicator lights, etc. The maximum current output per each module is 20 amps.

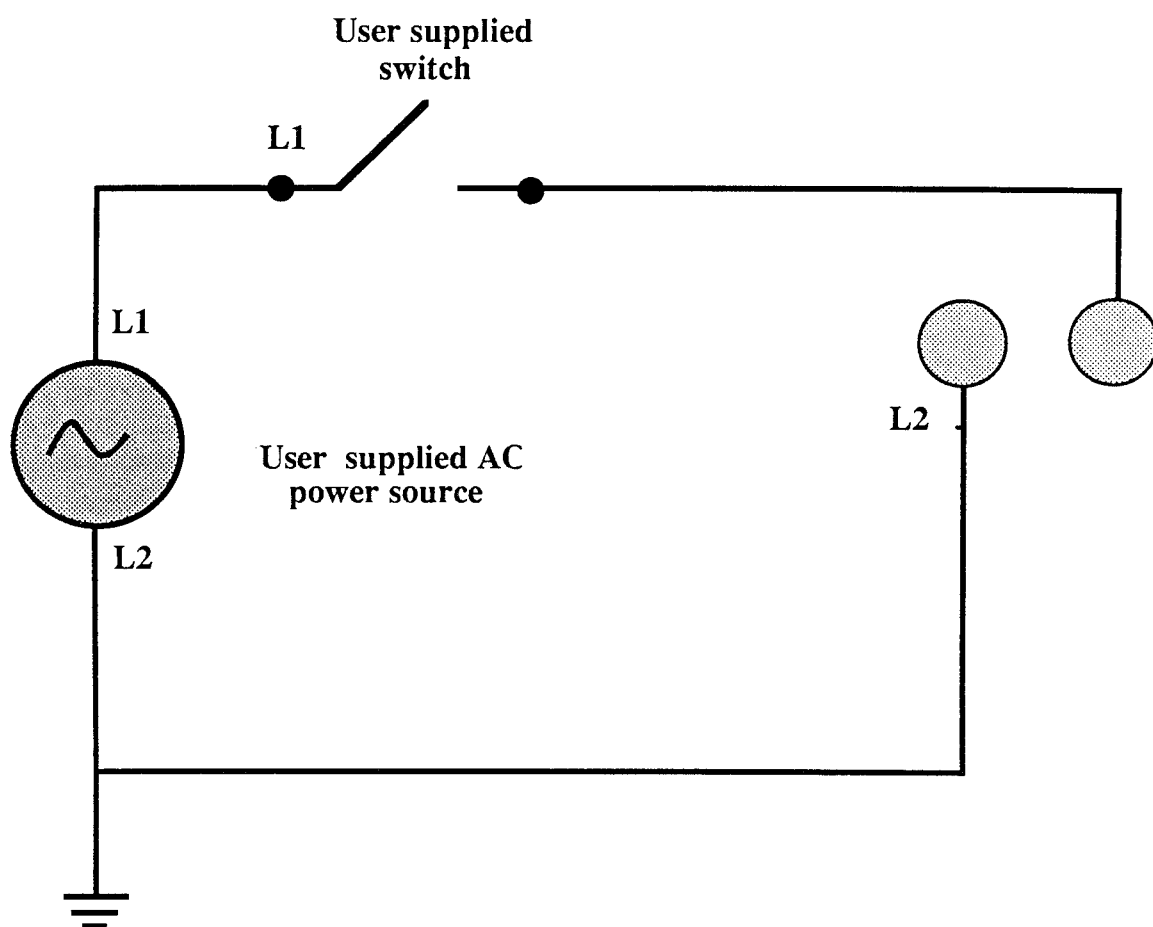
Channel Isolation

All channels are isolated from one other. Each channel can use a different power source and does not need to be grounded.

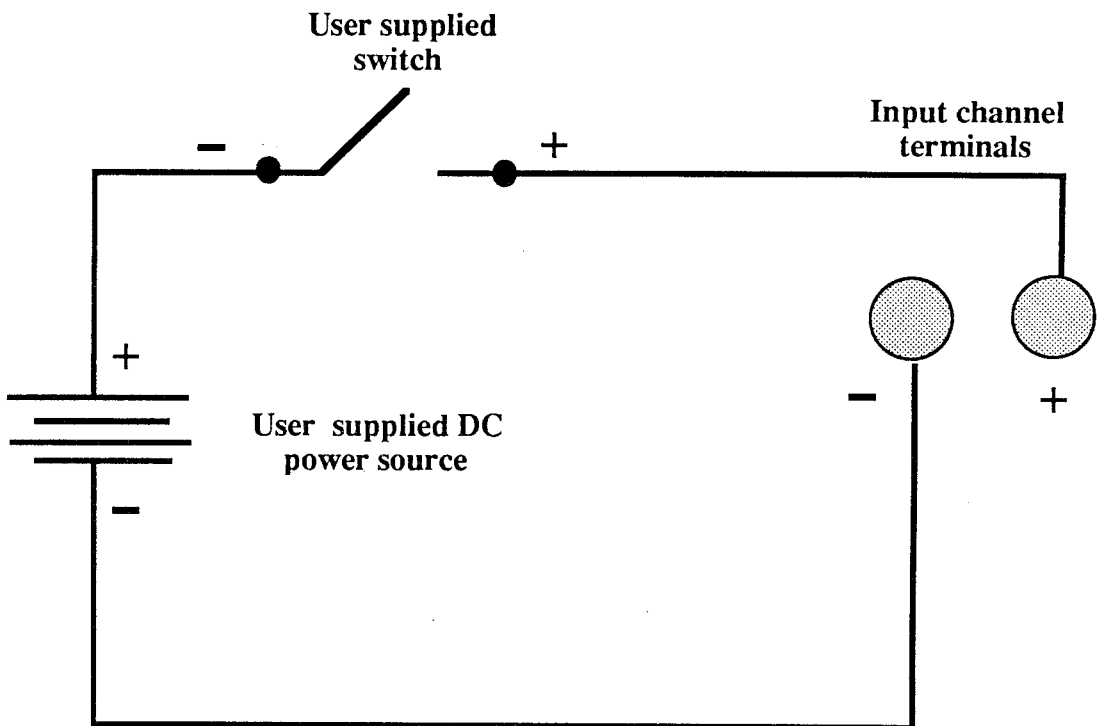
Warning: certain versions of the DC output module, model numbers D00016 and D00016-M are isolated in groups of four channels.

- Channel to Channel isolation - 1500 V rms
- Channel to Ground - 1500 V rms
- Channel to Communications: 1500 V rms
- Meets IEEE 472 Surge Withstand Test - 3,000 peak
- U. L. listed at 300 volts continuous.

Wiring of Input channels on
the DI11516, DI11532, DI23016 and DI23032, modules

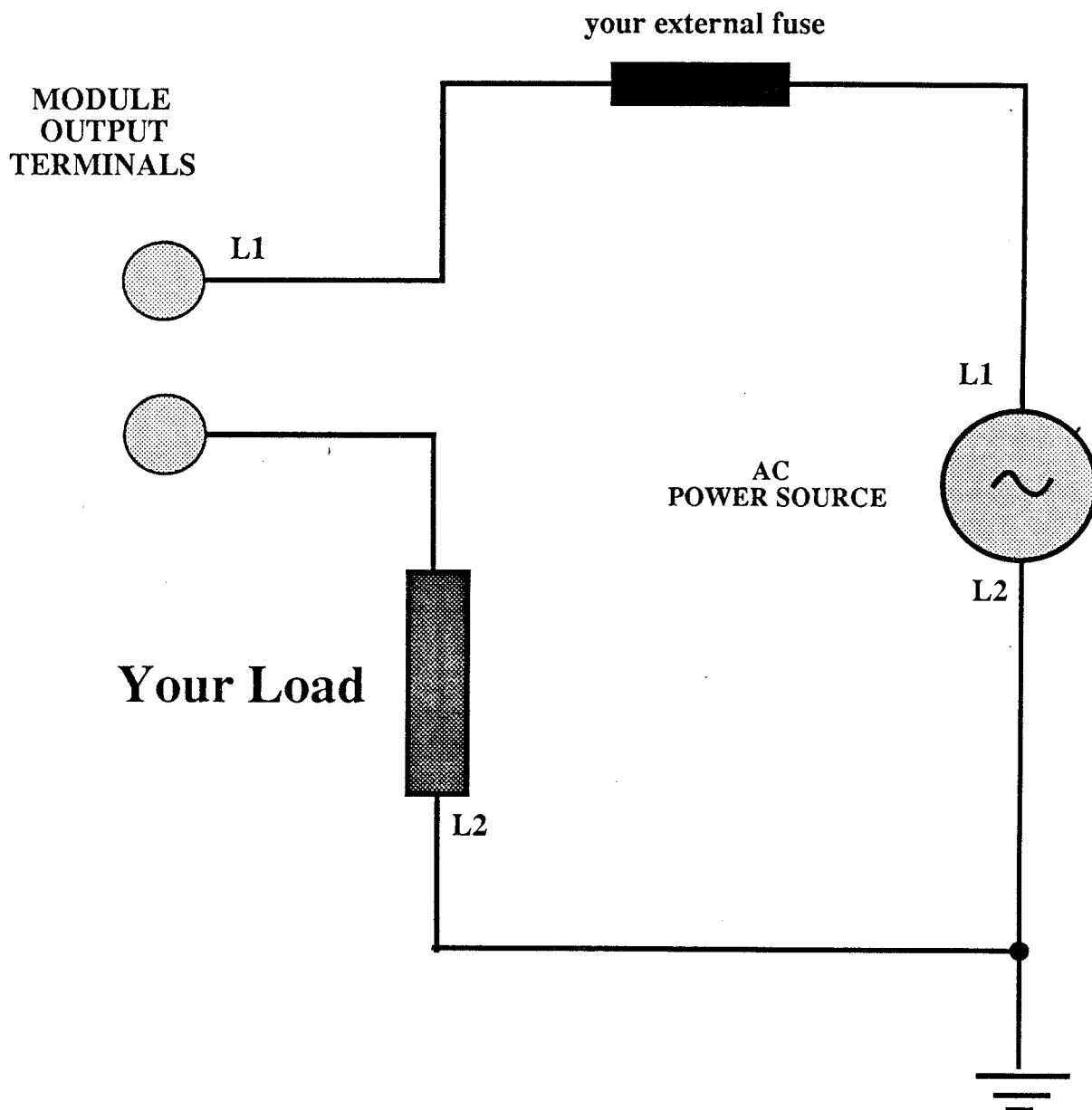


Wiring of Input channels on the DI05XX, DI05XX,
DI24XX and DI48XX, modules

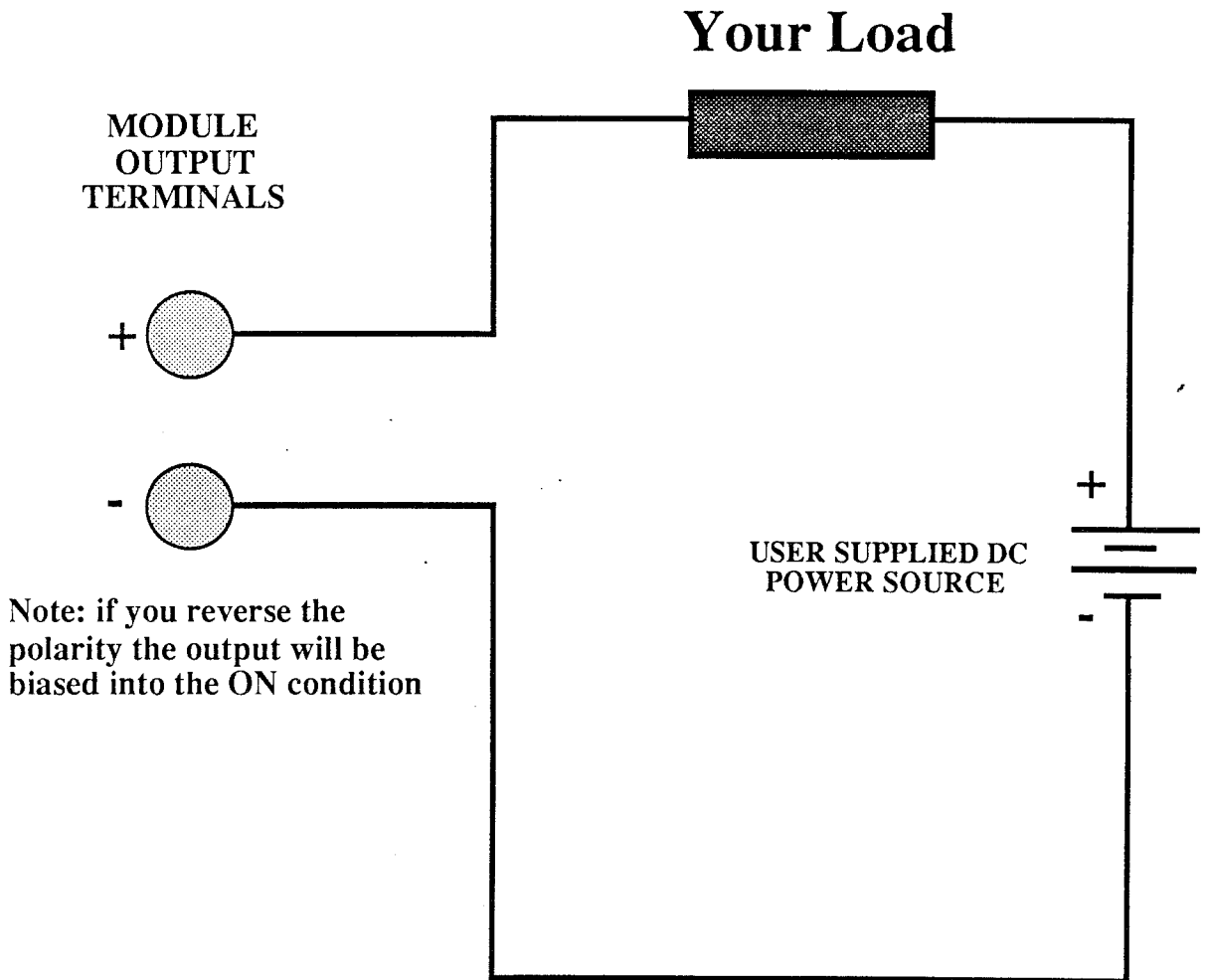


Note: If you reverse the polarity of the input terminals it won't sense inputs

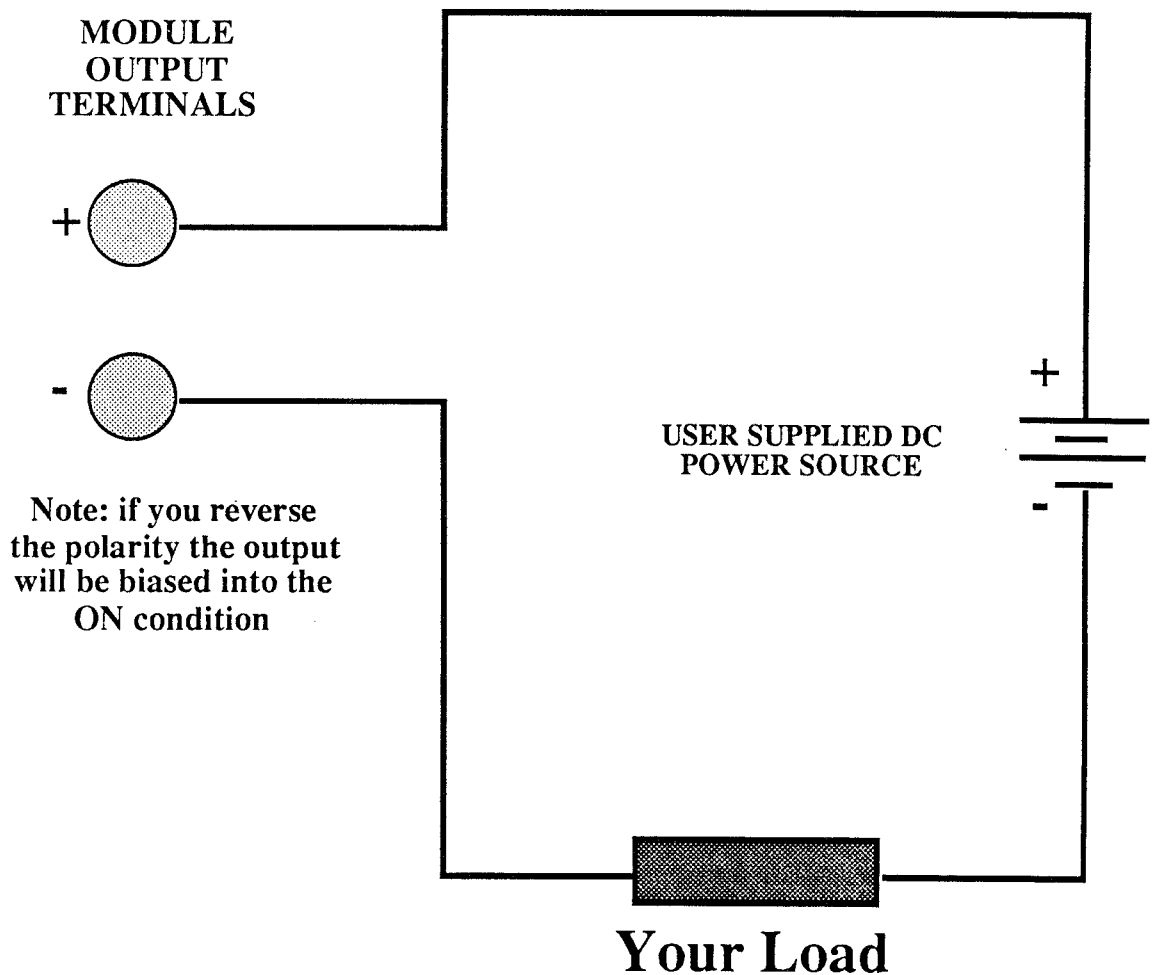
Wiring of Output channels on the
D00116 and D00116 -M
modules



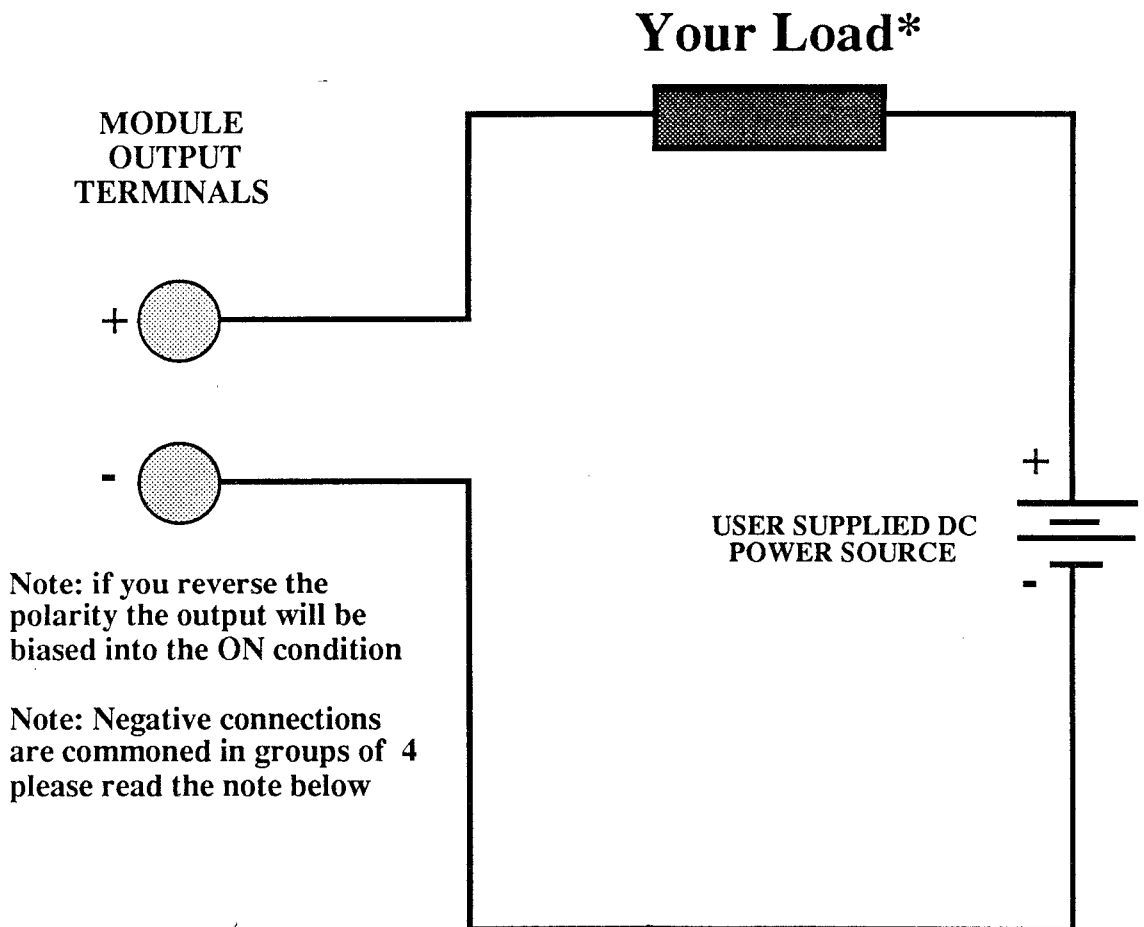
Wiring of Output channels on
the D00216 and D00216-M modules
Low side switching



Wiring of Output channels on the
D00216 and D00216-M modules
High side switching



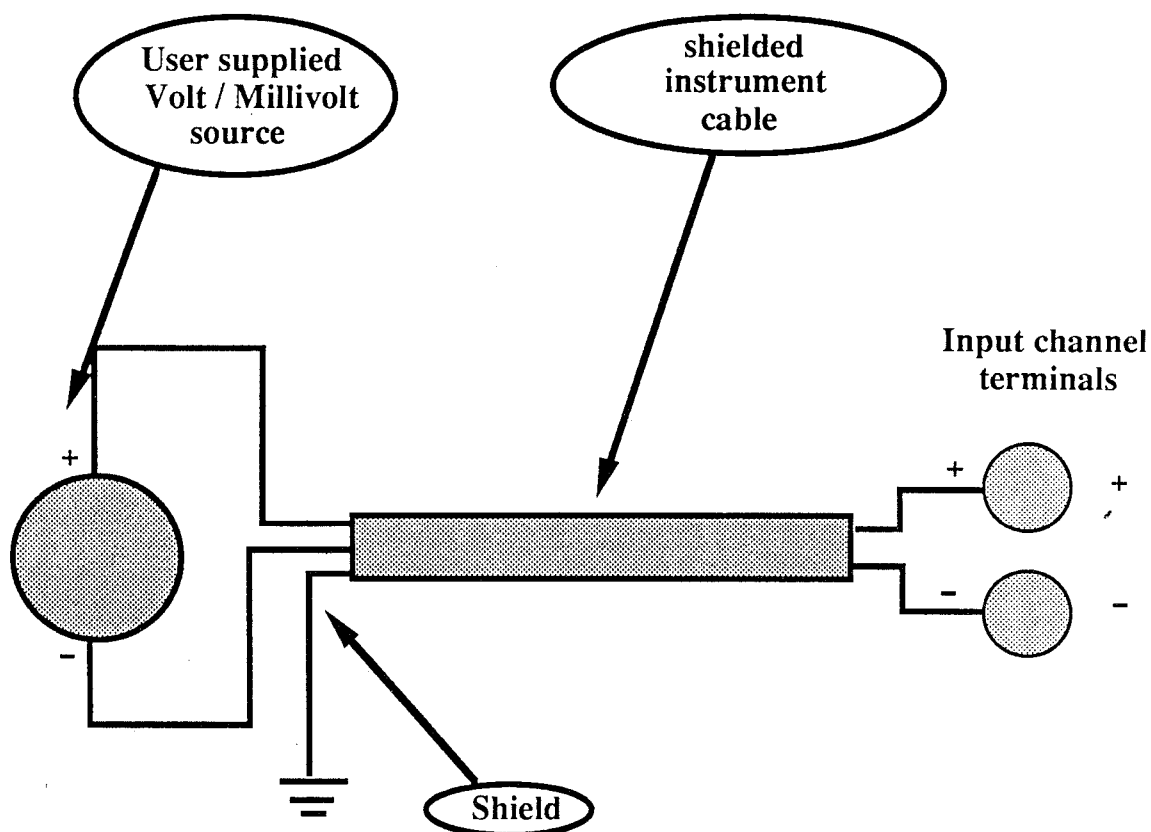
Wiring of Output channels on
the D00016 and D00016-M modules
Low side switching



NOTE: The D00016 and D00016-M modules are isolated in groups of 4. This means the negative terminal on each of four channels is common. Your load must be connected between the positive leg of your power source and the positive terminal of the channel. The negative terminal of the channel should be connected to the negative leg of the power source. **If you connect your load to the negative terminal of a channel, it will turn ON whenever you turn ON any channel in that group of four channels.**

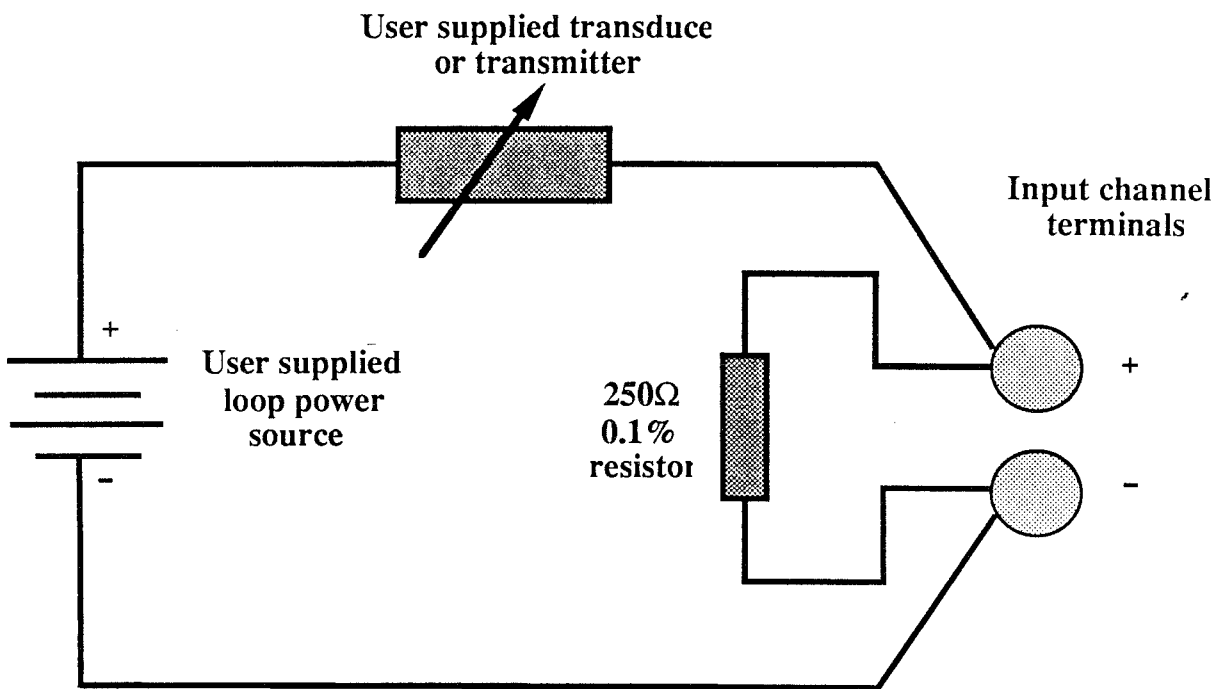
Connecting Module Field Wiring

Wiring of Analog Input channels
with voltage or millivolt sources using
shielded instrument wire



Note: shield must only be connected to ground in one place only. The chassis terminal on the base NOT suitable for shield connection.

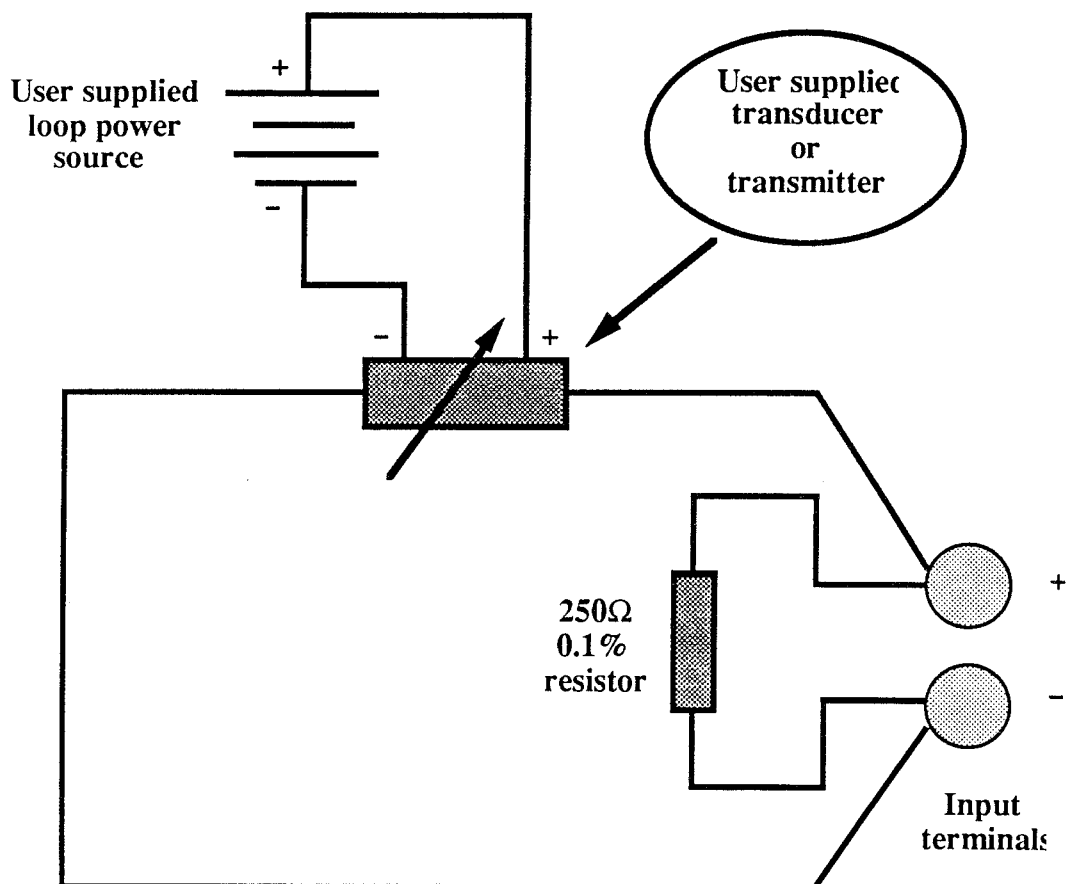
Wiring of Analog Input channels
with externally powered (2 terminal) 0-20mA or 4-20mA
current sources



Note: The polarities must be as shown for this circuit to work.

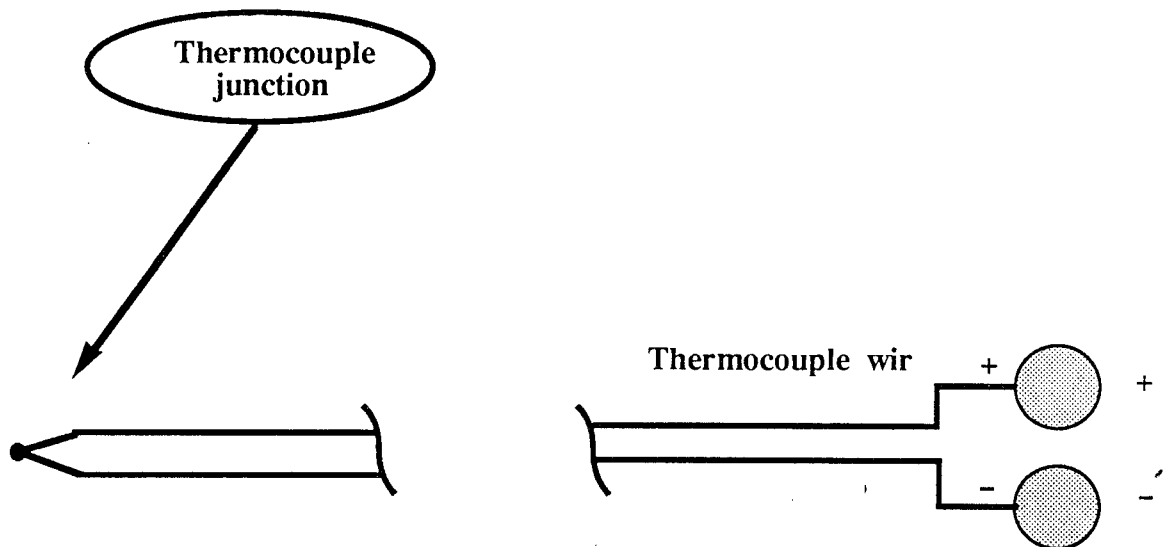
Connecting Module Field Wiring

Wiring of Analog Input channels
with internally powered (4 terminal) 0-20mA or 4-20mA
transducers and transmitters



Note: The polarities must be as shown
for this circuit to work.

Wiring of Analog Input channels
with Thermocouples.

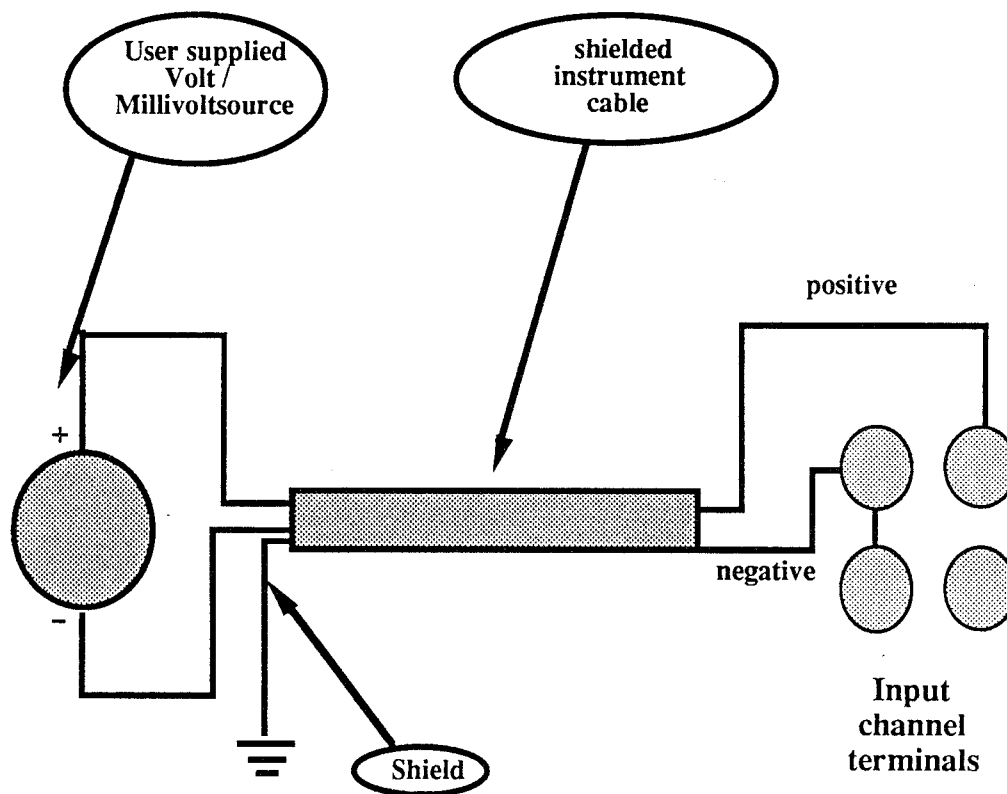


Note: If you reverse the polarity of the thermocouple wire the temperature measurement will have a large error.

Note : If you are using thermocouple extension wire make sure you observe the proper polarity . If you reverse the polarity of the extension wire you will induce an error into your thermocouple signal. Also be sure to select extension wire and terminals that match the thermocouple type you've chosen.

AI0108 or AI0116

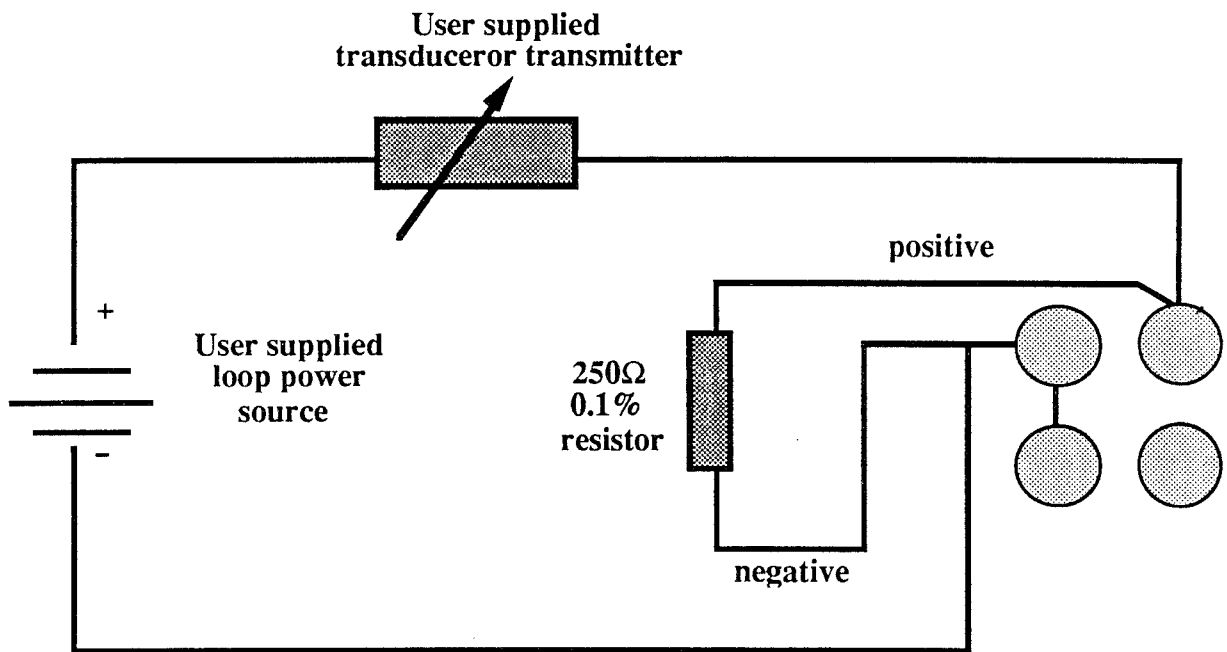
Wiring of Analog Input channels on an
with voltage or millivolt sources using shielded instrument wire



Note:

shield must only be connected to ground in one place only. The chassis terminal on the base is NOT suitable for shield connection. Note: each channel has four terminals, two for excitation and two for signal input.

**Wiring of Analog Input channels of an AI0108 or AI0116
with externally powered (2 terminal) 0-20mA or 4-20mA
current sources**

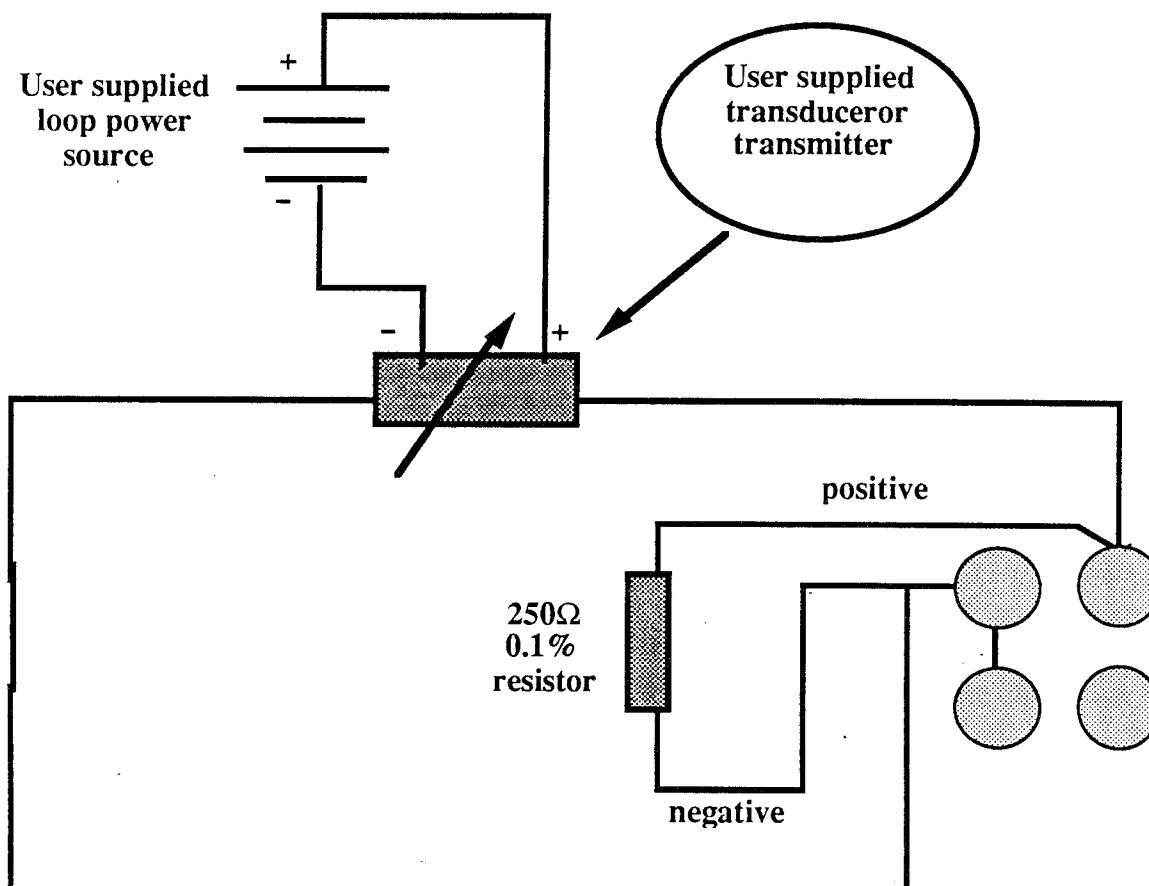


**Note: The polarities must be as shown
for this circuit to work.**

**Note: each channel has four terminals, two for
excitation and two for signal input.**

Connecting Module Field Wiring

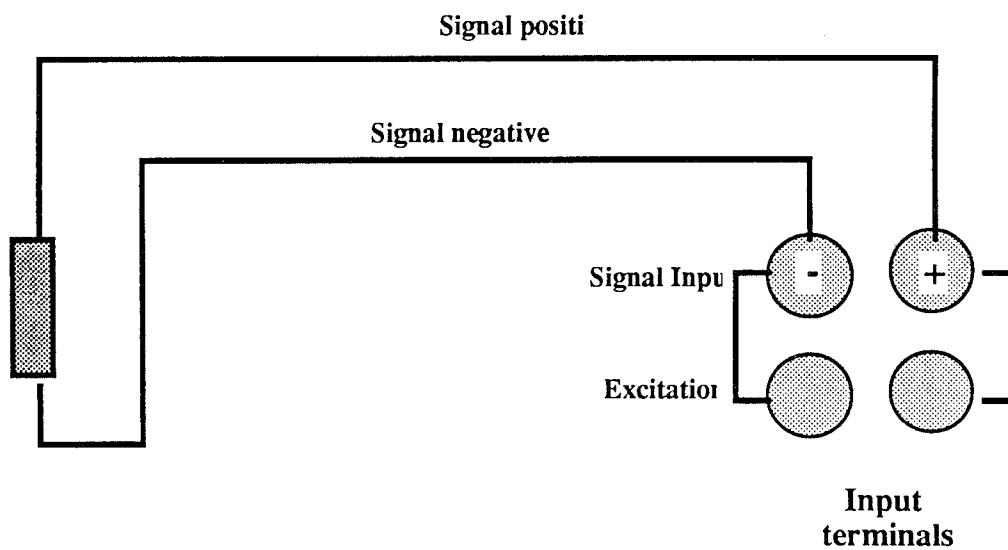
Wiring of Analog Input channels on an AI0108 or AI0116
with internally powered (4 terminal) 0-20mA or 4-20mA
transducers and transmitters



Note: The polarities must be as shown
for this circuit to work.

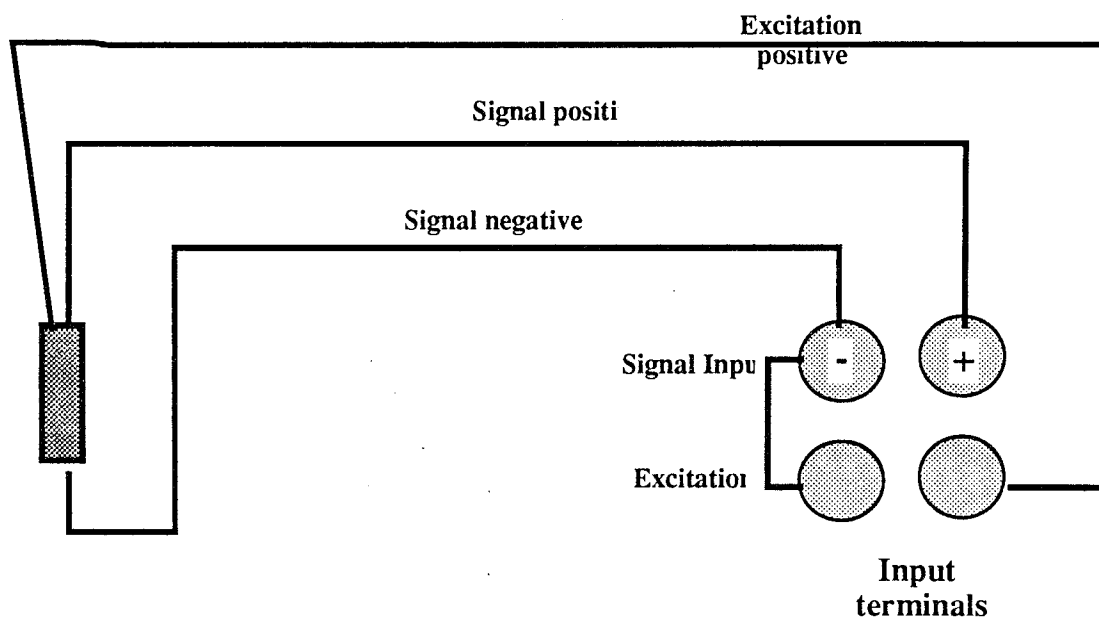
Note: each channel has four terminals, two for
excitation and two for signal input.

Wiring of analog input channels on AI0108 & AI0116
w/2 wire RTD



Note: The polarities must be as shown for this circuit to work.

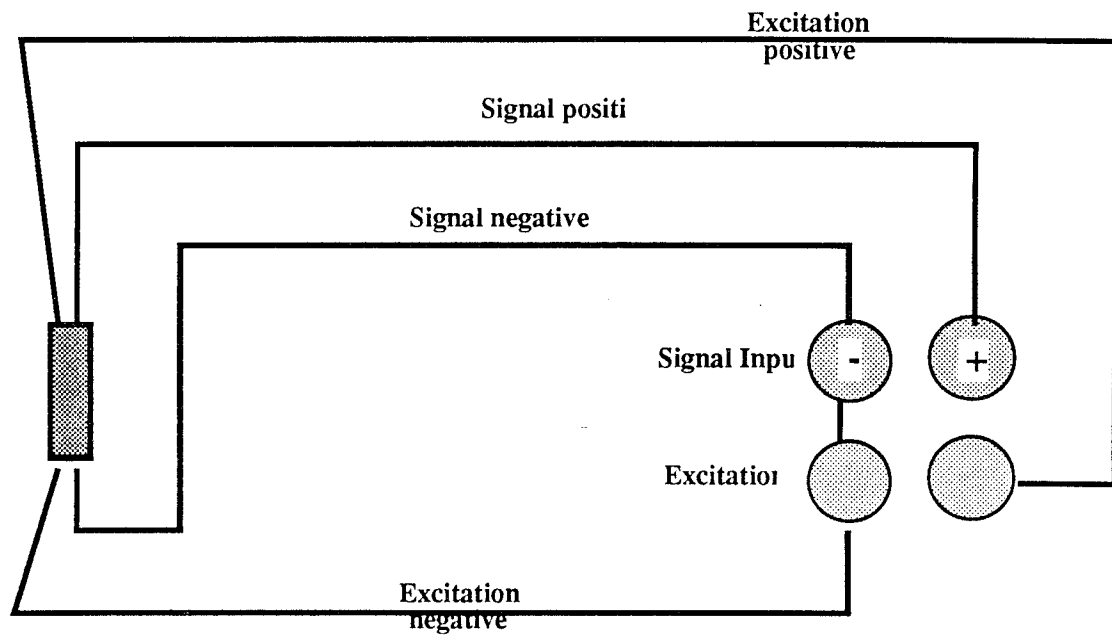
Wiring of analog input channels on AI0108 & AI0116
w/ 3 wire RTD



3 Wire RTD

Note: The polarities must be as shown for this circuit to work. Note: This module does not compensate for the lead resistance of the excitation wire. This will introduce significant errors into your measurement proportional to the lead resistance. This affect becomes worse with distance.

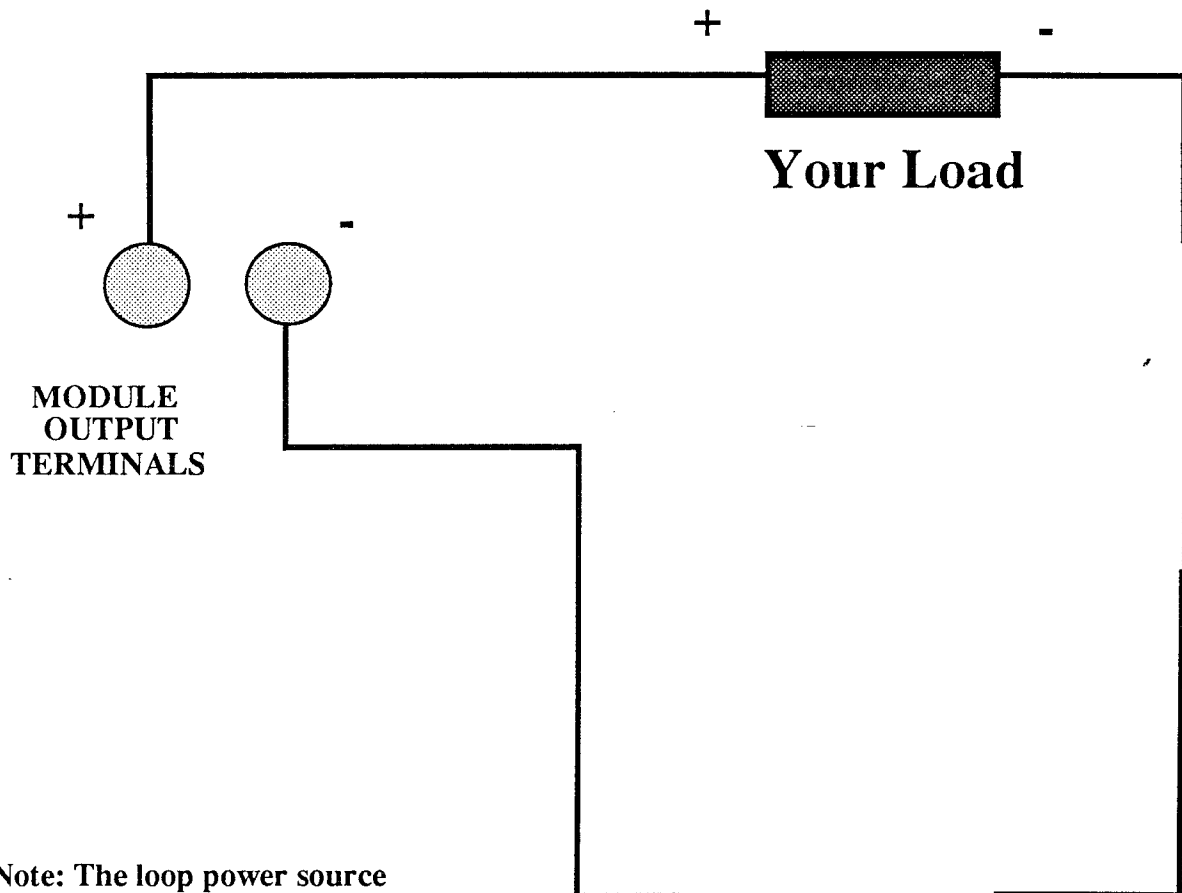
Wiring of analog input channels on AI0108 & AI0116
w/ 4 wire RTD



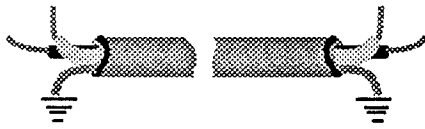
4 Wire RTD

Note: The polarities must be as shown for this circuit to work.

Wiring of Analog Output channels



Note: The loop power source in the module. Each channel has 600 Ω compliance.

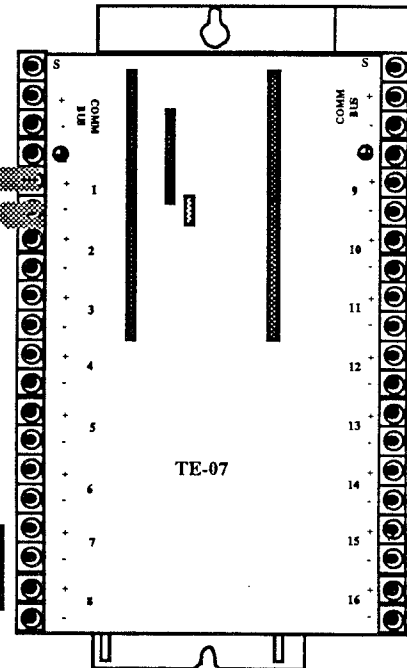


Wrong.....
Do Not ground any shielded cables at both ends

Field Device

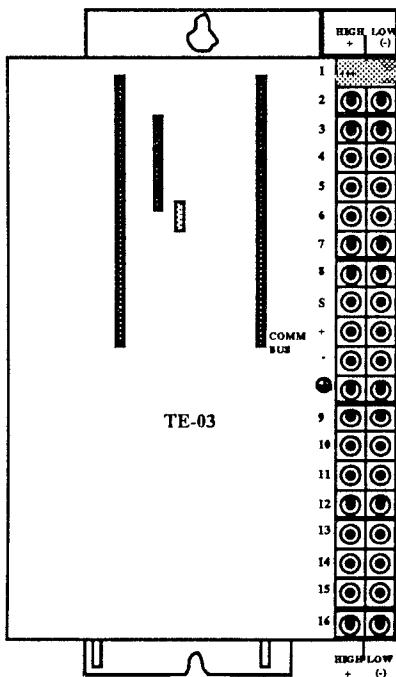
analog cable grounded at the "field" end.

Analog Inputs



Field Device

analog cable grounded at the "field" end.



Analog Outputs

Wrong---
Do Not connect analog shields to "S"
(the TransNet shield) terminals

Install TransNet Communications Network

Introduction

The TransNet Network consists of one main communications cable or line. Modules are connected to the main line using a combination of direct connect, multi-drop or cluster topologies. The signals transmitted on the network combined with the cable type, the modules are attenuated by "reflections". For example, the greater the attenuation, the greater the loss of the signal. When a signal is transmitted through the TransNet Network, a certain percentage of the signal is reduced. The following chart shows the recommended topologies of the TransNet Network.

Topology

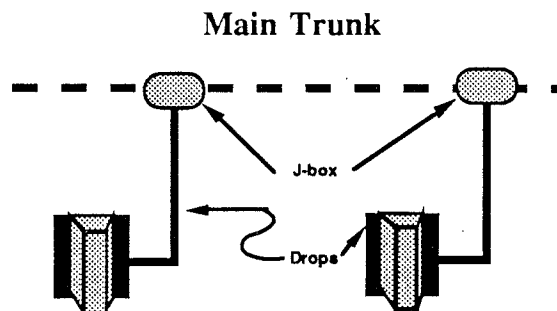
direct connect
multi-drop
cluster

Attenuation

least attenuation (best configuration)
more attenuation (next best)
most attenuation

Multi-drop- Next Best Configuration

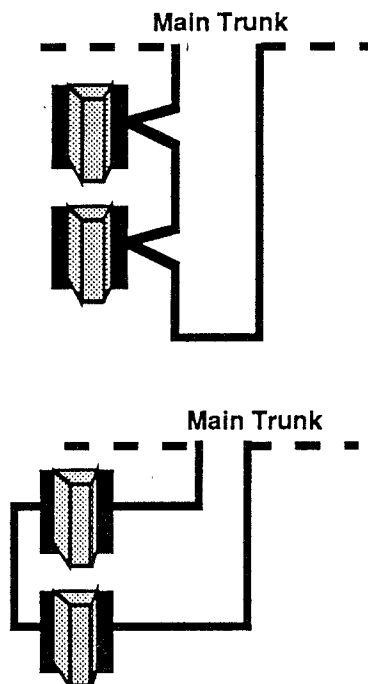
Muti drop configuration. The length of the "drop" cable should be as short as possible to reduce attenuation caused by reflections in the drop cable.



Installing Communication Network

Direct Connect - Best Configuration

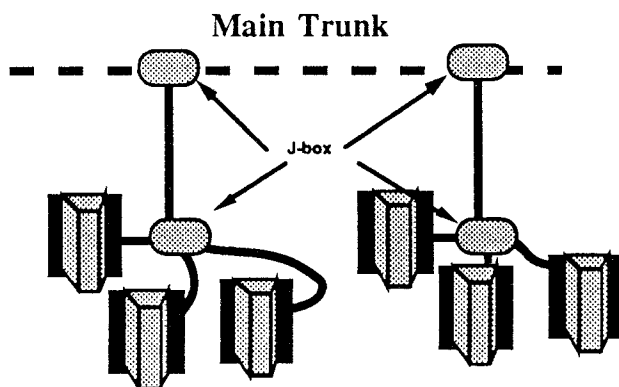
Either of these are direct connect configuration and provide the least amount of signal attenuation.



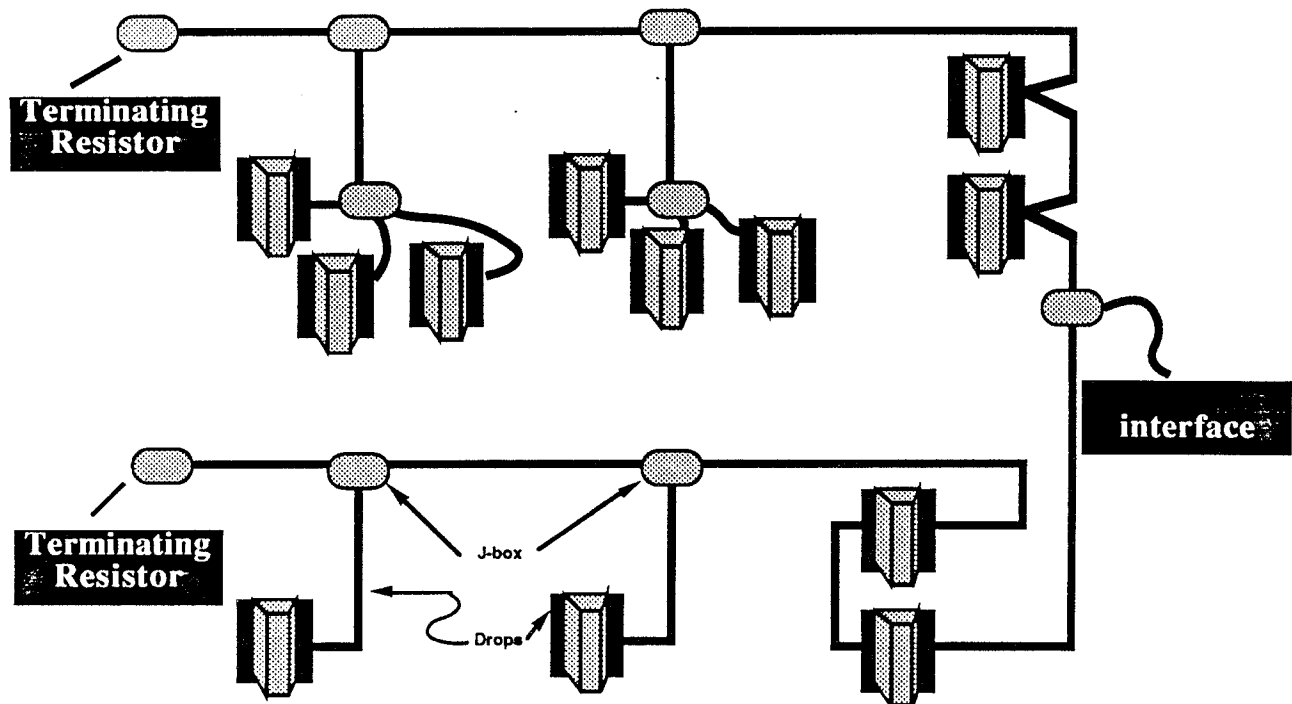
Note: If for some reason a module stops communicating the rest of the network is not affected.

Cluster- Least favorable Configuration

A drop is connected to a drop. This is acceptable if the lengths of the drops are short and the number of modules in a cluster is kept at a minimum. See attenuation charts.



Network Topology - All Three Types

Communication Distance

The length of the main line and the lengths of the drops are limited by attenuation due to line loss and reflections. The maximum length, away from the interface in either direction, of the main line and any drop must be less than one mile (1.65 km). For I/O modules connected to the main line with drops, the length of the drop must be less than 16 ft. (4.9 meters).

The Intelligent Input Output Processor (interface) (part number CI-IBM) can be connected anywhere on the main line. The interface can also be connected at a Junction box ("J-box") or at a module. See the interface Location Diagram in this section.

Power supplies can be connected anywhere on the main line. If necessary, multiple power supplies can be used to power the electronics of the input/output modules.

The main line needs two terminating resistors (See the Transition Technology Inc. parts listing in the Appendix). The resistors must be selected to match the nominal characteristic impedance of the network cable type you select. See the TransNet Network wiring diagrams in this section.

Installing Communication Network

How to Determine Signal Attenuation

Each module on the TransNet Network must receive a signal from the interface that is greater than 0.7 volt, peak to peak. The signal attenuation is determined by the sum of:

Cable loss, which is affected by the cable type and length.

Reflection loss, which is affected by the number of modules and drops on the main cable.

IMPORTANT: The sum of the signal attenuation **MUST BE** less than 27 dB.

How to Determine Cable Loss Attenuation

1. Determine the nominal attenuation. Attenuation is usually expressed "dB per 100 feet" and depends upon the operating frequency. The maximum TransNet frequency is 2 Mhz.

For example, nominal attenuation for Belden #9182 is shown in the following table:

Frequency (Mhz)	Nominal Attenuation (db/100 ft)
1	0.3 Belden Catalog
10	1.3 Belden Catalog
3 2.	0.41 Interpolation Determination

The Belden cable specification does not give the nominal attenuation at the 2 Mhz operating frequency. Interpolation was used to calculate the nominal attenuation.

2. Determine the length of the signal path along the cable between the interface and the I/O module.
3. Calculate the cable loss attenuation as follows:
cable loss attenuation = cable distance * nominal attenuation

How to Determine Reflection Loss Attenuation

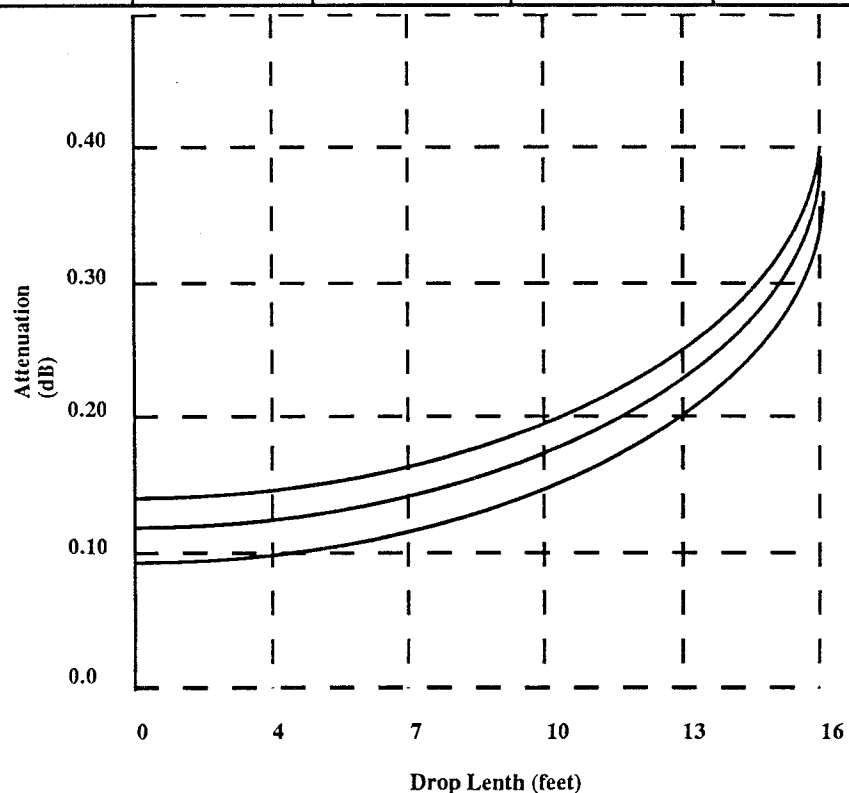
The signal arriving at a module is attenuated by reflections at each connection on the main trunk along the path of transmission. If there are four connections between the interface and a module; then that module is attenuated by FIVE reflection attenuations. Reflection attenuation due to a drop on the TransNet depends on the following:

- Length of the drop (if drop is used)
- Nominal impedance of the cable
- Number of modules clustered together on a drop.

Use the "Reflection Attenuation vs. Drop Length" chart and graph to determine reflection attenuation for one module connected to the main line. For modules connected directly to the TransNet network, use a drop length of zero feet. If there are multiple modules clustered on one drop, consider them as multiple drops, each with one module

Reflection Attenuation vs. Drop Length Chart

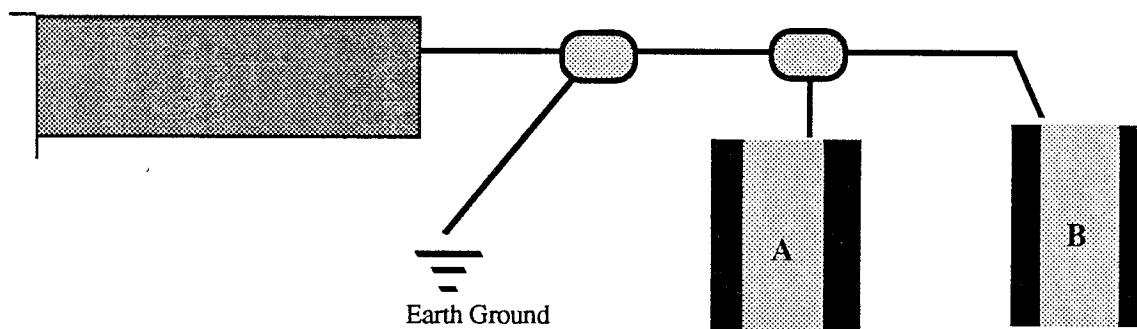
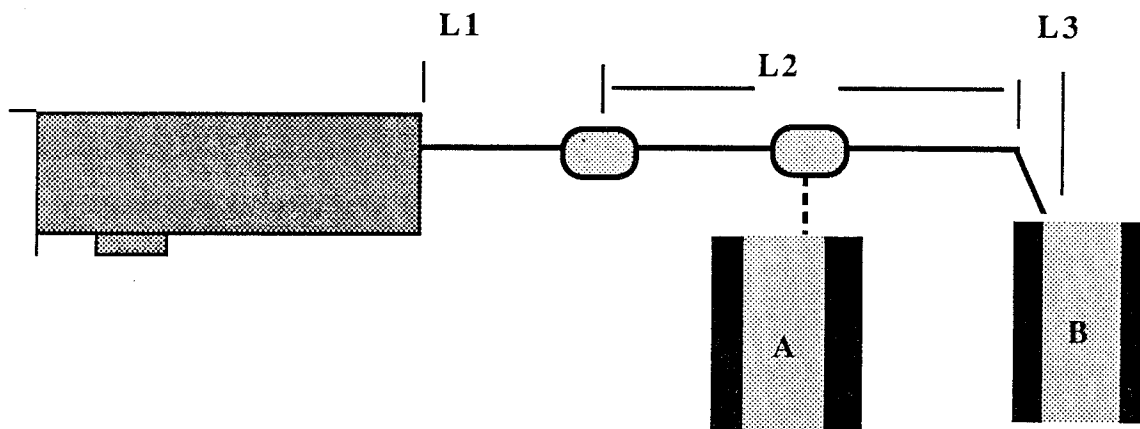
Cable	0 ft. (0 m)	4 ft. (1.22 m)	7 ft. (2.13 m)	10 ft. (3.05 m)	13 ft. (3.96 m)	16 ft. (4.88 m)
100 ohm	.09	.10	.12	.16	.21	.28
125 ohm	.11	.12	.14	.18	.23	.30
150 ohm	.13	.14	.16	.20	.26	.33



Signal Attenuation - Cable Loss and Reflection

For Cable Loss Attenuation - A signal transmitted on the TransNet Network is attenuated by cable losses. In the following chart:

- Module B sees an attenuation due to the length of the cable between the module and the interface.
- The total distance contributing to the cable loss is the sum of L1, L2, and L3.
- The nominal attenuation for the cable is expressed in terms of "db per 100 feet".
- This information can be found in the TransNet Network cable specifications.



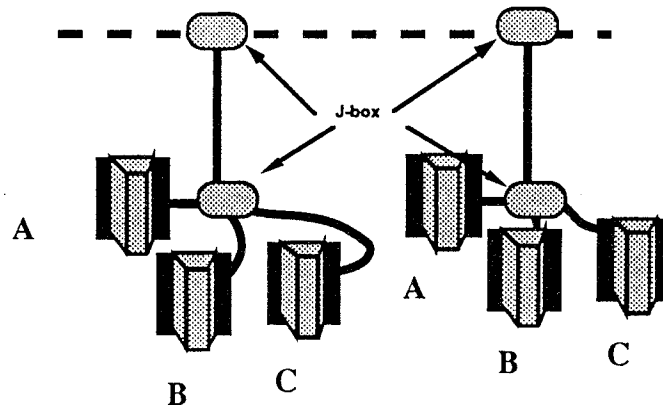
Cable Loss Attenuation

For Reflection Attenuation - A signal transmitted on the TransNet Network is attenuated by reflections from connections on the main trunk and the modules. In the following chart:

- Module A sees an attenuation due to one reflection.
- Module B sees an attenuation due to two reflections.
- If the terminating resistor is matched to the cable impedance correctly, the terminator does not produce any reflections.

Signal Attenuation - Cluster and Total Attenuation

For purposes of calculating reflection attenuation, use the following diagram:



All of the modules in the cluster will be affected by reflection attenuation from all the other modules in the cluster topology. For example, module A is affected by reflections due to module A, B, and C. Module C is affected by reflections due to modules A, B, and C.

Installing Communication Network

How to Calculate Total Signal Attenuation

The total signal attenuation for any module is the sum of the attenuation due to reflection and cable loss. To estimate the attenuation for each module on the network;

1. Determine the cable loss using the cable length between the interface and the module, and the "nominal attenuation".
2. Determine the reflection attenuation. For each connection on the TransNet Network between the interface and the module, use the Reflection vs. Drop Length to calculate the reflection.
3. Total all the attenuations for that module. Total attenuation must be less than 27 dB for all modules.

NOTE: Since modules do not transmit directly to other modules, it is not necessary to calculate attenuation between modules.

How to Select Cable Type

The TransNet Network requires a cable that consists of a single-shielded twisted pair type wire with the following important characteristics:

- Wire size or gauge
- Nominal impedance and
- Nominal attenuation.

A larger size wire reduces DC power loss and allows for more flexibility when locating the TransNet power supplies. In addition, a lower nominal impedance reduces signal attenuation caused by reflectance. The lower nominal attenuation reduces signal attenuation caused by "copper losses" or AC resistance.

Recommended cables are:

- Belden #9182
- Belden #9860
- Alpha #9823

Cable	Wire Gauge	Wire Loop Resist. Ohms/ft.	Nom. Imped. Ohms/ft.	Nom. atten. at 2 Mhz dB/ft.
Belden 9182	22	0.030	150	0.0041
Belden 9860	16	.008	125	0.0037
Alpha 9823	22	0.030	150	0.0051

Note: For other cables, refer to the manufacturer's specifications of wire gauge, nominal impedance and nominal attenuation.

How to Determine Interface Locations

The interface can be connected anywhere on the TransNet Network. The drop length of the cable used to connect the interface to the TransNet Network must be less than 16 ft. The recommended locations of the interface in the TransNet Network is determined by:

- The location of your computer, and
- The length of the drop cable from the interface to the TransNet Network.

Important Grounding Information

The TransNet Network shield **MUST BE** grounded at only one point to prevent ground loops. If you install more than one interface in the TransPort System; then ground only one interface.

DO NOT connect the shield on the interface cable to the computer chassis.

If the interface drop is connected to the end of the TransNet Network, a terminating resistor **MUST BE** installed at this connection point.

How to Wire the TransNet Network

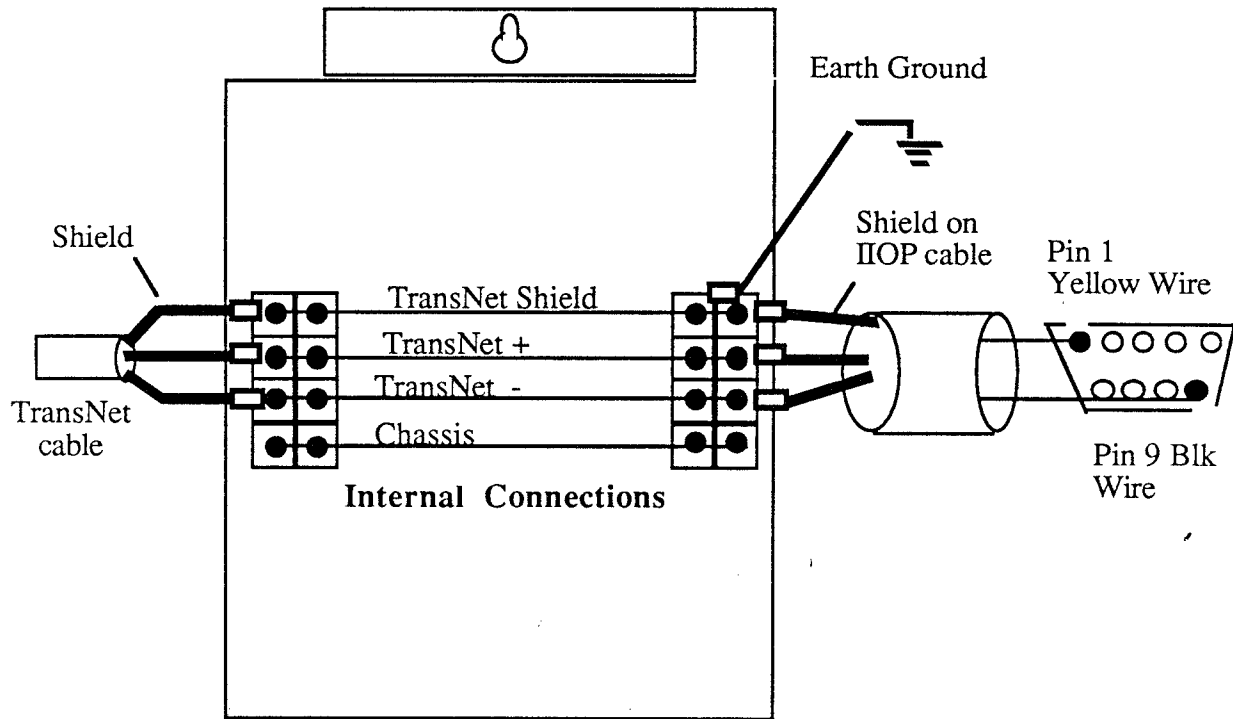
Before wiring the TransNet Network:

1. The TransNet Network must be grounded at only one point to prevent ground loops. If more than one interface is connected to the TransNet Network; ground one of them.
2. Make certain that the shield on the interface cable is not connected to the computer chassis.
3. If the interface drop cable is connected to one end of the TransNet Network, a terminating resistor must be used at this connection point.

The following diagrams show how to:

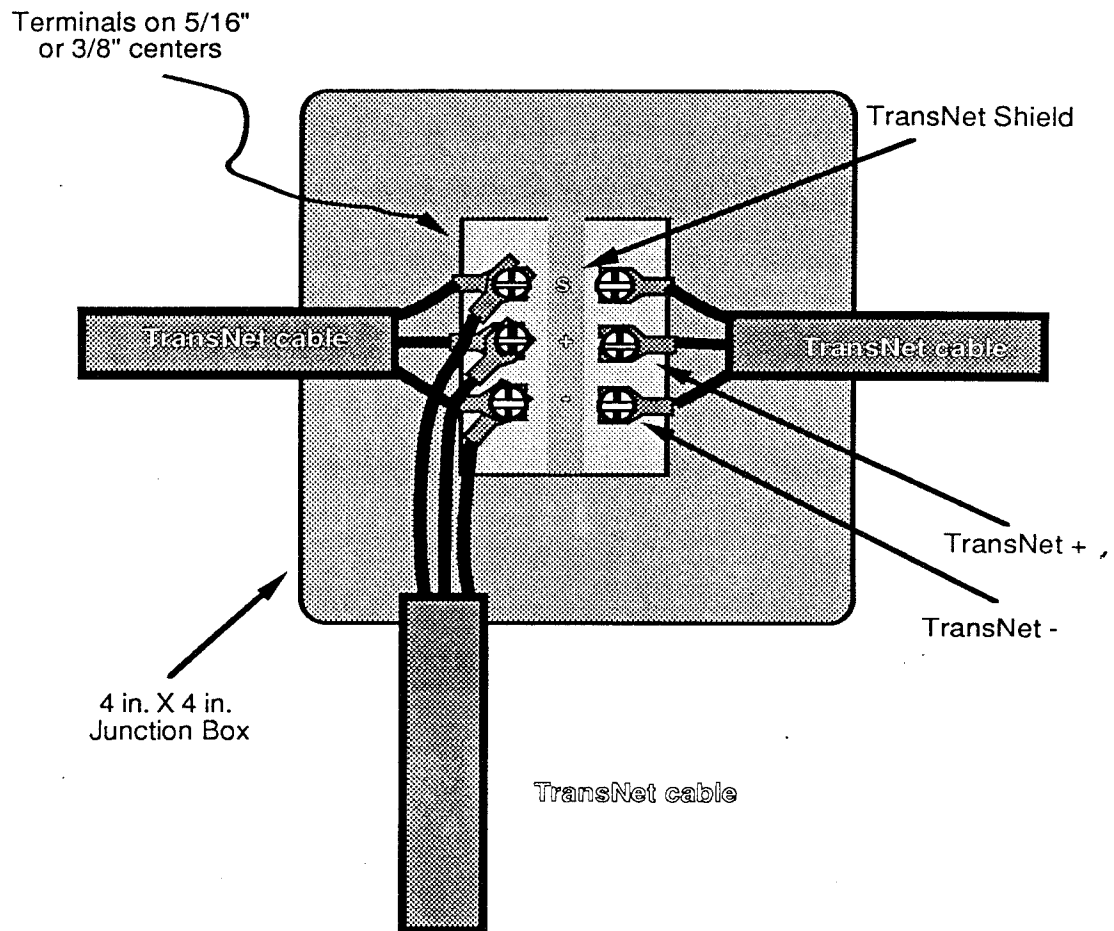
- Wire the interface to a module.
- Wire the interface to a J-Box.
- Install TransNet Terminating Resistor at a Module.
- Install TransNet Terminating Resistor at a J-Box.

Interface Connected at Module



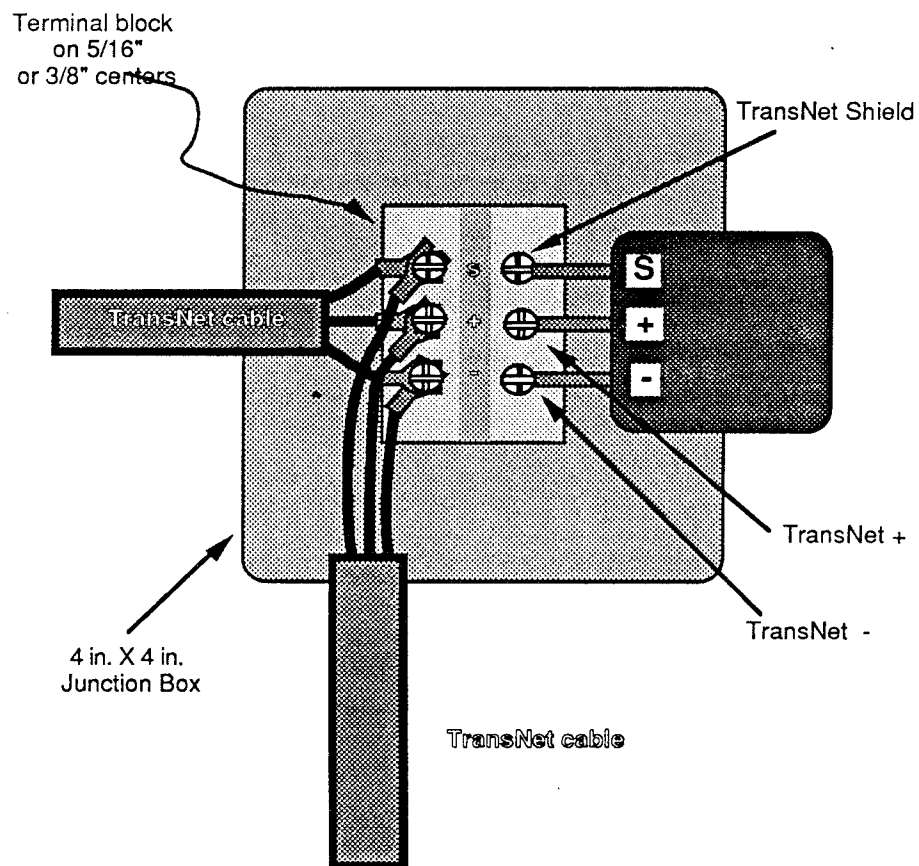
Note: The shield should only be connected to earth ground in one location. Connecting the shields to earth ground in multiple locations may cause communications problems.

Transnet Network Junction using a J-Box.

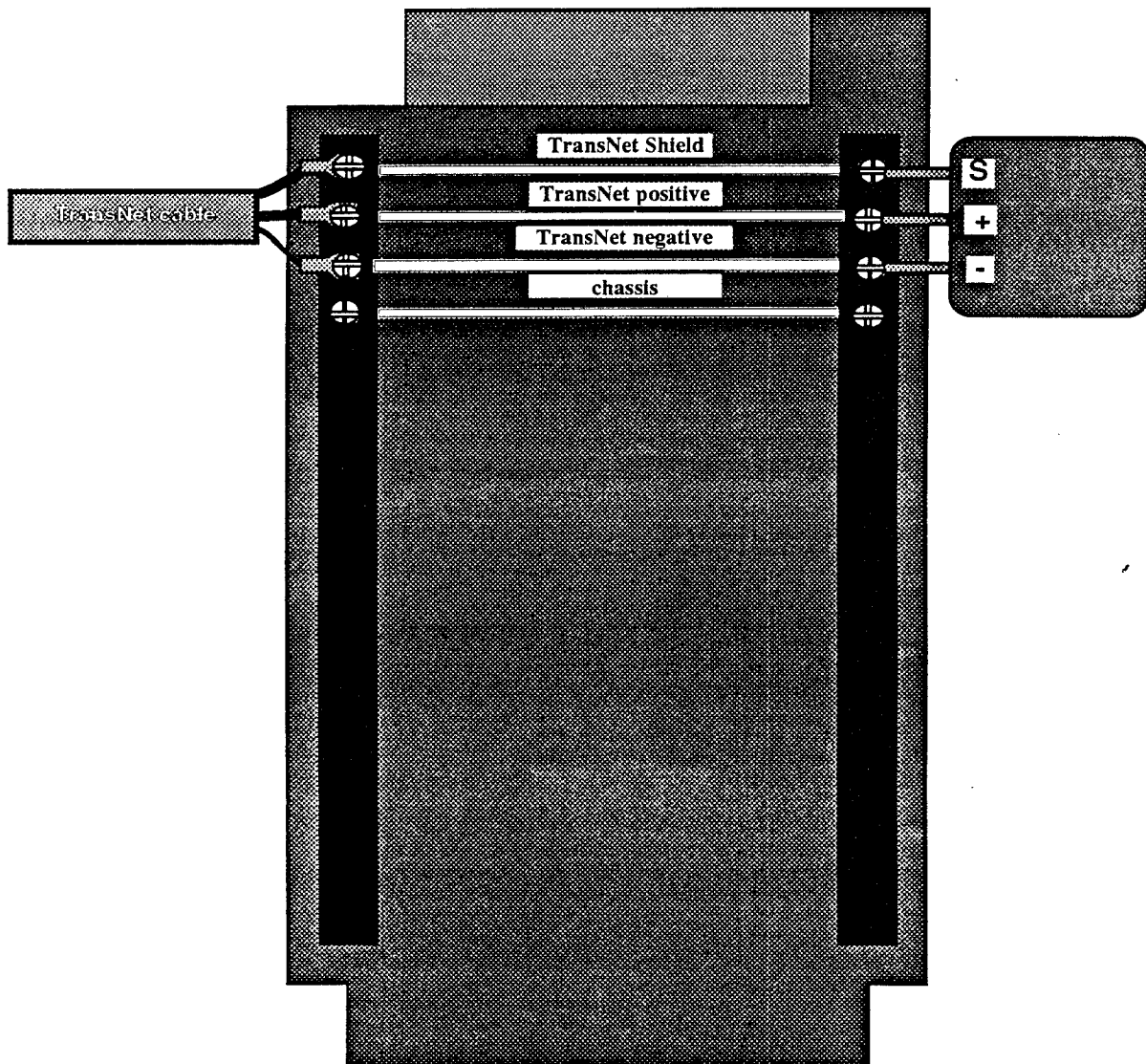


Installing Communication Network

Terminating Resistor on a J-Box



Terminating Resistor on Module



Note: The chassis terminal on the base is connected to the internal ground of the CPU in the module. Under normal circumstances, it is unnecessary to ground this terminal.

TransNet Network Power Information

Power is applied to the I/O modules from the power supplies connected to the TransNet Network. Due to DC resistance of the TransNet cable, the cable itself consumes some power and produces a voltage drop which reduces the voltage supplied to the I/O module. The location and quantity of power supplies can be estimated.

The PS01 power supply must:

- Provide at least 15 volts DC (the system is designed to run at 15 volt minimum) to all I/O modules,

AND

- Must have a power load that is less than 20 watts.

If the load on a power module is greater than 20 watts; then additional power modules are required. If an I/O module has a DC voltage less than 15 volts; then

- MOVE a power module closer to the I/O module,
- or
- ADD a power module closer to the I/O module.

Estimate the Number of Power Modules

For most applications, the Input/Output modules tend to be clustered together in groups, i.e., one group of six modules in a cluster, another group of eight modules, etc. For the purpose of calculations, each group can be treated as a separate entity with one or more power supplies located at each group. A "group" of modules would be modules located within 20 ft. (6.1 m) of cable length. At each group, use the number of power supplies required to provide the total power consumed by the I/O modules at that group. For example, if the power consumed by a group of modules adds up to 39 watts, the power is greater than 20 watts. Two power supplies would be required.

Table of Power Requirements

<u>Module Type</u>	<u>Watts Consumed</u>
Discrete output	3.7
Discrete input	2.9
Analog out, 8	10.7
Analog out, 16	19.4
Analog input 8	7
Analog input 16	12

Each group of modules can have power left over for some I/O modules installed remotely. The amount of power available to these remote modules depends upon the:

- Surplus power at the near group
- Number of power supplies at the nearest group
- Distance between the remote module and the nearest group, and
- Wire size

Powering The TransPort System

Exact Calculations for Power Supplies

An equivalent DC circuit for TransNet power can be determined by:

1. The length of TransNet Network main line and drops, and nominal DC resistance of cable (ohms per pair foot).
2. The power module supplies 24 VDC, has 2.5 ohms internal resistance, and has a 20 watt maximum capacity.
3. The I/O module requires 15 volts DC minimum.

The table below shows the DC loop resistance for various wire gauges.

Copper Wire Size (gauge)	Loop Resistance (ohms/1000 ft)
14	5.2
16	8.3 (Belden #9860)
18	13.3
20	21
22	30 (Belden #9182)

NOTE: A power supply does not necessarily need to be located at each cluster of modules.

How to "Hot Swap" Modules

CAUTION: High voltage. Serious injury can result from contact with high voltage.

When the system detects a module failure, a module can be "hot-swapped" or replaced while the system is running. The power can remain on and modules do not have to be reconfigured. Module configuration information is stored in the non-volatile EAROM memory of the module termination base.

Note: The host computer will detect a communications error when a module is removed from its base. Normal communications will resume when a module is replaced.

1. Loosen Module attaching bolt; then remove module.
2. Replace module; then tighten mounting bolt..

Safety and Maintenance Information

General safety precautions must be adhered to during all phases of operation. Failure to comply with these precautions violates safety standards of design, manufacture, and intended use of the TransPort System. The following is important general safety information:

Power Source (Power Module only)

This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Grounding (Power Module only)

The power module is grounded through the grounding conductor of the power cord. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Mount Modules in Correct Locations

Avoid locations that will cause excessive vibrations. Do not mount modules where the ambient temperatures are higher than 140°F (60° C) or lower than 0° C. Do not mount modules where any type of corrosive chemicals, water, excessive dust, or fluids can come in contact with the modules.

Practice Safe Maintenance

The TransPort System modules are constructed of Noryl plastic (a registered trademark name of GE Plastics). This product is known for its outstanding hydrolytic stability. It is important to note that this product can soften or dissolve in many halogenated and aromatic hydrocarbons. For more information concerning any other incompatible chemicals, consult GE Plastics. Serious damage can result if incorrect chemicals are applied.

Record your Module Identification Numbers

Each module has a serial number and a catalog (module) number. It is recommended that you keep a separate record of these numbers. These numbers are needed when you are requesting service and/or warranty information. A space on your module is also available to record your own tag number and order number. These numbers are available for your convenience and are not needed when requesting service or warranty information.

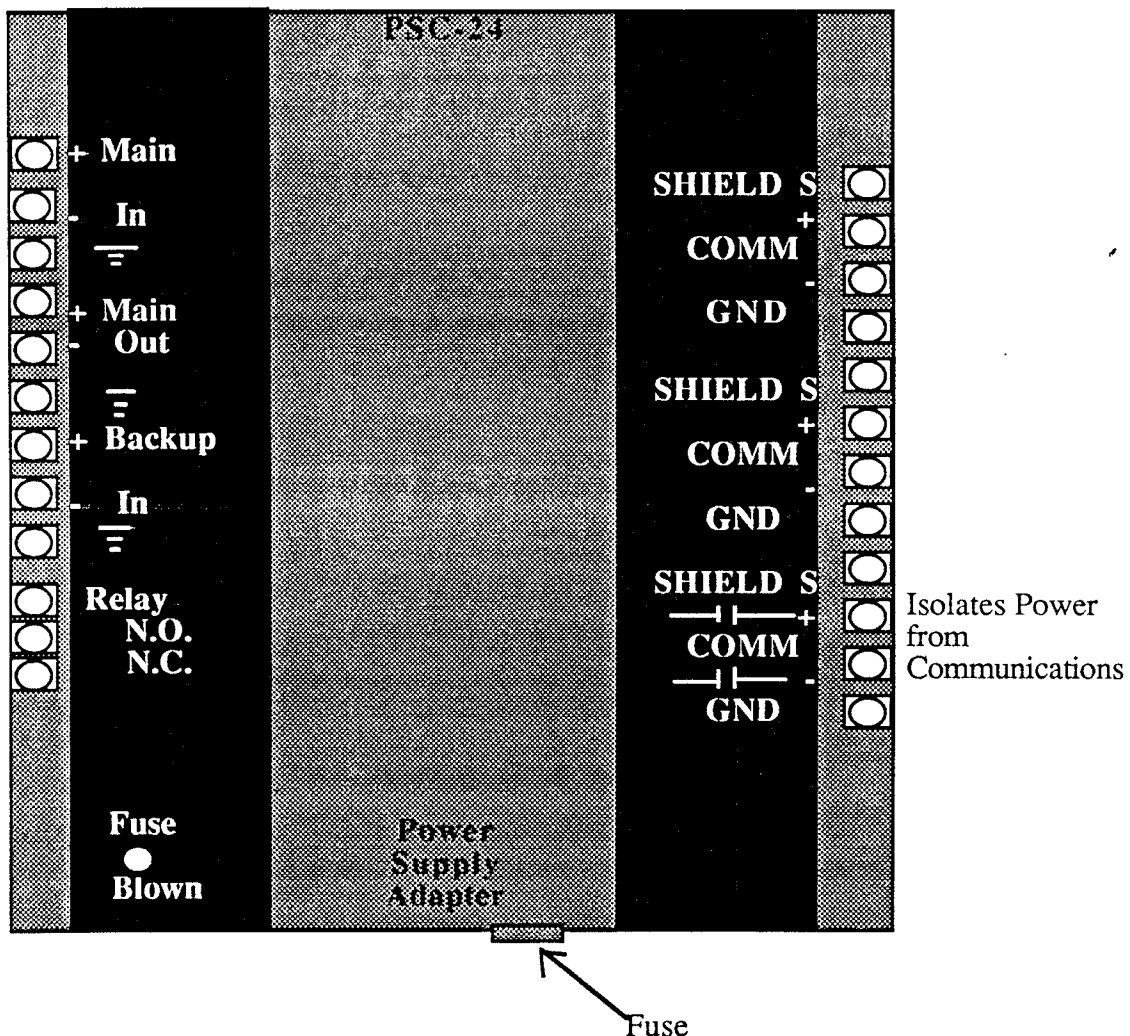
Powering The TransPort System

Power Modules

The PS01 provides DC power to the Input/Output modules over the TransNet Network cable. The power supply converts 115 Vac 60 Hz or 230 Vac 50 Hz to 15 to 35 Vdc for the electronics module. Multiple PS01 modules are required to provide adequate power to all Input/Output modules. See the TransNet Network Cabling and Power section of this manual for more information on power design.

Due to the DC resistance in the network cable, the DC voltage at each module will be less than the voltage supplied by the PS01. An Input/Output module requires a minimum of 15 Vdc and recommended minimum is 17 Vdc.

For larger systems, the PSC24 Power Supply Adapter is an economical alternative to multiple PS01 modules. The PSC24 accepts up to 35 Vdc from a separate power supply and "adapts" the power for use with the TransPort System. Connections for the PSC24 are as follows:



The TransPort System The Intelligent Input/Output Processor (Interface) Installation

The following pages outline how to:

- Prepare your computer to install the Intelligent Input/Output Processor (interface)
- Prepare your interface
- Set the port address
- Set memory address, and
- Set the Interrupt Request (IRQ) Line
- Complete your interface installation and verify the interface operation

Introduction

The IBM PCAT interface (Transition Technology Part Number CI-IBM) provides a means of communication between the computer (such as an IBM AT or 100% IBM PCAT compatible) and the Input/Output modules on the TransNet Network. The interface has on-board intelligence to handle TransNet communications and data manipulation without using the computer system's resources. The interface controls the I/O scanning, the memory mapping, the communications and the error detection in the system. The interface communicates with the computer system through the use of 64K of Dual Ported RAM (DPR).

The interface

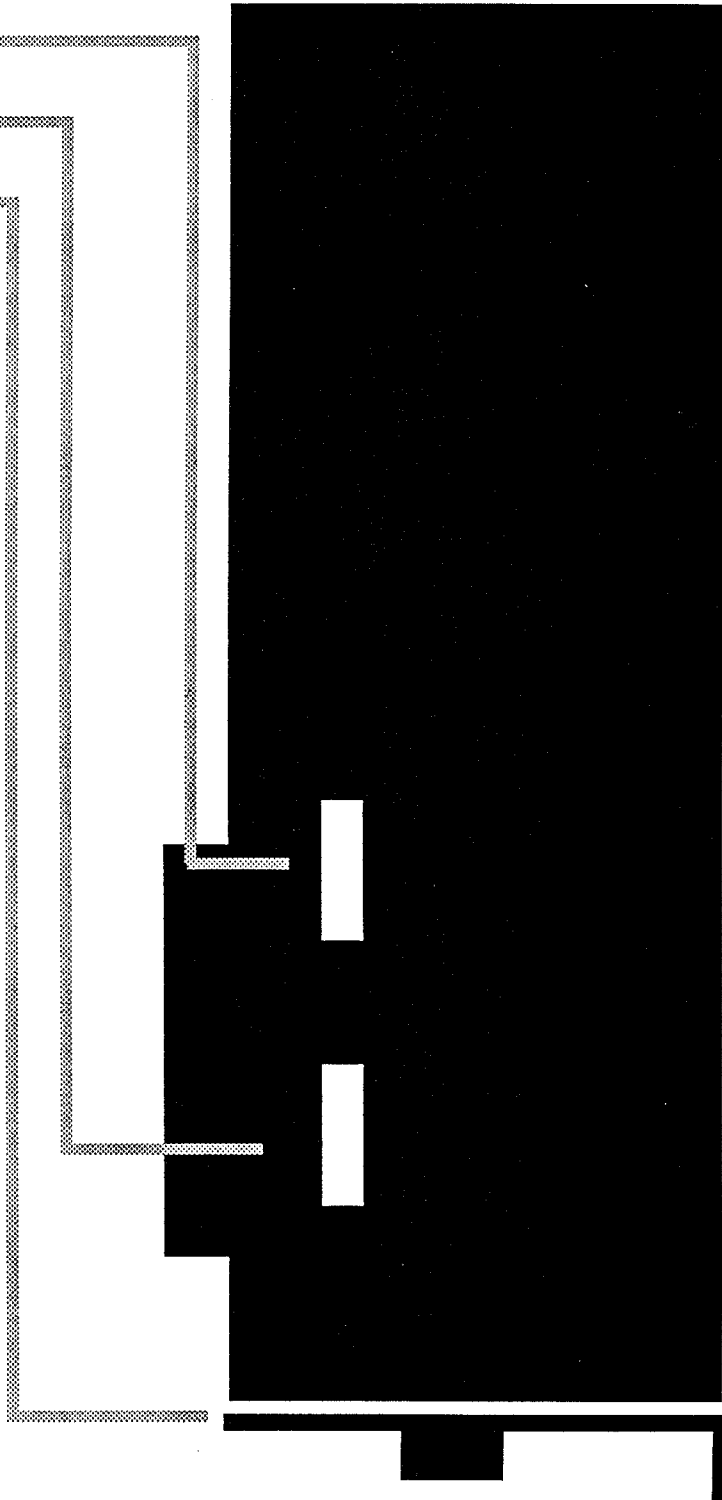
A - Dip Switches #1

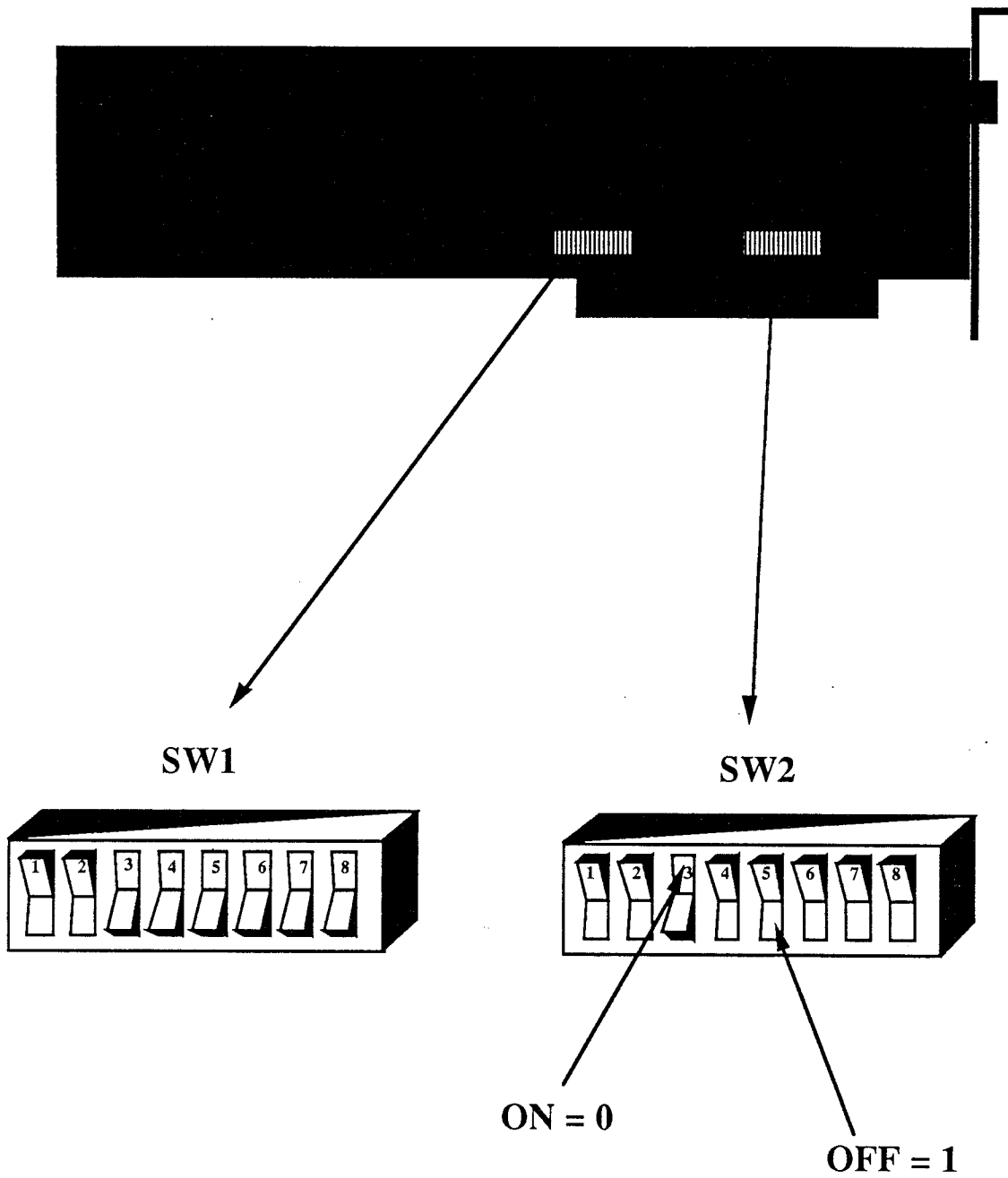
B - Dip Switches #2

C - Retaining Bracket

Prepare your Computer and the interface

1. Shut off power.
2. Remove computer cover. For removal instructions, see your computer operator's manual.
3. Select an available full size expansion slot location.
4. There are two blocks of eight dip switches on the CI-IBM. The interface dip switches are used to set the port address, the address for dual ported RAM, and hardware interrupt. Use the following diagram to set your dip switches to the correct setting.





SW1 = Port address for the first of 4 consecutive ports

Switch	Port
12345678	
00000000	000
00000001	004
00000010	008
00000100	010
00001000	020
00010000	040
00100000	080
01000000	100
10000000	200
...ETC...	
11000000	300 (Factory setting)
11000001	304
...ETC...	
11111110	3F8
11111111	3FC

SW2 = Base memory segment address for DPR

Switch 1234	Memory segment
0000	00000
0001	10000
0010	20000
0011	30000
0100	40000
0101	50000
0110	60000
0111	70000
1000	80000
1001	90000
1010	A0000
1011	B0000
1100	C0000
1101	D0000 (Factory setting)
1110	E0000
1111	F0000

SW2 (5,6,7,8) = Hardware interrupt selection

IRQ level Turn on

IRQ 4	switch 5
IRQ 5	switch 6
IRQ 6	switch 7 (DON'T)
IRQ 7	switch 8
NO IRQ	all off (factory setting)

" ON " is select

WARNING

**IRQ 6 is used for your hard drive. If you activate it,
your computer will crash!**

Select Port Address, Memory Address and Interrupt Request (IRQ) Line

When the TransPort System is installed, no other devices in the computer can use the same port address, memory address or IRQ line. The default settings (the settings of the dip switches as sent from the factory) are adequate for most applications.

Port Address (numbers are in hex)

The port address is used by the interface to manage the use of Dual Ported Ram (DPR). The port address requires four (4) consecutive locations which are. For example, 300, 301, 302, 303. The port address must start with an address divisible by 4. The following are recommended ports which can be any port between 100 and 3FF that are not reserved for other uses. For example, the addresses between 1F8 and 200 are available. The following is a typical IBM AT Port Allocation Chart:

<u>Port (from/to)</u>	<u>Description</u>
1F0 to 1F8	Fixed Disk
200 to 207	game I/O
20C to 21F	Reserved
278 to 27F	Parallel printer port 2
2B0 to 2DF	Alternate EGA card
2E1	GPIB
2E2 to 2E3	Data Acquisition #0
2F8 to 2FF	Serial Port 2
300 to 31F	Prototype Card <----- Default Setting

DPR Address (numbers are in hex)

DPR (Dual Ported Ram) is used for data transfer between your computer and the interface. Most of the memory is reserved or in-use except for the following default and alternate settings. The following is a typical IBM AT RAM allocation chart:

<u>Memory Address</u>	<u>Use of Memory</u>
00000 to 9FFFF	System board memory (640 K)
A0000 to BFFFF	128K video display buffer
C0000 to C8000	Disk Controller
D0000 to DFFFF	64K I/O expansion ROM <-Default setting
E0000 to FFFFF	128K reserved on system board

Interface Installation

Interrupt (IRQ) Selection

For high speed applications, the interface issues an interrupt to the computer when the TransPort System has completed an I/O scan; for example, when all the Input/Outputs have been read and written. There is no default IRQ setting. IRQ 4, 5 and 7 can be used if the corresponding port is not in use. Do not use IRQ 6, since most applications would be using a disk controller. The following is a typical IBM AT Interrupt Allocation Chart:

<u>IRQ</u>	<u>Description</u>
4	Serial Port 1
5	Parallel Port 2
6	Disk Controller
7	Parallel Port 1

Once you have set your selections, it is recommended that you record them in the spaces provided below. Write down Port address, Memory address, IRQ and dip switch settings along with your initials and the date. Keep this information current and near your computer. This configuration information is also needed when you set the System Parameters in the TransPort Setup and Configuration software.

Port Address: _____

Memory Address: _____

IRQ: _____

Dip Switch Settings:

8 7 6 5 4 3 2 1

SW1: _ _ _ _ _

8 7 6 5 4 3 2 1

SW2: _ _ _ _ _

Operator: _____ Date: _____

Install the interface

1. Make certain your computer is turned off; then remove the cover. See your computer operator's manual for removal instructions.
2. Follow ESD grounding procedures before you remove the interface from the shipping container.
3. Set dip switches as outlined in this section of the manual.
4. Install the interface into the first available full size expansion slot. For installation instructions, see the section on Input/Output Expansion Slots in your computer operator's manual.
5. Connect the interface to the TransNet Network. Replace the cover and turn on the computer.
6. Run software to verify installation is correct. Please see sections:
 - Installing TransPort Software
 - Setup & Configuration

Install the software in your computer.

Once the Master interface is in the host PCAT computer, you are now ready to load the TransPort software.

System Requirements

- DOS 3.0+.
- It must have at least 640K of RAM memory.
- It must also have a hard drive (with 1.5 Mbytes of free space) to store and run the program.
- The software is meant to run with most graphics adapters if you have difficulties please refer to section "**Troubleshooting**".

The Setup & Configuration software comes on 3 1/2" , 720K or 5 1/4" 360K floppy diskettes.

- Step A** Turn on your computer (if you don't have a hard drive in this computer you won't be able to run this software. **Call us**).
- Step B** After your computer has booted to the DOS prompt (e.g. C:\>), put the disk in your computer's floppy disk drive.
- Step C** Create a new directory for this software. At the DOS prompt (e.g. C:\>), type MD XXXXXXXX (up to eight character directory name. We usually call it TSCS) and then press the **Enter** (or **Return**) key.
- Step D** Move to the new directory. At the DOS prompt (e.g. C:\>), type CD XXXXXXXX (up to eight character directory name) and then press the **Enter** (or **Return**) key.
- Step E** Insert the floppy disk into your computer.
- Step F** At the DOS prompt (e.g. C:\>), type A: if the floppy is in drive A or type B: if the floppy is in drive B. Once this is done then press the **Enter** (or **Return**) key.
- Step G** At the DOS prompt type **INSTALL C: or INSTALL D:** (depending on which drive your new directory is in, if it's in E: then you'd type **INSTALL E:**), then press the **Enter** (or **Return**) key. This will start an install program which will load the software into the directory on the hard drive of your computer.

The following text will appear on the screen.

Installation Program

For Transition Technology Applications Software.

Copying files from floppy disk to current directory...

Extracting configuration software from archive file...

Extracting applications software from archive file...

Extracting utility software from archive file...

Extracting diagnostics software from archive file...

StepH

When the installation has been completed successfully, it will exit back to DOS in the directory in which the software is installed. At this time, you are ready to run the TransPort™ software.

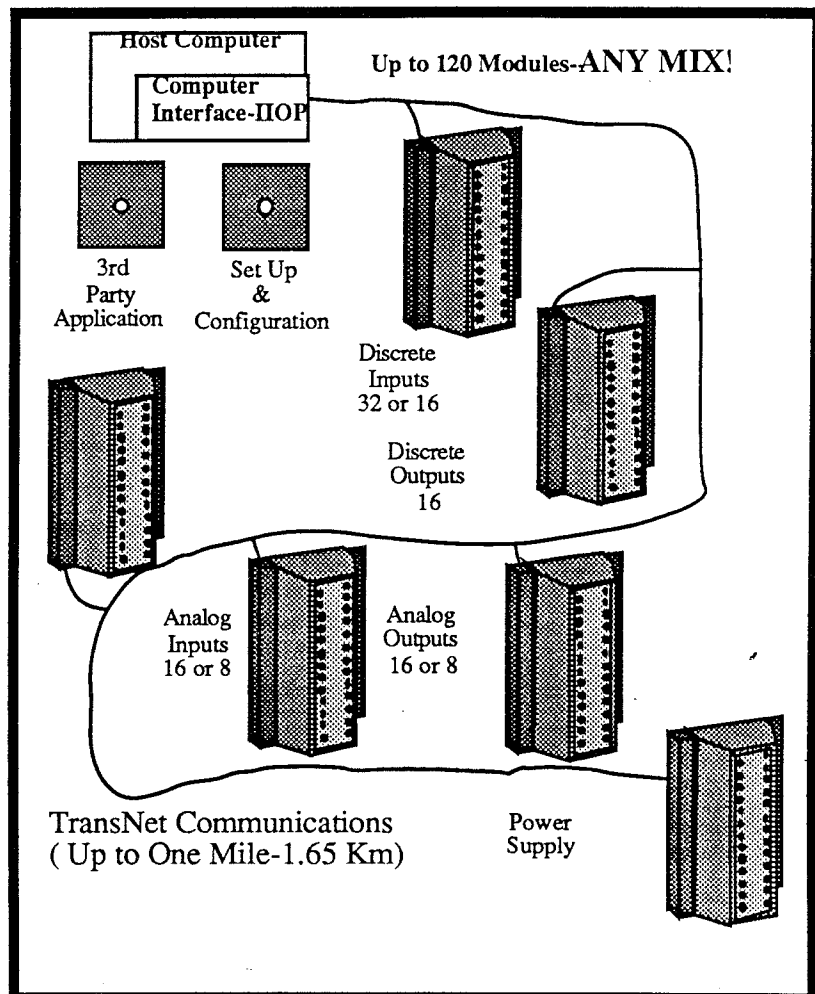
Introduction

The TransPort™ I/O system does not work until it has been configured.

This configuration is done with an IBM PC-AT, or compatible, computer and our Setup & Configuration software. The TransPort I/O modules are connected to a host computer via TransNet™, a proprietary serial communications network. Each of the modules is essentially a small computer and has parameters that must be programmed, both for communications and local operations. A copy of this information in the modules must also be loaded into the host computer and stored in a file.

In order for the modules to communicate with the host computer they must have a unique communications address. A communications address is analogous to a phone number. In a telephone system each phone must have a unique phone number (communications address), likewise every TransPort module must have a unique communications address.

The first part of configuration is the act of giving each module its unique address. Along with this address other important data is passed to the module at this time. The second part of the configuration process involves the programming of the I/O modules. All TransPort modules have certain programmable features. These features must be activated at configuration time.



The Setup & Configuration section of The TransPort™ System User's manual has the following sub-sections:

Configuration Theory

How to Use the Software

Starting Up the Software

Configuring System Parameters

Configure Modules Screen

Channel Information Screens

Flow Chart

File Utilities

Advanced User Mode

How to Configure the Modules

Command Line Parameters

- what is done in configuration and why.
- the basic elements of the software and how to move about in it.
- starting up the software from DOS to the Main Menu.
- setting up global software and system parameters.
- how the Configure Module Screen works.
- explanations of all Module Channel screens and their parameters.
- diagram of the Setup & Configuration software's screen flow.
- creating, selecting, and manipulating configuration files.
- ONLINE/OFFLINE Configuration, Screen Colors, and DOS Shell.
- step-by-step instruction on configuring modules.
- Setup & Configuration's DOS command line parameters.

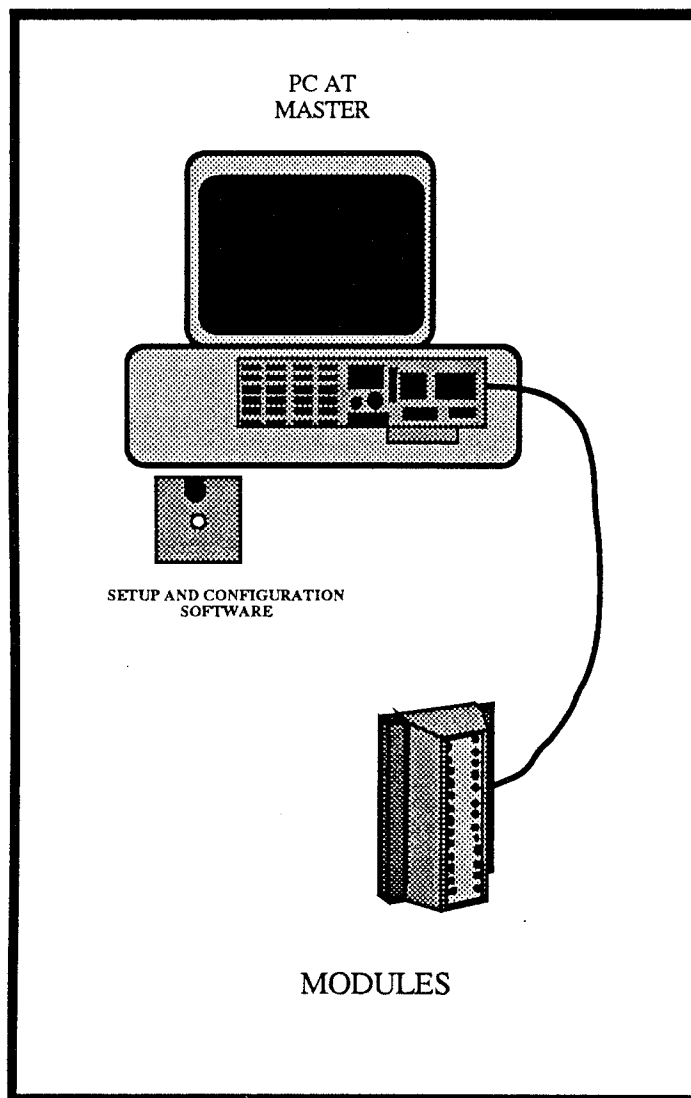
It is strongly suggested that you read and understand the **Configuration Theory** the system. This knowledge will help you understand what is happening while you go through the configuration process.

Configuration Theory

The configuration process is divided into two tasks. The first task is to initialize and address each module for communications. The second task is to configure an individual module's programmable parameters. In either case the basic configuration process revolves around the transfer of information from a personal computer to the interface plugged into the host computer and then to the modules. The interface may actually be in the PC running the configuration program or it may be in a separate computer. A quick look at the system architecture helps to understand these relationships.

The System

The TransPort I/O system is made up of two types of interconnected pieces. Interfaces and modules. These pieces are connected via a single two wire communications network.



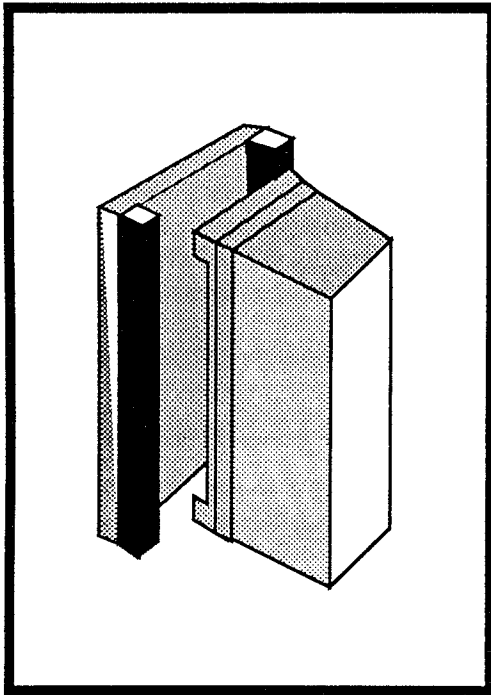
The Network

The TransNet™ network is the media for all information transfer in the system. TransNet is a serial communications link. It is implemented using a single two-wire (plus shield) twinaxial cable. The TransPort network is a single-master, multiple-slave type communications network. This means only one device may initiate communications on the network. All other devices are slaves and respond only to requests or commands from the master. The only way a slave device may initiate communications is to obtain mastership from the current system master.

Interfaces

The interface connects the TransPort system to the bus of a host computer. Interfaces work in one of three modes; master, listener or external configurator. In the master mode an interface is allowed to initiate communications with the modules. In the listener mode an interface is only allowed to listen to the communications traffic on the network. An external configurator may function as a listener but also may gain control of the network to configure the system. Interfaces are currently available for:

- PC-AT,
- VME,
- Modbus (RTU),
- Modicon Remote I/O (984),
- Allen Bradley Remote I/O (1771), and
- Serial ports (RS-232, 422/485).



Modules

The modules (up to 120) may be connected, a mile in either direction from the master interface. There are four basic varieties of modules; digital inputs, digital outputs, analog inputs and analog outputs. These four basic types have 32 different varieties. The modules are constructed in two pieces, an electronics unit and a termination base (see picture above). The electronics unit contains the processor, communication and signal conditioning circuits. The electronics unit plugs into the termination base. Connections for field wiring and communications are made at screw terminals on the termination base. The base contains only one piece of active electronics, a 1k bit EEPROM (electrically erasable programmable read only memory). This EEPROM is used to store the module's configuration data. When the module powers up it reads this information in the base to determine its communications address and channel configuration information. Configuration data is stored in the base to prevent the need for re-programming in the event of a module failure. The modules have electronics that allow them to be removed from and inserted into the base with the power on. This allows you to replace a failed module without removing system power or re-configuring the new module.

Information Flow of Configuration

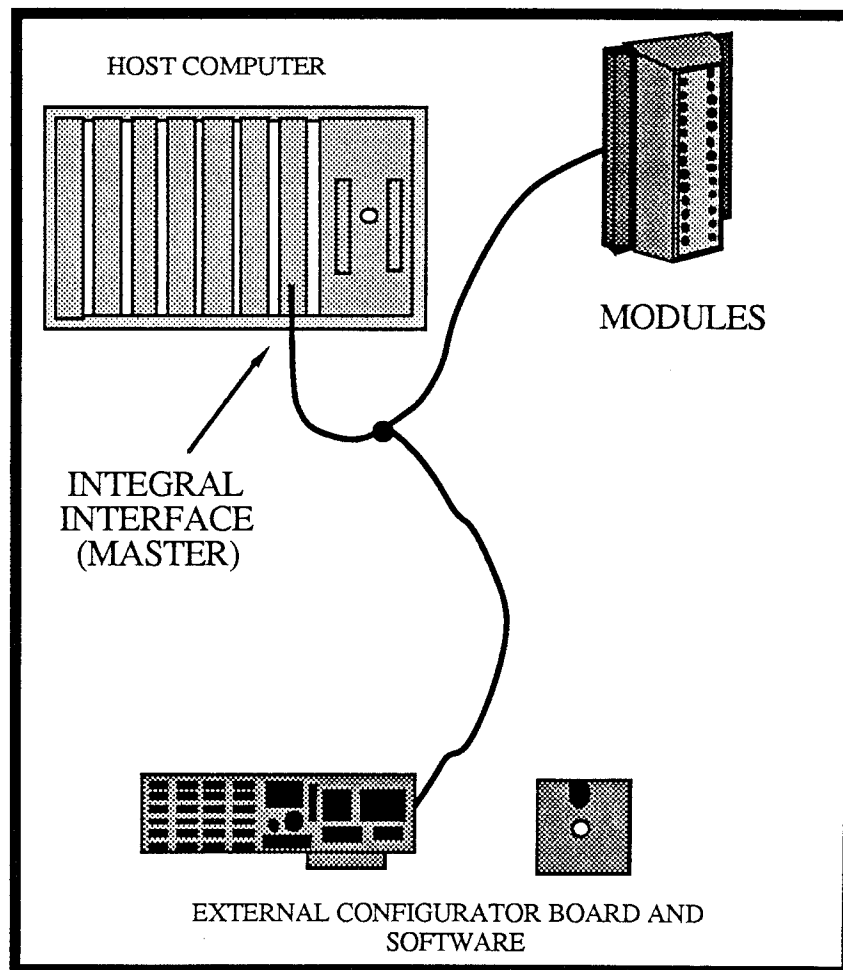
The configuration process is accomplished by transferring information generated in the Setup & Configuration software, running on a PC-AT based computer, to the modules and the master interface. There are two different equipment configurations possible with the TransPort system.

Direct Configuration

The first equipment configuration is pictured at the right. Modules are configured directly through the master interface. This master interface is plugged into a computer system that supports the Setup & Configuration software. Examples of this are PC-AT or VME (i.e. Radisys) AT bus based computers systems with access to Microsoft's MS-DOS operating system. The Setup & Configuration software configures each module, stores the information in a file and when configuration is complete downloads a copy of the configuration to the interface card. Upon exit from the Setup & Configuration program an image of the configuration is stored in a file.

External Configuration

The second equipment configuration is pictured on the next page. It has a non IBM AT based host computer. In this case it is necessary to use an External configuration scheme. This scheme employs a PC-AT with an External Configurator interface card, installed. The PC-AT with External Configurator gains control of the network and configures the modules. Once module configuration is complete, the external configurator sends a duplicate of the module configuration to the Host computer (not the AT, the other one). When the host computer acknowledges the receipt of this information the External Configurator relinquishes control of the network back to the host computer. Upon exiting the Setup & Configuration program an image of the configuration is stored in a file on the hard drive of the PC-AT. All non-PC-AT interface cards feature battery backed memory so they don't lose their configuration in the event of power loss.



Communications and Configuration

The TransPort™ network is a master-slave communications system. Within this framework it employs a two mode communications protocol; Command/Response and Broadcast. Only the system master may initiate communications (talk). This means that the modules may only talk in response to a command from the master interface.

Module Address

A module's address (phone number) is stored in the EEPROM in the module's termination base along with other configuration data. When power is applied to a module it reads this information in the EEPROM and determines its network address. Bases are shipped from the factory with a default configuration. Part of this configuration is the default module address of 121. 120 is the highest valid TransNet address. It is necessary to configure the bases (and thus the modules) **one at a time**. If any two modules reside at the same address they will talk over each other when responding to commands. The initial act of configuration involves **plugging the modules into the bases one at a time** and assigning the base a valid, unique address.

In addition to this address, two other pieces of information are downloaded to the module, and hence the bases EEPROM: the module's Broadcast time slot(s) and its communications loss time out value. These are discussed below. The actual configuration procedure (when to plug the modules in) is covered in *Adding New Modules*.

Command/Response

In Command/Response mode, a command is issued from the master to an individual module. The module performs the command and issues a response to the master. In order for this transfer to occur, each module must have a unique address. The master issues its command to this address. The only way for the modules to get this address is through the Setup & Configuration program.

Broadcast

This mode of communications differs from Command/Response in that a single command from the master initiates activity and responses from all of the modules. By issuing a single command, the master collects all inputs and statuses from every module (including output modules) and updates all the outputs. To do this in Command/Response would require the master to send a command to each module. The Broadcast method allows the master to gather more data, issuing fewer commands. This results in higher data throughput. The method used to make this happen is called Time Division Multiplexing. The following is a step-by-step explanation of a single Time Division Multiplexed, Broadcast cycle.

- 1) Broadcast is initiated by the interface sending a command.
This command is referred to as the synchronization command.
- 2) Each module receives this command and starts a timer.
- 3) When this timer times out in each module, the module transmits its input and status data (outputs also respond with this information).
- 4) After transmitting their status and input (readbacks) data, output modules start a second timer.
- 5) When this second timer times out, the output module receives output data from the master.
(The master after receiving input and status data, transmits output data to all output modules).

Each module's timer(s) (outputs use 2) use different times. This allows only one module to transmit data to the master interface during a given time interval and only one module to receive data from the interface during another time interval. In order for this to work every module must have the particular time slot in which it communicates its input and status data. Also if the module is an output it must know the time slot when it is supposed to receive output data from the interface. These time slots are assigned by the configuration program.

Setup & Configuration

The times that dictate when each module transmits or receives are generated during configuration. Like the communications (Comm) address, it is stored in the EEPROM on the termination base. Unlike the Comm address, this value changes every time a new module is added. Therefore if you remove a module from its base before the configuration process is complete, add a base configured on a different system or fail in any way to update the communications time of all modules, communications errors will occur.

Communications Loss Timeout

The communications loss timeout value is the length of time a module will go before receiving valid communications. If the module is an output and this time elapses, the module's output's will assume their comm loss default state. This state is defined during the second phase of configuration.

Module Information

In addition to the module's address and communication times (the Broadcast time slots and communications loss timeout) certain module specific parameter information must be configured and stored in the base's EEPROM. Each TransPort module, in addition to its simplistic function as a digital input, digital output, analog input, or analog output, performs other tasks. Each module is designed to perform what we refer to as intelligent pre-processing. This includes filtering, linearizing, capturing momentary signals and other functions. Most of these functions and can be configured on a channel by channel basis. See the sub-section, *Editing Module Channels* , for a description of each modules functions and features.

How to Use the Software

Before we actually begin configuring any modules, some notes about the software. This software program is built around a fill-in-the-blank screens, pop-up menus, messages, and function keys.

Menus Choices are made from the menus by two methods. The first method is, using the arrow keys, move the highlighted cursor to your selection, and press the Enter (or Return) key. The second method of making a menu selection is to press the key that corresponds to the highlighted character in that selection.

Messages There are three types of messages in this software program: Context Sensitive Help, Operational Help and Error Messages. They appear in boxes above the current screen.

Context Sensitive Help messages give information about the current menu or field. These messages are brought up by the user pressing the **F1 Help** key while positioned on a field entry or selecting from a pop-up menu. The user is prompted to use the Esc key to return to editing/selecting.

This is the module type field. This field should match the module that is located in the specified address of the network. Press <ESC>; then enter the module type, OR press the <F9> Selections key to view the Module Type pop-up menu.

Operational Help messages explain menu choices that are on the screen. They also explain what the computer may be doing during a pause.

The file specified was not found. If you wish to create a new file, select "Yes" above. If you wish to continue using the same file select "No". To see the available files in this directory, use the "Choose From Directory" selection.

Error messages will appear, often accompanied by a warning beep, to signify that an operation has been unsuccessful or that a situation exists that requires remedy. Read the message and take the action prescribed in it. If you are unable to get a successful result (the error repeats, or a new one appears), STOP. Consult the **Troubleshooting** section or call us. Many errors, especially communications errors are indicative of installation difficulties or equipment difficulties. Please do not go to the next step or try something new until you have located the source of the error.

The interface did not receive a response from a module or other interface board. This may be caused by CRC errors on the link or the module/interface board may not be present.
Press <ESC> to continue.

Function Keys The function keys in this program are context sensitive. They will appear in a banner (like the one below) on the bottom of the screen when they are active. Keys have different meanings in different screens. The following is a list of the keys and their functions. Remember they are only active when they appear on the screen. The exact sequence key sequence to generate these functions is covered later in this manual.

F1 Help	F3 Program	F5 Edit Scan	F7 Channels	F9 Selections
F2 Default	F4 Document	F6 Repeat	F8	F10 Menu

- | | | |
|--------|-------------|--|
| F1 | Help | This key is active on all screens except when the cursor is over a status field in the Configure Modules screen. The help function is context sensitive. When you press the F1 key a Help message will appear in a blue banner. The message will pertain to the field under the highlighted cursor. The message above is from the Configure Modules screen. This message would appear if the highlighted cursor is located over any module or empty space under the Module Type heading. |
| F1 | Status Info | This key is active only in the Configure Modules screen. The only time this key appears is when the cursor is positioned over the Status field in the Configure Modules screen. Pressing the F1 key at this time will give you an explanation of the current error status of the selected module. |
| F2 | Default | This key is active in all screens. This function automatically returns the highlighted selection back to its factory default state. In the Configure Modules screen selecting this key will set all of the highlighted module's channel configurations to the defaults (any tagnames will remain). In Set System Parameter, all System parameters are reset. When working on an individual module's channel, <i>only</i> the highlighted parameter is reset. |
| F3 | Program | This key is active in the Configure Modules screen only. It allows you to update the configuration of a single module. This key is useful in assuring that all the modules have the latest time slots (If you don't know what time slots are, please read the Configuration Theory section). |
| Alt-F3 | Program All | This key is active in the Configure Modules screen only. To activate this key hold down the Alt key and at the same time press the F3 key. This allows you to update the configuration of all modules. This key is useful in assuring that all the modules have the latest time slots and configurations (If you don't know what time slots are, please read the <i>Configuration Theory</i> section). |
| F4 | Document | This key is active in all screens. When you select this key the system allows you to store a copy of the configuration in a text file. (See <i>Documentation</i> sub-section.) |
| F5 | Edit Scan | This key is active only in the Configure Modules screen. It allows the user to change the configuration once it is entered. There are four selections under Edit Scan, Move, Insert, Delete, Search and Correct Module Type. (See <i>Editing the Scan</i> sub-section.) |
| F5 | Statistics | This key is active only when working on an individual channel on an analog input (AI00XX and AI15XX). This allows the user to enable / disable the Peak and Valley function |
| F5 | Globals | This key is active only when working on an individual channel on an analog input (AI01XX and AI02XX). This allows the user to enable / disable the Peak and Valley and AC Filtering functions. |

Setup & Configuration

F 6	Repeat	This key is active in the Configure Modules, and the individual module channel screens. There is a bug in the software. The key does not appear when you first enter a modules individual channel screen. It is active although it does not appear.
F 7	Channels	This key be active only in the Configure Modules main screen. This key will cause you to enter a screen that allows editing of an individual modules parameters. You will enter the screen that corresponds to the module under the highlighted cursor. This is the portion of the software that allows you to set modules to read different signals, latch on momentary contacts, set fail safes, filters and other parameters.
F 7	Edit Entry	This key may be active only when editing an individual channel parameter that must be alpha - numerically entered. Examples of this are the Up / Low range values in the analog input modules and wire tags.
F 9	Selections	This key may be active in all screens. The selections key is active whenever the highlighted cursor is over a parameter that may be changed via menu. Selecting the F9 key will pop-up a menu with the available choices.
F 10	Menu	This key will bring up the main menu.
Esc	Escape	The escape key is aptly named in this program. The purpose of the escape key is to allow you to escape from a screen or selection. This key is globally used as the exit mechanism for menus, error conditions, and sub screens.

Starting Up the Software

This topic covers how to get the Setup & Configuration software up and running.

If you have not yet installed the software on your PC-AT's hard drive, refer to the **Software Installation** section of this manual. Otherwise change to the directory in which you installed the software in (e.g. **CD C:\TSCS**).

Now to begin the Setup & Configuration software type the following at the DOS prompt (e.g. **C:\TSCS>**):

- *If you are using a Color display* (Color CGA, EGA or VGA):

```
C:\TSCS> SETUP
```

- *If your PC-AT has a VGA Monochrome display* (used often with laptops):

```
C:\TSCS> SETUP -M
```

then press the Return (or Enter) key. This should involk the Setup & Configuration software. If this is not the case see the **Troubleshooting** section of this manual. For an explanation of the Setup & Configuration software's command line parameters see the *Command-Line Parameters* sub-section.



Setup & Configuration

The next screen to appear is our copyright notice, again please press the space bar to continue.

Copyright Transition Technology Inc. 1988
Transition Technology Inc. claims
copyright in this computer program as an
unpublished work, versions of which were
first licensed in 1988. Claim of
copyright does not imply waiver of
Transition Technology Inc.'s other rights
in the work. This disk and the program
recorded on it are confidential trade
secrets and the property of Transition
Technology Inc. Use, examination,
reproduction, copying, transfer and/or
disclosure to others of all or any part of
this disk and/or program are prohibited
except by express agreement with
Transition Technology Inc.

Please press the Space bar to continue.

The next screen to appear is an introduction screen, again please press the space bar to continue.

The TransPort System

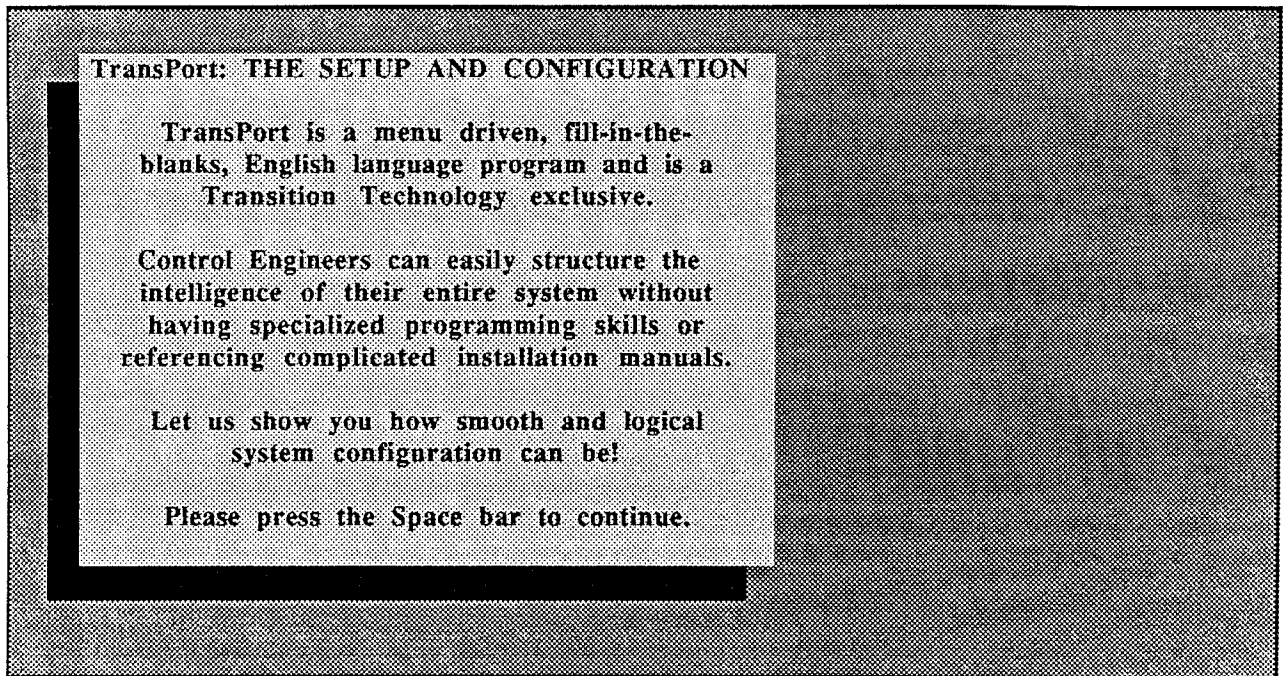
An Intelligent Distributed Industrial
Automation I/O System for Open, Standard
Computers and Third-party Software.

The Fastest, Most Far-reaching I/O System
for Factory Monitoring and Control.

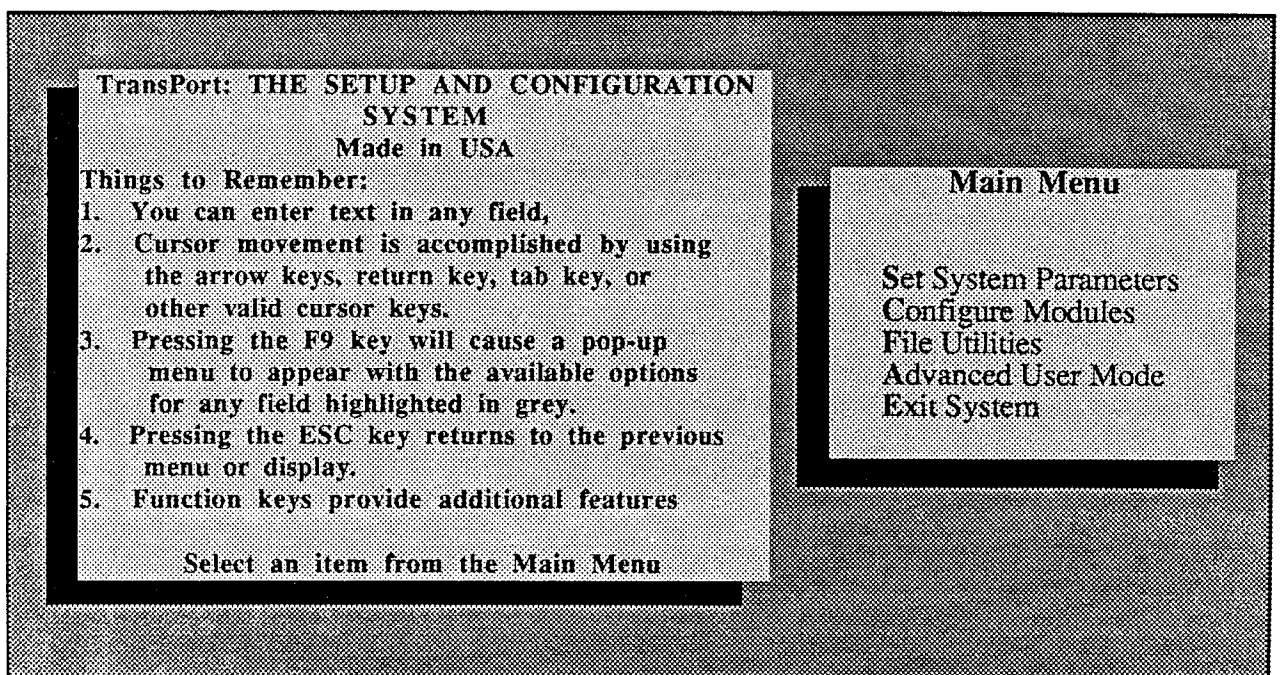
Innovation in Industrial I/O from
Transition Technology Inc.

Please press the Space bar to continue.

Another introduction screen should appear, press the space bar to continue.



A screen should now appear that looks like the one below. This is the Main Menu screen. This is the jumping off point for other parts of the package. By moving the highlighted cursor or pressing a highlighted letter you move from this screen to the menu choice. The first choice is the Set System Parameters Screen.



Setup & Configuration

Configuring System Parameters

Below is shown the Set System Parameters screen. This screen is divided into 4 boxes of parameters. Initially the highlighted cursor will be in the System Parameter box over the Comm Loss Timeout selection (the F9 key is active when the word "Selections" is visible next to it in the function key block). The arrow, and other cursor keys, are used to move from one selection, and from one box, to another. The parameters are as follows:

Interface Board Parameters (See the **Installing the Interface** section of this manual.)

I/O Port Address

The port access address for the interface card in the PC-AT.

Memory Address

The address of a 64K memory window to the interface card in the PC-AT.

System Parameters

Comm Loss Timeout

Represents the amount of time that a module will continue without communications from the interface before it considers the link to be down. This value can be set from 20 to 10000mS (10 seconds), (in increments of 4 below 250ms and increments of 250 from 250 to 1000mS). This field may also be **Automatic**, which sets the Comm Loss Time to 2.5 times the Scan time.

Module Restart On Error Selects whether to Automatically acknowledge module errors.

Interrupt Host After Scan Enables/Disables a hardware interrupt at the end of each broadcast scan.

Serial Port Parameters

(See the manual for your particular interface. **Not used with CI-IBM.**)

Baud Rate

This is the rate at which a serial connection to the interface will communicate.

Bits/Parity

These are protocol parameters for serial communications.

Node Address

This is the address on the interface will respond to on a serial network.

SETUP Parameters

(See the *Add New Modules* sub-section.)

New Module Search

Determines the way in which the Setup & Configuration program searches for and adds modules.

TransPort Setup & Configuration V2.15		ONLINE
File: TSCS.CFG		Available
System Master		
Interface Board Parameters	System Parameters	
I/O Port Address (Hex): 300	Comm Loss Timeout: 200.00	
Memory Address (Hex): D000	Module Restart On Error: Automatic	
	Interrupt Host After Scan: Disable	
Serial Port Parameters	SETUP Parameters	
Baud Rate: 19200	New Module Search: Automatic	
Bits/Parity: E, 8, 1		
Node Address: 001		
Use ARROW keys to move to selected item		
F1 Help	F3	F5
F2 Default	F4 Document	F6
	F7	F8
	F9 Selections	F10 Menu

When you are finished modifying information in this screen press the F10 key to bring up the Main Menu. From this point you may select any of the other four choices or return to Set System Parameters.

Configure Modules Screen

TransPort Setup & Configuration V2.15						ONLINE
File: TSCS.CFG						System Master
						Available
Scan Order	Module Type	Channels	Address	Status	ModuleTime (mSec)	
1	AI0016	16	1	Module OK	1.264	
2						
3						
4						
5						
6						
7						
8						
New Module Search: Disable				Scan Time: 5.000		
Polling Address: 1				Comm Loss TimeOut: 200.000		
Use ARROW keys to move to select item						
Press F7 key to Display Edit Module Channels						
F1 Help		F3 Program		F5 Edit Scan		F7 Channels
F2 Default		F4 Document		F6 Repeat		F8
						F9 Selections
						F10 Menu

The Configure Modules selection will move you to a set of screens where the actual configuration takes place. These screens are in two groups, Module Screens and Channel Screens. Above is an example of a module screen. Each page of the Module Screen holds 8 modules. There are 15 possible pages, allowing for up to 120 modules.

At the top of the Module Screen is a header block.

TransPort Setup & Configuration V2.15			ONLINE
File: TSCS.CFG			System Master
			Available

This header block contains the following read-only parameters:

- | | |
|---------------------------|---|
| Program Name | The name and version of the program. [TransPort Setup & Configuration V2.15]
The version number is important to remember if you call our applications engineers for assistance. |
| Configuration Mode | Displays whether configuration is being done in an ONLINE or OFFLINE mode.
[ONLINE] |
| File | This is the file where the configuration is stored. The default file name is TSCS.CFG. This may be changed by using the File Utilities from the Main Menu (except the .CFG extension). [TSCS.CFG] |
| Interface Type | The interface type tells what type of interface card has been found at the Port and Memory location entered in the Set System Parameters screen. It can be one of three types; System Master, External Configurator or Listener. [System Master] |
| Interface Status | The interface status displays Available if the program is able to locate the interface card at the port and memory location entered in the Set System Parameters screen. Otherwise it will show Unavailable and the Configuration Mode can only be OFFLINE. [Available] |

Setup & Configuration

The central block of the Module Screen is the main module configuration block.

Scan Order	Module Type	Channels	Address	Status	ModuleTime (mSec)
1	A10016	1 6	1	Module OK	1.264
2	AO42008	8	2	Module OK	0.964
3	DO0216	1 6	3	Module OK	0.548
4	DI2432C	3 2	4	Module OK	0.624
5					
6					
7					
8					
New Module Search: Disable				Scan Time:	5.000
Polling Address: 1				Comm Loss TimeOut:	200.000
Use ARROW keys to move to select item					
Press F7 key to Display Edit Module Channels					

Six parameters on this screen are related to individual modules:

Scan Order	Under this heading is the order in which the modules respond in broadcast. It is this location that determines the modules time slot in broadcast (for a full explanation of TransPort communications theory see the previous section).
Module Type	This is the actual model number of the module.
Channels	This parameter is just what it says, the number of channels on this module.
Address	This the unique Command /Response address necessary to talk to the module on an individual basis.
Status	This is the current status of the module. If this parameter displays anything but Module OK, move the cursor over it and press F1 for an expanded explanation of the error code (also see the section of this manual called Wrong turns).
Module time	This is the actual time the module takes to communicate data back tot he host computer.

The rest are global parameters:

Scan Time	This value is the sum of all the module times.
Comm Loss Timeout	This is time downloaded to each module. If this amount of time elapses without a module receiving good communications, the module will assume its default output state.
New Module Search:	This parameter displays the type of configuration process. The TransPort system can be configured in Automatic, Menu Driven, or Disable mode. This parameter can be changed under the Set System Parameters screen.
Polling Address	Polling address is a read only parameter, active in the ONLINE mode. The software continually polls for each of the 120 addresses. This is done to assure that you don't have modules on the network that are not in the configuration.

The Bottom block of the Modules Screen is a Function Key Block.

F1 Help	F3 Program	F5 Edit Scan	F7 Channels	F9 Selections
F2 Default	F4 Document	F6 Repeat	F8	F10 Menu

In this block, all the currently active function keys are displayed. When a key is active its function will be displayed beside it. For an explanation of the use of these keys see the *How to Use the Software* sub-section.

Channel Information Screens

In addition to the Module Screen there is a set of Channel Information screens associated with every module. In order to access these screens the user simply presses the **F7** key when the cursor is over the desired module. In the ONLINE mode this will cause the software to check the status of the module under the cursor and move to the Channel Information Screens related to that module. In the OFFLINE mode the software will immediately move to the Channel Information Screens associated with the module under the highlighted cursor. It is within these screens that individual module channel parameters are modified. Each module has two types of Channel Information Screens. The first screens are for entering tagnames, the second for entering module information. All channels screens have eight channels per screen. (e.g. a 32 channel device will have 4 screens for tagnames and 4 for module information.)

Tagname Screens

The Tagname screens are the same for all module types. The screen is divided into three sections or blocks. The top block is a header, the middle block is the main body, the bottom is the function key block.

In the header block of all Channel Information Screens are at least three pieces of information that appear (analog inputs have up to six):

Type: This is the module's model number. When ONLINE this is followed by the module's software version.
ONLINE or OFFLINE: The current configuration mode. See the *Advanced User Mode* sub-section.
Address: This is the module's address.

In analog input modules there are one or two additional parameters, which appear in the middle of the header block. These are explained later under Analog Inputs.

The middle area is the place where channel tagnames and wire tags are entered. Use the arrow keys to move to the desired Tag Name or WireTag. An eight character alpha-numeric entry may be made via the key board. These names are stored in the configuration file, and are used by the document feature when printing documentation files.

The function key block is where the available function keys are displayed. When a key is active its function will be displayed beside it. For an explanation of the use of these keys, see the *How to Use the Software* sub-section.

Type: DO0216 V2.20				ONLINE	
Address: 3					
Channel	Tag Name	Term# Wire Tag	Term# Wire Tag		
1		1H	1L	>	
2		2H	2L	P	
3		3H	3L	a	
4		4H	4L	g	
5		5H	5L	e	
6		6H	6L	R	
7		7H	7L	i	
8		8H	8L	g	
		v		Page Down	v
Use ARROW keys to move to select item				>	
Press Esc to Save/Exit screen.				>	
F1 Help		F3	F5	F7 Edit Entry	F9 Selections
F2 Default		F4 Document	F6 Repeat	F8	F10 Menu

Module Information Screens

There are different types of Module information screens. Like the Tag Name Screens they are divided into three blocks; Header, Main Body and Function Key Block. On the next pages are the seven types of module information screens and descriptions of the modules, their function, and features.

Selections are made in these screens by cursoring to parameters with the arrow keys. Once over a selection, if the F9 Selections key is active in the Function Key Block, press this key for a pop-up menu of the available choices. If this key is not active then the parameter requires a numerical entry. You may move from the Tag name screen to the Module information screen by pressing the right as if you were sending the cursor out the right side of the computer. Moving from the Module information screen back to the Tag Name Screen is accomplished by pressing the left arrow key as if you were sending the cursor out the left side of the computer.

To **exit** from the Channels Information Screens entirely, press the escape (ESC) key. This action will bring up a pop-up menu. This menu gives you a choice of saving and exiting or just exiting. This will bring you back to the Configure Modules Screen.

Setup & Configuration

Analog Input Modules

All TransPort analog input modules measure an analog voltage at each channel and convert this information into a digital number. Each channel has its own analog to digital conversion circuitry and can be programmed to read a variety of signals. In addition there is pre-processing of the converter information done in the module.

Function

The function of an analog input channel refers to the type of input signal that may be read.

AI00XX Signal types: Each channel can be set to any of the available functions within these groups. The first group are Signal Values. This programs the analog to digital converter (A/D converter) to read values within the selected voltage range. The Signal Value functions are:

12.5 $\pm$ mVdc, 25 $\pm$ mVdc, 50 $\pm$ mVdc, 100 $\pm$ mVdc, 5 $\pm$ Vdc, and 1-5 Vdc.

AI00XX Thermocouple types: The second set of functions are Thermocouple Types. This programs the A/D converter to read a particular type of thermocouple. This also sets up the module to do the necessary Cold junction compensation and linearization for this thermocouple. The functions are as follows:

J, J DIN, K1, K2, K DIN, T, E, C, S, R, B, and N.

AI01XX and AI02XX Signal types: In modules with model numbers that match AI01XX, there are three different groups of functions from which to select. The first group is Signal Value. This sets the A/D converter to read values within the selected voltage range. The selections for this type of module are:

0-12.5 mVdc, 0-25 mVdc, 0-50 mVdc, 0-100 mVdc, and 0-5 Vdc.

AI01XX RTD types: The second set of functions are RTD Types. The A/D converter is programmed to read a particular type and range of RTD (Resistance Temperature Detector). At the same time, the module is also automatically set up to do the necessary linearization for the RTD. In addition to the type of RTD, the function selected also chooses the temperatures range of the RTD. In the AI01XX modules platinum and Nickel RTD's are accepted. For instance a Platinum 385 RTD with a range of -199 to 60 $^{\circ}$ C is displayed as Pt 385 60 $^{\circ}$ C. A Nickel 120 with a range of -79 to 320 $^{\circ}$ C is shown as Ni 120 320 $^{\circ}$ C. The Platinum RTD's all have a low range of -199 $^{\circ}$ C and the Nickel RTD's all have a low range of -79 $^{\circ}$ C. The selections are as follows:

Pt 385 60 $^{\circ}$ C, Pt 385 400 $^{\circ}$ C, Pt 385 879 $^{\circ}$ C, Pt 391 60 $^{\circ}$ C, Pt 391 400 $^{\circ}$ C,
Pt 391 879 $^{\circ}$ C, Pt 392 400 $^{\circ}$ C, Pt 392 879 $^{\circ}$ C, Ni 120 150 $^{\circ}$ C, and Ni 120 320 $^{\circ}$ C.

Type: AI0016		V2.22		Statistics: Enabled		ONLINE	
Address: 1							
Channel	Tag Name	Function	LowRng	UpRng	Format	Burnout	Filter
<	1	5 $\pm$ Vdc	-5.00000	5.00000	N/A	N/A	0
P	2	J	-185.000	760.000	Deg C	Cwnscl	250
a	3	12.5 $\pm$ mVdc	-99999.9	-77777.7	Units	Upscale	0
g	4	5 $\pm$ Vdc	-100.000	100.000	%	N/A	100
e	5	C	.000000	2300.00	Deg C	Upscale	50
	6	T	-200.000	400.000	Deg C	Upscale	25
L	7	T	-328.000	753.000	Deg F	Upscale	10
e	8	5 $\pm$ Vdc	-5.00000	5.00000	N/A	N/A	0
f		v	Page Down		v		
t	Use ARROW keys to move to select item						
<	Press Esc to Save/Exit screen.						
F1 Help		F3		F5		F7 Edit Entry	
F2 Default		F4 Document		F6 Repeat		F8	
						F9 Selections	
						F10 Menu	

AI01XX Slide Wires: The third group to select from are Slide Wires. A slide wire is a general name for a three terminal device that measures some physical parameter by changing the resistance of a potentiometer. Our module supplies a current to this device and measures the resulting voltage across the potentiometer. The modules are setup to measure a range of resistances. In the AI01XX the following resistance values may be measured:

0-100 Ω , 0-125 Ω , 0-250 Ω , 0-500 Ω , and 0-10 k Ω .

AI02XX RTD types: In the AI02XX modules Copper RTD's are accepted. For instance a Copper 10 Ω at 0 $^{\circ}\text{C}$ RTD with a range 0f -199 to 260 $^{\circ}\text{C}$ is displayed as Cu10 @0 260 $^{\circ}\text{C}$. The Copper RTD's all have a low range of -199 $^{\circ}\text{C}$. The selections are as follows:

Cu10 @0 58 $^{\circ}\text{C}$, Cu10 @0 260 $^{\circ}\text{C}$, Cu10 @25 89 $^{\circ}\text{C}$, Cu10 @25 260 $^{\circ}\text{C}$

AI02XX Slide Wires: In the AI02XX the following resistance values may be measured:

0-50 Ω and 0-1 k Ω .

AI15XX: This module accepts signals only within the range of ± 5 Vdc. There are no other **Functions**.

LowRng & UpRng

The numbers that come back to the host computer from the analog input modules are integers between -32,767 and +32,767 or 0 and 65,535. This depends on which module you are using and the **Format** you select. In order to convert these numbers into engineering values (temp, pressure and flow) it is necessary to assign engineering unit numbers to the full scale positive and full scale negative numbers returned from the module. The Setup & Configuration software uses these numbers to generate a multiplier and zero offset ($y = mx + b$) necessary to create engineering units in IOPINFO and third party software drivers.

Format

AI00XX, AI01XX & AI02XX: For temperature sensing devices (thermocouples and RTD's) the format selection allows the user to choose between $^{\circ}$ Centigrade or $^{\circ}$ Fahrenheit. This default selection is **Deg C**, you may change it to **Deg F**.

AI01XX & AI02XX: This type of module is uni-polar. When the values coming back are from Signal Values or Slide Wires, the numbers range from 0 to some maximum value. This A/D converter has 16 bits of resolution and will deliver 65,520 counts when the input is at full scale. Some software packages are not set up for a full 16 bit unsigned value. This selection allows you to choose between **Signed** 15-bit (0 to 32,760) or **Unsigned** 16-bit (0 to 65,520) format.

AI00XX & AI15XX: For Signal Values this field has no meaning so any string can be entered here for documentation purposes.

Burnout

On modules with RTD or Thermocouple functions the module checks the electrical continuity of the input sensor. Should this input sensor open, the module posts an error and drives the input value for that channel either full scale positive or negative. The selection for full scale positive is **Upscale** and conversely for full scale negative it is **Dwnscl**.

Filter

Each channel in an analog input module has a programmable software filter. The purpose of the filter is to attenuate noise that may occur at the input. In factory environments it is normal to have a wide variety of sources for electrical noise. Some of this may appear on the input to this module. In order to suppress this noise we have provided a software filter. This filter responds much the same as a simple RC low pass filter ($1 - 1/e$). In Setup & Configuration the filter selection provides five time constants for this filter. The following are the valid entries for the given module types: (in milliseconds)

AI00XX & AI15XX: 0 mS, 10 mS, 25 mS, 50 mS, 100 mS, or 250 mS.

AI01XX & AI02XX: 0 mS, 50 mS, 100 mS, 250 mS, 500 mS, or 1000 mS.

Setup & Configuration

Statistics

Accessed via the F5 function key, the statistics function **Enables/Disables** the module to collect and store Peak and Valley data on each channel. This means that every acquisition the module checks to see if the new value is the largest or smallest recorded, if it is the value is stored. These values can be recalled from the host and reset via Command/Response commands.

AC Filtering

Also accessed using the F5 function key, Analog Input modules with model numbers AI01XX or AI02XX, have a choice of acquisition times. This is the time required to collect a single sample of every channel. The module is programmed to acquire data at a **50 Hz** or **60 Hz** rate. The module should be set to the frequency of the line voltage in your country. This allows the module to better reject these frequencies, when they occur as a common mode voltage. This will improve the performance of the module.

Type: AI0116		V2.22		Statistics: Eabled		ONLINE	
Address: 10				AC Filterng: 50 Hz			

Channel	Tag Name	Function	LowRng	UpRng	Format	Burnout	Filter,
< 1		0-5 Vdc	.000000	5.00000	Signed	N/A	0
P 2		Pt 391 400 °C	-199.000	400.000	Deg C	Cwnscl	250
a 3		0-12.5 mVdc	-99999.9	-77777.7	Signed	Upscale	0
g 4		0-5 Vdc	.000000	100.000	Unsign	N/A	100
e 5		NI 120 150 °C	-79.0000	150.000	Deg C	Upscale	50
6		Pt 385 879 °C	-199.000	879.000	Deg C	Upscale	1000
L 7		Pt 385 879 °C	-326.200	1614.20	Deg F	Upscale	500
e 8		0-250 Ohm	.000000	250.000	Unsign	N/A	0
f		v		v			
t							
<							

Page Down

Use ARROW keys to move to selectes item
Press Esc to Save/Exit screen.

F1 Help	F3	F5	F7 Edit Entry	F9 Selections
F2 Default	F4 Document	F6 Repeat	F8	F10 Menu

Digital Input Modules

TransPort digital input modules, sense the presence or absence of a voltage at their terminals. If the voltage at the input terminals rises above a prescribed threshold level the module will see that channel as being ON or having a digital 1 as its state. If the voltage at the input terminals drops below this prescribed threshold the module will see that channel as being OFF or having a digital 0 as its state.

Input Latch

Each channel on a digital input modules may be configured to latch on a momentary pulse. The duration of this pulse varies with the type of module and whether filters are assigned. If this feature is activated when a channel goes from an OFF to an ON state it remains in that ON state, even if the voltage on the terminals is below threshold, until it is reset via a Command/Response command from the host.

Filter Time

Each channel also has a programmable software filter. The digital inputs scan the input channels as fast as every 100uS. It is possible to see noise as an ON condition that truly does not exist. In order to protect against this, it is important to distinguish between spurious input signals and a true ON condition. In order to do this we have implemented a software filter for each channel. This filter ensures that a signal must be there for a prescribed length of time specified before recognizing it as ON. The filter on each channel may be 0 mS (milliseconds), 10 mS, 25 mS, 50 mS, 100 mS, or 250 mS.

Count Type (Counter Modules Only)

The first four channels of modules with a -C in their model number are counters. This parameter allows the user to select whether a channel will count on the transition from OFF to ON or from ON to OFF. The module will count every time the input goes from OFF to ON if you select **On Trig**. Conversely, the module will count every time the input goes from ON to OFF if you select **Off Trig**.

Type: DI2432C V2.13
ONLINE

Address: 4

Channel	Tag Name	Count Type	Input Latch	Filter Time
< 1		On Trig	Disable	0
P 2		On Trig	Disable	50
a 3		On Trig	Disable	100
g 4		On Trig	Disable	10
e 5		N/A	Disable	250
6		N/A	Disable	10
L 7		N/A	Disable	25
e 8		N/A	Disable	0

v Page Down v
 Use ARROW keys to move to select item
 Press Esc to Save/Exit screen.

F1 Help	F3	F5	F7 Edit Entry	F9 Selections
F2 Default	F4 Document	F6 Repeat	F8	F10 Menu

Setup & Configuration

Analog Output Module

The TransPort analog output module is a multi-channel digital to analog converter. The host computer sends numbers between 0 and 32,760 for each channel and the module outputs a current from 0 - 20mA proportional to this number.

Power-up Percent

Power up percent is the state that each channel will assume upon power up. This state is held until the host computer initiates communications and sends new output values to the module. Each channel can individually be set an output value from 0 - 100% of full scale.

Comm Loss Percent

Comm loss percent is the state that each channel will assume upon loss of communications with the host computer. As you will recall the module is given a comm. loss timeout value during communications configuration. During runtime if this time elapses, without good communications from the host computer, the module assumes its comm loss default states. This state is held until the host computer re- initiates communications, resets and sends new output values to the module. Each channel can individually be set an output value from 0 - 100% or to **Hold** the channel in its current state.

Type: AO42008 V2.12		ONLINE		
Address: 2				
Channel	Tag Name	Function	Power Up Percent	Comm Fail Percent
< 1		0-20 mA	0	0
P 2		0-20 mA	100	50
a 3		0-20 mA	40	30
g 4		0-20 mA	33	66
e 5		0-20 mA	0	100
6		0-20 mA	0	0
L 7		0-20 mA	100	100
e 8		0-20 mA	5	10
t 0				
t				
<				

Use ARROW keys to move to select item
Press Esc to Save/Exit screen.

F1 Help	F3	F5	F7 Edit Entry	F9 Selections
F2 Default	F4 Document	F6 Repeat	F8	F10 Menu

Digital Output Modules

TransPort Digital Output modules are multi-channel solid state switches. By sending a digital 1 or ON to a channel you are closing the switch. Likewise, by sending a digital 0 or OFF to a channel you are opening the switch. In addition to the switch function, modules with a -M in their model number have a current sensor in each output circuit. When the switch is closed the module expects current to flow. When the switch is open the module expects no current flow. The current sensor sends back digital value, a 1 or 0, signifying that current is or is not flowing. This value is matched against the state of the switch and if a mismatch exists the module sends an error back to the host. This monitored feature allows the module to be used in applications where it is critical to know the physical as well as logical state of the output.

Power Up State

Power up defaults are the states that channels will assume upon power up. This state is held until the host computer initiates communications and sends new output values to the module. Each channel can individually be set to either an ON or OFF state in Setup & Configuration.

Comm Loss State

Comm loss defaults are the states that each channel will assume upon loss of communications with the host computer. As you will recall the module is given a comm. loss timeout value during communications configuration. During runtime if this time elapses without good communications from the host computer, the module assumes its comm loss default states. This state is held until the host computer re-initiates communications, resets and sends new output values to the module. Each channel can individually be set to either an ON, OFF state or to Hold the channel in its current state.

Filter Time (Monitored modules only)

In the monitored output each channel also has a programmable software filter. This filter is used on the signal from the current sensor in each channel. The filter ensures that the current must flow for a prescribed length of time specified before recognizing it as ON. The filter on each channel may be 0 mS (milliseconds), 10 mS, 25mS, 50mS, 100 mS or 250 mS. This feature allows the module to distinguish between real signals and spurious noise.

Type: DO0216 V2.20		Address: 3		ONLINE
Channel	Tag Name	Power Up State	Comm Fail State	Filter Time
<	1	OFF	OFF	0
P	2	ON	OFF	50
a	3	OFF	ON	100
g	4	ON	ON	10
e	5	OFF	OFF	250
	6	ON	OFF	10
L	7	OFF	ON	25
e	8	ON	ON	0
f				
t				
<				

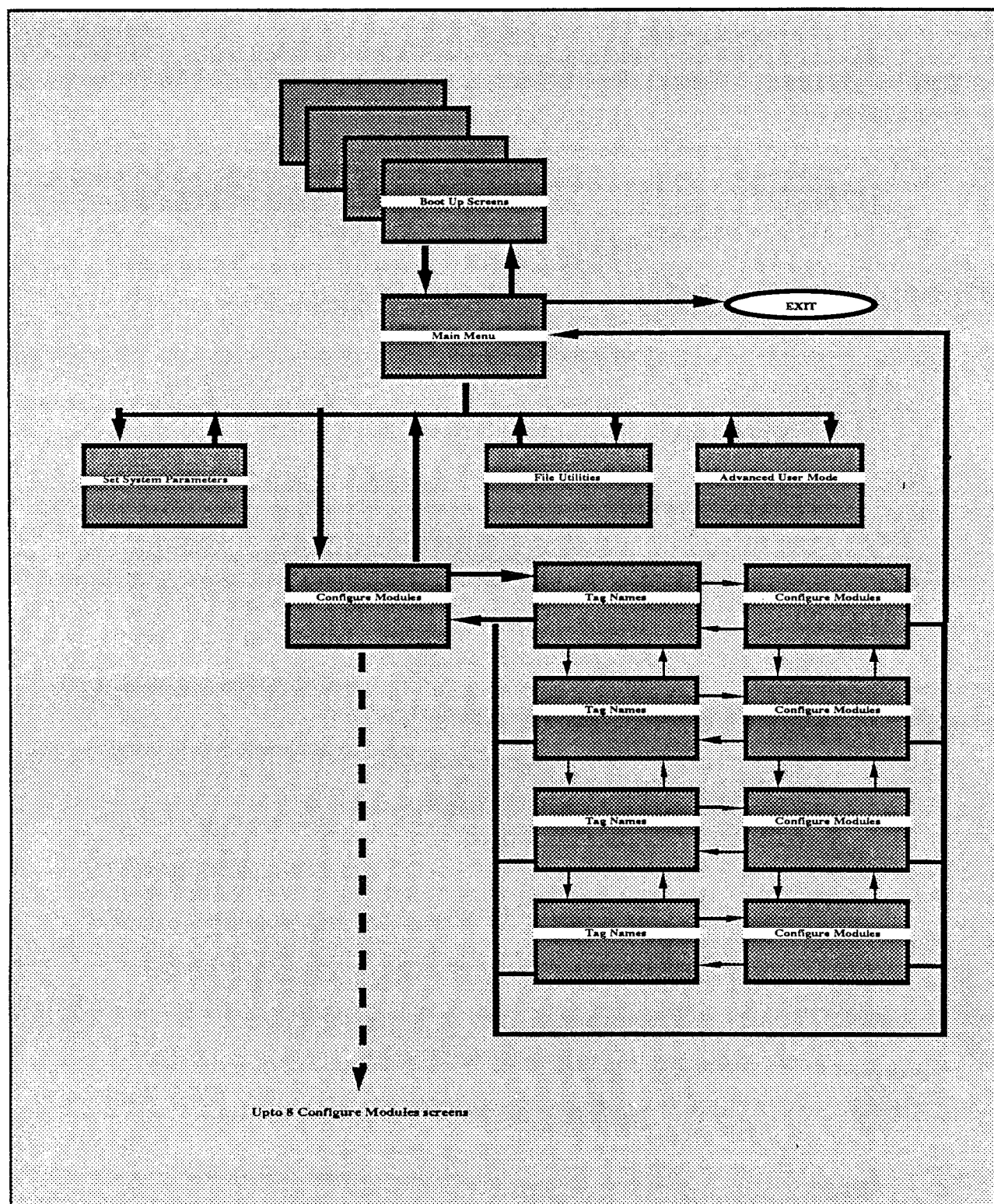
v Page Down v

Use ARROW keys to move to selectes item
Press Esc to Save/Exit screen.

F1 Help	F3	F5	F7 Edit Entry	F9 Selections
F2 Default	F4 Document	F6 Repeat	F8	F10 Menu

Flow Chart

Below is a chart of the software flow. The arrows signify the ability to exit and enter a screen from another.



File Utilities

The File Utilities selection of the Main Menu brings you to the menu below. From this menu you may manipulate configuration files. This menu's selections are:

Enter Database Name

Allows you to type in the pathname of the configuration file you wish to work on.

Choose From Directory

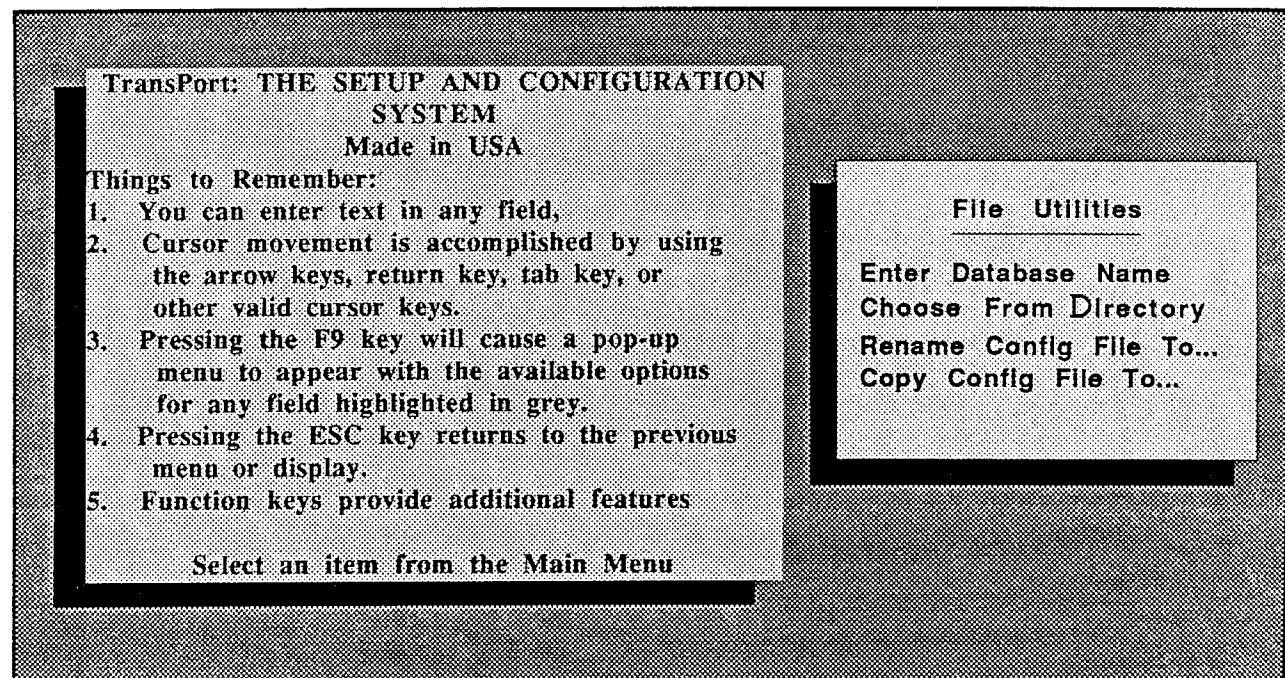
Allows you to choose a preexisting file from a directory.

Rename Config File To...

Allows you to rename the current working configuration file.

Copy Config File To...

Allows you to make a copy of the current working configuration file under a different name. After copying the newly created file will be used as the current working file.



Advanced User Mode

The Advanced User Mode selection brings you to the menu below. From this menu you may select one of the following functions:

Go ONLINE or Go OFFLINE

Allows you to operate in an ON or OFF line mode. In ONLINE mode the software is downloading information to the interface, the modules and the configuration file. Confirmation of data is received from the modules and interfaces. In the OFFLINE mode the software only stores the information in the configuration file; there is no active feedback from the hardware that the information is correct.

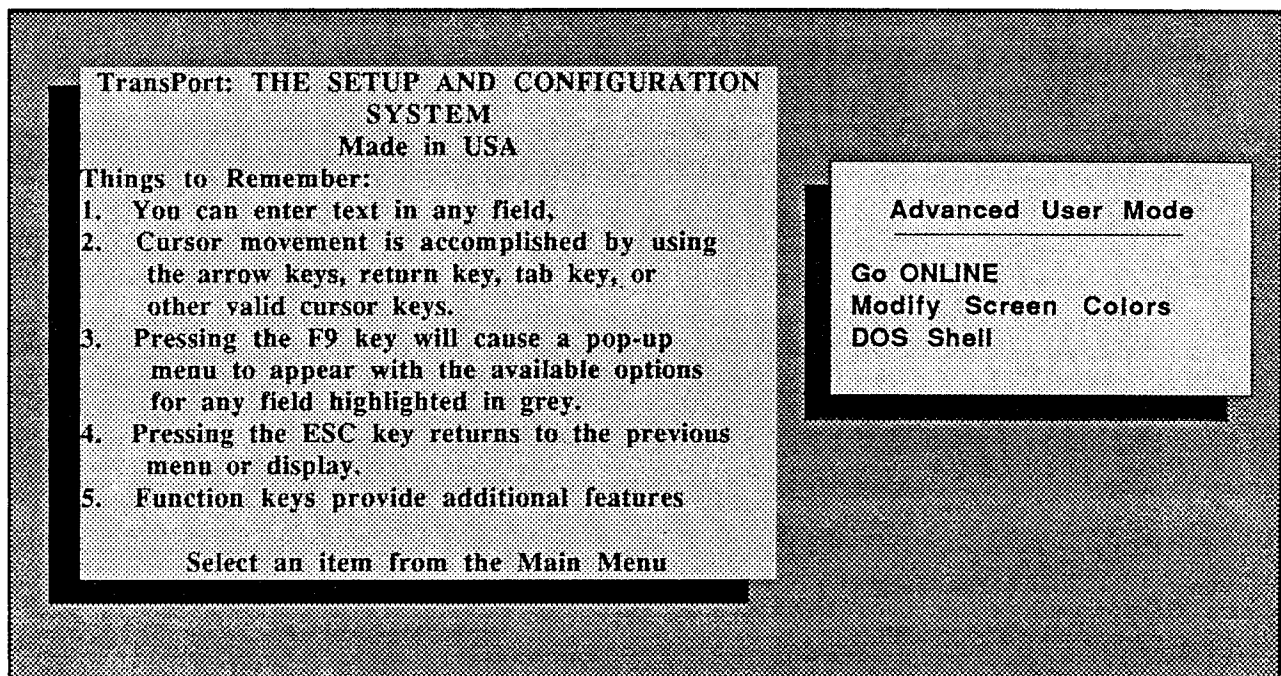
Modify Screen Colors

Allows the choice of different screen colors. This is useful if you are using a monitor other than a color CGA, EGA, or VGA.

DOS Shell

Allows the user to SHELL out of this program and perform operations in DOS.

Warning: This program is still resident in memory when you do this. Do not reinvoke the program outside the shell. To return from the shell, simply type EXIT at the command line and hit the Return key (Enter).



How to Configure the Modules

This section of the manual outlines how to configure the TransPort I/O system. The following is an overview of the steps necessary to properly configure the system.

1. Wire the network to the bases.

(DO NOT INSTALL THE MODULES ON THE BASES)

2. Install the TransPort master interface in your host computer.
3. Attach the TransPort master interface to the network.
4. Power the network and the TransPort interface.
5. **If your computer is not a PC-AT type of computer do the following steps 5a and 5b:**
 - 5a. Install the external configurator card in a PC-AT computer,
 - 5b. Wire the external configuration card to the network.
6. Install the Setup & Configuration software onto the PC-AT computer.
7. Run the Setup & Configuration software.
10. If your computer is not a PC-AT .
Gain mastership of the network away from the Host Interface.
11. Set the systems basic parameters.
12. Plug in one module.
13. Configure it.
14. Repeat steps 12 and 13 till you have configured all of the modules.
15. Exit the Setup & Configuration software.

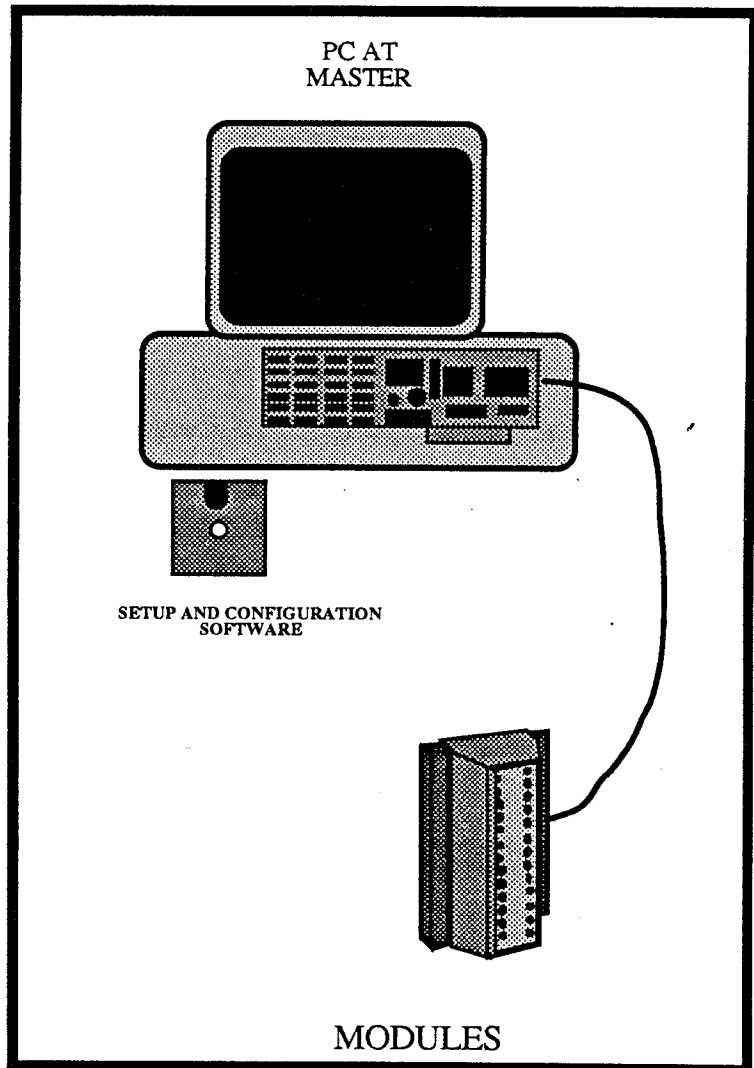
What follows is hopefully enough information to perform these steps without undue trouble. Please read each section carefully and follow the steps it prescribes. If for any reason you begin to have trouble please stop and refer to the **Troubleshooting** section of this manual.

Setup & Configuration

d1) Wiring the Network

In order to configure the system, the network must be properly wired and powered. If you haven't installed the network correctly, this will be a very difficult process. Please be sure that the system has:

- a) Adequate power (min 20 Vdc) at each base.
- b) **The termination resistors are installed (at the two ends of the network).**
- c) It is also important not to ground the system improperly. If you have connected earth, safety or shield wires to any of the terminals marked with the ground symbols, **please remove them**. This terminal is not for earth grounds. It is the digital common of the module CPU. It should not be connected on modules or PSC24's. Connecting this terminal to ground may cause communications errors.
- d) Make sure that you have connected the shield on the communications cable properly. Is the shield connected to every module? If the shield is open anywhere on the network you could get communications errors. Is the shield connected to ground in only one place (remove the connection to ground and check for continuity to ground with an Ohm meter)? If the shield is connected to ground in more than one place you may get communications errors.
- e) If you are not sure whether the network is together properly please refer to the **Troubleshooting** section of this manual or please call us (1-800-835-7075) and one of our applications engineers will answer your questions.
- f) **PLEASE DO NOT INSTALL THE MODULES ON THE BASES AT THIS TIME.**



2) Install the TransPort System Master

The interface in your host computer (the one that will actually be controlling the TransPort I/O modules) must be installed and connected to the network. For a detailed description of this procedure refer to the interface installation section of this manual or the specific interface manual. If your system master is a PC-AT (model # CI-IBM) type of computer, skip step 3, you are now ready to install the TransPort software on your computer. If your computer is not a PC-AT style computer do not attach the interface to the network at this time.

3) Install the External Configurator card

If your system master is not a PC-AT (model # CI-IBM) computer, you need to install an External Configurator Card (model # CI-IBM-R) in a PC-AT style of computer. If you do not have one of these cards **STOP**. You will need to order one and install it in a PC-AT (Not an XT, the card won't fit) compatible computer. Installation instructions for this card are found in the interface installation section of this manual.

Note: If you did not order a CAI-01 external configurator cable, you will need to wire it to the network the same way the Master is attached.

DO NOT connect the interface to the network yet!

4) Install the software in your computer.

Once the Master interface is in the host computer and if necessary the external configurator is in a PC-AT. You are now ready to load the TransPort software. For this to work the computer must be an IBM compatible AT computer.

System Requirements:

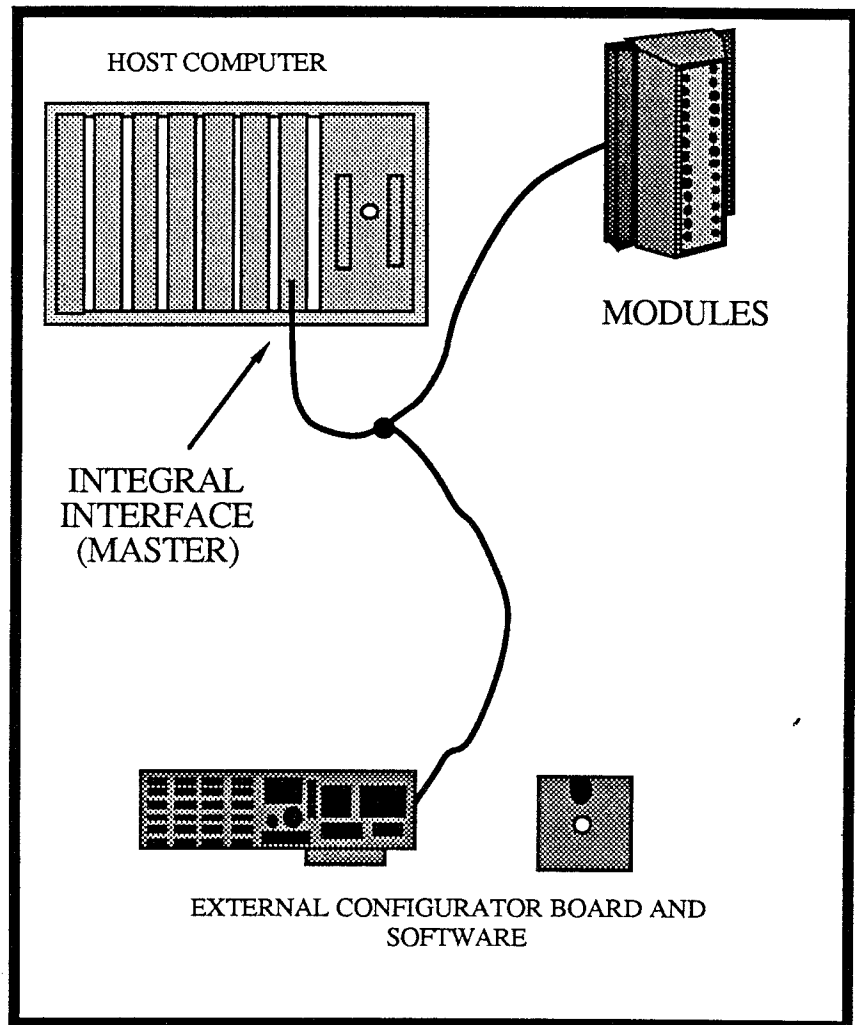
- At least 640K of RAM memory.

- A hard drive (with 1.5 Mbytes of free space) to store and run the program.
- The software is meant to run with most graphics adapters if you have any difficulties please refer to the **Troubleshooting** section (or call us).

The Setup & Configuration software comes on 3 1/2", 720K or 5 1/4" 360K floppy diskettes.

The following is a quick step-by-step instruction on the software installation:

- Turn on your computer (if you don't have a hard drive in this computer you won't be able to run this software. **Call us**).
- After your computer has booted to the DOS prompt (e.g. C:\>), put the disk in your computer's floppy disk drive.
- Create a new directory for this software. At the DOS prompt (e.g. C:\>), type MD XXXXXXXX (up to eight character directory name. We generally call it TSCS) and then press the **Enter** (or **Return**) key.



Setup & Configuration

- d) Move to the new directory. At the DOS prompt (e.g. C:\>), type CD XXXXXXXX (up to eight character directory name. We always call it TSCS) and then press the **Enter** (or **Return**) key.
- e) Insert the Setup & Configuration floppy disk into your computer.
- f) At the DOS prompt (e.g. C:\>), type A: if the floppy is in drive A or type B: if the floppy is in drive B. Once this is done then press the **Enter** (or **Return**) key.
- g) At the DOS prompt type **INSTALL C:** or **INSTALL D:** (depending on which drive your new directory is in, if it is in E: then you'd type **INSTALL E:**), then press the **Enter** (or **Return**) key. This will start an install program which will load the software into the directory on the hard drive of your computer. The following text will appear on the screen.

**Installation Program
For Transition Technology Applications Software.**

files from floppy disk to current directory...

Extracting configuration software from archive file...

Extracting applications software from archive file...

Extracting utility software from archive file...

Extracting diagnostics software from archive file...

- h) When the installation has been completed successfully, it will exit back to DOS in the directory in which the software was installed. At this time you are ready to run the TransPort™ software.

5) Test the Interface:

The installation procedure loads four programs; SETUP.EXE, IIOPIINFO.EXE, IIOPILOAD.EXE and TESTIIOPI.EXE. In order to check if your interface board is at the correct address run TESTIIOPI.

- a) To do this, at the DOS prompt (e.g. C:\TSCS>), type **TESTIIOPI**.
- b) If you have set the interface card to a different port or memory address than the factory default (memory = D000 and port = 300) you will need to invoke the program as **TESTIIOPI -BXXXX -PXXX**. The X's are the addresses of the B (memory) and P (port). The valid entries for memory address are; 0000 through F000. This is the segment of memory where the board resides (factory set for D000). The valid entries for P are 300 - 3FF. If this is confusing you re - read interface installation section of this manual. If the TESTIIOPI executes successfully the program the following should be on your screen.

C:\TSCS> **TESTIIOPI**

TransPort PC IIOPI Test V2.06 06 December 1991
Copyright (C) Transition Technology Inc. 1989-91 All rights Reserved

Checking for interface board - port 300 board D000

Status: 00h Interface board is running

If this program does not produce a status of 00h, STOP! The switches on the interface board are set incorrectly, there is another device in the computer at this Port or Memory Address, the board has malfunctioned or the computer has malfunctioned. See the section on setting these switches or the **Troubleshooting** section of the manual. Do not try to continue until this problem is resolved.

6) Start the Setup & Configuration program.

To do this, at the DOS prompt (e.g. C:\TSCS>), type SETUP. The following banner will appear on the screen very quickly.

TransPort Setup & Configuration System V2.1X 20 December 1991
Copyright (C) Transition Technology Inc. 1989-91 All rights Reserved

This will be followed by the boot up screens. There are four of them. They require no action other than to press the space bar to continue. You will come to the Main Menu screen after the Boot Up Screens. (if this doesn't sound familiar read the How the Software Looks and How the Software works sections of this manual). At this point the first part of the configuration process begins.

7) Initializing Setup & Configuration

Recall that in steps 2 and 3, if you were using a External Configurator we instructed you not to wire the interfaces to the network. At this point we would like you to connect the external configurator directly to the master (step a). If your PC-AT computer is the system master proceed to step c.

- a) If you have a CAI-02 external configurator cable simply attach the nine pin " D " connector to the external configurator card and insert the microphone connector into the jack on the master interface.
- b) Power up both interfaces. If this is the first time you have powered up the Master interface, cycle power on it (turn it off then back on).
- c) Once this is accomplished choose the (Use the arrow keys to put the cursor over it and hit enter) Set System Parameters selection from the Main Menu.
- d) This is the first time the software has been used so a pop up menu with Yes and No selections and the following message will appear:

The file specified was not found. If you wish to create a new file select "Yes" Above. If you wish to continue using the new fileselect "No". To use available files in the directory, use the " Choose from Directory" Selection.

The only valid selection is "Yes" this will cause the software to create a configuration file.
Warning: There is a bug in the software. If you hit the <ESC> key more than once, the computer will lock up. This will require that you re-boot the computer.

Setup & Configuration

- e) If the memory or port address you set, is not the factory default (memory = D000 and port = 300), you will get one of the following errors;

There is no interface board responding at the Memory Address specified. Configuration will continue OFFLINE; changes will be saved to disk file but not to the interface. Correct the Memory Address on the 'Set System Parameters' screen, if ONLINE configuration is desired. Press <ESC> to continue

OR

There is no interface board responding at the Port Address specified. Configuration will continue OFFLINE; changes will be saved to disk file but not to the interface. Correct the Port Address on the 'Set System Parameters' screen, if ONLINE configuration is desired. Press <ESC> to continue

Upon escape from this error message you will be in the Set System parameters screen. In the header block, OFFLINE and Not Available will be displayed. Cursor over to the Interface Board Parameters block. Place the highlighted cursor over the I/O port address and enter the 3 digit port address. If the Port address you just enter is incorrect, the following message will re - appear.

There is no interface board responding at the Port Address specified. Configuration will continue OFFLINE; changes will be saved to disk file but not to the interface. Correct the Port Address on the 'Set System Parameters' screen, if ONLINE configuration is desired. Press <ESC> to continue

If you get the above message again, the switches on the interface board are set incorrectly, there is another device in the computer at this Port Address, the board has malfunctioned or the computer has malfunctioned. **STOP!** See the **Interface Installation** section for how to set these switches or the **Troubleshooting** section of the manual. If the Port Address entered is correct and the Memory Address is correct, the header block will now have Available displayed under OFFLINE. Simultaneously a message and pop-up menu will appear for you to go to ONLINE mode. If the Memory Address is incorrect the following message will reappear.

There is no interface board responding at the Memory Address specified. Configuration will continue OFFLINE; changes will be saved to disk file but not to the interface. Correct the Memory Address on the 'Set System Parameters' screen, if ONLINE configuration is desired. Press <ESC> to continue

Press the escape key and position the highlighted cursor over the Memory Address selection. Enter the most significant digit of the memory address. The entry for the factory default address of D000 would be D. **Warning:** There is a software bug. If you enter the full 4 digit address (i.e. D000) the software will not recognize it, even if this is the correct address. Enter only the most significant digit (valid entries are 0 - F hex). If the Memory address you entered is incorrect the message above will re - appear. If the Memory Address is now correct, the header block will have Available displayed under OFFLINE, and simultaneously a message and pop-up menu will appear. This message and menu asks if you want to go to ONLINE mode. Selecting no will leave you in OFFLINE mode. If this computer is the System master go directly to step 8.

- f) Going ONLINE will cause the External Configurator to gain mastership of the network away from the System Master. The following message will appear;

The External Configuration System has requested mastership of the link. This process takes up to ten seconds to complete.

- g) If the External Configurator is successful in gaining mastership, the Set System Parameters screen will appear. You will be in the ONLINE mode and the Interface Type will be External configurator.
- h) If it is not successful an error message will occur accompanied by a warning beep.

The interface cannot enter the mode requested. If this application is running on an External Configurator, the most likely cause is that mastership was not granted from the Bus Master. Please Check the cables
Press ESC to continue.

If this occurs, **STOP!** One of three pieces of hardware is not working; the External Configurator card, The Master Interface, or the cable connecting the two of them has a problem. If this happens see the **Troubleshooting** section of this manual or call us.

- i) Assuming this is success, press the Escape key to get out of the Set System Parameters.
- j) Now exit out of the program.
- k) Connect both interfaces to the communications network. If you have any doubts as to how to connect these components refer to the section in this manual on network installation.
- l) repeat steps b through i. If this process is not successful. **STOP!** The interfaces are OK. Check all the system cabling, refer to the **Installing Communication Network** and **Troubleshooting** sections of this manual.

DO NOT TRY TO CONFIGURE THE SYSTEM UNTIL YOU CAN GAIN AND RELEASE MASTERSHIP WITHOUT ERROR!

8) Set the Comm Loss Timeout

If step l is successful the configuration process is ready to begin. From the Main Menu select Set System Parameters. Set the Comm Loss Timeout to your desired value. This value must be a minimum of 200mS and at least 2 1/2 times the total scan time of the system. The time you pick should be the length of time your process can safely be idle wait before assuming a fail safe state.

Setup & Configuration

9) Set the New Module Search parameter.

From the Main Menu select Set System Parameters. The configuration process is ready to begin. The essential act of the configuration process is to plug a modules in, allow the system to add it to the configuration and repeat this process till all the modules are installed and configured. The New Module Search parameter sets up how the system will recognize and configure new modules.

To refresh your memory the communications address and all other configuration parameters are stored in an EEPROM in the termination base. All termination bases are shipped from the factory with address 121 stored in the memory. In order to communicate the module must have a unique (no two modules can have the same one) address from 1 -120. To configure a module, while running the Setup & Configuration program you plug a module onto a base. The software when triggered (thats what this selection is about) will query (ask a question of) the network for any module at address 121. If one responds the package when triggered will configure it with the next sequential unused address. As you can see if you have two modules plugged into bases with a factory default error they will both respond. This will not work.

The New module search parameter controls how the software is triggered to look for modules at address 121. The choices are Automatic, Menu Driven or Disable.

a) Automatic

In automatic mode the software polls every 15 seconds without prompting for new modules. If one is found it adds the module to the configuration and assigns it the next unused address without user intervention.

b) Menu Driven

In Menu Driven mode the software polls every 15 seconds without prompting for new modules. If one is found it brings up a menu with a choice. One of the choices is making this a new module and adding it to the network at the next unused address. The other choices will be to give the module a configuration and address that was entered in the OFFLINE mode.

Some people prefer to enter the configuration OFFLINE (remember when the software is in the OFFLINE mode it stores the entered configuration in the file only.) and then using the Menu Driven mode plug the modules in and match them to this configuration.

c) Disabled

In Disabled mode the software does not poll for new modules except when prompted by the user. In the Configure Modules Screen you must press F5 Edit Scan and select Search from the pop-up menu that appears. This is the only time the software will poll for new modules in this mode. When one is the software behaves like the Menu driven mode.

For first time users I suggest that you use the Disabled mode. As a note when you plug a module into a base at address the lights on the front of the module will be in the following state; Power (on), Fault (on), Active (off), and Comm (on).

To exit from Set System Parameters press the escape key or the F10 Menu key. Both of these methods will get you back to the Main Menu Screen.

10) Configure the Modules

From the Main Menu select the Configure Modules Screen. We are now ready to begin. Plug in ONE (only one) module. Press the F5 key. From the pop - up menu select Search. You should have a big message / menu banner on the screen that says:

A new module has been detected on the link. Please choose whether to assign it one of the configurations below, OR to give it a new configuration. Highlight your selection and press the < Enter > key. Press < ESC > to avoid adding this module to the scan list.

Warning: If you plugged the module in and did not get this banner, it is possible a problem exists with either the module, the base or the communications network. If you get an immediate CRC error when you invoke this command it is possible that you have more than one module plugged onto a base containing address 121 (factory default address). If you get a different error or anything except above message, **STOP!** Call us or See the **Troubleshooting** section of this manual. **Do not try to plug in a different module if the first one does not work.**

Position the highlighted cursor over the new configuration selection and press the enter key. This should cause the screen to pause for a moment and then the module should be added to the next open row on the configure modules screen. If the configuration is successfully downloaded to the module and the module acknowledges properly the Status column will display; Module OK.

If you receive an error, follow the instructions in the error message. The most common errors are; module returned a bad CRC, module timed out, module received an invalid byte count or module received an invalid command. It is possible that either the module or the communications network has a problem. These errors are generally indicative of communications network problems. If the software adds the module to the scan list and displays it on the Configure modules screen place the highlighted cursor over the module type parameter and press F3 Program key. If the Error occurs again see the Troubleshooting section of this manual. If the module was not added try pressing the F5 edit scan key and again selecting search from the pop - up menu. If the error repeats itself, STOP and determine the problem with this module or the network. See the Troubleshooting section. If you are able to successfully configure this module and you get any more errors configuring subsequent modules STOP! You have an installation problem, please refer to the Troubleshooting section.

Repeat this process until all of your modules have been added to the configure modules screen. Warning do not remove any modules once they are configured Remember that with the addition of each new module the broadcast time slot is changed in every module.

11) Configuring the Module Information

Once you have configured all the modules you may now change the individual module parameters. This is done by putting the highlighted cursor over the desired module in the Configure Modules screen and pressing the F7 Channels key. Program the parameters as required and press the escape key. A pop-up menu will appear and give you a choice of saving and exiting or exiting without saving. If you choose save and exit the information will be downloaded to the module. If you choose to exit without saving the information will not be downloaded to the module and none of these changes will be preserved. For more information on these selections see the sections titled Theory of Configuration, the How the Software Works and the How the Software Looks.

If you receive an error entering the channel screen or upon saving, follow the instructions in the error message. The most common errors are; module returned a bad CRC, module received an invalid byte count or module received an invalid command. It is possible that either the module or the communications network has problems. These errors are generally indicative of communications network problems. Place the highlighted cursor over the module type parameter and press the F3 Program key. If the Error occurs again see the Troubleshooting section of this manual. If the error repeats itself, STOP and determine the problem with this module or the network. See the Troubleshooting section. If you are able to successfully download information to this module and you get any more errors configuring subsequent modules, STOP! You have an installation problem, please refer to the Troubleshooting section.

Once all the module information is as you want it, return to the Main menu.

12) Exiting the Program

From the Main Menu simply select Exit. Upon exit the software will send a copy of the configuration to the configuration file and then to the master interface, if this is an external configurator.

If you receive an error upon exiting the program, follow the instructions in the error message. If this is an external configurator and it was unable to release mastership of the network you will have to shut both the system master and this computer off. Re-booting the computer is not enough, the interface card is not reset until powered off. These errors are generally indicative of communications network problems. Re-do step 7.

Command Line Parameters

Options used for running Setup and Configuration

The following information is for version 2.11 or greater of Setup and Configuration.

The Help Parameter

The Help Parameter gives a list and a description of the optional parameters used in Setup and Configuration. The information displayed when running this option will be the current information on Setup and Configuration and will supersede the information contained here. To get a list of this menu on the screen of your computer, perform the following steps:

1. Change to the sub-directory which Setup and Configuration is installed.
2. Type "Setup -H" then hit Enter.

The Environment Variable TSCSx:

Setup and Configuration can use the Environment Variable TSCSx to determine the path and file name for the configuration file. The TSCx Environment Variable is also used by some Transition Technology Industrial Control Software Drivers. This variable can be set in the autoexec.bat batch file by adding the following line:

```
SET TSCSx=C:\TSCS\TSCS.CFG
```

NOTE:

C:\TSCS\ is the drive and path.
TSCS.CFG is the name of the default configuration file.
The x in TSCSx is equal to one to a number from one to five.

The "-I" Parameter

The "-I" Parameter is used to initialize the configuration file to the interface. This parameter may be used running setup and configuration from either batch file or from the DOS prompt. Setup and Configuration will use the Environment Variable TSCSx to find the configuration file unless the "-F" parameter is used.

To use the "-I" with the Environment Variable TSCSx set type the following:

```
SETUP-I
```

or

```
SETUP-I-FTSCSx (x is equal to a number from one to five)
```

Either example will work as well as the other.

If TSCSx is not set, then the "-F" parameter must be used. An example of this is:

```
SETUP-I-Ftscs.cfg
```

NOTE: tscs.cfg is the name of the configuration file.

IIOPINFO Software

Introduction

The IIOPINFO utility program is designed to interface with the CI-IBM Interface of the TransPort System which is Transition Technology's PCAT Interface Board. This utility software enables the user to diagnose system functional errors, or to better understand how the system is configured and operating.

Installation

The installation procedure is located in the "readme.com" file on the IIOPINFO floppy disk. To print the information on the screen of your computer, place the IIOPINFO floppy disk in Drive "A" and type "a:/readme" then hit the Enter key.

Note: This program is installed at the same time as Setup & Configuration. Please see the Setup & Configuration section of this manual for details.

Note: The IIOPINFO Diagnostic software shares error message files with Setup & Configuration. Therefore, it should be loaded in the same directory as Setup Configuration.

To run the IIOPINFO utility program

1. Change directory to the one containing IIOPINFO (e.g. cd c:\tscs)
2. Type "IIOPINFO" then hit the Enter key.
3. IIOPINFO will now be running!

To exit IIOPINFO

1. Hit F10 (Function Key 10)
2. Type "E" to exit.
3. Press the "Y" key to answer yes.

Help Screens

The help information ranges from how to edit a text string, to what a menu selection can perform and to how to move around in the system. The help screens are context sensitive and are available to the user by pressing the HELP function key F1 (Function Key 1) once, to get more specific help information.

Theory of Operation

IIOPINFO provides multiple levels of information, some more technical or involved than others. This allows a novice to use this utility at their specific level of understanding. The user may look at information at a top-level, or may dive deep into the workings of the TransPort System for a better understanding.

To facilitate the multiple user levels, the IIOPINFO program is organized into several sections of operation. Each section provides information that allows the user to obtain the information as required to diagnose, or understand the operation of the system. These sections are discussed in greater detail in the following paragraphs.

- **System Information**

General system configuration and run-time status.

- **Module Information**

Module configurations downloaded to the modules and stored in the Interface board.

- **Module Data**

Display and/or control of module data (input and/or output), status, and channel information.

- **Advanced Operations**

Information used to obtain a better understanding of the system and to help diagnose more severe system errors.

- **Interface Board Initialization**

Inform the IIOPINFO program of an Interface Board configured at an address different from that of the system default addresses.

- **Error Information**

The IIOPINFO program can be directed to display the status of the system IIOP Board and each module. The IIOPINFO program can also display a short explanation of each status.

- **Command Line Parameters**

Inform the utility program of configuration parameters while starting up the program.

- **Program Information**

Display utility program release date and version.

- **Help Screens**

Display necessary help to understand current screen, menu selection or available keyboard input.

System Information

The System Information is displayed from the main screen that appears when the program is started. This information is the main control of the system, providing run-time operation parameters and procedures that the Interface Board uses in its minute-by-minute operations. This information is obtained from the Interface Board's two microprocessors via the Dual Port RAM available on the Interface Board.

The information displayed indicates current system status for the two processors running on the Interface Board and the status of the configurations and data used to run the Interface. The current mode of operation for the Interface Board is also indicated, along with the available modes that it can operate in. The user can also use this information to check if the current configuration in the system is valid, and if not, what might be wrong with it.

Run-time status, such as number of CRC (cyclic-redundancy-check) errors in communications and number of time outs (when modules on TransNet link do not communicate), are available to diagnose any problems with the modules, or even may indicate bad communications cable used for the TransNet communication system.

The main display shows the number of CRC errors. By going further into the module information you can determine which modules are having problems. This information will then guide you to determine if a single module has a problem or if all the modules are being affected by a bad communication cable.

The Interface Board PROM version numbers are useful for diagnosing any system problems while working with Technical Support Service. This information is given on the first page of the IIOPINFO Diagnostic software package.

The overall system configuration is displayed on this system information screen. The number of modules, types (input and/or output) of modules, communications time to collect and/or output data are all available. A graphical representation details the communications timing used to control the I/O modules. This can be used to understand how the TransPort System (along with the TransNet communications) operates and controls the I/O modules.

The bottom line of the screen indicates which keys are available to display the system help information and to call the main menu. These keys are available at all times throughout the program.

Module Information

The module information used in the TransPort system consists of the module configurations (stored in the Interface Board and the module base EAROM), module status and module and base pair types. This information is available from the Module Information menu selection.

The module configurations inform the module and the interface board how the modules are to operate in the currently configured system.

The configurations of the module can be displayed by looking at the current configuration for the module that is stored in the interface board or that is stored in the module base EAROM. These two pieces of information **MUST** be identical, and if not, may indicate some level of system problem, either in the system configuration or the interface board.

Displaying the configuration information that is in the interface board indicates to the user how the interface board perceives how that module should work and displaying the configuration information that is stored in the base EAROM indicates to the module how it perceives it should work in the system.

The module scan lists inform the interface board, and user applications, what order the modules are going to transmit data information to the interface board and what order the modules are going to receive data information from the interface board. This information is necessary because of the time-based method of communications used to control the I/O of the modules.

The status of an individual module, or all modules on the link, can be displayed to see how each module is operating or to determine if a module is diagnosing any problems within itself or the communications link.

Clearing the bases (effectively erasing the EAROMs), enables a base and module pair to start out fresh as if from the factory. This can be accomplished using the "Clear All Bases" selection. Only the bases with modules plugged into them will be cleared. This process should be done with caution, because the modules will all have to be removed and reconfigured with the Setup & Configuration software.

The types of modules that are on the link, configured or not, can be displayed via the Display Module Types menu selection. This information is useful to help reconfigure a system when the configuration data file may have been lost. (Versions 2.13 or greater of Setup & Configuration will also reconfigure a system if the configuration file is lost.)

Module data (input and/or output) is accessed from this selection by selecting the Display/Edit Module Data menu selection from the Module Information Menu. This process is described in more detail in the following section.

Module Data

Input module data is displayed on a module by module basis. The output data may also be displayed or edited in this same manner. This is accomplished by going from the Main Menu to the Module Information Menu to the Display Edit Module. Then select the type of module you want to examine. The data can be displayed or edited on a channel by channel basis, or by entering/displaying the binary values for channel data. These two features enable a simple interface for editing and displaying module data.

All module types (digital and analog, input and output) can be used in both modes. However, while in the channel by channel mode, the data is edited/displayed differently according to the channel type. Digital data is displayed with "On/Off" nomenclatures. Analog data is displayed using a 16 bit value. As the data is displayed/edited, the current status of the module is displayed.

Digital input data is displayed using "On" (for high) or "Off" (for low) text. The data for all channels on the current modules is updated continuously, as is the status of the module. Editing the data requires that the user simply presses the cursor keys to select channel, then press 1 or 0 to select the channel value. You may also use the "S" key to set all channels high or "C" to clear all channels to low, or press the space bar to toggle value.

CAUTION: This will activate the outputs of the module and any relays, motors, etc. will be driven by this process.

Analog input data is displayed using 16 bit values, in hexadecimal or decimal, depending upon current display mode. The data for all channels on the current modules is updated continuously, as is the status of the module. The data can be converted in Engineering Units (EUs) via the simulated M&B coefficients of $EUs = (M * \text{Raw Value}) + B$ equation (data assumed to be linear). The EUs can be displayed using the M and B coefficients that are stored into the interface board which were created from the Setup & Configuration Program.

Analog output data is displayed using 16 bit values, in hexadecimal or decimal, dependent upon current mode of the utility mode. The data for all channels on the current module is updated continuously, as is the status of the module.

To display/edit the module data in pure binary mode, select the Binary Mode Display/Edit Menu selections from the Module Data Menu. This mode makes no reference to digital or analog and is strictly binary only.

While in the channel by channel mode, invoking a "Quick Pick" menu allows for quick movement from one module type (or number) to another.

Advanced Operations

The advanced operations are designed to help out in those areas where more information is necessary. For example, if the user wishes to confirm (or measure) system performance, the user would use the advanced operations. The advanced Operations enable the user to understand more of the process of data collection and control.

Interface Board Initialization

IIOPINFO uses a default configuration for communicating with the interface board. Two of the configuration parameters are I/O Port Address and Board Memory Address. The default addresses are selected at the factory. However, if the default addresses are not used for the current system, IIOPINFO must be notified of the address settings selected by the switch settings on the IIOP board.

Error Information

The status of the system, and/or modules in view, are continuously updated on the screens. If for any reason an error occurs, a corresponding error text screen can be displayed to give the user some detailed information on the error. Using the "ALT E" key enables the user to read from the Error Text File used in the Setup & Configuration software, therefore, that file must be available for reading by the IIOPINFO program.

Command Line Parameters

The utility program makes extensive use of command line parameters entered at program invocation. I/O Port and Board Memory addresses can be entered from the command line, as well as data display mode (decimal or hexadecimal), help and error file names, and the ability to process as an External Configurator if available. To get a complete list and description on these parameters run IIOPINFO followed by the "-H-" parameter.

Example:

At the DOS prompt type: IIOPINFO -H

Program Configuration

The current configuration of the diagnostics program can be saved in a configuration file for re-use when the program is restarted. This saves the user from having to set up the configuration every time the IIOPINFO program is started. Some of the available configuration parameters (but not limited to) that are stored in the configuration file are:

- I/O Port Address
- Board Memory Address
- Help and Error File Names
- Decimal or Hexadecimal Display Mode
- User Application Command Line Invocation Data
- User Entered Engineering Units Conversions

Some of the information that is stored into the configuration file can be entered from the command line parameters or what is currently set up from the utility. The configuration parameters can be reset to the default parameters.

Program Information

The program information, available from the Configuration Display enables the user to determine the current version and release date of the utility.

Special Keys

The ALT Keys:

The following ALT keys may be used anywhere in IIOINFO program. They may be executed by holding the ALT key down and hitting the letter key. If you need help on any of these keys, type F1 (Function Key 1) and then type the key you need help on.

- Press Alt A** to create a pop-up to appear with a query for new address. This address is the new address of a module to display or the address of a memory location to display.
- Press Alt B** key to display the menu selections to allow changing of operating modes. This function is identical to the Change Mode selected from the Main Menu.
- Press Alt E** to create a pop-up to appear which will explain the current error recorded for a specific module or the interface being displayed. This information is read from the TEXT file used to store the error messages. This function can also be used to display any other error message that is available in the system.
- Press Alt I** key to display the Input Scan List for module address selection. The module is selected by highlighting the desired address and pressing the ENTER key.
- Press Alt N** to toggle the data display from Hex to Dec to Hex. Data affected is addresses, counts, and configuration data. A mode indicator is in the top left corner. While in Dec mode, a number highlighted in yellow indicates a value between 100 and 199 (less 100). A number highlighted in red indicates a value between 200 and 255 (less 200).
- Press Alt O** key to display the Output Scan List for module address selection. The module is selected by highlighting the desired address and pressing the ENTER key.
- Press Alt V** to allow the viewing of data from other IIO interfaces, providing they are available. The bottom of the screen indicates current view of:
 - System Master via System Master
 - External Configurator via System Master
 - System Master via External Configurator
 - External Configurator via External Configurator
- Press Alt X** key to explain the information that is displayed. Standard information for module configurations and base configurations are explained while in those screens.

IIOPInfo Software

Press Alt Y key to display the channel types and count for the currently selected module. This information is for reference only (is subject to change), and should be confirmed by checking with the sales brochures.

Press Alt F1 key to display the IIOPINFO Configuration Menu for selecting configuration save or reset. The current configuration of the application (module numbers currently viewing, data mode, file names, floating point conversion numbers, etc.) are stored in a CONFIG file in the same directory as this application resides.

Introduction

This section of The TransPort™ System User's Manual is meant to help make diagnose and correct any problems you may have run into in setting up your system. If after consulting this section your problem still persists please call our Technical Support at 1-800-835-7075, toll-free, 24-hours a day.

Software Installation

1. If, when you type **INSTALL**, the computer prints one of the following on the screen:

a) **Error reading drive A**
Abort, Retry, Fail?

- Is the disk in drive A?
- If it is in drive B, type **B:** then press the **Enter** key. Now again type **INSTALL** then press the **Enter** key.
- Check to make sure the disk drive door is closed.
- If the above fails to work, call us. It is possible your disk has been damaged. If this is the case we will send you another disk

b) **Bad command or filename**

- Check to see that you have the right disk inserted into the disk drive
- The possibility exists that your copy of the program has become damaged. Call us and we'll get you another disk.

2. If the install program runs but displays the message:

INSUFFICIENT DISK SPACE FOUND

This installation cannot continue, press any key to leave.

- This means that you've used up all the space on your hard disk. You will have to remove some files to install the program.

Testing the Interface

If you have set the interface card to a different port or memory address than the factory default (memory = D000 and port = 300) you will need to invoke the program as TESTIOP -BXXXX -PXXX. The X's are the addresses of the B (memory) and P (port). The valid entries for memory address are; 0000 through F000. This is the segment of memory where the board resides (factory set for D000). The valid entries for P are 300 - 3FF. If this is confusing you re - read **Interface Installation** section of this manual. If the TESTIOP executes successfully the program will generate the following output.

```
C:\TSCS> TESTIOP
```

```
TransPort PC IOP Test V2.06      06 December 1991
Copyright (C) Transition Technology Inc. 1989-91 All rights Reserved
```

```
Checking for interface board - port 300 board D000
```

```
Status: 00h      Interface board is running
```

1. If you type TESTIOP and hit enter and the following message appears.

Bad command or filename

- type (at the DOS prompt) dir *.exe and the following programs should be listed:
SETUP.EXE,
TESTIOP.EXE,
IOPINFO.EXE, and
IOPLOAD.EXE.

If these are not there repeat, the **Software Installation** procedure.

If the message appears but the status is not 00h then the software was unable to communicate with the interface card. The most common errors returned are the ones below:

- a) **Status E0h** - Interface port address selected is invalid. If you get this error and you have the not changed the switches from the factory default read pages 11 -14. Make sure the switches are set properly. If they appear to be set properly it is possible that another device in your computer resides at this address. If this is the case change the Port Address and re-run this test.
- b) **Status E1h** - Interface Memory Address selected is invalid. If you get this error and you have the not changed the switches from the factory default read pages 11 -14. Make sure the switches are set properly. If they appear to be set properly it is possible that another device in your computer resides at this address. Many devices such as Local Area Network cards will also have default addresses in the D000 memory segment. If this is the case you must change the address and re-run this test. If you have expanded memory in the computer this also may cause the problem. If the expanded memory driver is QEMM or REMM you will have to modify your config.sys file to include a line that looks like the following. The important part is that the line contain the x = d000 - dfff.

```
Device = C:\PATH\QEMM386.SYS X = D000 - DFFF MAPS = 18
```

```
Device = C:\PATH\QEMM.SYS X = D000 - DFFF MAPS = 18
```

```
Device = C:\PATH\REMM.SYS X = D000 - DFFF
```

- c) **Status E3h, E4h, E5h, E6h, E7h, or E8h** - Check the switch settings on the board and try again if you get the same result call Technical support. This may be the result of a hardware failure on your interface card.
- d) **Status EBh** - The interface has not closed the memory access before another access has been requested. This error happens most often when a VGA graphics card is installed that uses 16 bit memory transfers. You must reconfigure your VGA card to use 8 bit memory accesses. Please refer to the manual that came with your graphics adapter card.
- e) **Status EFh, F0h, F1h, or F3h** - Check the switch settings on the board and try again if you get the same result call Technical support. This may be the result of a hardware failure on your interface card.

Troubleshooting

Unable to Gain Mastership of the Network (External Configurator Only)

If when trying to gain mastership of the network this message appears:

The External Configuration System has requested mastership of the link. This process takes up to ten seconds to complete.

Press ESC to continue.

Disconnect the communications network (the modules) from the master interface (the one that isn't in the PC). Connect the External Configurator (the one in the PC) directly to the Master. Re-try gaining mastership. (in setup & Configuration enter the Configure Modules Screen or the Set System parameters screen). If the above message still appears check the continuity of the cable connecting the two interfaces. Make sure the cable is less than 12 ft. long. If the cable checks out you have a hardware fault in one of the interfaces. Run the program called TESTIOP if this returns a Status of 00h call Technical Support.

If you are able to gain mastership of the network above, there is something wrong with the network installation. With the interfaces still connected together, enter the Configure Modules Screen and gain mastership. If you have previously entered a configuration simply exit out of the software. If there are no modules entered move the highlighted cursor to the first row in the module type column. Press the F9 selections key and enter a module. This will cause the following error.

The interface did not receive a response from a module or other interface board. This may be caused by CRC errors on the link or the module/interface board may not be present. Press (ESC) to continue

Press the escape key and ignore it. Exit from the Setup & Configuration program. (hit the escape key and select exit from the Main Menu). Now invoke the program IOPINFO.EXE. Type IOPINFO at the DOS prompt and hit the enter key. This will start the TransPort diagnostic program called IOPINFO. IOPINFO will be used to test the communications network.

If when you invoke IOPINFO you get the message: **Bad Command or File Name**. Check the directory and see if the four programs SETUP.EXE, IOPINFO.EXE, TESTIOP.EXE AND IOPLOAD.EXE are there. If these programs are not in this directory re-run the installation program.

TransPort: IIOPinfo PCAT V2.0X

Control Word:	H00000010	L10000100	Memory Manager Status:	00
Status Word:	H00000000	L00000000	Comm Handler Status:	00
			Interface Status:	00
Number or CRCs:	0002A		TransNet Staus:	00
Number or Time Outs:	00023		Configuration Status:	00
Number or Scans:	0A23B		Module In Error:	00
			NOVRAM Staus:	00
IIOP Mode: (Lstr)	Broadcast		System Configuration:	00
Memory Manager SW Version:	2.10		Available Modes:	000101
				01
Comm Handler SW Version:	2.11		IIOP I/O Port Address:	300
Interface OEM Number:	20		IIOP Memory Segment:	D000
Number of Input Modules:	1		Scan Time (mS):	19
Memory Manager SW Version:	0			

Broadcast Time	0.50 mS	1.73mS	19.0 mS
----------------	---------	--------	---------



F1 Help

F10 Menu

Assuming that the program is there the above screen will appear. Look in the first column on the left side of the screen. There is a parameter called Number of Scans. This number should be incrementing. If it is not, hit the F10 menu key a pop-up menu will appear. Choose the selection titled advanced user info. Another menu will appear choose the Validate Configuration. This should produce a message that says

System Configuration is OK

If it does not say this call us. Press the ESC key to get back to the menu. Press the ESC key until you get back to the original screen with no menu. The number should now be incrementing. If it is not call us.

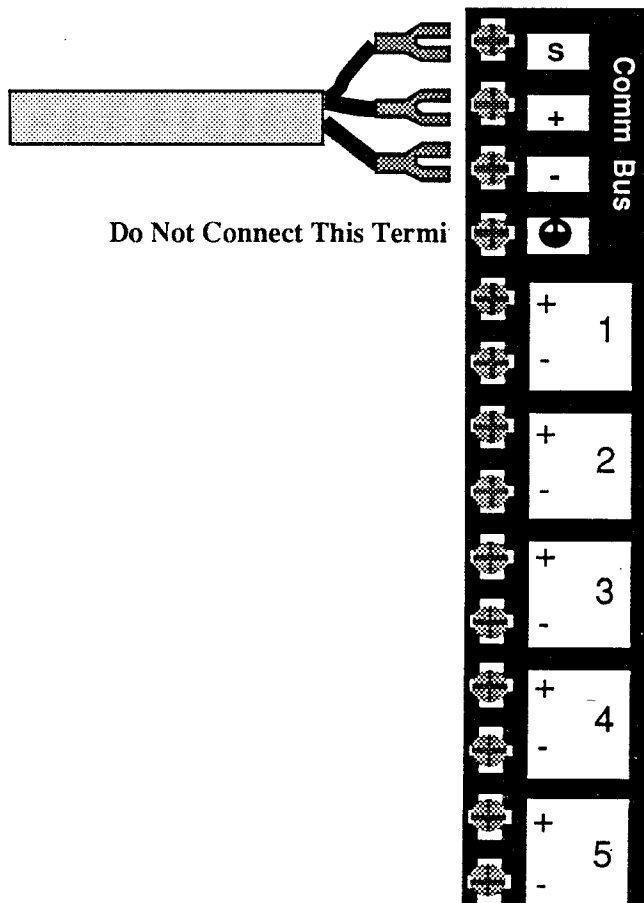
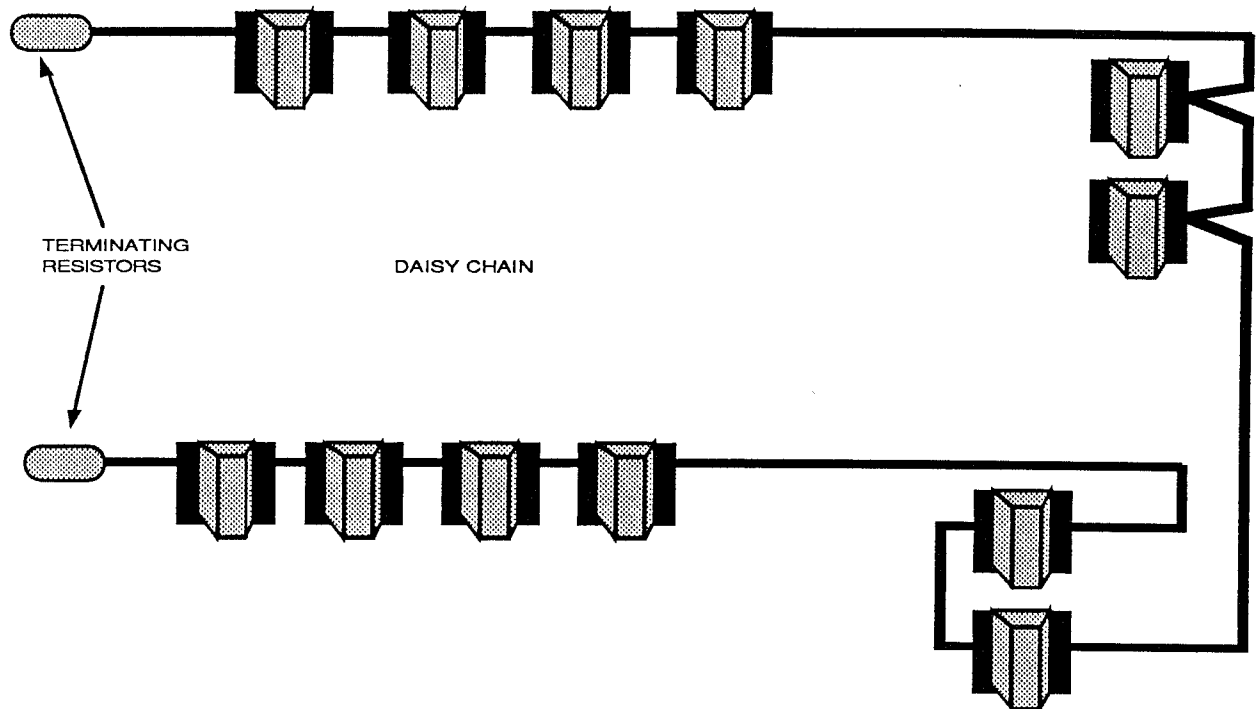
Once you have assures that the Number of scans is incrementing check to see if the Number of CRCs is incrementing. If it is you have communications network problems.

Network Wiring Problems

In order to configure the system, the network must be properly wired properly. If you haven't installed the network correctly, this will be a very difficult process. Please be sure that the system has:

- b) **The termination resistors are installed (at the two ends of the network). This is the most commonly missed item. Please make sure that these are attached to the network**
- c) It is also important not to ground the system improperly. If you have connected earth, safety or shield wires to any of the terminals marked with the the ground symbols, **please remove them**. This terminal is not for earth grounds. It is the digital common of the module CPU. it should not be connected on modules or PSC24's. Connecting this terminal to ground may cause communications errors. Some earlier termination bases had a design error. The shield terminal was internally connected to this terminal. Make sure (with an ohm meter) that when you measure the resistance from this terminal on every module to ground there is infinite resistance. Even if the meter reacts as if you were measuring a capacitor this is wrong. It should be a completely open circuit.
- d) Make sure that you have connected the shield on the communications cable properly. Is the shield connected to every module? Check with an Ohm meter. If the shield is open anywhere on the network? If it is, you could get communications errors. Is the shield connected to ground in only one place (remove the connection to ground and check for continuity to ground with an Ohm meter)? If the shield is connected to ground in more than one place you may get communications errors.
- e) If you are not sure whether the network is together properly please call us (1-800-835-7075) and one of our applications engineers will answer your questions.

Once you have found the problem with the network re-run the IIOPINFO program to make sure that the Number of CRC Errors are not incrementing. If they are call us. Retry to gain and release mastership in the Setup & Configuration program.



Problems Initializing Setup & Configuration.

If you get either of the messages below in the Set System Parameters screen after you entered either a new I/O Port Address or Memory Address. Exit the program and try step 5 again (Test The Interface page 38)

There is no interface board responding at the Port Address specified. Configuration will continue OFFLINE; changes will be saved to disk file but not to the interface. Correct the Port Address on the 'Set System Parameters' screen, if ONLINE configuration is desired. Press <ESC> to continue

There is no interface board responding at the Memory Address specified. Configuration will continue OFFLINE; changes will be saved to disk file but not to the interface. Correct the Memory Address on the 'Set System Parameters' screen, if ONLINE configuration is desired. Press <ESC> to continue

Warning: There is a software bug. If you enter the full 4 digit address (i.e. D000) the software will not recognize it, even if this is the correct address. Enter only the most significant digit (valid entries are 0 - F hex).

If you still can't get the software to accept these parameters after successfully running step 5 call

Errors Configuring the Modules

During polling for new modules various module, interface and communications errors can occur. **DO NOT** plug another module into a base until you have successfully configured the one you working on. If you do, you may end up with a system that will not configure without being reset.

Errors When Polling or Searching for New Modules

When you place a module on a new base and trigger the new module search function. The software should put up a message acknowledging that it has found a new module and assuming that the New Module Search is Disabled, there should also be a large menu with a selection called new configuration.

If nothing happens when you do this, the following problems may be occurring, 1) the base already has an address, 2) the module is faulty 3) the base is faulty, or 4) your network is not connected to them.

- 1) If the base has an address (other than 121) and this address has not been used in your configuration, the Setup and Configuration program will recognize it and add it to the configuration.
- 2) If the base has an address that has already been used in your configuration, when this address is polled it will cause the module that shares this address to display an error in the status column. Remove the new module. If this cause the status of the other module to become "Module Ok" then this is the problem. To cure the problem, position the highlighted cursor over to the Address of the the module. Enter a new address (an unused one from 1 -120). Now install the other module on it's base. The software will automatically recognize it and add it to the configuration.
- 3) There are four diagnostic LED's on the front of every module. The top one is the Power light (green), the is the Fault light (red), the is the Active light (green), the last one is the Comm light (red). When the module is plugged in the it should take a couple of seconds to initialize itself and then the Power, Fault and Comm light should be ON if this a module is at address 121. If the power light does not come on, check the voltage at the Communications terminal (+, -). There should be at least 20 Vdc at these terminals. If there is not check your power supplies. If it's news that there should be power here, read the section on powering the system. If there is power at these terminals check the fuse in the middle of the base with an ohm meter. If the fuse is open replace it and try again. If the fuse is good or if it blow again we need to look at the module. (call us, we'll ship you a new one).

To determine if you have a faulty base you will have to plug the module onto the base. Exit from Setup & Configuration software.

- a) Type IOPINFO at the DOS prompt and hit the enter key. This will start the TransPort diagnostic program called IOPINFO.
- b) The screen shown on page s48 will appear.
- c) Press the F10 menu key. If this is an external configurator select Change Mode from this menu.
- d) Gain Bus Mastership.
- e) Use the escape key to get back to the menu entitled, Interface Display Menu
- f) Select Module Information from this menu.
- g) Select Display Base Data from the Module Information menu.
- h) There should be a large box in the middle of the screen with the title Display Module Base Data
- i) Use the PG UP key to change the address in this box to 121. This function will try to read the base.
- j) There are two numbers in the upper right hand corner titled Status. If the second number is not 00 then there is an error communicating to the module. If the second number is 80h (hex) then the module is

not responding at all. Check the wiring.

- k) If the Status is a 00 there will be rows and columns of data, call us and we'll tell you why it won't talk.
- 4) Check the wiring. Make sure there is continuity between the interface and this base. See the section titled Network Wiring Problems in this section or refer to the network installation section of this manual.

Errors After a New Module is Found

After the system has recognized a new module at address 121, it will try to add the module to the configuration. Errors can occur at this time.

Although a variety of errors can occur at this time, there are basically two types of module configuration errors. The first are transaction errors. These errors occur because the system (interface, network, or module) was not able to transfer data without error. These errors are almost always related to improper installation of the system. See the section called Network Wiring difficulties. All the type 1 errors are listed below.

Module Detected Communications Time Out - The module detected it has not received any communications synchronizations in a specified time slot (defined by the broadcast scan time). Therefore, the module will enter its Communication-Loss Error routines and perform the necessary functions.

Module Detected CRC Error - The module detected a single CRC-16 error of the data on the link. The module does not process any of the message or data. If 5 consecutive CRC errors are detected, the module will enter its Communication-Loss Error routines and Perform necessary functions.

Invalid Command Received - The module determined that the command it received is not valid or it did not know how to process the task.

Invalid Count Received - The module determined that the command that it received did not contain the correct number of bytes.

Invalid Data Received - The module determined the data received inside the message cannot be processed by the I/O processor.

I/O Processing Not Enabled - The module cannot process any I/O because it has not been enabled or has not been re-started after power-up. This is the general state if diagnostics pass on boot-up and restart is not transmitted on the link.

Module did not Receive broadcast Data - The module expected broadcast data in a specific time slot, but the data was not received.

Module Received Invalid Count in Broadcast - The module expected a specific number of data bytes in the broadcast message, but the incorrect number was received. The module does not process any of the data.

Module Received Invalid CRC in Broadcast - The module detected a single CRC-16 error of the data on the link. The module does not process any of the message or the data. If 5 consecutive CRC errors are detected, the module will enter its Communication-Loss routines and perform the necessary functions.

IIOP Received Invalid Opcode in Response - The response opcode received from the slave is different than the one that was sent in the message.

Communications Times Out/Slave Not responding - The IIOP has determined that the slave it was trying to communicate with did not respond in the specified time frame.

IIOP Received Bad CRC - The IIOP has detected that the slave that it communicated with, transmitted a response with a CRC-16 error. The response is ignored and the application program should re-try the message.

IIOP Received Invalid Command - the IIOP has received an invalid command from the host system or a pseudo master on the link (i.e. the External Configurator transmitted an invalid request).

IIOP Received an Invalid Response - The IIOP received an invalid response from a slave on the link. The response is ignored.

IIOP received Invalid Byte Count in Response - The IIOP expects a specified number of bytes for each particular command and did not.

The second type of errors are equipment configuration problems. These errors occur because there is a mismatched or faulty device (hardware or software). You will get this type of error if the module you are plugging in does not match the base it is on. You will also get this kind of error if you send a module bad information. All the type 2 errors are listed below.

EAROM Read/Write Error - The module has determined that it cannot read or write to the EAROM properly. Most likely, the control line signals are not responding appropriately. The module resets its address to 79 (hex) and only processes command/response messages.

EAROM CRC Error - The module has determined that the EAROM data is invalid due to a bad CRC-16 calculation. The module resets its address to 79 (hex) and processes only command response messages.

Module Invalid For Base - The module has determined through its internal look-up tables that the base that it is powered up on is not valid for the module type. The module retains its address, but does not process any I/O data. The current module may not be allowed to program any data into the EAROM.

EAROM Exceeded Maximum Number of Bytes - The module has determined the EAROM has exceeded its maximum number of writes (9,000) and must be replaced. The base may be copied using the TransPort duplication tools. The module retains its address, but does not process any I/O data. The current module may not be allowed to program any data into EAROM.

Module Map Version Level Invalid - The module has determined the EAROM map version level is non-upgradeable. The base must be upgraded using the TransPort upgrade tools. The module retains its address, but does not process any I/O data.

Module OEM Type Different from Base - The module has determined the EAROM OEM number is different from the module's software, therefore the module will not be allowed to work with the base. The current module may not be allowed to program any data into the EAROM.

Module Invalid Address in EAROM - The module has determined that the address stored the EAROM is invalid (not within 1-120). The module resets its address to 79 (hex) and processes only command/response messages.

Module Invalid for EAROM with compability - The module has determined the EAROM configuration does not exactly fit its module type, but that it is close enough that the module can use the configuration to upgrade it to the current module type (i.e. EAROM - DO0116 and module - DO0216). The module retains its address and does not process any I/O data

Module Invalid for EAROM without Compability - The module has determined the EAROM configuration does not fit its module type. None of the data can be used by the configuration system to upgrade it to the current module type (i.e. EAROM DI11516 and module - DO0216)The module retains its address, but does not process any I/O data.

Channel Configuration Invalid - The module has determined the EAROM channel configuration is invalid for the current module type. The module retains its address, but does not process any I/O data.

Communications Times/Timeouts Invalid - The module has determined the EAROM communication times are invalid (i.e. 0's) and therefore, cannot properly communicate on the link during broadcast transmissions. The module retains its address, but does not process any I/O data.

Troubleshooting

Output Readbacks Incorrect - The module has determined that the output readbacks do not match the output commands. This may be due to filtering times.

Module Has Invalid I/O Circuit - the module has determined that the I/O circuit is faulty. A possible problem could be a bad Cold Junction Compensation Circuit. The module cannot perform any I/O functions on that module until the errors are fixed.

Module has I/O EAROM CRC Error - The module has determined that the EAROM(s) used for special I/O have invalid CRC(s). The module cannot perform any I/O functions on that module until the errors are fixed.

Module has Invalid I/O EAROM - The module has detected an error in the EAROM(s) used for the special I/O. This may be caused by the inability to read them or storage of invalid data.

Power Supply Graphs

What these graphs are for

The purpose of these graphs is to show how much power is available to remote modules as shown below. The graphs take into consideration the amount of power- - - -

provided by the PS-01 power supply
number of PS-01 power supplies
consumed in the cable

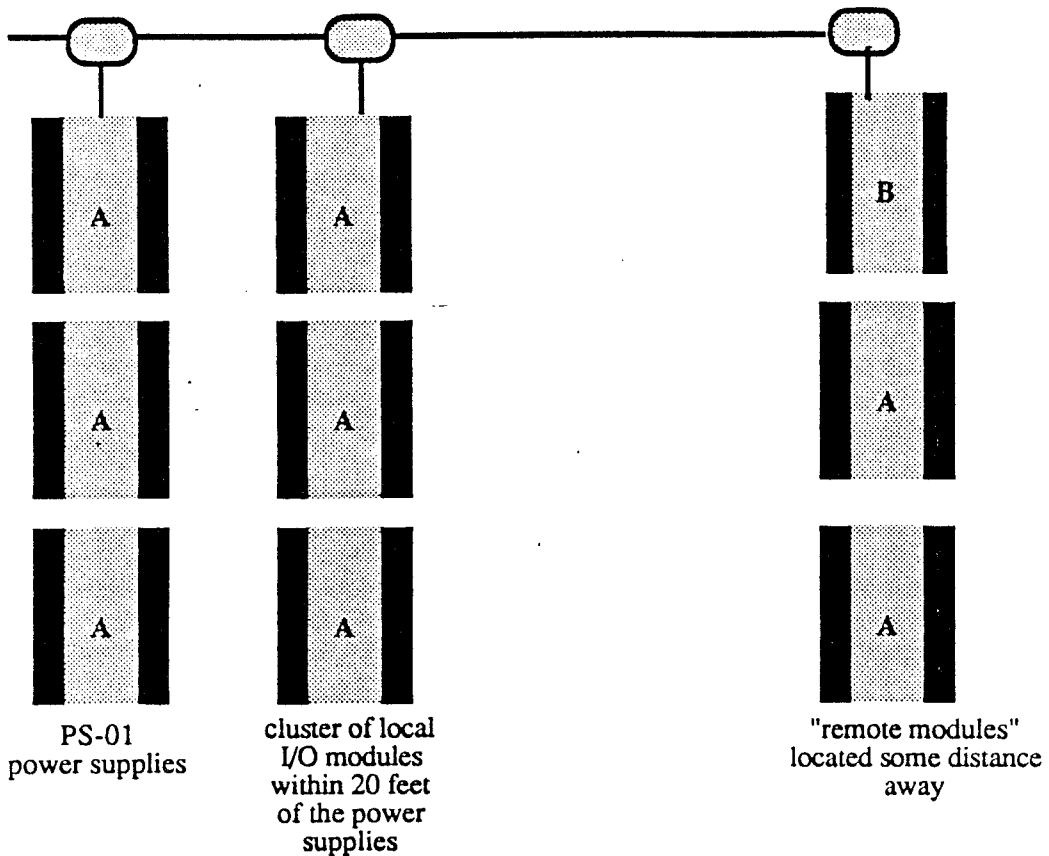
What is needed to use these graphs

To use the graphs, you need to know
wire gage of the network cable
number of PS-01 power supplies
amount of power consumed in the local I/O modules
distance between remote cluster(s) and local cluster

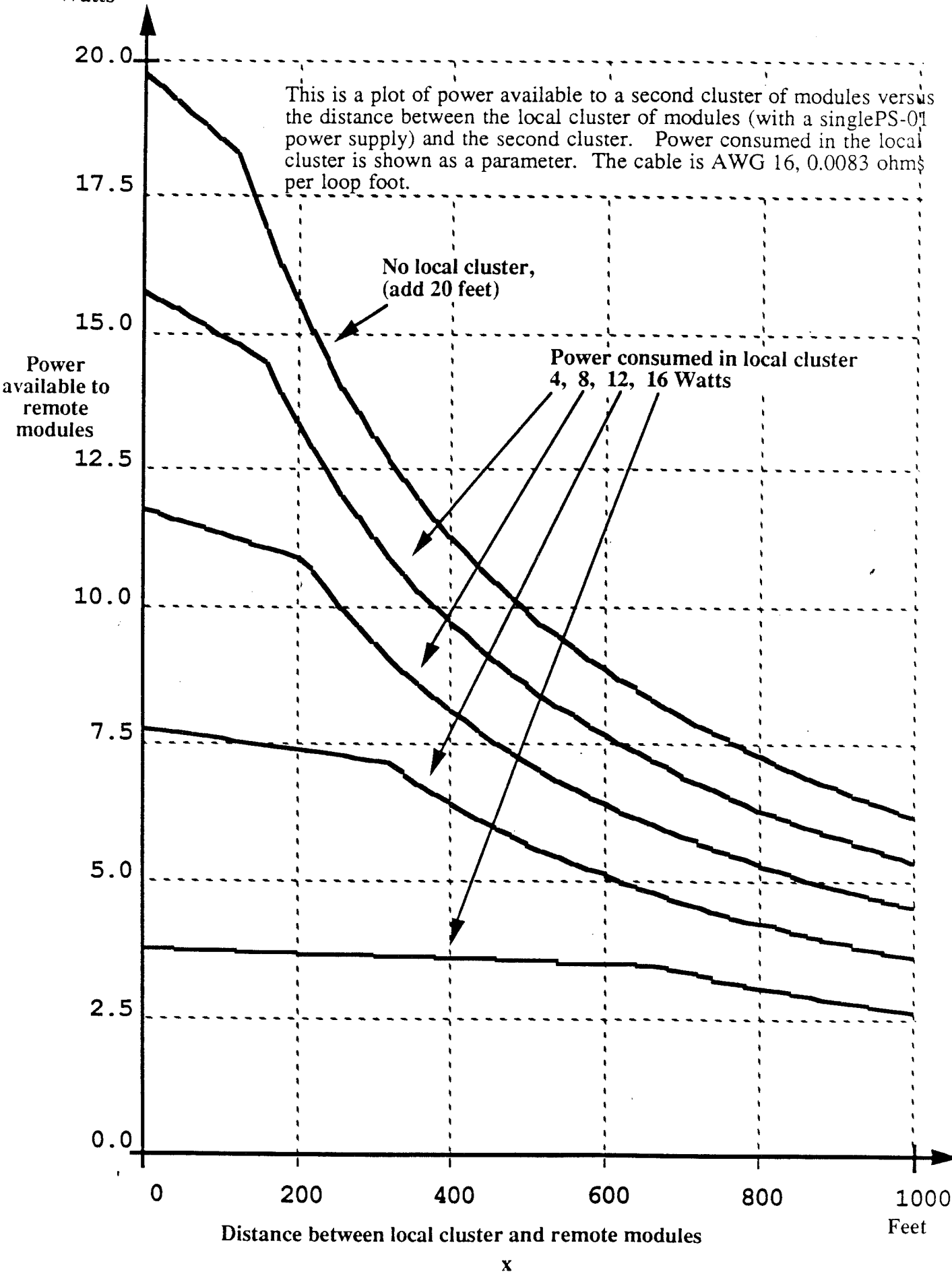
power supplied
by PS-01 cluster

power consumed by
local modules

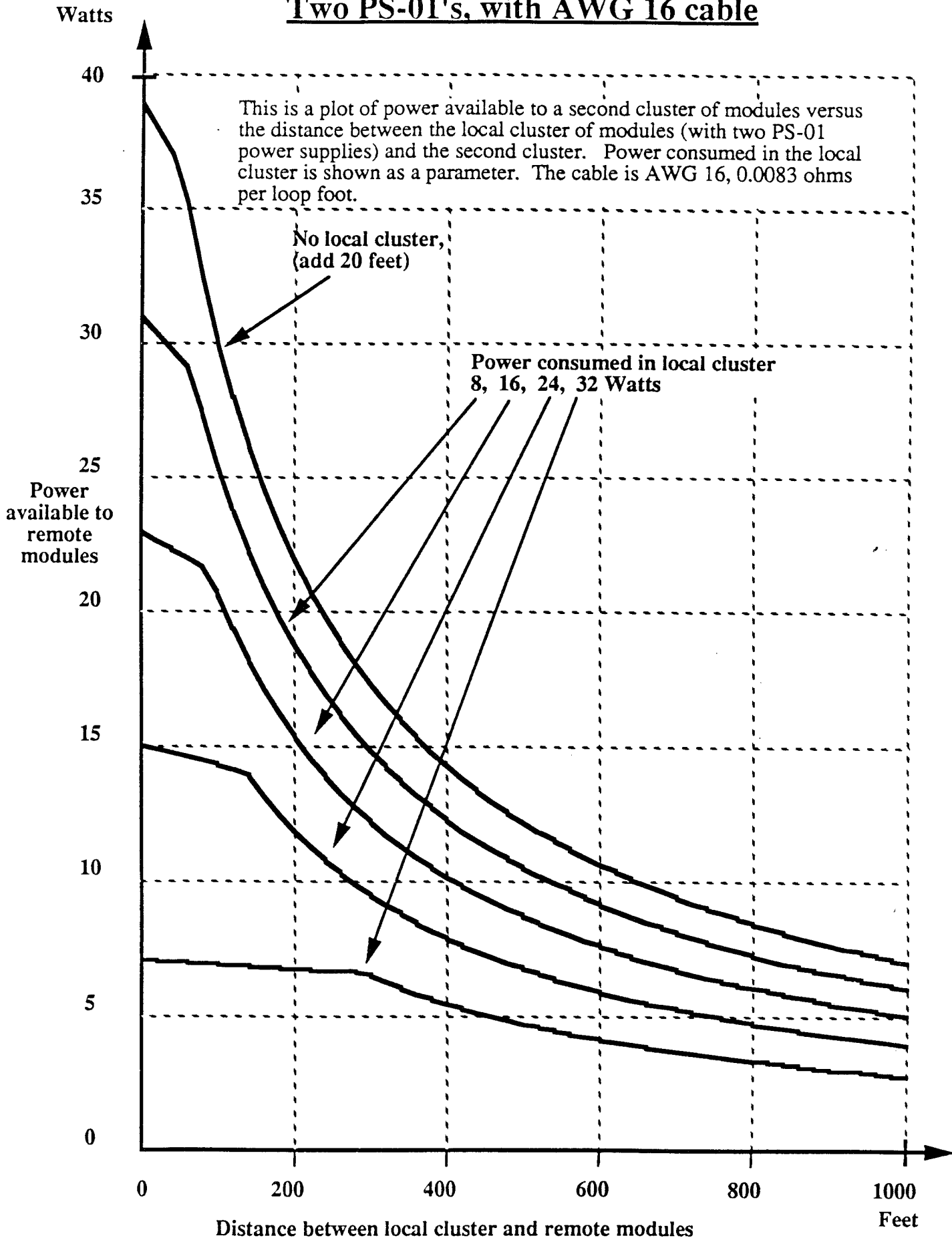
power available to re-
mote modules



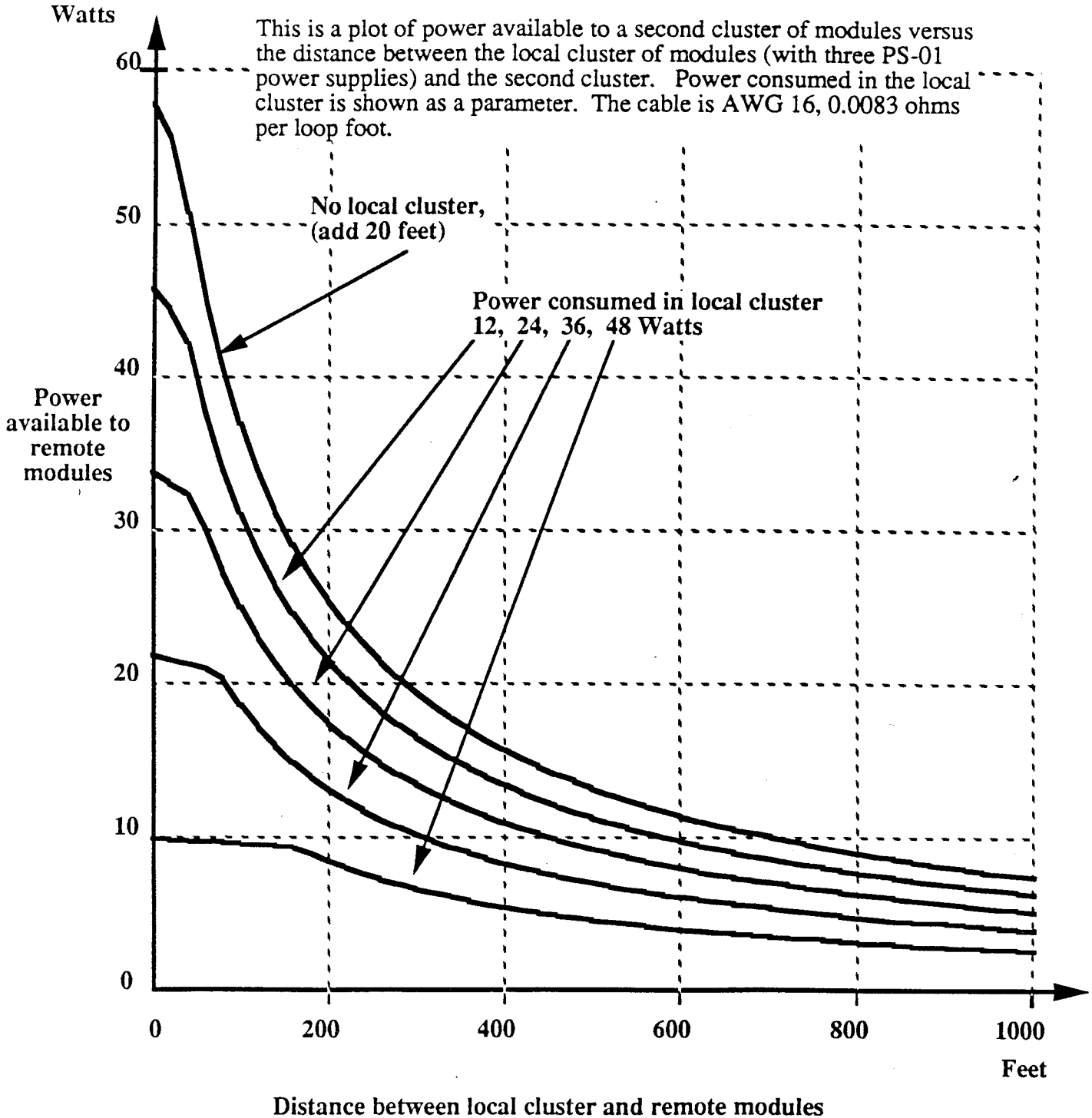
One PS-01, with AWG 16 cable



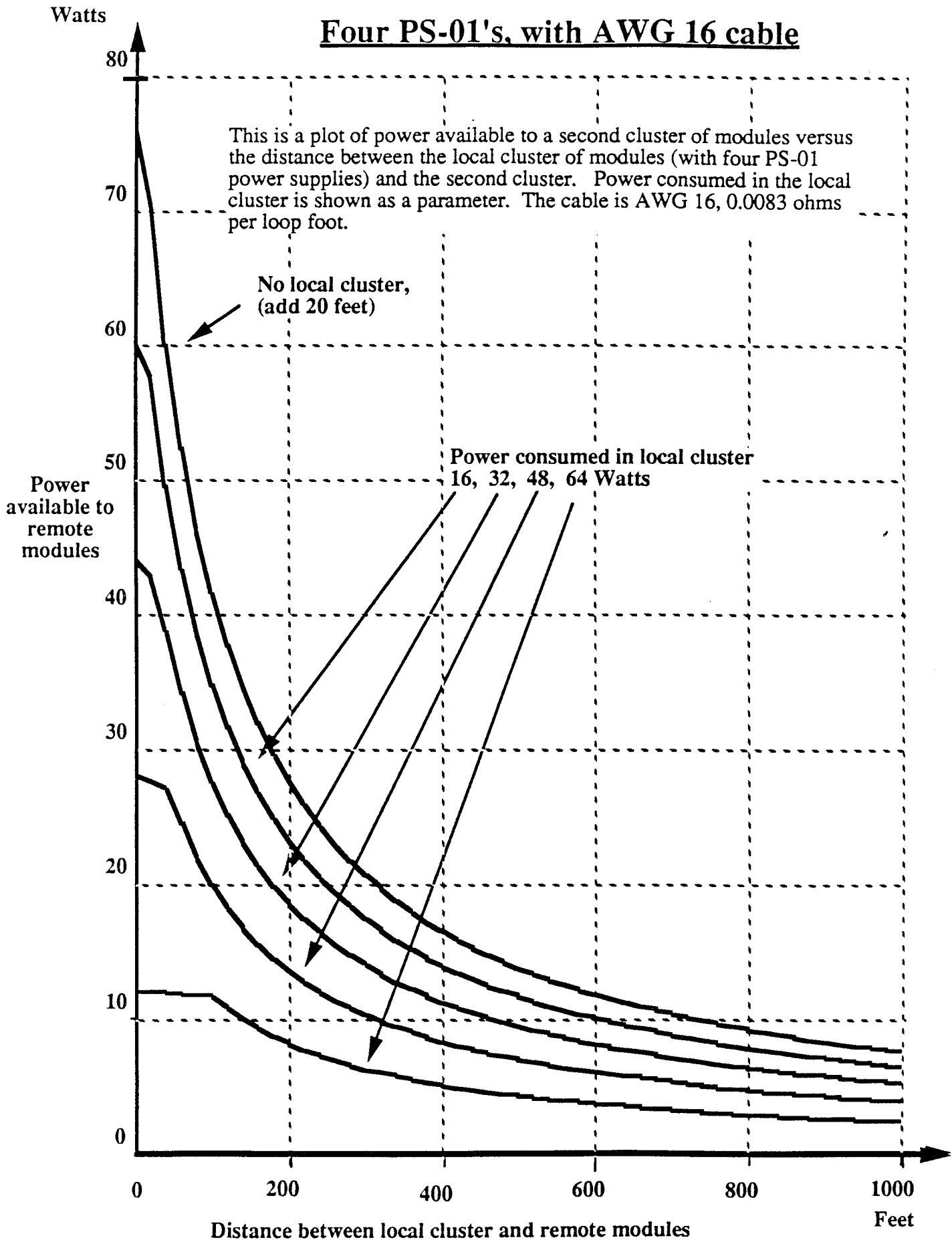
Two PS-01's, with AWG 16 cable



Three PS-01's, with AWG 16 cable

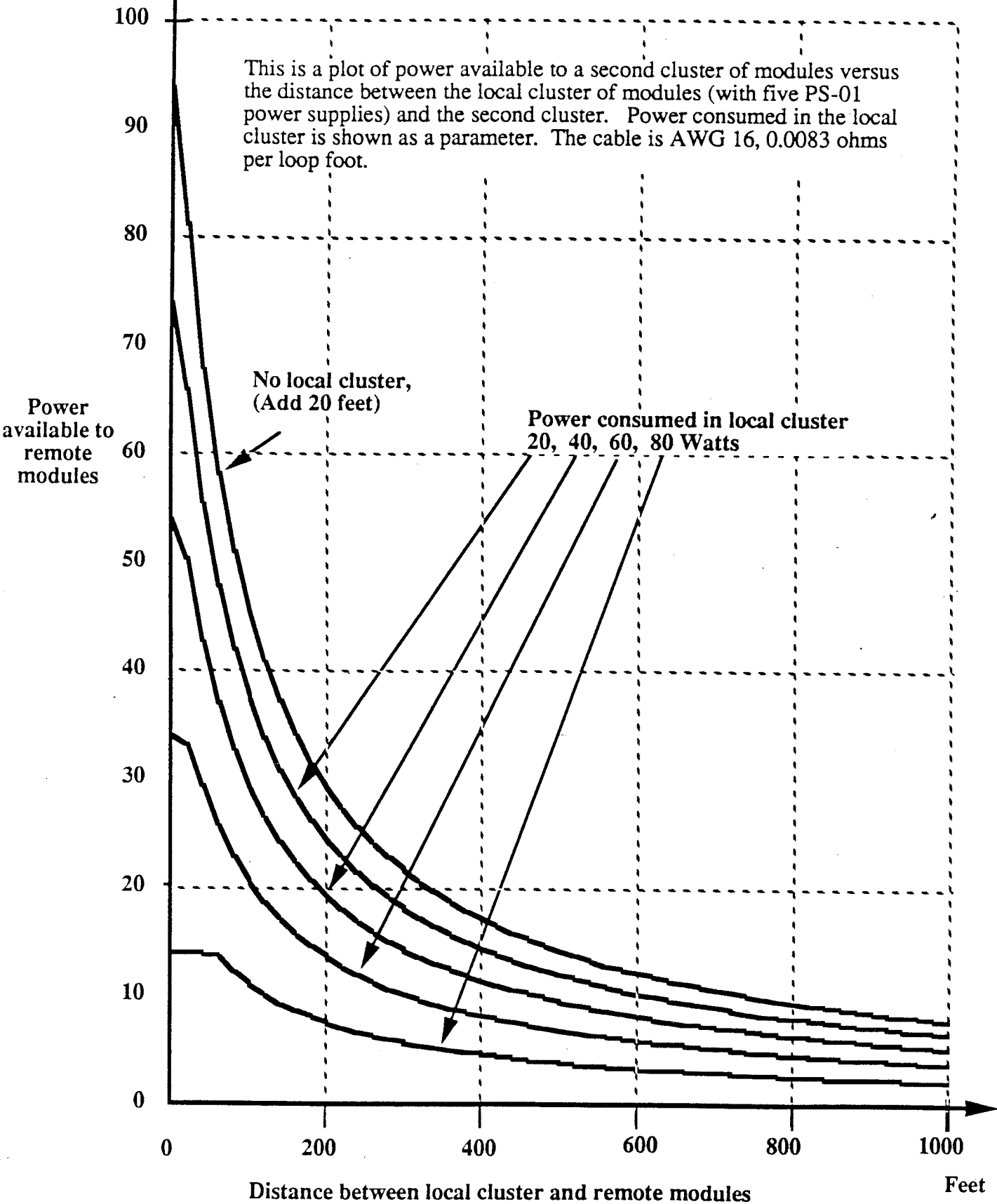


Four PS-01's, with AWG 16 cable

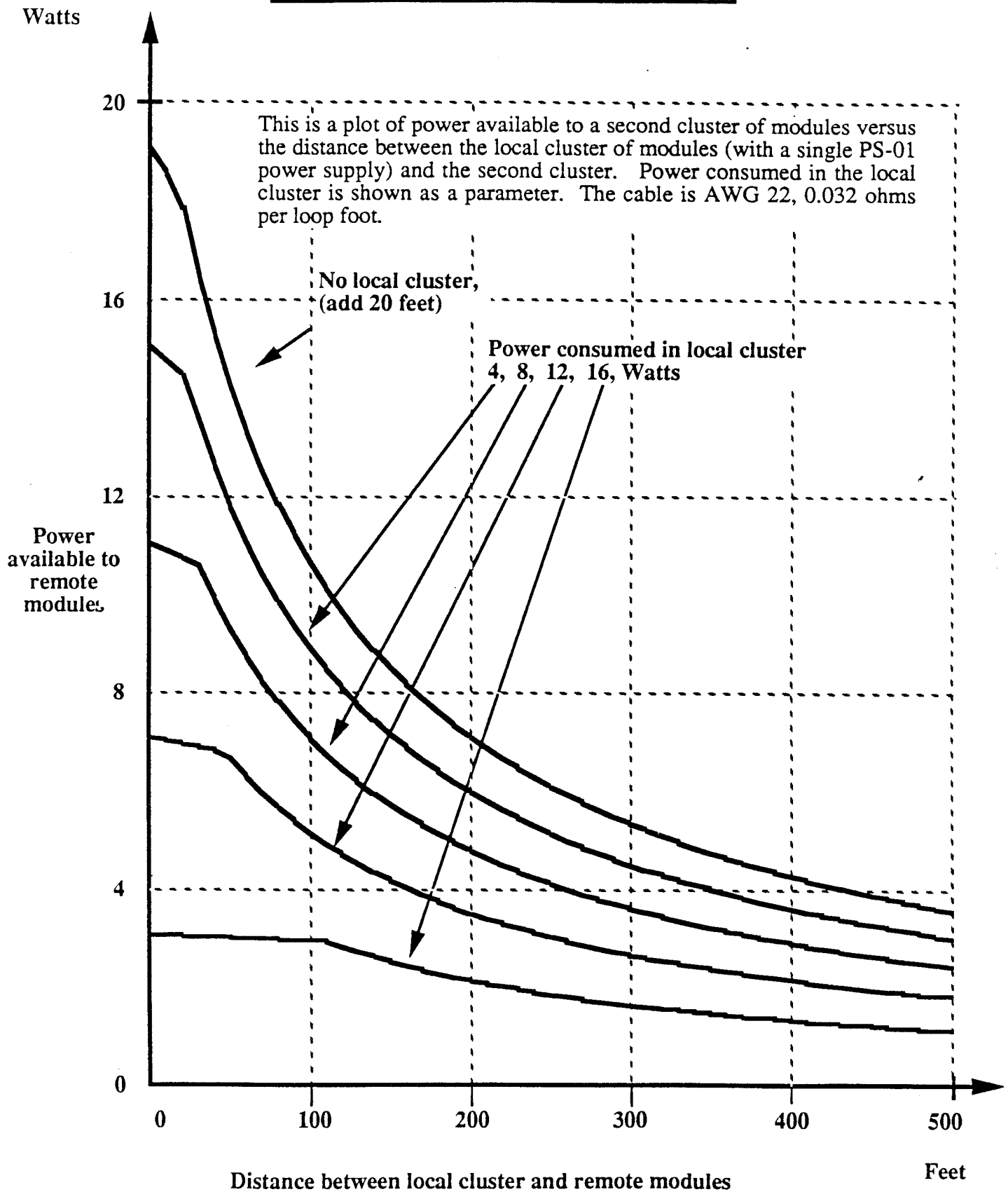


Five PS-01's, with AWG 16 cable

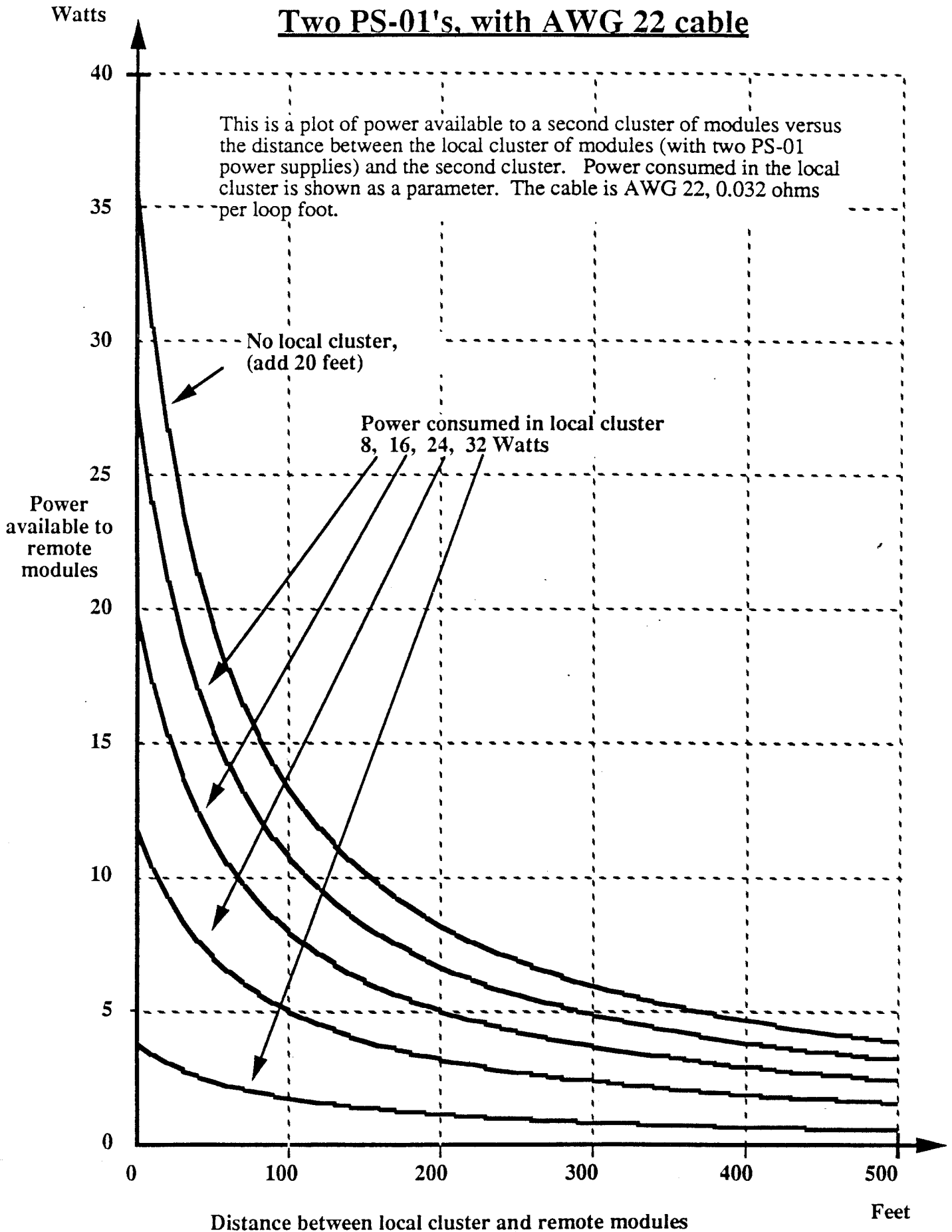
Watts

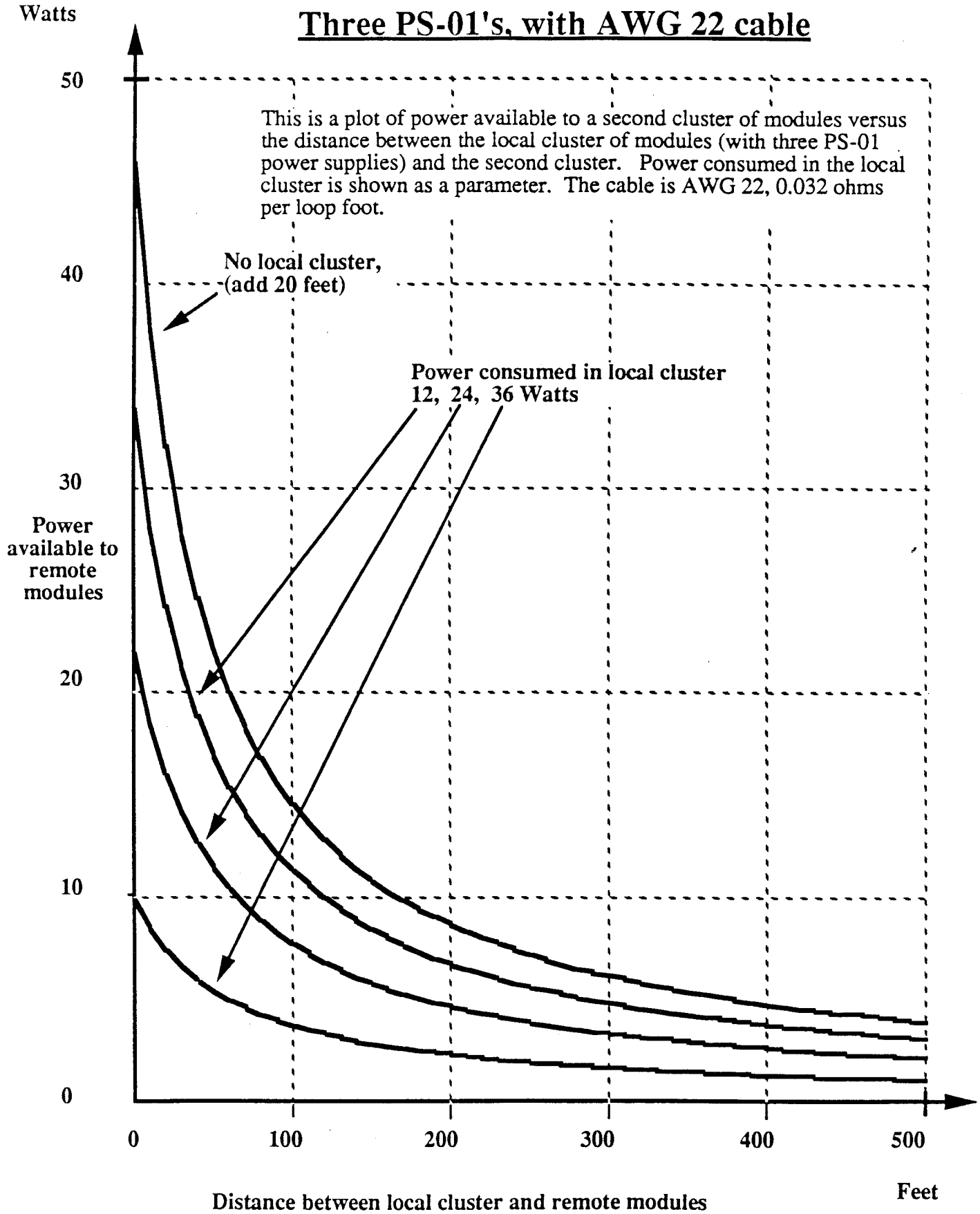


One PS-01, with AWG 22 cable

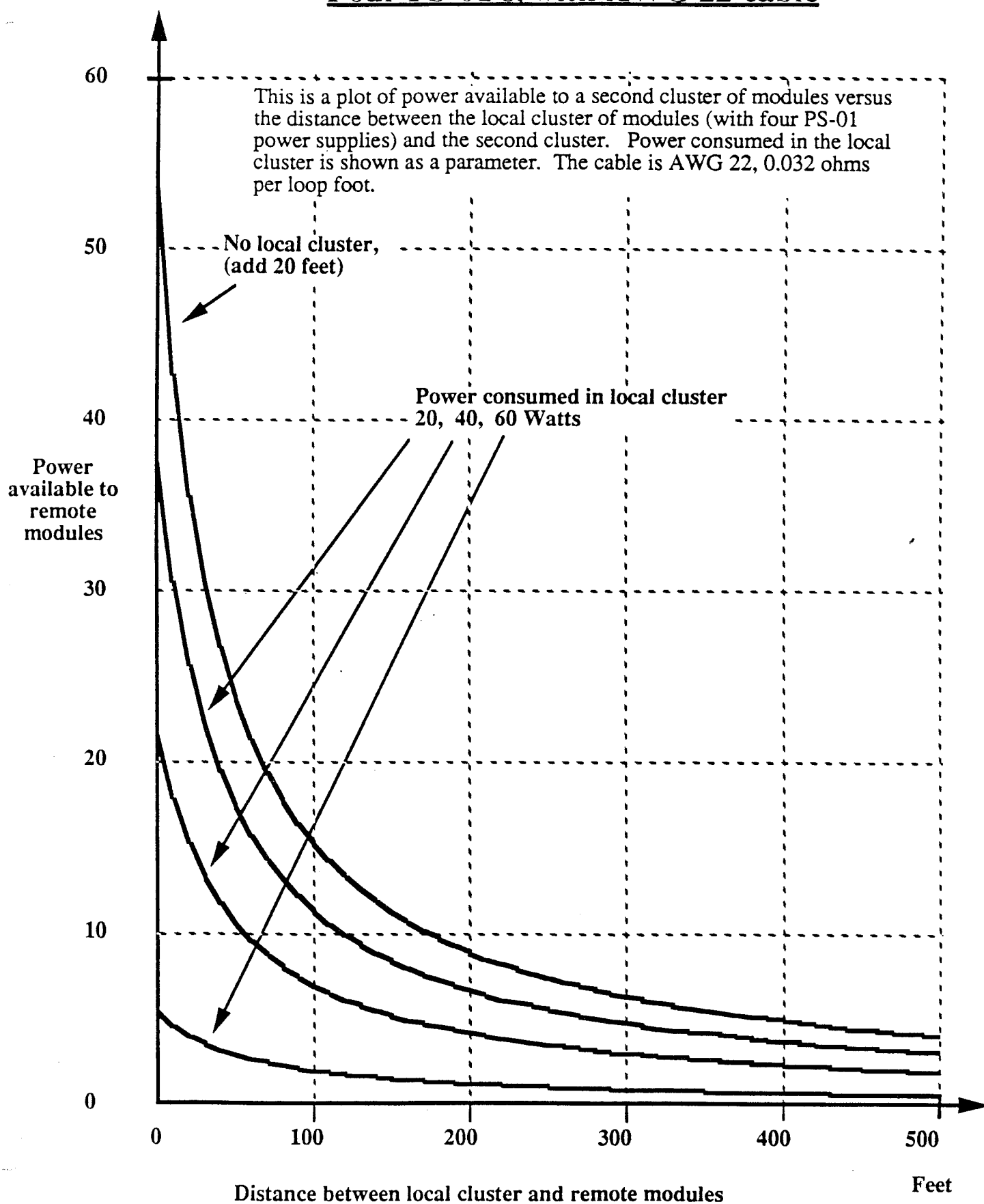


Two PS-01's, with AWG 22 cable

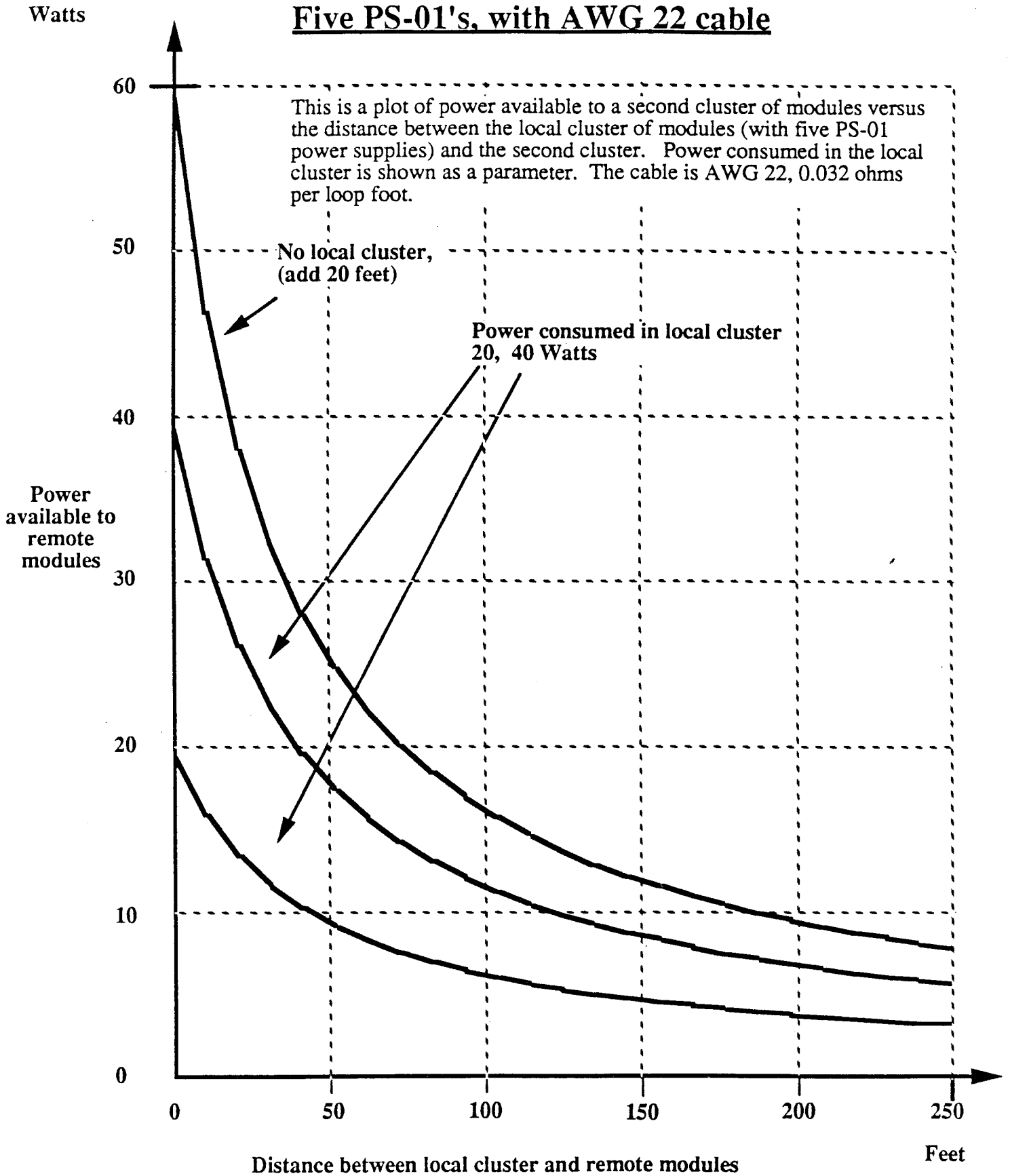




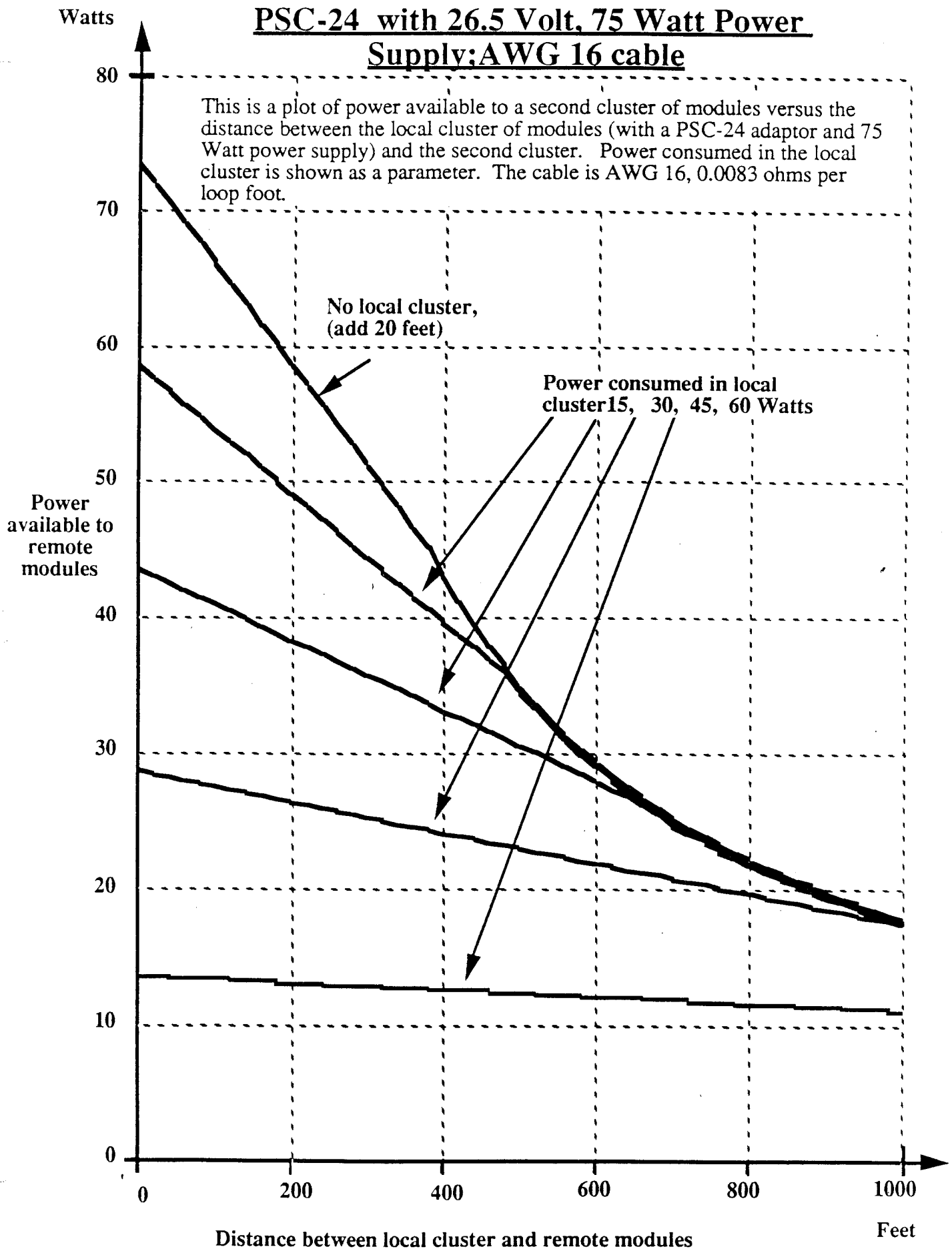
Four PS-01's, with AWG 22 cable



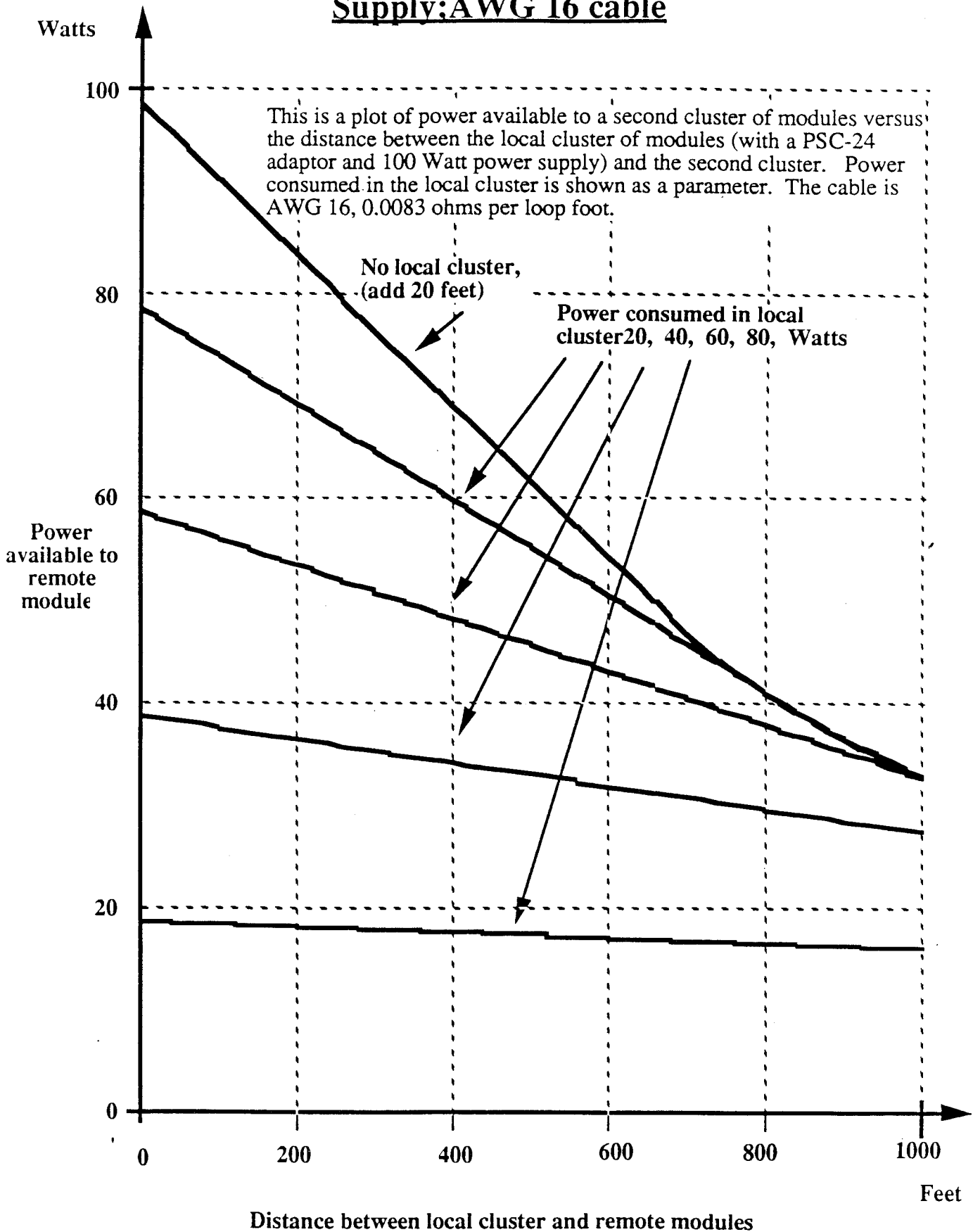
Five PS-01's, with AWG 22 cable



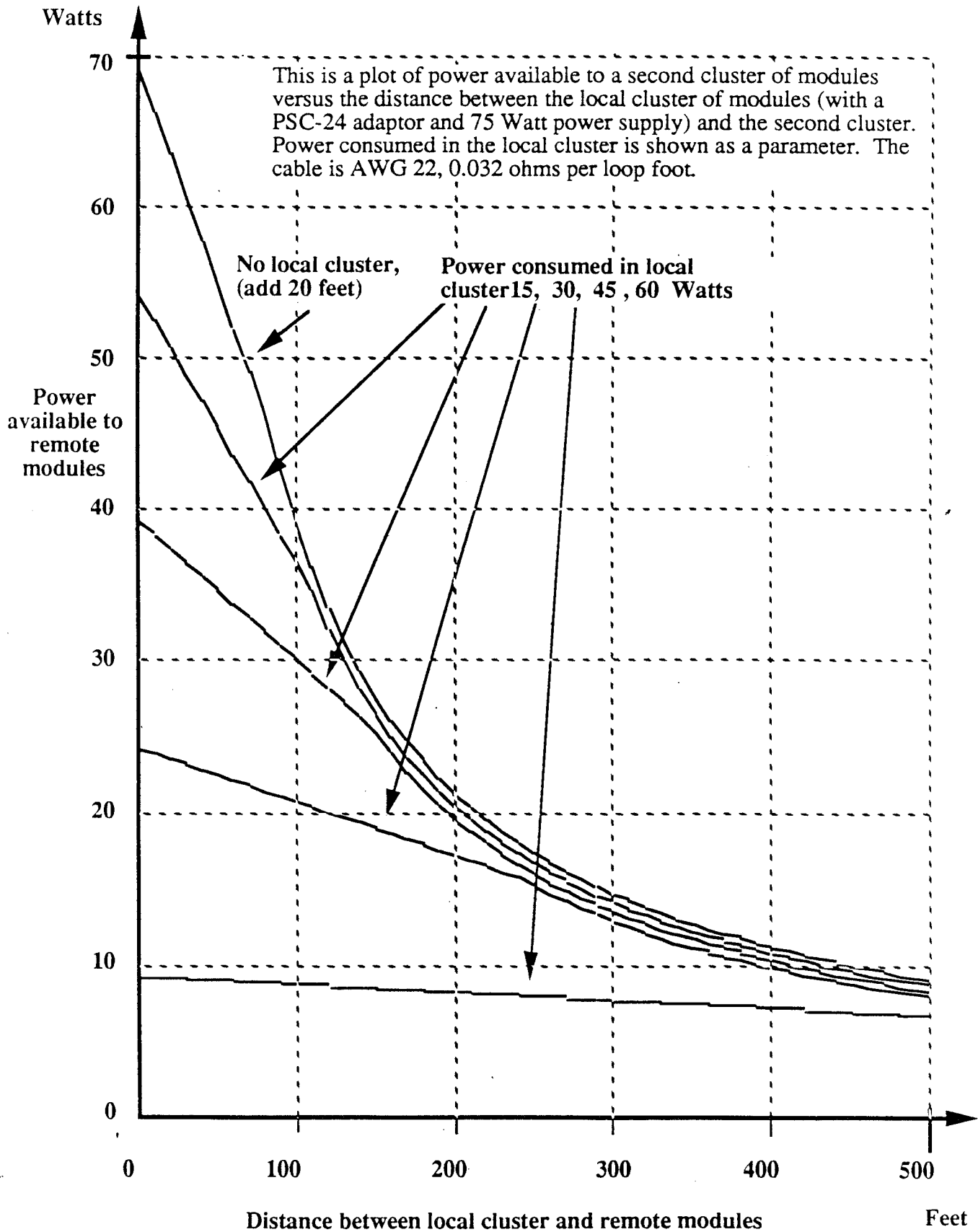
PSC-24 with 26.5 Volt, 75 Watt Power Supply; AWG 16 cable



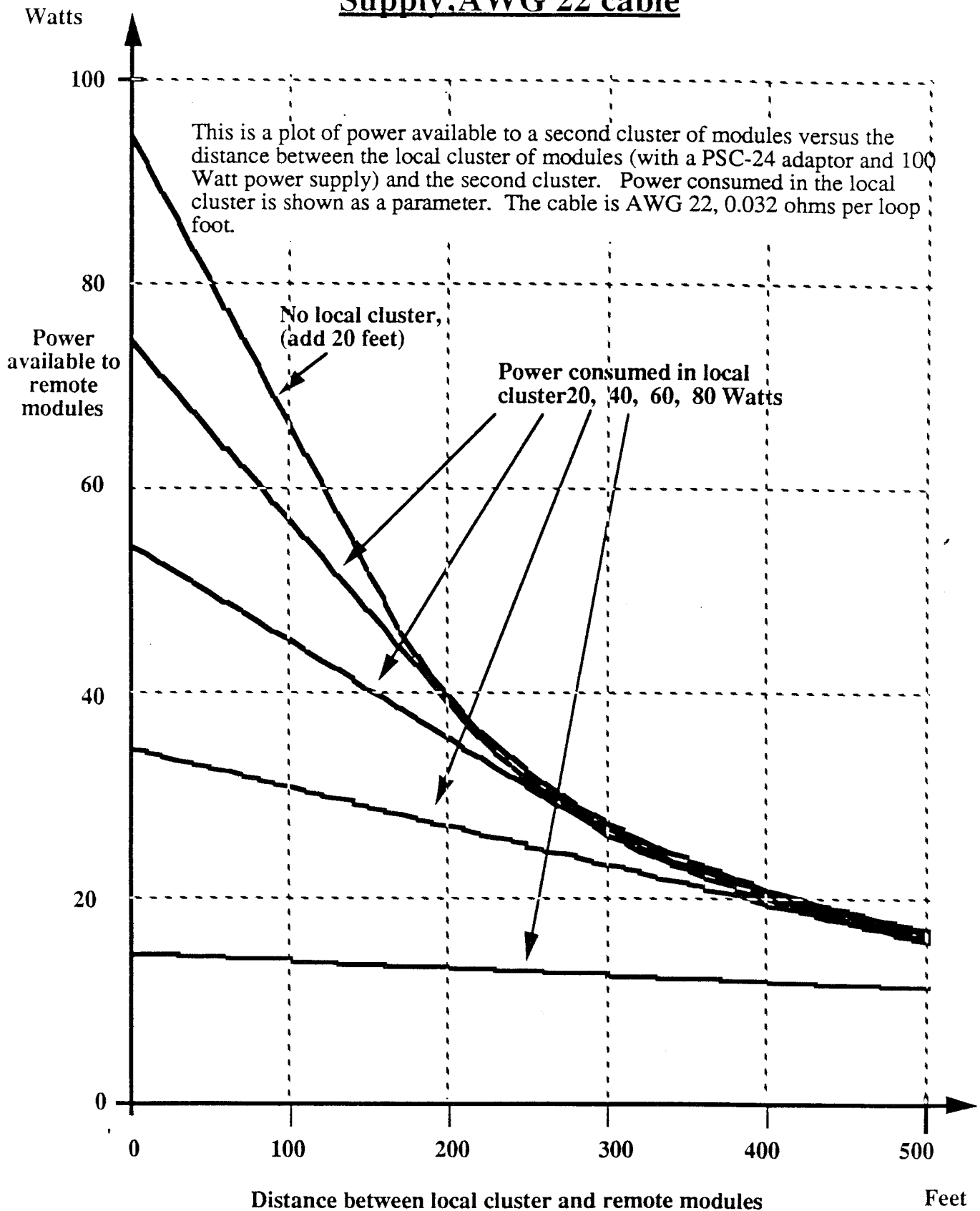
PSC-24 with 35 Volt, 100 Watt Power
Supply; AWG 16 cable



PSC-24 with 26.5 Volt, 75 Watt Power Supply; AWG 22 cable



PSC-24 with 35 Volt, 100 Watt Power Supply; AWG 22 cable



Appendix B: Input/Output Selection Guide

The TransPort System Input/Output Selection Guide

The following helps you to determine the correct type of modules you need for your system.

Discrete Input Modules

Type	# of Channels	Input Voltage	Range	Off	On	Switch Level Nominal
DI0516	16	5 Vdc	2.4-15 Vdc	0-1 Vdc	2.4-15 Vdc	2.2 Vdc
DI0532	32	5 Vdc	2.4-15 Vdc	0-1 Vdc	2.4-15 Vdc	2.2 Vdc
DI2416	16	24 Vdc	18-35 Vdc	0-5 Vdc	18-35 Vdc	11.5 Vdc
DI2432	32	24 Vdc	18-35 Vdc	0-5 Vdc	18-35 Vdc	11.5 Vdc
DI4816	16	48 Vdc	25-50 Vdc	0-10 Vdc	25-50 Vdc	18 Vdc
DI4832	32	48 Vdc	25-50 Vdc	0-10 Vdc	25-50 Vdc	18 Vdc
DI11516	16	115 Vac	90-130 Vac	0-30 Vac	90-130 Vac	65 Vac
DI11532	32	115 Vac	90-130 Vac	0-30 Vac	90-130 Vac	65 Vac
DI23016	16	230 Vac	180-260 Vac	0-60 Vac	180-260 Vac	130 Vac
DI23032	32	230 Vac	180-260 Vac	0-60 Vac	180-260 Vac	130 Vac
For Counter Modules:						
DI0516-C	Same as DI0516 with first four inputs, 0 to 65,535 count, 450 Hz count rate					
DI0532-C	Same as DI0532 with first four inputs, 0 to 65,535 count, 400 Hz count rate					
DI2416-C	Same as DI2416 with first four inputs, 0 to 65,535 count, 450 Hz count rate					
DI2432-C	Same as DI2432 with first four inputs, 0 to 65,535 count, 400 Hz count rate					

Discrete Output Modules

Type	# of Channels	Output Voltage	Range	Off ma Leakage	(vdrop) On	Output Current
DO0116	16	20 to 250VAC	20 to 250VAC	<2.5	<1.2@ 2 Amps	2 Amps
DO0116-M	16	20 to 250VAC	20 to 250VAC	<2.5	<1.2@ 2 Amps	2 Amps
DO0016	16	5 to 50VDC	5 to 50VDC	<.250	<1.0@ 2 Amps	2 Amps
DO0016-M	16	5 to 50VDC	5 to 50VDC	<.250	<1.0@ 2 Amps	2 Amps
DO0216-M*	16	5 to 50VDC	5 to 50VDC	<.250	<1.0V@ 2 Amps	2 Amps
DO0216*	16	5 to 50VDC	5 to 50VDC	<.250	<1.0V@ 2 Amps	2 Amps
Note: Maximum Module Output Current is 20 amperes						

Appendix B: Input/Output Selection Guide

Analog Input Modules

Type	# of Channels	Input Voltage	Ranges- Software selectable per channel
AI0016	16		mVdc ± 12.5m Vdc ± 25.0m Vdc ± 50.0m Vdc ± 100.0m Vdc Vdc ±5 Vdc Thermocouples J,K-1, K-2, J-DIN, K-DIN, T, E, C, S, R, B or N
AI0008	8		Same as AI0016
AI1516	16		Vdc±5 Vdc
AI0116*	16		MVdc 0 - 12.5m Vdc 0 - 25.0m Vdc 0 - 50.0m Vdc 0 - 100.0m Vdc Vdc 0 - 5 Vdc RTD's Pt(385), (392), (391) 100Ω Ni 120Ω Slide Wire's
AI0108*	8		Same as AI0116

* Note: The asterick denotes products not currently released for sale

Analog Output Modules

Type	# of Channels	Output Ranges- Software selectable per channel
AO42016	16	0 to 20 mAdc 4 to 20 mAdc
AO42008	8	0 to 20 mAdc 4 to 20 mAdc

Table of Power Requirements

<u>Module Type</u>	<u>Watts Consumed</u>
Discrete output	3.7
Discrete input	2.9
Analog out, 8	10.7
Analog out, 16	19.4
Analog input 8	7
Analog input 16	12

Appendix B: Input/Output Selection Guide

Input/Output Module Summary

Module	Number of Channels	Signal Levels	Compatible Bases	Power Requirements
Discrete Inputs				
DI23016	16	230 VAC	TE01/TE02	2.90
DI23032	32	230 VAC	TE01	2.90
DI11516	16	115 VAC	TE01/TE02	2.90
DI11532	16	115 VAC	TE01	2.90
DI2416	16	24 VDC	TE01/TE02	2.90
DI2416C	16	24 VDC	TE01/TE02	2.90 w/4 ctrs
DI2432	32	24 VDC	TE01	2.90
DI2432C	32	24 VDC	TE01	2.90 w/4 ctrs
DI4816	16	48 VDC	TE01/TE02	2.90
DI4832	32	48 VDC	TE01	2.90
DI0516	16	5 VDC	TE01/TE02	2.90
DI0516C	16	5 VDC	TE01/TE02	2.90 w/4 ctrs
DI0532	32	5 VDC	TE01	2.90
DI0532C	32	5 VDC	TE01	2.90 w/4 ctrs
Discrete Outputs				
DO0116	16	20-250 VAC	TEF09	3.70
DO0116-M	16	20-250 VAC	TEF09	3.70
DO00116	16	5-50 VDC	TEF09	3.70
DO0016-M	16	5-50 VDC	TEF09	3.70
DO02116*	16	5-50 VDC	TEF09	3.70
DO0216-M*	16	5-50 VDC	TEF09	3.70
Analog Inputs				
AI0016	16	mV/VTC	TE07	12
AI1508	8	mA/V	TE08	7
AI0116*	16	mV/VRTD	TE06	12
AI0108*	8	mV/VRTD	TE06	7
AI1516	16	mA/V	TE08	12
AI0008	8	mV/VTC	TE07	7
Analog Outputs				
AO42008	8	mA	TE03	10.70
AO42016	16	mA	TE03	19.40

* Note: The asterick denotes products not currently released for sale

Module Communications

Speed:	375 Kbits/second
Wire:	Shielded, twinaxial cable
Distance:	Up to one mile wire distance from the host computer in both directions
Error Checking:	CRC-16, Watchdog Timer
Transmitter:	Frequency Shift Keying (FSK)
Detector:	FM

Module Diagnostics

Power Up Diagnostics:

- Internal voltage within range
- All RAM memory
- CPU diagnostics
- ROM checksum
- EAROM checksum

Run Time Diagnostics:

- Watchdog Timer

Appendix B: Input/Output Selection Guide

Physical Specifications

Module:

Height	9.5 inches (24.1 cm)
Width	3.9 inches (7.37 cm) Input
	4.1 inches (10.4 cm) Output
Depth	4.1 inches (10.4 cm)

Termination Base:

Height	8.6 inches (21.8 cm)
Width	5.1 inches (12.9 cm)
Depth	1.6 inches (4.1 cm)

Assembled:

Height	9.5 inches (24.1 cm)
Width	5.1 inches (12.95 cm)
Depth	4.25 inches (10.8 cm)

Weight:

2.0 lb. (0.90 Kgr) Input*
2.25 lb. (1.02 Kgr) Input with base*
2.87 lb. (1.30 Kgr) Output*
3.12 lb. (1.42 Kgr) Output with base*
*with shipping container

Shipping Container Dimensions:

Base:	10.5 x 8.25 x 3 inches (26.67 x 20.95 x 7.62 cm)
Module:	14 x 7 x 6 inches (35.56 x 17.78 x 15.24 cm)

Standards

Designed to meet UL (Underwriters Laboratory) and CSA (Canadian Standards Association) specifications.
NOTE: Specifications and designs are subject to change without notice.



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