"PC" Central Access Control System

Hardware Guide

CORPORATION
TOYE
Access Control Systems

FIELD LAYOUT OPTIONS

The system may be fully controlled by either a personal computer or a "PC" Smart Cartridge.

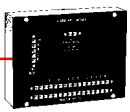
RS-232 CONVERTER

SYSTEM BUS
2 Twisted Pair
(#22 with overall shield)
4,000' max length
Use In-line booster to extend

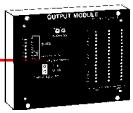
SELF-CONTAINED
Reader, Command Module, and Keypad all together in the same All-Weather Housing.

COMMAND MODULE REMOTE FROM READERS
Single or Dual Reader Command Modules are available to support any card technology. Reader to Module distances vary from 20' to 200', see appropriate reader specification sheet.

16 INPUT MODULE
Provides inputs for up to 16 zones with programmable shunt and enable periods. System will support up to 100 modules.



16 RELAY OUTPUT MODULE
Each of 16 relays may be programmed independently for pulsed or continuous operation, and may also be programmed to activate from card or alarm transactions. For elevator applications, timed and transaction activated programming may be combined for public and secure floors. Standard mode is Fail-Secure. Fail-Safe Mode is available as an option.



DUAL I/O MODULE
Provides 2 inputs for alarm monitoring or space counting, and 2 individually programmable relays for alarm shunting, door unlock, or lot full sign control. Available as a Transaction Activated Module.

TO INSURE A TROUBLE FREE INSTALLATION PLEASE READ THE FOLLOWING:

Considerable effort has been taken to produce a computer-based Access Control System that is reliable and easy to use.

Trouble free performance depends entirely on the observance of a few basic installation requirements.

Please take a minute to read this booklet, and then before getting started, read, and re-read the following special precautions, and be sure to check off each item prior to beginning, and especially before applying power to any system component.

INSTALLATION CHECK LIST

- ❑ **Handling Power**
  Do not plug, or unplug components without first turning off power.

- ❑ **RS-232 CONVERTER**
  MUST be connected to ground before its power supply is plugged in. The master ground for the system and the converter is normally obtained when connected to the computer. Be sure the computer has a three pronged plug and that it is plugged in.

- ❑ **GROUND ISOLATION**
  INPUT POWER TO EACH COMPONENT MUST BE ISOLATED FROM EARTH GROUND. Before connecting power to any module, verify that the DC power input to be connected to the Module is isolated from earth ground. If this same power source is being used to power other devices in addition to the module, make sure that no short to ground can occur through the wiring or by those devices.

- ❑ **INPUT POWER REQUIREMENTS FOR ALL SYSTEM COMPONENTS**
  Model 4120 series Command Modules require **12-24 volts DC**. Model 4110 Command Modules, Alarm Input Modules, and Relay Output Modules require either of the following input voltages: **20-30 VAC 10 VA, or 22-40 Volts DC 10 watts.**

- ❑ **WIRING & POWER SUPPLIES**
  Make sure that all the wire lengths and conductor sizes are calcu-

lated to provide the required power to each component. **Separate power supplies are recommended for each reader or module location. Use a separate power source when using fail safe type electromagnetic locks.**

- **GROUNDING**
  Ground each housing and each module to the nearest good earth ground.

- **SYSTEM BUS**
  The BUS cable must be 2 twisted pair # 22 or larger with an overall shield. Each conductor must be a unique color.

  The shield must be connected to each module AND THE SHIELD MUST BE ISOLATED FROM EARTH GROUND UNTIL CONNECTED TO THE RS-232 CONVERTER.

- **HIGH LIGHTNING AREAS**
  If the system is to be installed in an area with frequent lightning storms or known transient power problems, the optional high lightning area RS-232 converter is recommended.

- **EXIT BUTTONS**
  Make sure that the exit button wires are twisted pair, and the exit button is a momentary dry contact N.O. type.

- **SHIELD CONTINUITY**
  Make sure that each Command Module is connected to the bus shield and that shield continuity is preserved throughout the entire system up to the Converter.

- **POINT TO POINT WIRING**
  Make sure that point to point twisted pairings are preserved and are consistently terminated at the same screw terminal points throughout the system.

- **END OF LINE RESISTOR**
  At the last Module on each bus (not each stub), install a 220 OHM resistor between terminals C and D.

- **CALCULATE POWER NEEDS**
  Be sure that input voltage and power to each component are

according to specifications, and be particularly careful with common power sources which are supplying power to more than one system component. Excessive voltage could create extensive damage. Insufficient voltage will cause intermittent or total component malfunction. The minimum power rating for common power supplies should be the sum of the individual component minimum power requirements. To calculate the minimum transformer rating needed for a given load, multiply the volts times the load in amperes. IE: A two ampere 24 volt door strike requires a 48 VA (volt amp) transformer (2 x 24 = 48).

❑ **OBSERVE RELAY RATINGS**

Be sure that the Module output relay rating is observed. Each contact can handle 1 ampere. A maximum of 2 amperes may be switched with the output relay using both poles wired in parallel. For loads exceeding 2 amperes, use a second relay to switch the load.

❑ **RELAYS CONTACT PROTECTION**

Always use a varistor across the switched load to protect the relay contacts from premature failure. Forty volt varistors are normally supplied for use with 24 volt circuits. When switching higher voltages, higher rated varistors must be used.

❑ **SPECIAL HANDLING CARE**

Be very careful handling readers with power applied. Do not disconnect cable connectors or allow reader boards to come in contact with metal objects.

❑ **KEYPADS & STATIC**

Metal keypads are sensitive to static electricity, so they must be grounded whether power is applied or not. Be sure there is a good earth ground path to the keypad.

❑ **MODULE CODES**

Be sure to select a unique code for each reader module and keep track of its exact location for later programming.

To test a reader, set Command Module switch # 9 to "ON". With the computer off-line, the reader response time will be about one second. If the computer is on-line, and the test card is valid in a defined level, reader response time should be instantaneous. If the

card is not valid in a defined level, no relay activation should occur. Late model readers flash three times when a card is valid when on-line, twice off-line, and once when invalid on-line.

❑ **WHAT IF IT DOES NOT WORK**

If any unusual symptoms occur after power is applied, remove power, check all wiring, and call for assistance immediately. NEVER assume that a component that fails to work is faulty. Trying a second unit invariably results in two damaged units if the problem is not isolated as to its cause. All components are 'burned-in' at the factory and fully tested.

❑ **ONE SUGGESTION BEFORE BEGINNING**

Set up a one reader system on your work bench. It will only take a short time, but you'll learn much about the actual operating characteristics of the system before you install it.

When you are ready to begin installation, connect only the first (nearest) reader on the BUS first. Make sure it works before you add a second. By adding them one at a time you will save many hours of troubleshooting if there is a basic problem with the BUS wiring.

ONE FINAL NOTE

THE INFORMATION JUST PRESENTED IS VITAL TO A SUCCESSFUL INSTALLATION, PLEASE MAKE SURE YOU UNDERSTAND EACH ITEM, IF NOT, PLEASE ASK.

INSTALLATION OF SYSTEM COMPONENTS

THE COMPUTER

Any IBM PC or Compatible set up to run Windows 95 will provide the minimum resources needed to run Access Central.

Unless specifically specified otherwise when ordering, PC Central will use Serial COM port 1. This setting cannot be changed in the field.

Be sure to read the documentation supplied with your computer for proper installation. Serial ports are normally not labeled, so be sure to ascertain their location. Note: Serial ports normally have a male socket, and printer ports a female socket.

THE REMOTE COMMAND MODULE

The "heart" of the PC system is its Remote Command Module. Three models are available, the older style 4110 series, and the newer style 4120 single reader module, and 4122 dual reader module. Command Modules are designed to provide the interface between field inputs, and a host processor such as a "PC" or Smart Cartridge. When not communicating with a host processor, it can make independent off-line access decisions if desired.

Command Modules use a two digit hexadecimal identification code which is set using the two rotary switches at the bottom of the module. There are 127 available module codes between 01-7F.

Each Module may be programmed separately depending upon the security requirements at each entry point. Each Module can support the following device connections:

1. One card reader (4110 & 4120) or two readers (4122).
2. One keypad with PIN decoder (16 pin DIP socket) or one or two P.I.N. prox readers.
3. One or two exit button or request to exit inputs.
4. One or two inputs for monitoring a normally closed door contact or space counter input.
5. One or two auxiliary inputs for monitoring normally open or normally closed alarm contacts, or space counter inputs.
6. Two double pole Form C output relays.

Remote Command Modules can also be used without readers for alarm monitoring and programmable remote relay activation. (See Dual Input/ Output Module)

When a transaction (access or alarm) occurs, the Module will transmit the information to the host, and the host will acknowledge the transaction in less then 1/10 of a second. If the computer is Off-line, or not connected, the Module will grant access if programmed to do so, and will store any alarms until the computer comes back On-line. If a keypad is connected, the module will automatically require the use of the PIN number and card for access when off-line.

MOUNTING THE REMOTE COMMAND MODULE

The Remote Command Module is contained in an aluminum enclosure, or may be mounted against the back of the optional self-contained reader housing. Threaded "standoffs" are used to permit easy installation and

removal of the Module. The housing has a feed through hole for field wiring. When the Reader and Module are contained in the same housing, a ribbon cable is used to connect the two together. When the Module is remoted from the reader, an extension cable must be field fabricated.

OUTPUT RELAYS

The 4120 Command Module has two output relays. Relay 1 (the main output relay) is used for unlocking the entry point, and is the relay that responds to Unlock Time Programming and Instant Unlocks. D.I.P. switch #10 determines whether or not Relay 2 pulls in concurrently with relay 1, or does nothing unless programmed independently to do so. Relay 2 is considered the Shunt Relay for programming purposes. You may use Relay 2 as a shunt relay by jumpering the door contacts through its common and normally open contacts. This would allow a "pot adjustable" shunt period. With the 4120 Command Module, there is an automatic 25 second software shunt period built-in, so it is not necessary to use Relay 2 for shunting inputs.

The 4122 Command Module has two output relays. Relay 1 is the Unlock relay for reader 1. Relay 2 is the Unlock relay for reader 2. Door alarm contacts from readers 1 and 2 must be shunted if desired using the standard 25 second shunt period option. The shunt period automatically expires in 25 seconds or when the door is closed, whichever comes first.

The output relays provides two Form C contacts rated at 1 AMP @ 24V per pole non inductive. For switching loads greater than 1 AMP, use both contacts for a total capacity of 2 AMPS. Always protect the contacts with varistors for door strike switching. A timer adjustment "pot" is located at the lower left of the Module. The output relays may be adjusted to remain energized for up to 15 seconds.

EXIT BUTTON (REMOTE OVERRIDE)

A "dry" contact switch, motion detector, or button isolated from earth ground may be used to activate the main output relay just as if a valid card had been inserted. Activation of this circuit will unlock the door and shunt the alarm for the time set on the adjustment "pots". Use a shielded twisted pair from the exit button. The distance between the Command Module and the exit button should not exceed 20 feet. Use a pilot relay located near the Module to trigger the circuit for distances greater than 20 feet. ***DO NOT UNDER ANY CIRCUMSTANCES INTRODUCE A VOLTAGE TO THIS CIRCUIT.***

DOOR ALARM CONTACT MONITORING

Two monitor inputs are provided on the 4120/4122 Command Module. These inputs can be used to monitor alarms, or space counts, or both together. You may monitor normally open, or normally closed contacts by selecting the appropriate D.I.P. switch setting. See D.I.P Switch settings for complete details.

DO NOT UNDER ANY CIRCUMSTANCES INTRODUCE A VOLTAGE TO AN INPUT CIRCUIT.

READER INHIBIT

For some parking applications, it may be desirable to inhibit the operation of a reader unless a vehicle is present. A dry contact closure will disable the reader. See D.I.P. switch settings for input points.

CARD READERS

The Remote Command Module supports readers of most popular technologies. When ordered with a self-contained housing, each reader is supplied with a short cable and connector. When the Command Module is to be mounted elsewhere, an aluminum box for the Command Module is supplied, and the installer must fabricate an extension cable in the field. Specifications and installation instructions for specific readers are attached separately.

METAL KEYPADS

Metal Keypads may be added to any Command Module for extra protection against the use of unreported lost or stolen cards. The standard keypad which includes a PIN decoder board connects to the Remote Command Module with a 16 conductor ribbon cable. The ribbon cable connection is pin for pin. Although no damage can occur if the cable is plugged in backward, care should be taken that the cable connector and socket orientation notches are aligned. If the connector is accidentally inserted with the pins offset, damage will occur.

If the Keypad is to be installed more than 12" from the Command Module, the decoder board should be removed from the keypad, and placed next to the Command Module, and a new cable should be fabricated between the keypad and decoder board.

Be sure there is physical continuity between the keypad and earth ground to prevent static discharge from reaching the electronics.

Keypads may be connected to Remote Command Modules without card

readers for keypad only entry points.

Keypads are normally mounted in the optional large self-contained housing, however they may be flush mounted over a standard 4" x 4" electrical box, and plastic finisher bezels are available at no charge.

The keypad option may be ordered in different configurations.

Card *plus* Keypad means that when a Keypad level is defined, cardholders must first key in their unique P.I.N number, and then insert their card. If the CPU is off-line, the use of the keypad will always be automatically required.

Card *or* Keypad means that when a Keypad level is active, entry will be granted if either a correct and valid P.I.N. number or valid card is used. If the CPU is off-line, keypad entry will be denied.

Each card is assigned its own unique PIN number. This PIN number can be a scrambled version of the code, or the actual code contained in the card. When scrambled, the PIN number for each card may be obtained by running the PIN program supplied on the system program disk. Simply enter the card memory code, and the unique P.I.N. code for that card will be displayed.

Keypad Levels may be defined in software (Function 5.2K) to enable and disable the keypad function. When enabled, the cardholder must use the following sequence to gain entry:

1. Press the star button (*)
2. Key in the unique number assigned to that card
3. Press the pound key (#)
4. Insert the card

When the reader is not in an active keypad level, it will operate with card only if the computer is on-line. The red L.E.D. on the reader is used to indicate that the reader is currently in an active keypad level, and that the cardholder must use the card and unique PIN number to gain access.

If the computer is off-line, access will be granted only if the PIN sequence is used, AND Remote Command Module DIP switch 9 is "ON".

For Keypad only applications, DIP switch #9 should be off to prevent the

use of invalid numbers in case the computer is off-line.

ALARM INPUT MODULE 16 Zone)
For applications requiring additional inputs for either space counting or alarm monitoring purposes, the Alarm Input Module will accept 16 individually addressable zones each. These Modules may be placed anywhere on any BUS.

Programmable shunting of the inputs is possible using Function 5.5.

IMPORTANT: If the software shunting feature is used, module location codes must fall within 00-3F except 20. If 16 Relay Output Modules are used on the system at the same time, do not duplicate module address codes between both type modules.

Each input can be defined as an alarm, as an input to a space counter, or it can be programmed to pulse a relay on the 16 relay module. When using the Alarm Input Module for space counting, optional firmware for the module is available for high speed input capture to insure that short pulsed count inputs are not lost.

The Alarm Input Module incorporates the necessary circuitry to interface closed circuit line supervision to the computer.

Each Module constantly monitors up to 16 input lines. Any change in any line status will be reported to the computer. If the computer is Off-line, the Module will store the change(s) of state until the computer acknowledges the status change. The Module can store up to 32 unacknowledged events.

An input line is considered secure if the total loop resistance is less than 2000 ohms. A line is considered open if the total loop resistance is greater than 5000 ohms. Resistances between these thresholds are unpredictable as to status.

The Alarm Input Module may be placed anywhere on the BUS, and the respective BUS connections (A, B, C, D, & Ground) are clearly marked on the Module face plate.

Power to the Module is 24 volts AC or DC at 10 volt amps AC, and 10 Watts DC without respect to polarity.

Each module may be individually coded for address recognition by the

computer. To select a code, remove the 4 face plate mounting screws, and use a tiny screwdriver to select the two digit Module code. The red rotary switch selects the first digit, and the yellow rotary switch selects the second.

At the computer, the actual alarm code will then be the two digit module code, plus the two digit monitor code, a total of four digits. For example: A module coded 9E with a closed circuit attached to the #1 screw terminals would print out as alarm code 9E01 if opened. A Module coded 03 with a closed circuit attached to the #16 screw terminals would produce a printout of 0316 if opened.

The Alarm Input Module will accept commands from the computer to disregard specified inputs during defined times. Alarm Module Levels (Function 5-5) are used to define shunt periods. When used in this manner, module codes from 00-3F except 20 must be used. Address codes used for Alarm Modules may not be used as Relay Output Module address codes.

DO NOT UNDER ANY CIRCUMSTANCE INTRODUCE A VOLTAGE TO ANY MONITOR INPUT. The Alarm Module monitors dry circuits only.

DUAL INPUT /OUTPUT MODULE

This module may be used for both monitoring and relay shunting of two alarm zones. Two independent alarms, and two independently programmable output relays are included.

In the normal configuration, an Unlock Command (Function 5-2U) is used to program Main Output Relay activation. An Alarm Shunt Command (Function 5.2A) will activate the Shunt Relay.

Each input can either be defined as an input for space counting or an alarm.

This module may be placed anywhere on the BUS and is basically a Remote Command Module without reader support circuitry. With Management Software, each alarm point can be shunted independently, or the module could be used for two programmable outputs.

Alarms originating from these modules will be identified by a four digit code beginning with the two digit module code followed by either 71 or 72, depending on which module input is used.

Two relays are provided for shunting or other remote command purposes. When defining Remote Commands (Function 5-2), the Main output relay is identified as "U", and the Alarm Shunt relay is identified as "A". If both relays are to be programmed, separate command levels must be used. Power to the Module is 24 volts AC or DC at 10 volt amps AC, and 10 Watts DC without respect to polarity.

OUTPUT MODULE (16 relay)

Three versions of firmware are available:

1. The default firmware is Fail Secure with manually adjustable timers. With the Fail Secure version, the relays remain relaxed when power is applied to the module. A relay activation command from the computer activates the coil of the relay. When power fails, any active relay will drop out. A timer 'pot' is provided for each of two banks of 8 relays adjustable from 1-15 seconds. This firmware is not designed to accommodate both Time Activated, and Transaction Activated events at the same time.

2. Fail Secure with firmware timers, and automatic matrix restoration. This firmware is designed to accommodate both Time Activated and Transaction activated concurrently. If a Time Activated matrix is active, a Transaction activated event can occur, and the Time Activated matrix will be restored immediately after according to the parameters set by the installer. (See table).

3. Fail Safe with firmware timers, and automatic matrix restoration. This firmware is designed to accommodate both Time Activated and Transaction activated concurrently. If a Time Activated matrix is active, a Transaction activated event can occur, and the Time Activated matrix will be restored immediately after according to the parameters set by the installer. (See table). With the Fail Safe version, all relays activate when power is applied to the module. A relay activation command deactivates the relay by removing power from its coil. When power fails, all relays drop out.

The Output Module provides 16 Form C relay contacts which are usable for transaction activated events (Function 5.3) such as Elevator Control. In addition, it can be programmed for pulsed or continuous activation (Function 5.4) according to defined schedules (Function 5.4) for lighting, environmental controls, and locking schedules. Further, each relay may be programmed to respond to space and area counter zero count outputs. When a relay is defined to activate in response to a zero count, it will remain activated until the count increments from zero.

Although the 16 Relay Output Module can respond to both time programmed relay schedules and transaction activated levels, the latter takes precedent. If one or more relays are activated by a time program, and a transaction activated event is generated, the module will assume the matrix of the transaction activated level.

Relay Activation is possible as follows:
1. Momentary activation of relays in response to authorized cards (Elevator levels FUNCTION 5.3).

2. Continuous activation of relays in response to time programmed parameters (Output levels).

3. Momentary activation of relays in response to a programmed time (Output levels). This feature is automatically activated if the programmed Start Time is the same as the Stop Time.

4 Continuous activation in response to the zero count space counter output. (Function 4.2)

The relays are rated at 1 AMP (110V) or 2 AMP (28V) noninductive.

Power for the Output Module is provided by a regulated supply mounted on the Module. Input power is 20-30 VAC 10 VA, or 22-40 Volts DC 10 watts. The input power supply must be isolated from earth ground. There is no polarity at the screw terminals.

There are 63 available address codes 00-3F (except 20), and each module must be set to a unique address using the two yellow rotary switches on top of the module. Do not duplicate codes used for 16 Zone Alarm Input Modules which are used for programmable shunting.

For the normal Fail Secure firmware, there is a separate time delay adjustment for each bank of 8 relays. For momentary activation, the relays may be adjusted to hold in for up to 15 seconds (clockwise) after the command is issued by the computer.

The following table shows module code settings that will produce various combinations of relay time delays for the two firmware versions designed for concurrent Time and Transaction Activated modes:

FAIL SECURE WITH AUTOMATIC MATRIX RESTORE FIRMWARE

This module firmware allows "mixing" Time-Scheduled Relay Activation with Elevator Control.

The Module ID Code is restricted to 00-3F (excluding 20).

If the module is going to be used for both Scheduled & Elevator modes, using the most significant digit (SWITCH #1), the maximum delay time before the module resumes its time-scheduled matrix may be set as follows:

Actual Module Code	2 DELAY	3 DELAYS	4 DELAYS
0x	4x	8x	Cx
1x	5x	9x	Dx
2x	6x	Ax	Ex
3x	7x	Bx	Fx

where the DELAY increment is factory set, according to the customer's specifications (in one-second increments). It is usually advisable to set the Relay Bank Timer Pots to maximum, for this kind of an application.

FAIL SAFE FIRMWARE WITH AUTOMATIC MATRIX RESTORE FIRMWARE

This mode precludes the use of the Timer Pots.

1 DELAY	2 DELAYS	3 DELAYS	4 DELAYS
0x	4x	8x	Cx
1x	5x	9x	Dx
2x	6x	Ax	Ex
3x	7x	Bx	Fx

Where the DELAY increment is factory set, according to the customer's specifications (in one-second increments).

TRANSACTION ACTIVATED DUAL I/O MODULE

This module emulates the functionality of a 16 Output Module and a 16 Input Module, but with two inputs and two outputs.

The Module's Address is restricted to 00 through 1F, and 21 through 3F. These addresses correspond to those used by 16-Input Alarm Modules and 16-Output Relay Modules.

The xx71 Alarm Input will be translated to xx01, and xx72 to xx02 (where "xx" is the Module Address, as set by the DIPSWITCH assembly). NOTE: The Alarm Inputs cannot be shunted through software

See 4210**layout**.**Pd**f for pg. 16 & 17

Function 5.5

The Main Relay will be translated to xx03, and the Shunt Relay to xx04. These Outputs are normally defined using Functions 5.3 & 5.4, but are also usable as Space-Counter "Lot-Full" outputs.

ALARM ANNUNCIATOR MODULE

This Module contains two relays which pulse in response to alarms generated anywhere in the system. It may be placed in any location and attached to the system BUS network.

One relay will activate in response to all alarms, the other relay will activate in response to any specific alarm location.

When an alarm is transmitted from any command module, or any alarm module, the Annunciator Module's main output relay pulls in for the time period set on the Main timer adjustment pot. For this mode of operation, the Annunciator Module DIP switches should all be off.

When the address DIP switch settings on the Annunciator Module match the settings on any specific Alarm module, or Command Module, then only the shunt relay will be activated for the period set on the shunt timer adjustment pot when an alarm is transmitted from one of those modules. The main output relay will then only pull in when there is an alarm from a location code that differs from the code set on the Annunciator Module.

Installation procedures are the same as for the Command Module except that only one twisted pair of the BUS need be connected to terminals 26 and 27 plus the BUS shield which should be connected to terminal 23. Be sure that the C and D conductors are connected exactly the same as they are on other modules, and not crossed.

RS-422 TO RS-232 CONVERTER

This device converts the field RS-422 wiring signals to computer compatible RS-232 signals.

Each BUS requires a converter which is powered by a (provided) plug-in transformer. The converter includes a Pigtail connector for easy connection to the BUS. It may be plugged directly into the computer's RS-232 port COM 1, or connected with a standard RS-232 cable.

RS-232 DATA SPLITTER

Data Splitters are used to combine multiple BUS inputs to create a single RS-232 serial input to the computer. A system with a remote site tied in via modems would require a Data Splitter to combine the local and remote site.

To install a splitter, simply plug the end with the female receptacle into the computer's serial port, and the bus inputs into the male plugs. Multiple splitters may be connected together in a like manner.

Each input to a splitter is considered a separate bus and thus requires an RS-232-RS422 Converter and an end of line 220 OHM resistor.

RS-422 BOOSTER

The RS-422 In-Line Booster can be used when bus lengths exceed the maximum specifications, or when more than 32 devices need to be attached to the same common bus.

The booster's female receptacle must point toward the computer. On the computer side of the booster, place a 220 OHM resistor on the module closest to the booster (across C & D terminals).

On the male side of the booster, place 10,000 OHM resistors at the closest module to the booster. One between terminals +5VDC & B, the other between GND & A.

The booster's pin out for both sides is:
A= 2
B= 14
C= 16
D= 3
SHIELD= 7

NETWORK TRANSFER MODULE

This module is designed to permit the connection of second computer or Smart Cartridge to a system BUS in order to provide a fully redundant back up should the main computer fail. The module constantly monitors the communication BUS and immediately detects a main computer failure. If this should occur, the module transfers the BUS to the back up computer, and will automatically switch back once the host is back on line.

Both computers (or computer and Smart Cartridge), and the system BUS are connected to the module with the following terminal connections:

System BUS
- A TO 24
- B TO 25
- C TO 8
- D TO 5
- SHIELD TO 18

MAIN COMPUTER
- A TO 24
- B TO 25
- C TO 26
- D TO 27
- SHIELD TO 23

BACK UP COMPUTER
- A TO 24
- B TO 25
- C TO 6
- D TO 3
- SHIELD TO 10

POWER TO 1 AND 2 (24V ISOLATED)

WIRING THE MAIN BUS

The Reader/Command module network uses a BUS of two twisted pair AWG #22 with an over-all shield. A BUS is defined as the two twisted pair wiring network that terminates into the RS-232 converter. The BUS transmits and receives RS-422 data signals. These signals are converted to RS-232 by the converter for compatibility with the computer's serial port. A single BUS may be up to 4,000 feet in length including stubs, and may accommodate up to 32 devices each. While daisy chaining the BUS from one reader to the next is preferred, short stubs not exceeding 10% of the total BUS length are permissible.

In place phone cable may be used for the access control bus provided it is twisted pair. Since phone cable is typically not shielded, a 5th conductor is required for the master system ground.

For bus runs exceeding the maximum distance limitations, or when more than 32 devices are connected, in-line boosters may be used.

Pair A & B transmit data from the Command Module to the Computer. Pair C & D transmit data from the computer to the Modules.

Systems may be configured with more than one BUS. Each BUS must

terminate into a converter at the computer, and plugged into data splitters to create a single computer input. A combination of 32 devices may be placed on each BUS. These devices include Readers, Alarm Modules, and Output Modules.

Terminate each BUS (Conductors C & D only) with a 220 OHM resistor at its farthest point.

The cable shield must be attached to terminal H2-5 of each Module on the BUS. Make sure continuity of the shield is preserved at all points, and is attached to pin 7 of the pigtail connector entering converter. If the computer is properly grounded through its three pronged plug, no other grounding is necessary nor desirable. If not, tie the shield to earth ground.

If a shielded cable is not used, terminal H2-5 of each Module must be attached to earth ground, and the ground input to converter left disconnected. Each pair of the wire BUS must be independently twisted, and the twisting should be preserved as close to the terminal screws as possible. Always use color coded wires, and be sure not to make splices of differing colors.

IMPORTANT: It is imperative that each of four conductors always terminate at the same respective terminal at each Module. For example; if one conductor (red) is tied to terminal 1 (A), than the red conductor MUST terminate at the same terminal at every other Module. The other conductor which is twisted with red MUST terminate at terminal 2 (B) at all Modules. The same is required of the other twisted pair which terminate at terminals 3 (C) and 4 (D).

MODEMS

On-line system operation from remote sites is possible using modems at both ends. The most common modem used for phone line connections is a 202T type leased line modem. It requires 4 point to point conductors.

The output of the head-end modem connects directly to the computer's COM 1 port with a standard RS-232 cable. When two or more BUS' terminate at the head end, RS-232 Data Splitters must be used.

At the remote end, the BUS is connected to the RS-422 to RS-232 converter. This converter must be connected to the modem using a "null modem cable" with pins 2 and 3 reversed. A standard pin to pin RS-232 cable will not work. The BUS shield should be connected to the nearest

earth ground.

SMART CARTRIDGE INSTALLATION

The PC Smart Cartridge is a PC controller intended as substitute for an actual IBM PC or compatible computer. Therefore all the Hardware Installation instructions for the PC system contained in this guide are applicable and are not repeated.

CARTRIDGE PLACEMENT

The Smart Cartridge should be placed in a location protected from the elements or excessive heat. It is also wise to avoid placing it next to devices capable of generating high voltage transients.

BUSS AND POWER WIRING

The Smart Cartridge connects to the reader bus differently than does a PC, so check the illustration before making connections. Basically the bus is terminated directly onto the Smart Cartridge's terminal strip, and not through an RS-422 to RS-232 converter.

The Smart Cartridge may be powered by the 5 Volts DC available at the Command Module. If the Smart Cartridge is to be located any great distance from a Command Module, a separate regulated 5 volt DC supply must be provided to power the Smart Cartridge. The Smart Cartridge Programming Interface includes a regulated 5VDC supply suitable for this purpose.

The Smart Cartridge may be located anywhere on a bus of up to 4,000 feet in length. There may be up to 127 readers on the bus all controlled by one Smart Cartridge.

HANDLING THE SMART CARTRIDGE

The Smart Cartridge contains sensitive electronic components that can be damaged by static electricity. Always make it a practice to touch a piece of grounded metal prior to handling the unit.

BATTERY LIFE

The Smart Cartridge is equipped with a battery capable of protecting its volatile program and transaction memory. While the battery has a shelf life of 10 years, it will have a shorter life when under a constant drain. Therefore it is advisable to place a thin piece of cardboard or plastic between the battery and its hold down clip when the Smart Cartridge is not in service. The battery is not in the circuit, and will not discharge when 5

volts is applied to the Cartridge.

ANTI-PASS-BACK

Power reset

When power to the Smart Cartridge is removed, and than reapplied, the system program will immediately begin running, and if the parameters of the system include Anti-Pass-Back, then the Anti-Pass-Back in-exit buffer will reset automatically so that all cards are re-synchronized for immediate use in the next reader location whether "in" or "out".

If for any reason (gate malfunction) Anti-Pass-Back requires manual re-synchronization, power can be cycled by momentarily removing the Smart Cartridge Main Terminal Connector, or ideally a manual reset button can be installed to interrupt the 5 volt input to the cartridge.

Field APB Override

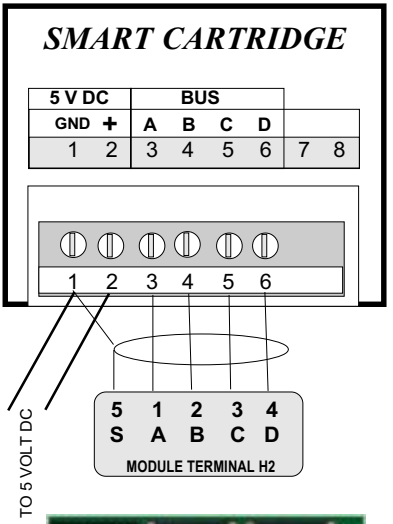
Anti-Pass-Back is normally enabled at the time the Smart Cartridge is programmed by the PC. It is possible to instantly override APB in the field by simply flipping one of the Command Module's D.I.P. Switches.

To utilize this feature, simply include one extra "dummy" reader location in your Security Level, but do not include this extra location code in your Anti-Pass-Back definitions.

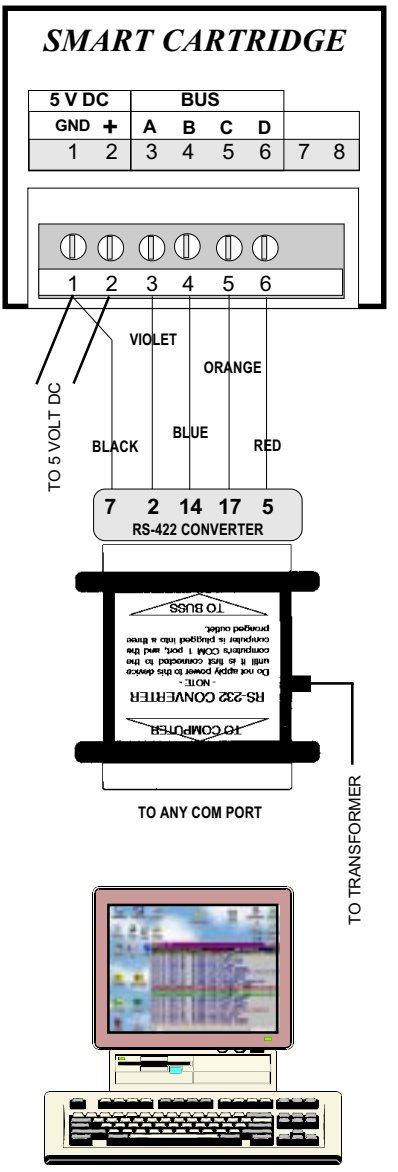
Whenever the primary location code is set in the module, Anti-Pass-Back will function as programmed by the PC. To override APB, simply change the D.I.P. setting to the "dummy" non APB module code.

Smart Cartridge Wiring

READER/BUS CONNECTION



DIRECT TO "PC" PROGRAMMING



Wiring Notes

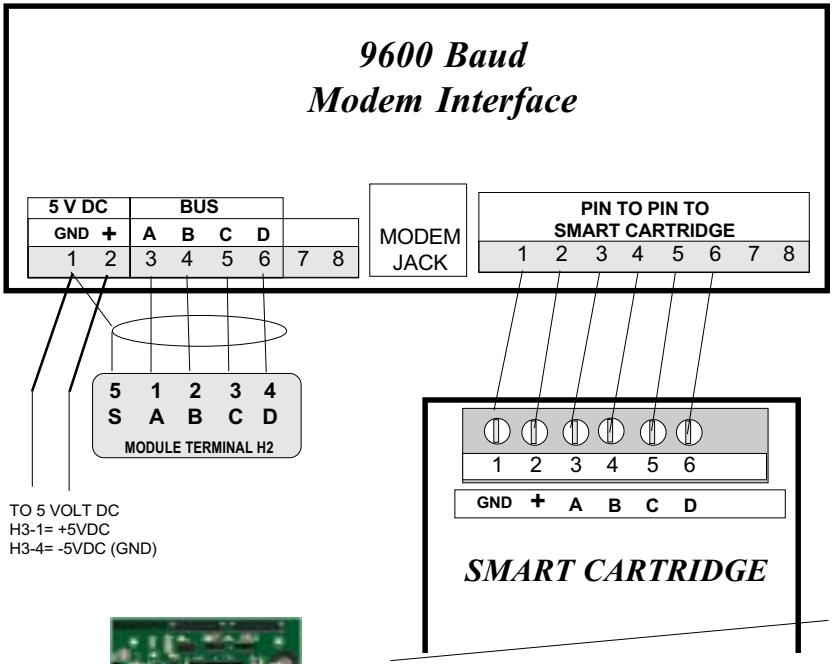
Power

The Smart Cartridge requires a source of regulated 5 volts DC. This may be obtained from the nearest Command Module, or a separate supply.

Bus Shield

Shield continuity should be maintained from Module to Module. The shield must be connected to earth ground in only one location. At a Module, or at the Smart Cartridge.

Smart Cartridge Telephone Programming Connections



Notes

The Modem Interface permits telephone programming using an external 9600 baud modem. Connect the modem's cable to the jack on the interface, and connect a CO phone line to the modem. The system reader bus connects to the Modem Interface as shown.

Power

The Smart Cartridge requires a source of regulated 5 volts DC. This may be obtained from the nearest Command Module, or a separate supply.

Bus Shield

Shield continuity should be maintained from Module to Module. The shield must be connected to earth ground in only one location. At a Module, or at the Smart Cartridge.

Connecting Remote Sites

RS-422 to RS-232 Converter

RS-232 Splitter

RS-422 Line Booster

RS-422 Fiber Converter

Local Reader Bus
2 twisted pair #22 shielded

Fiber Cable

202T Leased Line Modems
1200 Baud
Full Duplex / Asynchronous

Leased Telco Lines

RS-422 Fiber Converter

7 2 3

7 2 3

DB 25 MALE
TO COMPUTER
RS-232 CONVERTER
TO BUS
DB 25 FEMALE

Remote Site Reader Bus
2 twisted pair #22 shielded
(Ground Shield At Converter)

-NOTE-

At **LAST** module on **EACH** bus, install one 220 OHM resistor.

TROUBLE SHOOTING

Most problems can be isolated as to cause with a systematic approach to trouble shooting. The most common problems encountered during installation and normal service are listed below. Before calling for assistance, be sure to follow each suggestion completely:

Each Command Module has two L.E.D.s for monitoring send and receive signals. The AB pair sends data from the module to the head end. The CD pair carries the signals sent from the head end. When a card transaction is transmitted, the AB L.E.D. should blink followed immediately by the CD L.E.D. If when a card is inserted, the AB L.E.D. blinks 5 times, this indicates that the message did not go through. If the CD pair is healthy, and the computer or Smart Cartridge is programmed with at least one device, the CD L.E.D. will blink every minute on the minute when it receives supervision signals.

Helpful trouble shooting tools:

1. Volt meter.
2. Small screwdriver
3. RS-232 Mini tester.

The mini tester is helpful in checking RS-232 signals at the computer.

COMMON PROBLEMS DURING INSTALLATION

If after hooking up the first reader you cannot establish communication with the computer, check the following:

1. Was the software ordered for COM 1 or COM 2? Are you connected to the correct COM port? All COM ports have MALE connectors. Printer ports have female connectors.
2. Is the PC software On-Line? If not, see the software guide for QUICK START UP initial programming.
3. Recheck the communication bus. You must have at least 3.5 volts between A&B, and the same between C&D when measured anywhere on the bus. Be sure there are no ground loops. Remove the shield from the converter's black wire, and OHM it to ground. There should be no continuity.
4. If your alarms are not reporting to the computer, you must first define them in text (FUNCTION 3.7).
5. Below is a trouble shooting guide. When you identify your symptom, check each recommended solution no matter how remote you feel that possibility may be. ***Anything is possible no matter how many times you***

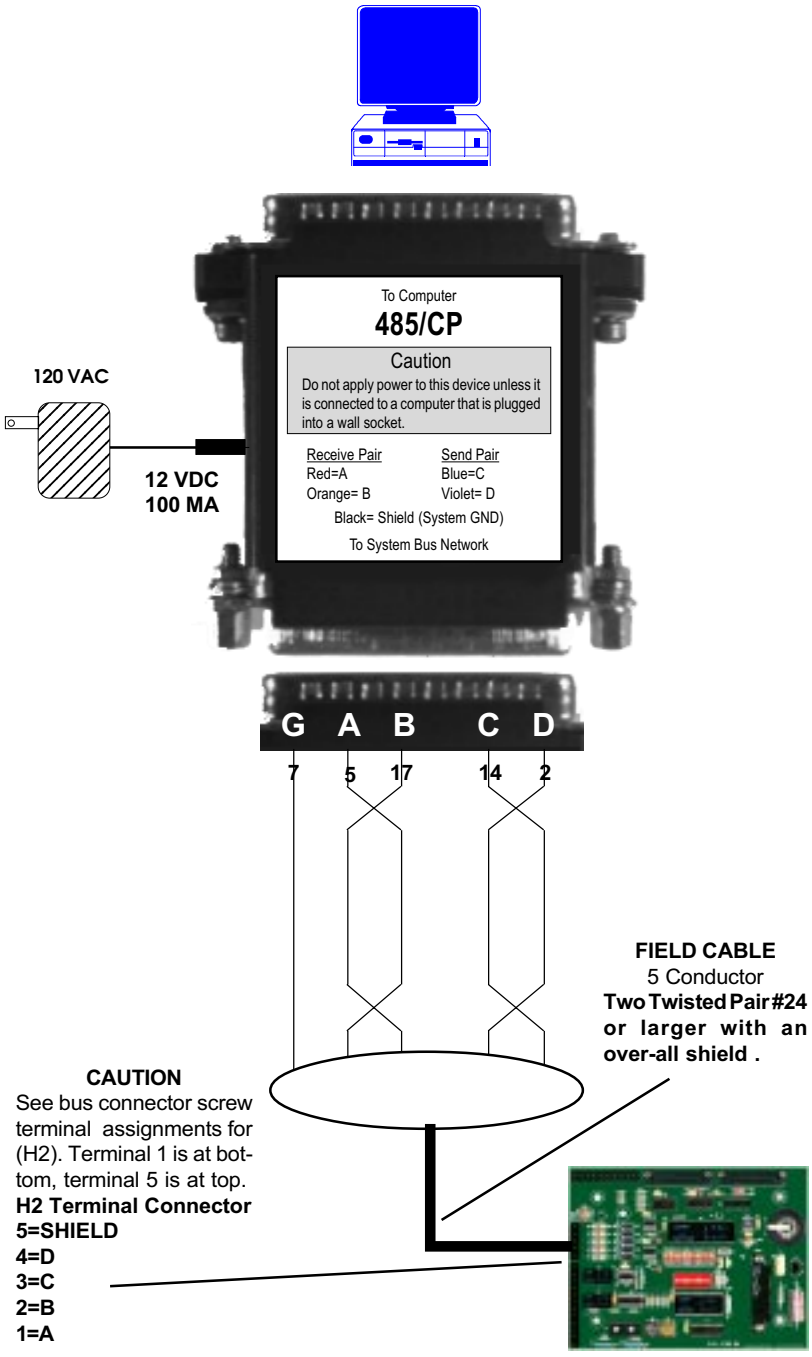
checked and rechecked it.

The following is a list of common SYMPTOMS followed by one or more letters. See the failure CAUSE list to interpret the letters

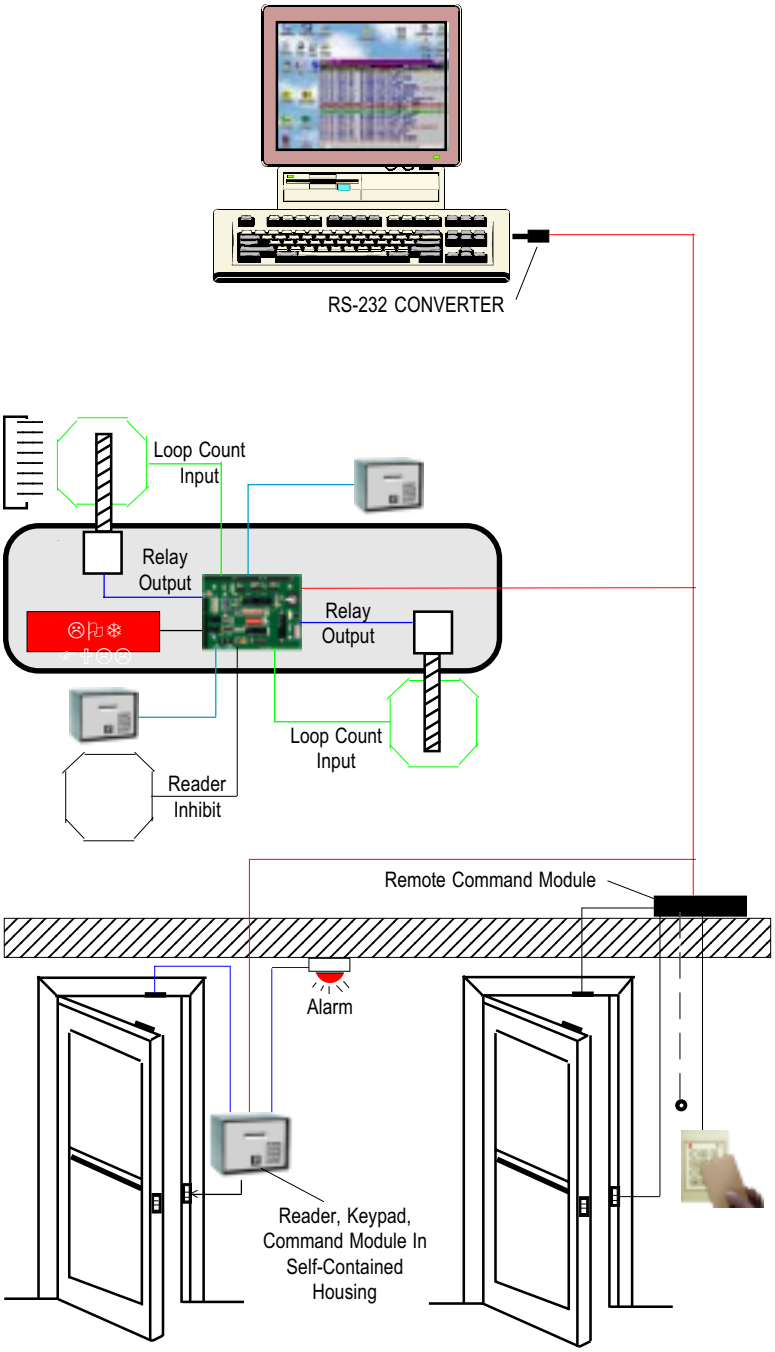
Cards do not read on or off-line.....A-F
Cards work Off-Line but no computer display.....G-J,P
Each transaction prints out 5 times.....K-M
Remote unlock command does not work.....K-M
Garbled messages or incorrect location codes.....H
Module board heats up.....E,N
Module relay drops out prematurely.....B,O
Command Module relay won't work.....Q

POSSIBLE CAUSES AND SOLUTIONS

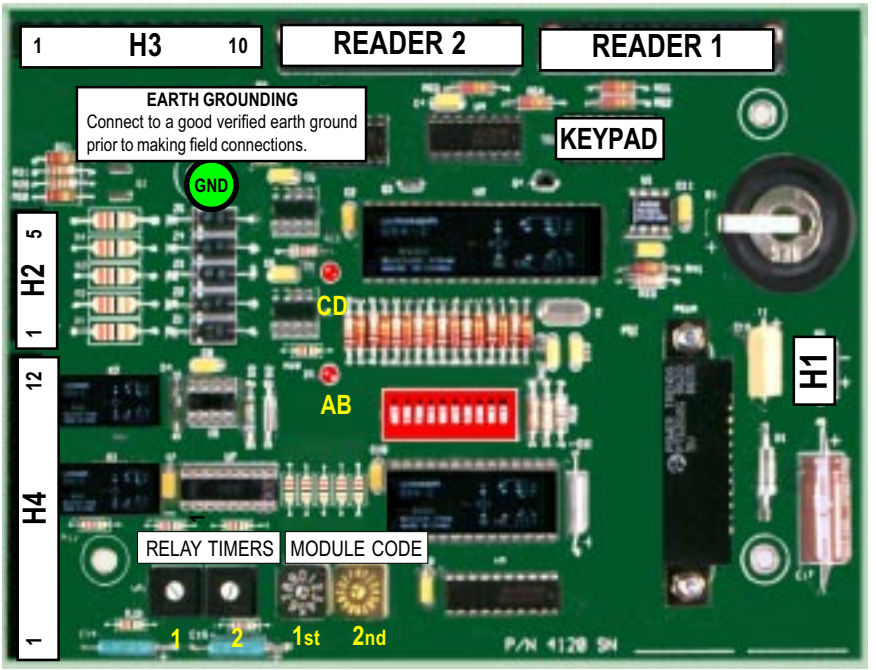
A WIRING ERROR--CHECK ALL POINT TO POINT CONNECTIONS. CHECK THE READER TO MODULE WIRING
B NOT ENOUGH POWER TO SERVE ALL COMPONENTS--RECALCULATE REQUIRED POWER
C DOOR STRIKE IS DRAWING TOO MUCH CURRENT FOR RELAY CONTACTS--USE PILOT RELAY
D MODULE Switch 9 IS OFF--TURN TO 0N POSITION
E READER TO MODULE CABLE MISWIRED--RECHECK
F INCORRECT SYSTEM CODE IN CARD--VERIFY
G COMPUTER IS OFF-LINE--DEFINE A LEVEL AND PROGRAM CARDS
H SYSTEM COMMUNICATION BUS MISWIRED--CHECK
I SYSTEM BUS PLUGGED INTO PRINTER PORT--CHECK
J FAULTY AB TRANSCEIVER CHIP AT MODULE--USE LED TESTER TO VERIFY SIGNALS
K CD PAIR MISWIRED--CHECK
L FAULTY CD TRANSCEIVER CHIP AT MODULE
M FAULTY RS-232 CONVERTER--CHECK POWER & USE MINI TESTER TO CHECK SIGNALS TO COMPUTER, CHECK READER L.E.D.S.
N INPUT POWER NOT ISOLATED FROM EARTH GROUND
O TIMER POT SET AT MINIMUM
P NO MODULE CODE--SELECT A CODE
Q CHECK PROGRAMMED LEVELS (5.2)


To Computer
485/CP
Caution
Do not apply power to this device unless it is connected to a computer that is plugged into a wall socket.
Receive Pair
Red=A
Orange= B
Send Pair
Blue=C
Violet= D
Black= Shield (System GND)
To System Bus Network
120 VAC
12 VDC
100 MA
G A B C D
7 5 17 14 2
FIELD CABLE
5 Conductor
Two Twisted Pair #24 or larger with an over-all shield .
CAUTION
See bus connector screw terminal assignments for (H2). Terminal 1 is at bottom, terminal 5 is at top.
H2 Terminal Connector
5=SHIELD
4=D
3=C
2=B
1=A

Index


RS-232 CONVERTER
Loop Count Input
Relay Output
Relay Output
Loop Count Input
Reader Inhibit
Remote Command Module
Alarm
Reader, Keypad, Command Module In Self-Contained Housing

4120/4122 Command Module



TERMINAL CONNECTIONS

H1 (Input power)
12-24 VDC

H2 (System Bus)
1 A
2 B
3 C
4 D
5 SHIELD (System Ground)

H3 (Inputs)
1 5 VDC OUTPUT (Smart Cartridge)
2 ALARM 71 INPUT FOR READER 1
3 ALARM 72 INPUT FOR READER 1
ALARM 71 INPUT FOR READER 2
4 ALARM COMMON
(System Ground)
5 READER 1 INHIBIT (Short to 7 to inhibit)
6 READER 2 INHIBIT (Short to 7 to inhibit)
7 READER INHIBIT COMMON (Sys GND)
8 READER 1 REQUEST TO EXIT
9 READER 2 REQUEST TO EXIT
10 REQUEST TO EXIT COMMON
(System Ground)

H4 (Relay Contacts)
1 RELAY 1 POLE 1 N/C
2 RELAY 1 POLE 1 COMMON
3 RELAY 1 POLE 1 N/O
4 RELAY 1 POLE 2 N/C
5 RELAY 1 POLE 2 COMMON
6 RELAY 1 POLE 2 N/O
7 RELAY 2 POLE 1 N/C
8 RELAY 2 POLE 1 COMMON
9 RELAY 2 POLE 1 N/O
10 RELAY 2 POLE 2 N/C
11 RELAY 2 POLE 2 COMMON
12 RELAY 2 POLE 2 N/O