AMAG

Access-Control System

multiNODE-2 (SMD)
Installation Manual

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference. In which case, the user will be required to correct the interference at his own expense.

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Group 4 Securitas Technology Corporation

multiNODE-2 (SMD) Installation Manual

9600-0250

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Contents

Chapter 1: Introduction

About the MDU-4, MDU-2 and 2DC

This manual describes how to install an MDU-4, MDU-2 and 2DC (also known as nodes or controllers).

The MDU-4 and MDU-2 provide distributed processing for access-control and alarms-monitoring applications. The MDU-4 supports the direct connection of up to four readers, and an MDU-2 supports the direct connection of up to two readers.

You can expand the number of readers controlled by an MDU-4 or MDU-2 (up to a maximum of eight readers) by connecting up to two 2DCs to an MDU-4, or up to three 2DCs to an MDU-2. The MDU-4, MDU-2 and 2DC are each housed in a separate cabinet.

In applications where more than 8 readers are required, MDUs can be connected with others using 20mA current loop communications to form a "chain" of nodes. There can be one or more chains, each with a maximum of 32 nodes.

Refer to the *User's Guide* provided with the access-control software for an introduction to the access-control system.

Power

All nodes are powered from an external 18 Vac supply. There are no mains voltages in the cabinet.

The node includes a power supply board, which provides 12 Vdc for the MDU-2, MDU-4 or 2DC PCB and has some spare capacity for 12 Vdc door locking devices and auxiliary outputs (it is unusual to power auxiliary outputs from the power supply board). The specifications on page 42 give details of the available power.

There is space within the cabinet for a 12 V 7AH maintenance-free rechargeable battery, which maintains operation if normal power is disconnected. The battery can be charged from the power supply board.

PC Communications

Each chain of nodes communicates with a PC installed with the appropriate access-control software. The access-control software is used to set up the rules of access control, monitor alarms, produce reports and manage the system.

The access-control software can communicate with a chain using one of several methods:

- Via an external RS232-to-20mA converter. This connects between the PC's serial port and the first MDU-4 or MDU-2 in the chain (see the note on bi-directional communications below).
- Using a direct RS232, or dial-up, connection to an RS232 module mounted in the first MDU-4 or MDU-2 in the chain (see the note on bi-directional communications below).
- Via Ethernet communications to a network interface card (NIC module) mounted in the first MDU-4 or MDU-2 in the chain (also supports fall-back dial-up communication via an RS232 port).

Bi-directional Communications

Optionally, a chain can use bi-directional communications, where both the first and last nodes in the chain are connected to different RS232 ports at an access-control PC. In the event that communication through the primary port fails, the secondary port is used instead.

If you require the chain to use bidirectional communications, each node at either end of the chain must be fitted with an RS232 module or must connect to a separate RS232-to-20mA converter. It is allowable for one end to use an RS232 module and the other an RS232-to-20mA converter.

Reader Types Supported

A range of 20mA and Wiegand readers is supported.

A WIM (Wiegand Interface Module) must be fitted to a MDU-4, MDU-2 or 2DC if it connects to a Wiegand-interfaced reader. The MDU-4 uses a WIM-4. The MDU-2 and 2DC use a WIM-2.

Monitor Points and Auxiliary Outputs

Monitor points and auxiliary outputs can be connected to an 8-input, 4-output I/O module mounted on an MDU-4, MDU-2 or 2DC board. The MDU-4 board can accommodate two I/O modules, to give a maximum of 16 monitor points and 8 auxiliary outputs available from each MDU-4. The MDU-2 and 2DC boards can accommodate a single I/O module.

Optional Modules

The following summarizes the optional modules that can be used:

- **RS232 module** (MDU-4 and MDU-2 only) - for RS232 communications to the access-control PC. An external RS232-to-20mA converter can be used instead of an RS232 module.
- **Network Interface Card (NIC module)** (MDU-4 and MDU-2 only) - for Ethernet communications to the PC.
- **I/O module** - for connection to monitor points and auxiliary outputs.
- **WIM module** - to support connection to Wiegand-interfaced readers.

Planning the Installation

Installation requires careful planning. The following are some of the issues that you should address during the planning stage:

- Check that suitable space is available to accommodate the cabinet. Figure 2-1 shows the dimensions of the cabinet.
- Determine the reader types needed and their locations.
- Ensure that the required number of option modules are available (RS232 module, NIC module, WIM module and I/O modules).
- Plan the cable requirements carefully. In particular, determine the routes, length and number of wires needed. See page 9.
- Ensure that there is a 110 Vac mains socket available for connection to the external 18 Vac transformer.
- If necessary, ensure that external power supplies are available to power the door-release devices and auxiliary outputs. The power supply board has limited capacity to power these devices (see page 42).
- The cabinet **MUST** be earthed.
- Where appropriate, ensure proper liaison with the installer of the door furniture and other auxiliary equipment required for the access-control system.
- Ensure that you have suitable supplies of:

  Cable.
  Cable clips.
  Minitrunking or plastic tubing.
  Sleeving for screens.
  Grommets (glands) for entry of cables into the cabinet.
  Door furniture (door-monitor contacts, exit-request push buttons and door releases).
  Screws and wall plugs.
  Spare fuses (see page 49).
  9-way or 25-way connectors for connections to PC or modems, if required.
  10Base-T Ethernet cable for RJ-45 connection to NIC module, if required.
  Termination resistors and enclosures for cable supervision (see page 32), if required.
  Crimp connectors for earthing.

Board Layouts

The following figures show the locations of the terminal blocks, links and other key features on the printed-circuit boards.

You may want to photocopy these figures for ease of reference.

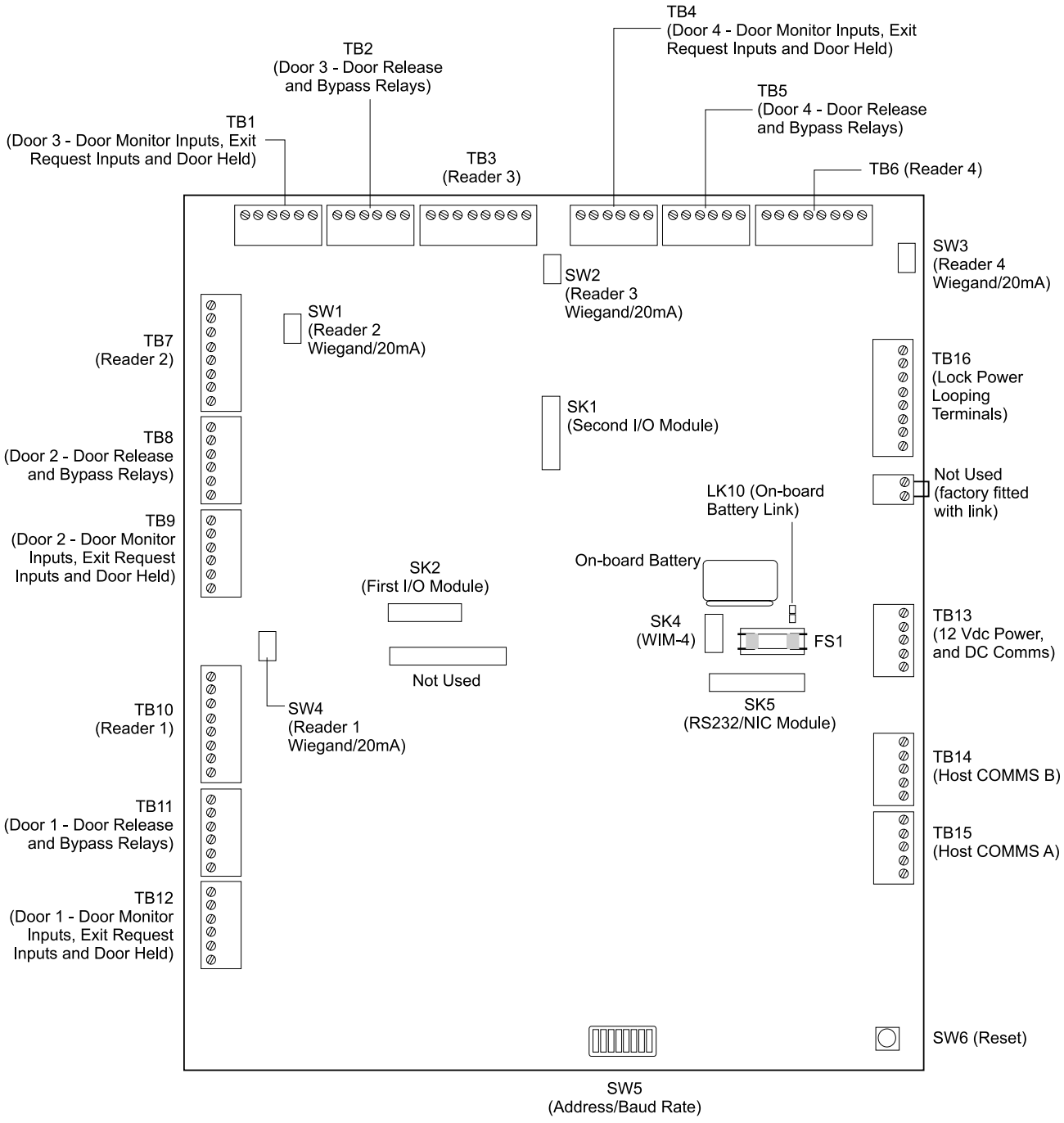


Figure 1-1 – MDU-4 Layout

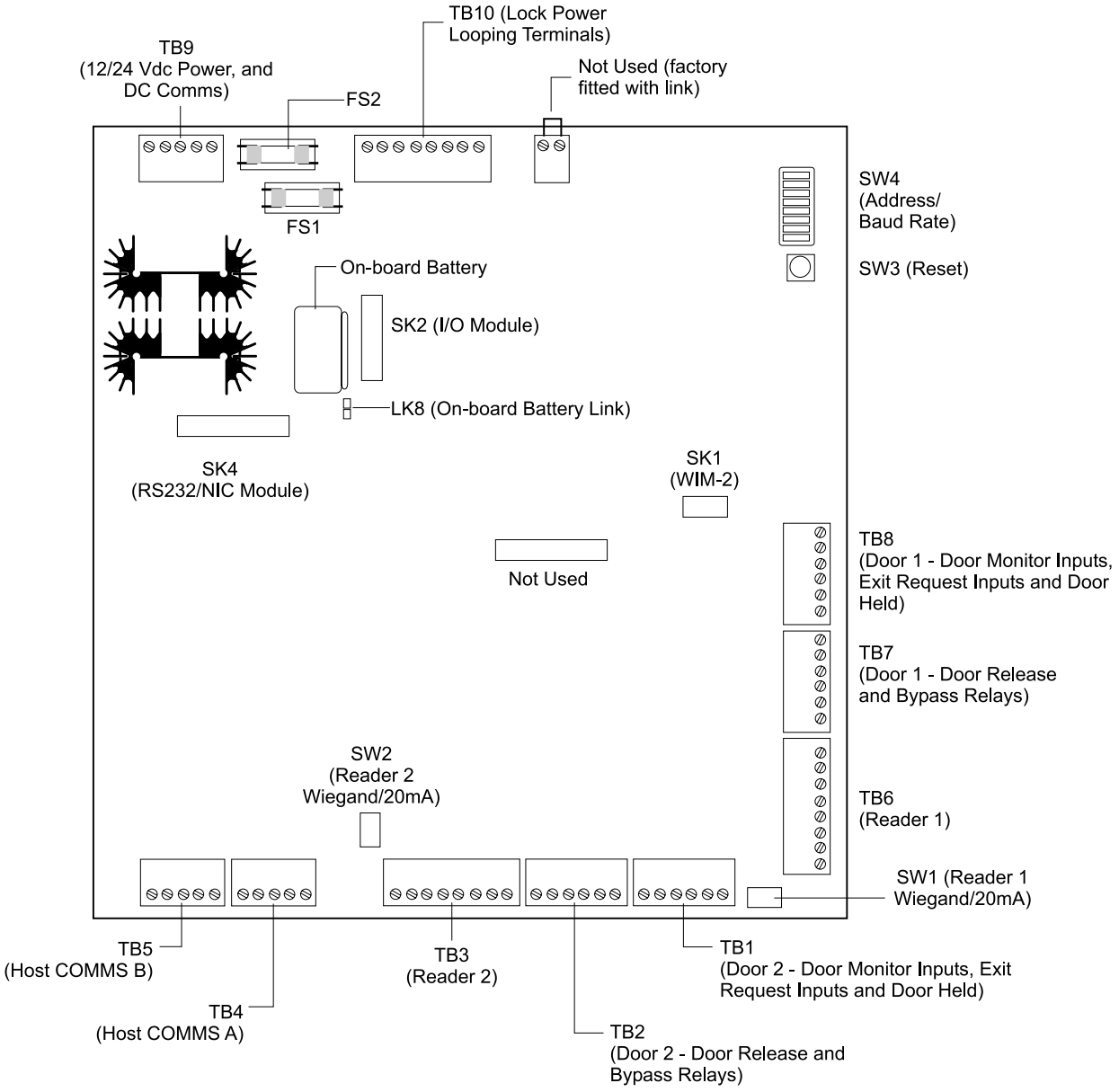


Figure 1-2 – MDU-2 Layout

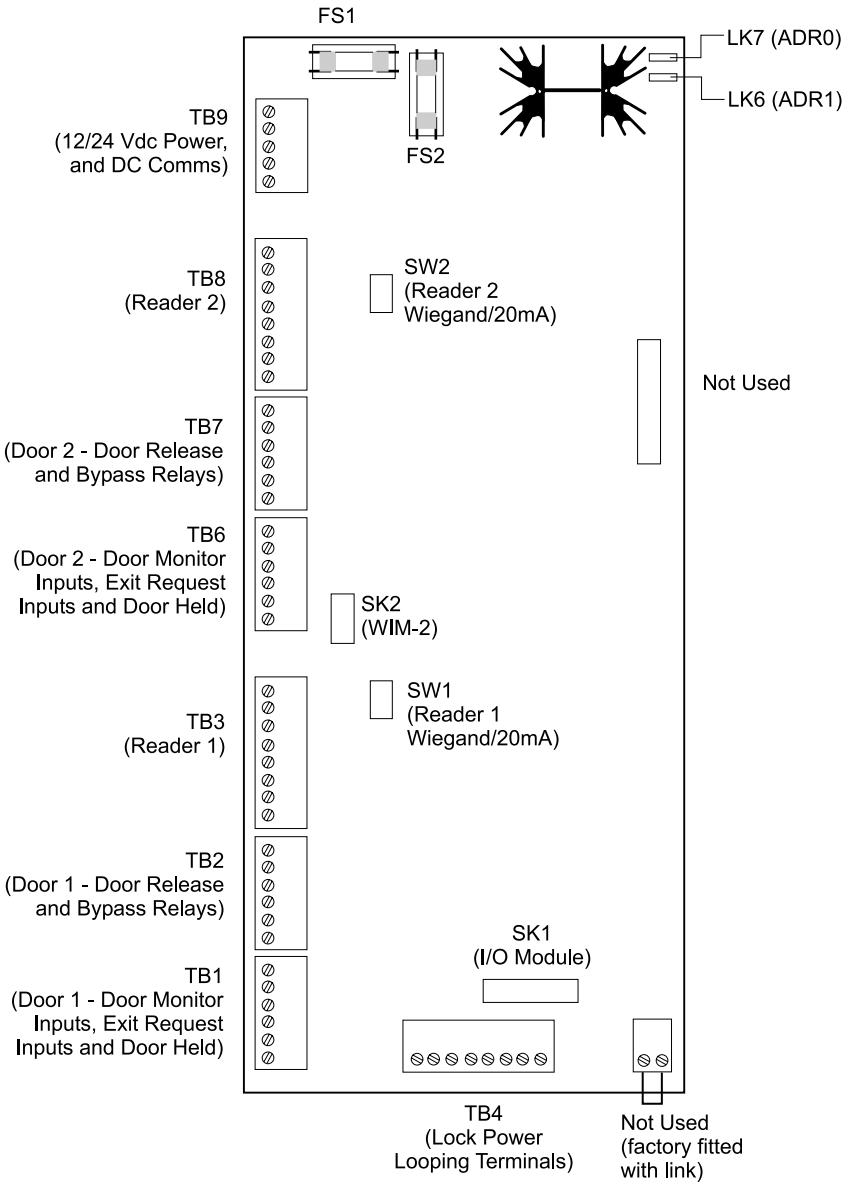


Figure 1-3 – 2DC Layout

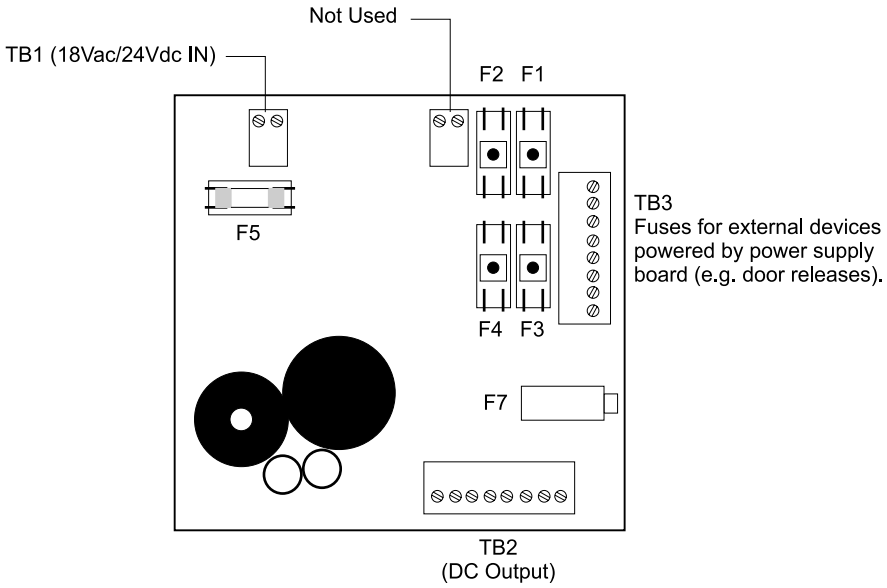


Figure 1-4 – Power Supply Board Layout

Chapter 2: Equipment Installation

Step 1 - Installing the Cabling

1. Decide where to locate each component of the system. You will mount the components in *Step 2 - Mounting the Equipment*.

2. Install all cables. Note the following points.

Signal Cables

The minimum recommended cable type for connecting all 20mA reader types is Belden 9503 (3 twisted pairs plus screen) or equivalent. Doubling up the reader power cores will increase the maximum reader distance allowed, this requiring Belden 9504 (4 twisted pairs plus screen) or equivalent to be installed.

The minimum recommended cable type for connecting all Wiegand reader types is Belden 9537 (7 cores plus screen) or equivalent. Doubling up the reader power cores will increase the maximum reader distance allowed, this requiring Belden 9539 (9 cores plus screen) or equivalent to be installed. The minimum recommended cable type for MDU-to-MDU or MDU-to-2DC communications is Belden 9502 (2 twisted pairs plus screen) or equivalent.

Items to be Connected	Max. Length of Cable	Cable
MDU, or DC to 20mA readers.	450ft (150m)	Belden 9503
	900ft (300m)	Belden 9504
MDU, or DC to Wiegand readers.	225ft (75m)	Belden 9537
	450ft (150m)	Belden 9539
MDU to MDU or DC	3000ft (1km)	Belden 9502
MDU to PC or modem (RS232)	45ft (15m)	Belden 9535
I/O module to monitor point	1500ft (500m)	2 cores 24 AWG

...Continued

MDU or DC to door monitor	1500ft (500m)	2 cores 24 AWG
MDU or DC to exit request	1500ft (500m)	2 cores 24 AWG
MDU or DC to locking device	**Note:** Maximum distance and cable choice is dependent on the specific lock current and its minimum operating voltage. **Note:** Locks can be powered from an independent external power supply or from the internal power supply (see page 42). A suppression diode must be installed across the coil of the locking device.	

Power Cable

Power cable to the node must have the following minimum rating:

Node Powered By	Cable Rating
18 Vac	4 A

Screens

To avoid multiple paths to earth, cable screens must be connected only as shown in this manual. All screens within the cabinet must be connected to the nearest stud. If the screen is shown unconnected at one end of the cable, it must be insulated to prevent accidental shorting to, for example, the case. Use sleeving to insulate all exposed screens. The cabinet must be connected to a suitable earth.

Labels

Label cables whose source or destination could be confused with others.

Door/Reader Pairing

The cabling from a reader and its associated door furniture must go to the same MDU-4, MDU-2 or 2DC board. Separate cables must be used for the reader and for the door furniture.

Wiring Knock-outs

Before mounting the cabinet, remove any required wiring knock-outs from the sides of the cabinet. Fit a rubber grommet (gland) to each hole to be used to protect against sharp edges. Cables for door-releases, power and auxiliary outputs should use different holes from those used by signal cables.

Step 2 - Mounting the Equipment

Mounting the Cabinet and Readers

The cabinet can be mounted on the wall using the three mounting holes shown in Figure 2-1. You can mount the cabinet in either "landscape" or "portrait" orientation, as required. It is recommended that you always mount a 2DC in portrait orientation, otherwise you will need to remove the 2DC board to gain access to the upper mounting hole.

To make mounting easier, drill and plug a fixing hole for the upper mounting position only, hang the cabinet from a screw at this position, then mark the positions of the lower mounting holes. Remove the cabinet, drill and plug for the lower mounting positions, then mount the cabinet.

Mount the readers as specified in the separate installation instructions provided with the readers.

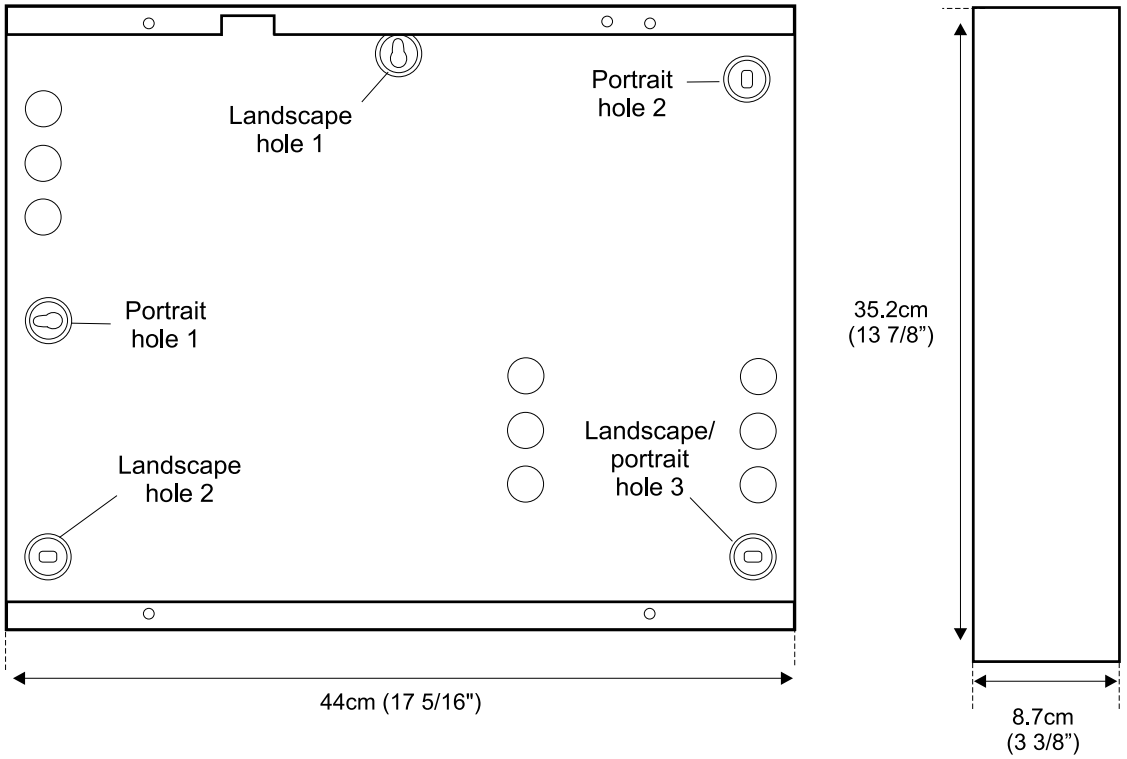


Figure 2-1 - Cabinet Mounting Holes and Dimensions

Step 3 - Fitting the Boards

Note: It is not normally necessary to follow this step, since each board is factory fitted inside its cabinet. This step is provided only for completeness in the event that you need to replace a board.

Each board is mounted on spacers in the positions shown in the following figures. Plastic spacers are used, plus either two or four metal spacers, depending on the board fitted. Screws fix the board to the metal spacers, thereby providing grounding to the metal cabinet.

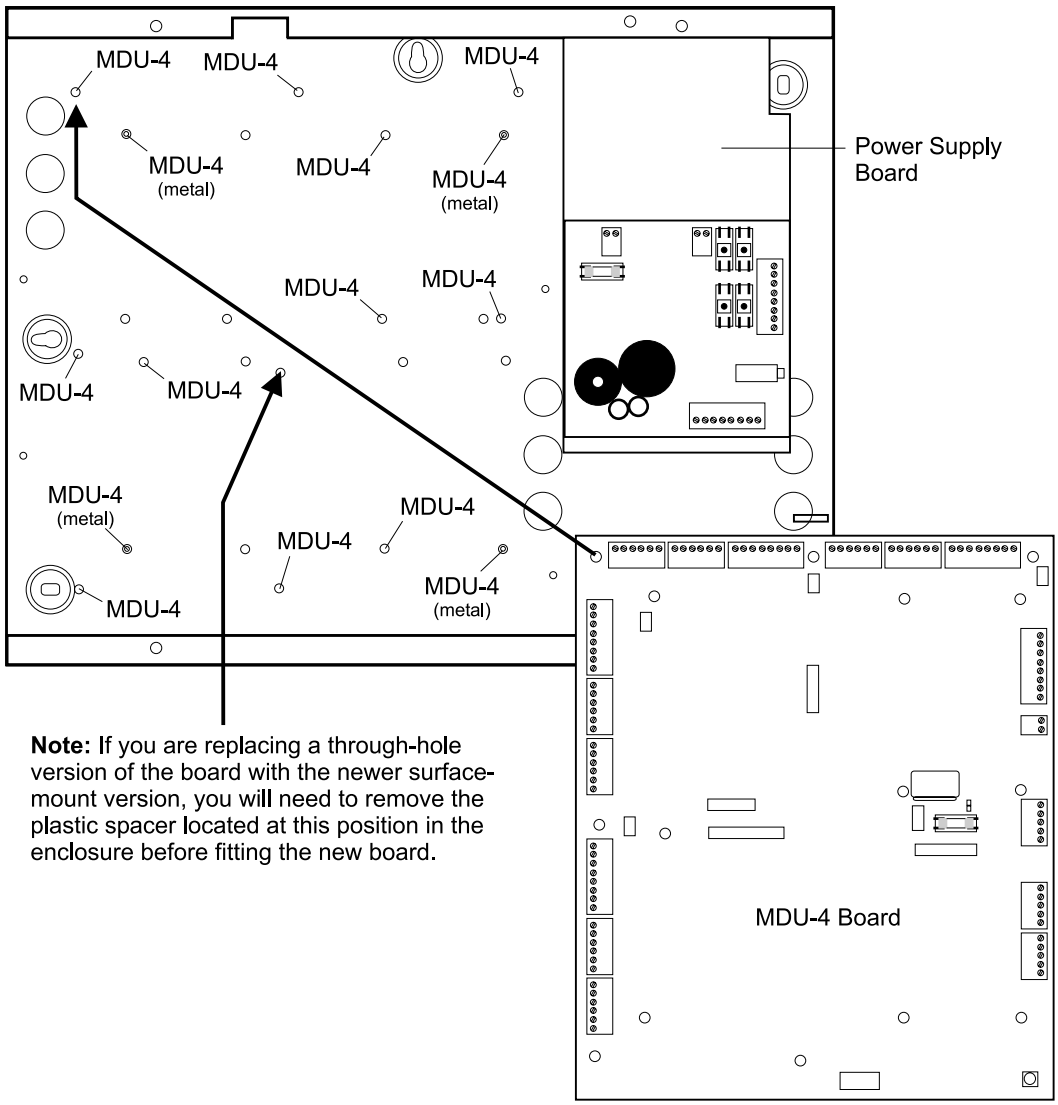


Figure 2-2 - Spacer and Board Location for the MDU-4

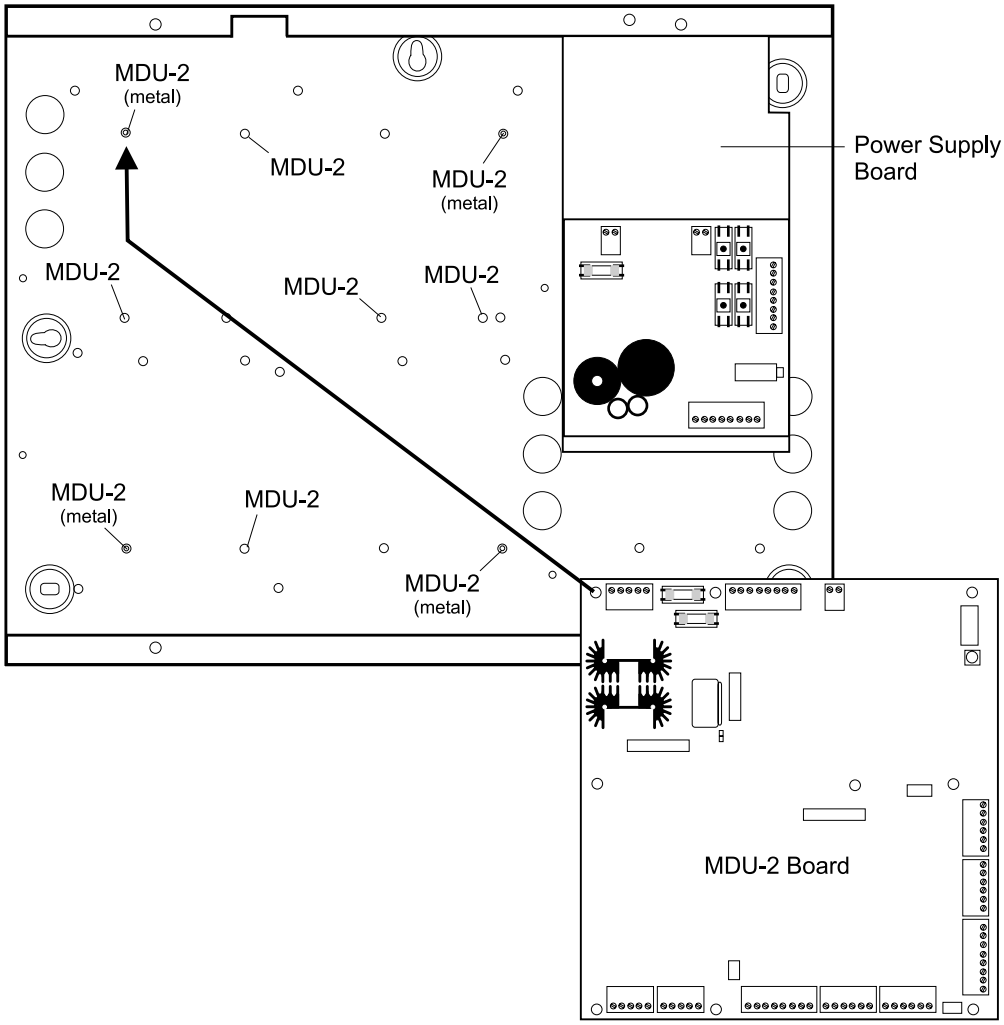


Figure 2-3 - Spacer and Board Location for the MDU-2

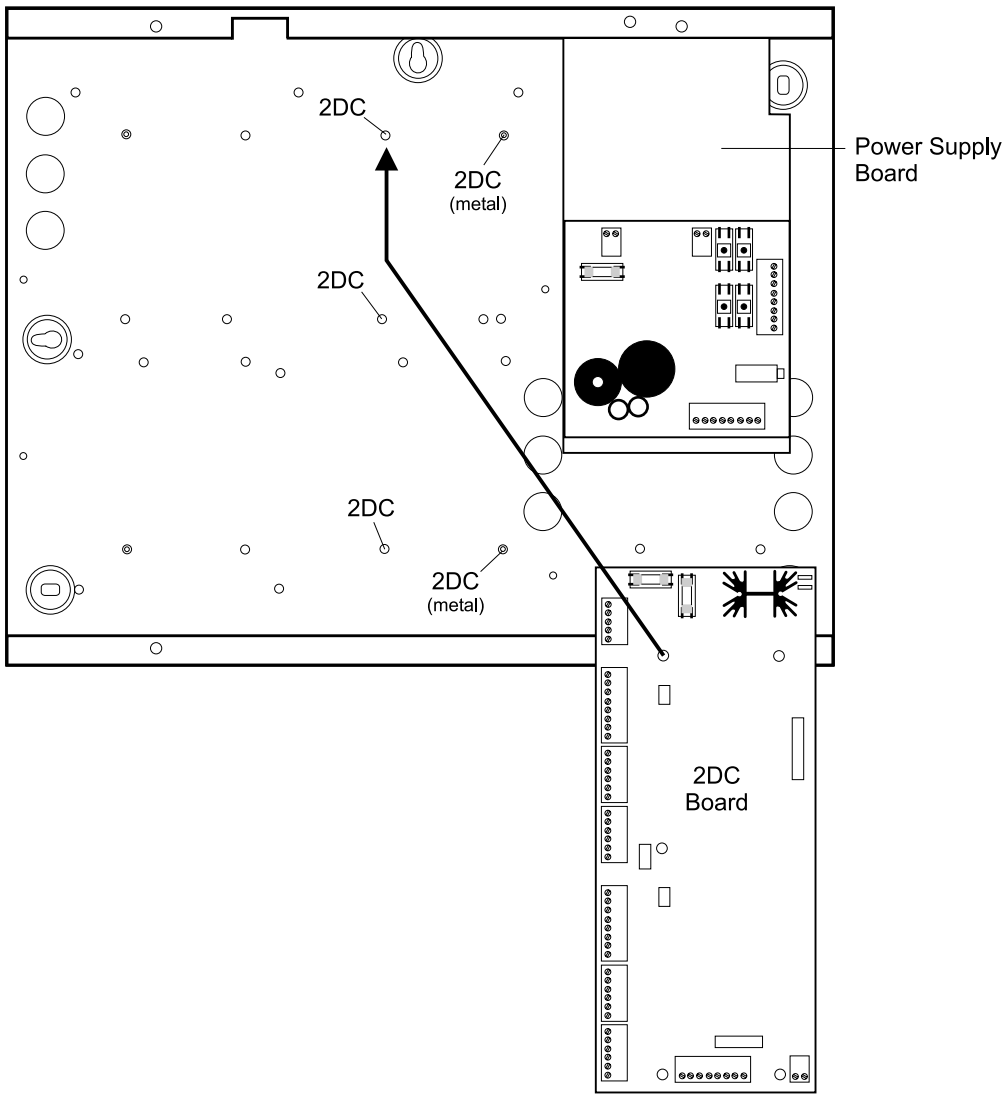


Figure 2-4 - Spacer and Board Location for the 2DC

Step 4 - Setting the Node's Address and Baud Rate

If you are installing an MDU-2 or MDU-4, you need to set up the address and baud rate of the node. Set the address using SW4 on the MDU-2, or SW5 on the MDU-4. Refer to the board layout figures (from page 5) for the locations of these switches.

Check that the appropriate baud-rate switch is set to ON, according to the baud rate you wish the chain and PC communications to operate at (default 9600). This setting must match the setting made in the Install/Machine Port Definitions screen of the access-control software.

The default address of the node is 1. If you intend to connect the node to a chain of nodes (see *Step 7 - Connecting a Chain of Nodes*), you must ensure that each node has a unique address on the chain. In this case, set the required address using SW4 (MDU-2) or SW5 (MDU-4) as follows.

Node Address	Address Bit Switches				
	ADR4	ADR3	ADR2	ADR1	ADR0
1	0	0	0	0	0
9	0	0	0	0	1
17	0	0	0	1	0
25	0	0	0	1	1
33	0	0	1	0	0
41	0	0	1	0	1
49	0	0	1	1	0
57	0	0	1	1	1
65	0	1	0	0	0
73	0	1	0	0	1
81	0	1	0	1	0
89	0	1	0	1	1
97	0	1	1	0	0
105	0	1	1	0	1
113	0	1	1	1	0
121	0	1	1	1	1
129	1	0	0	0	0
137	1	0	0	0	1
145	1	0	0	1	0
153	1	0	0	1	1
161	1	0	1	0	0
169	1	0	1	0	1
177	1	0	1	1	0
185	1	0	1	1	1
193	1	1	0	0	0
201	1	1	0	0	1
209	1	1	0	1	0
217	1	1	0	1	1
225	1	1	1	0	0
233	1	1	1	0	1
241	1	1	1	1	0
249	1	1	1	1	1

Step 5 - Connecting RS232 Communications to the PC

Ignore this step for nodes on a LAN (Ethernet) chain; see *Step 6 - Connecting a Network Interface Card (NIC Module)* instead.

An access-control PC can use serial communications to a chain of nodes by using an RS232 module or an RS232-to-20mA converter at the first node in the chain. Additionally, if bi-directional communications are used (see page 2), an RS232 module or RS232-to-20mA converter must be used at the last node in the chain.

An RS232 module can be connected either directly to a PC's COM port, or via a modem for a dial-up link.

Using an RS232 Module

Refer to Figure 2-5 or Figure 2-6. Fit the plastic spacers to the module, then push the module fully home into SK5 (MDU-4) or SK4 (MDU-2) on the first/last node in the chain. Using the screw provided, secure the RS232 board to the metal spacer (required for grounding).

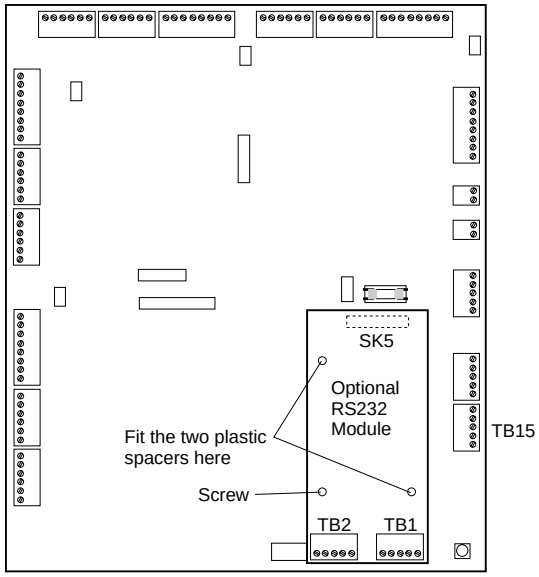


Figure 2-5 - Location of the RS232 Module on the MDU-4 Board

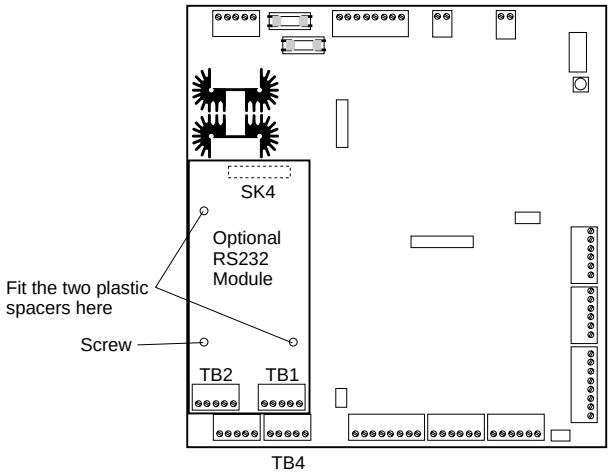


Figure 2-6 - Location of the RS232 Module on the MDU-2 Board

Connecting the RS232 Module to a PC COM Port

Use the connections shown in Figure 2-7 if the RS232 module is to communicate directly with the COM port of an access-control PC.

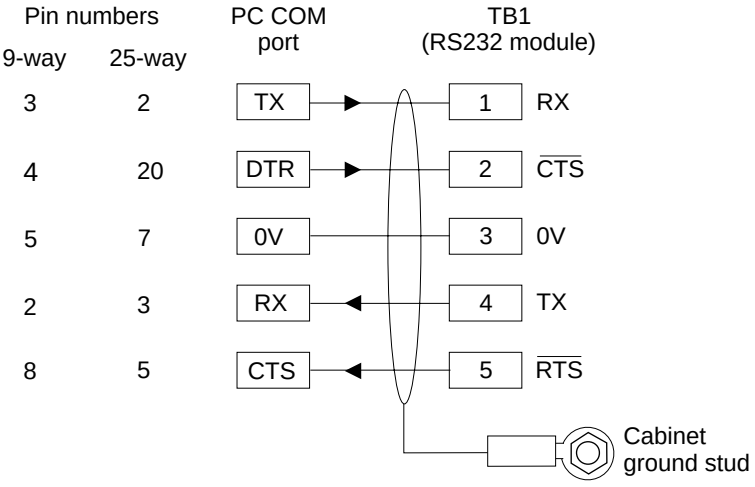


Figure 2-7 - Connections Between an RS232 Module and PC

TB2 on the RS232 module is not used.

Connecting the RS232 Module to a Modem

Use the connections shown in Figure 2-8 if the RS232 module is to communicate via a modem.

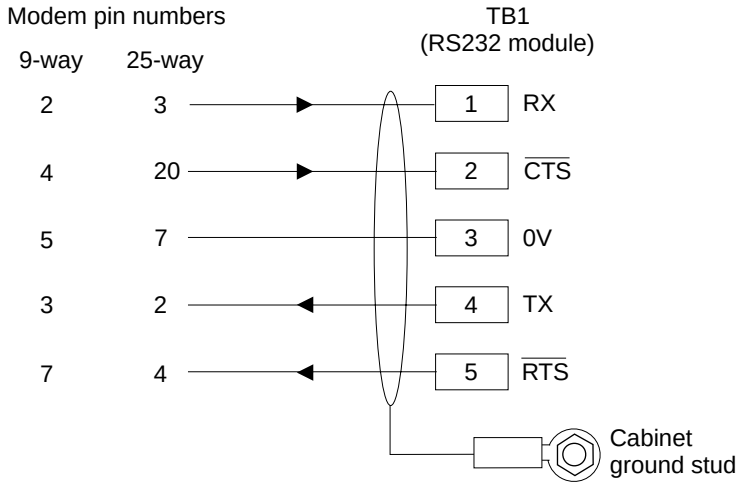


Figure 2-8 - Connections Between an RS232 Module and Modem

Refer to the following table for DIP switch settings (when applicable) for US Robotics Sportster modems. Refer to the Software Installation Manual for details of modem initialization strings.

Switch	Setting	Description
1	on/down	Ignore DTR
2	on/down	Result codes are numeric
3	on/down	Result codes are enabled
4	on/down	Do not echo in command state
5	off/up	Auto answer on first ring
6	off/up	Carrier detect reflects modem connection
7	off/up	Loads Y_0 or Y_1 from non-volatile memory
8	on/down	AT command recognition enabled

DIP Switch Settings for US Robotics Sportster Modem (when applicable)

TB2 on the RS232 module is not used.

Using an External RS232-to-20mA Converter

Connect the converter ("Black Box" 232/CL-E) to the PC and first/last node in the chain as shown in Figure 2-9. Refer to the board layout figures (from page 5) for the locations of the terminal blocks.

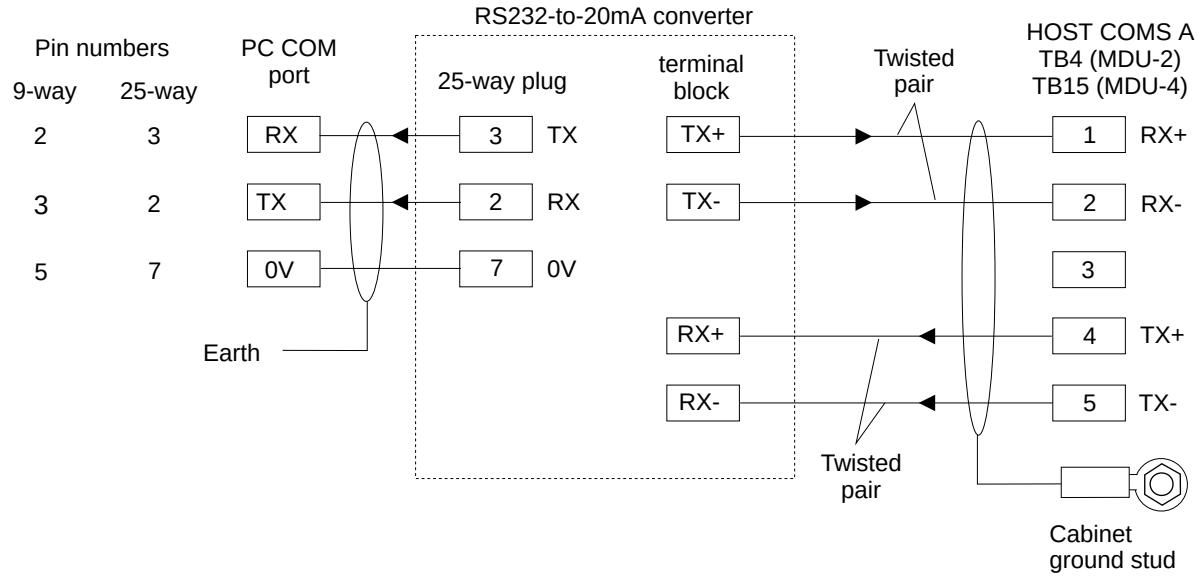


Figure 2-9 - Connections Between the RS232-to-20mA Converter, PC and Node

Switch SWB (20-60mA)		Switch SWC (DTE/DTC)		Switch SWA (Config)	
1	Open	1	Closed	1	Open
2	Open	2	Open	2	Closed
3	Open	3	Closed	3	Open
4	Open	4	Open	4	Closed
		5	Closed	5	Open
		6	Open	6	Closed
		7	Closed	7	Open
		8	Open	8	Closed
		9	Closed	9	Open
		10	Open	10	Closed

Converter Switch Settings

Step 6 - Connecting a Network Interface Card (NIC Module)

About the NIC Module

The NIC module enables a chain to communicate with an access-control PC over an Ethernet LAN. The module should be used only if the chain is configured as a LAN chain at the access-control software, and only at the first MDU-4 or MDU-2 in the chain.

The NIC module also has an RS232 modem port (TB2) for optional fall-back dial-up communications. The modem is used only if the chain detects an alarm condition when Ethernet communications are unavailable.

Fitting the NIC Module

Refer to Figure 2-10 or Figure 2-11. Fit the plastic spacers to the module, then push the module fully home into SK5 (MDU-4) or SK4 (MDU-2) on the first node in the chain. Using the screw provided, secure the module to the metal spacer (required for grounding).

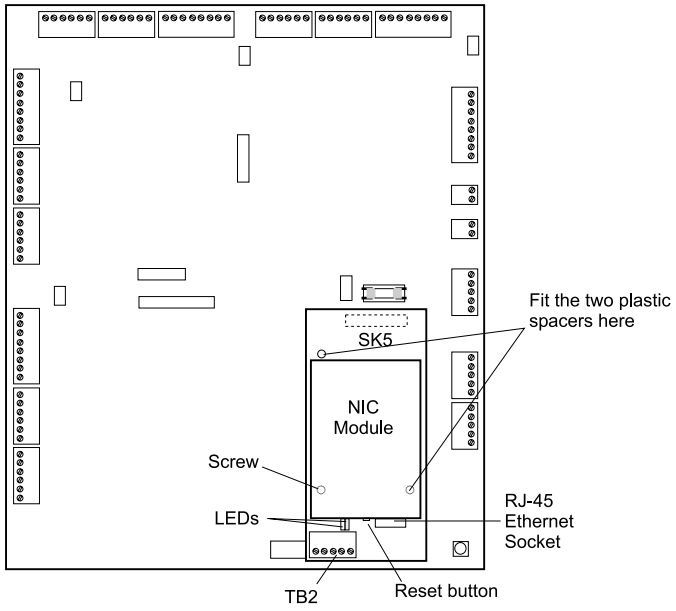


Figure 2-10 - Location of the NIC Module on the MDU-4 Board

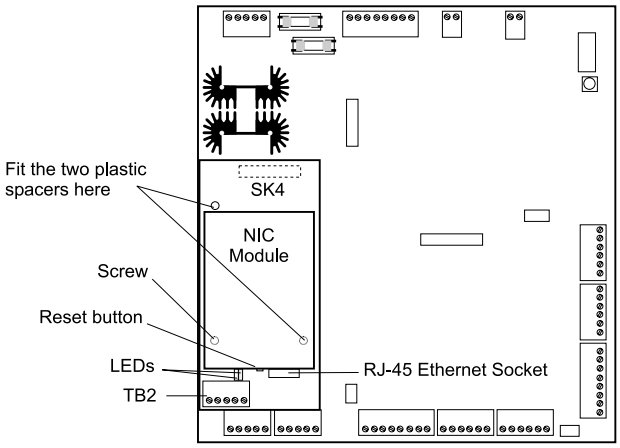


Figure 2-11 - Location of the NIC Module on the MDU-2 Board

Connect the module to the Ethernet LAN using an RJ-45 cable (10BASE-T).

Connecting a Modem to a NIC Module

If a modem is required for fall-back alarm communications, connect the modem to the NIC module as shown in Figure 2-12.

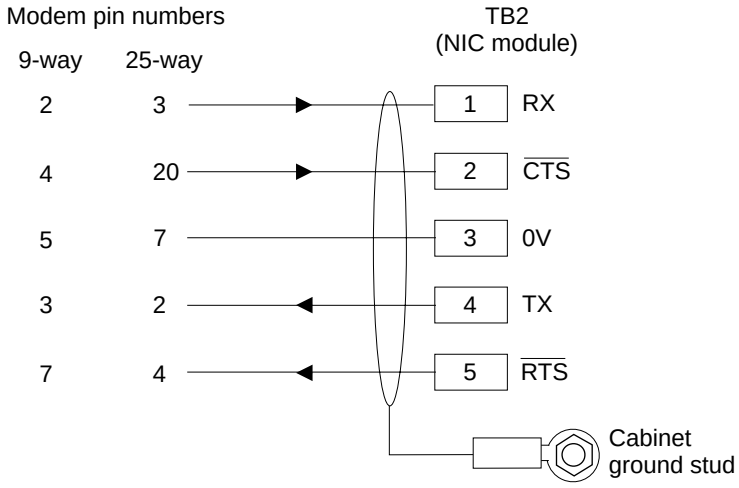


Figure 2-12 - Connections Between a NIC Module and Modem

Refer to the Software Installation Manual for details of modem settings.

Configuring the NIC Module

Configure the NIC module (e.g. to set up its TCP/IP address) using the PC-based configuration tool supplied with the access-control software. Refer to the tool's online help for further information.

Module Reset Button and LEDs

The NIC module has a reset button and two LEDs, which are located adjacent to the RJ-45 port. There should be no need to press the reset button, but doing so while applying power causes the module configuration to return to factory defaults. Any configuration changes you want to make should be carried out using the supplied configuration tool.

The LED furthest from the reset button flashes green approximately every two seconds to show that the module is active, and occasionally red as packets are sent and received. The LED closest to the reset button is solidly lit green when there is a valid Ethernet connection.

Step 7 - Connecting a Chain of Nodes

To create a chain of nodes, connect the HOST COMS B port on the MDU-2/MDU-4 board to the HOST COMS A port on the MDU-2/MDU-4 board of the next node in the chain, as shown in Figure 2-13.

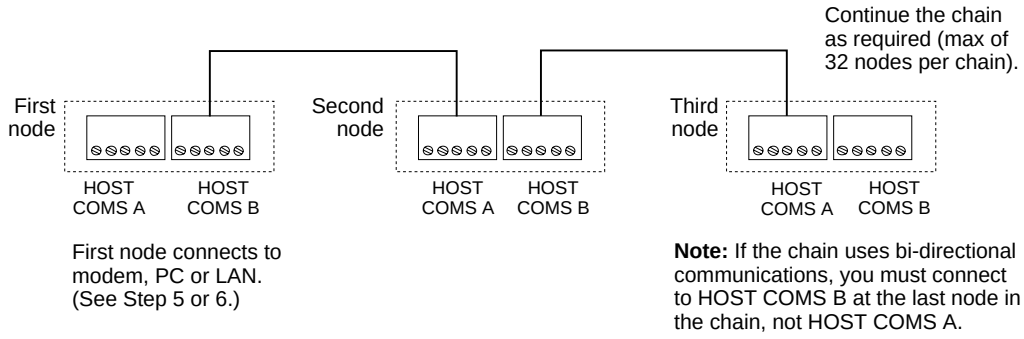


Figure 2-13 - Creating a Chain

The connections between HOST COMS A and HOST COMS B are shown in Figure 2-14. Figure 2-15 shows the connections between the HOST COMS B terminal blocks when connecting to the last node in a bidirectional chain. Refer to the board layout figures (from page 5) for the locations of these terminal blocks.

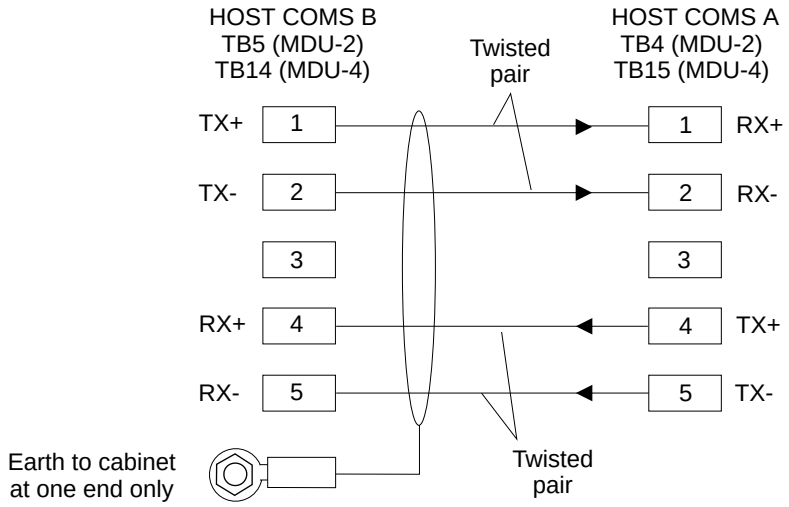


Figure 2-14 - Connections Between Nodes in a Chain

When the RS232 or NIC module is fitted, HOST COMS A is automatically disabled.

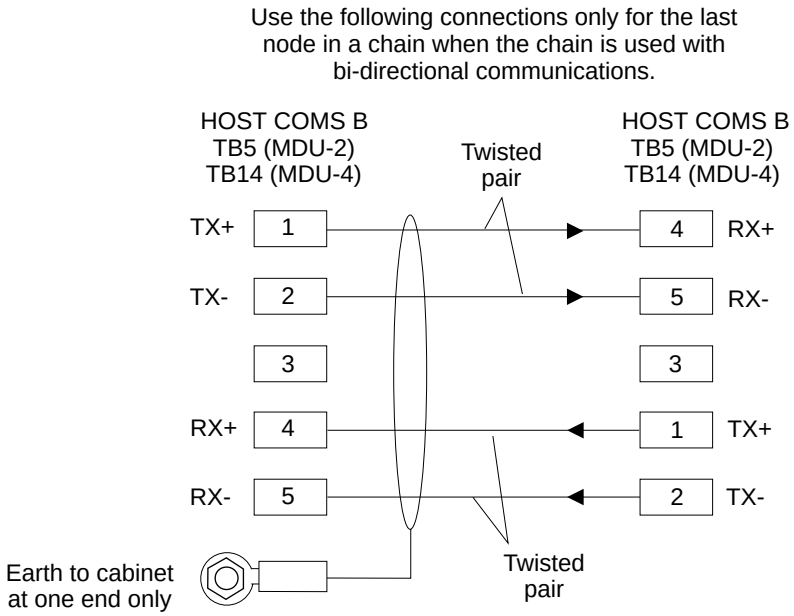


Figure 2-15 - Connections to Last Node in a Bidirectional Chain

Step 8 - Connecting a 2DC to an MDU-4 or MDU-2

You can expand the number of readers controlled by an MDU-4 or MDU-2 (up to a maximum of eight readers) by connecting up to two 2DCs to an MDU-4, or up to three 2DCs to an MDU-2.

Connection Details

You can connect 2DCs to the MDU-4/MDU-2 in a daisy chain connection topology, as shown in Figure 2-16. (otherwise known as a "multidrop" connection topology). Alternatively, you can connect all the DCs directly to the MDU-4/MDU-2 in a star connection topology, or you can use a mixture of both topologies. Refer to the board layout figures (from page 5) for the locations of the terminal blocks.

Using links LK7 and LK6 on the 2DC board, you must assign a unique address range (of 3 to 4, 5 to 6, or 7 to 8) for each 2DC connected to an MDU.

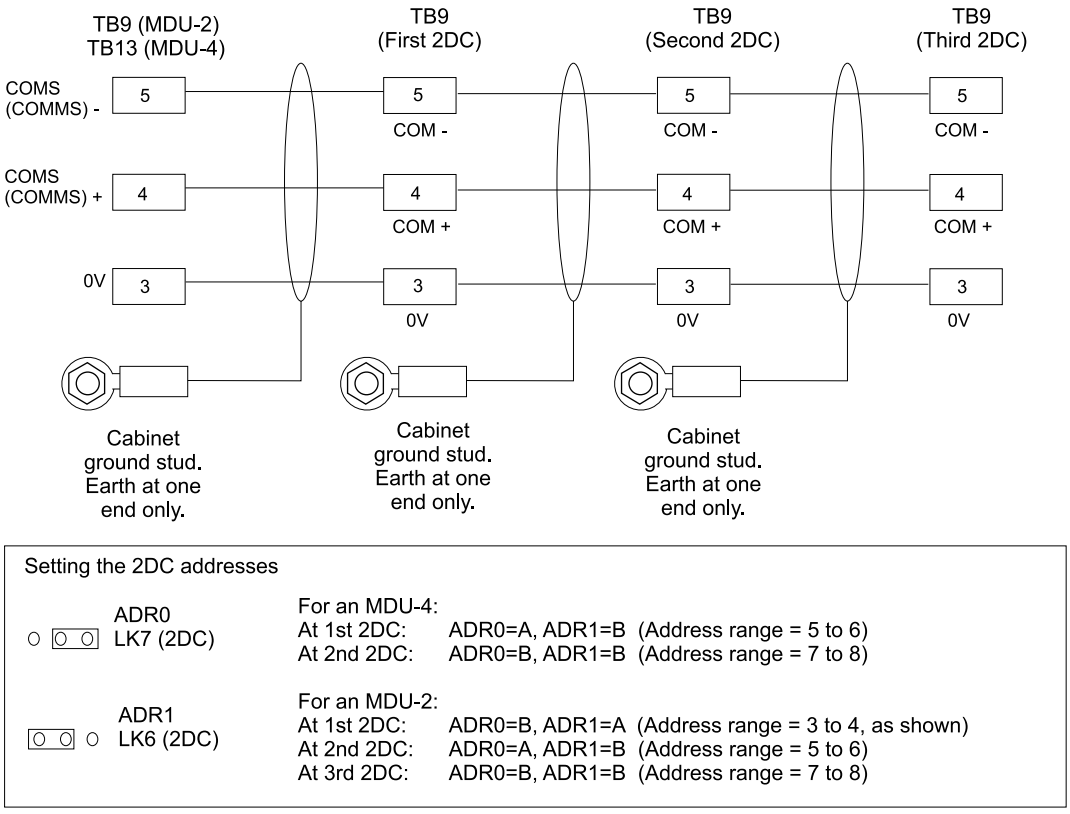


Figure 2-16 - Connecting 2DCs to an MDU

Step 9 - Connecting the Readers

You can connect up to four 20mA or Wiegand readers to an MDU-4. You can connect up to two 20mA or Wiegand readers to an MDU-2 or 2DC.

If you wish to use two readers at one door, refer to page 28.

Connecting 20mA or Wiegand Readers

Each 20mA or Wiegand reader and its associated door furniture connects directly to a set of three terminal blocks on the MDU-4/MDU-2/2DC board. Each reader also has a switch on the MDU-4/MDU-2/2DC board, which specifies whether it is a 20mA or Wiegand reader.

To use Wiegand readers, a WIM-4 module must be fitted to SK4 on the MDU-4. A WIM-2 module must be fitted to SK1 on the MDU-2, and to SK2 on any 2DCs. It is allowable to have a mixture of Wiegand and 20mA readers connected to the same board.

Refer to the board layout figures (from page 5) for the locations of the reader and door terminal blocks, reader switches and WIM socket.

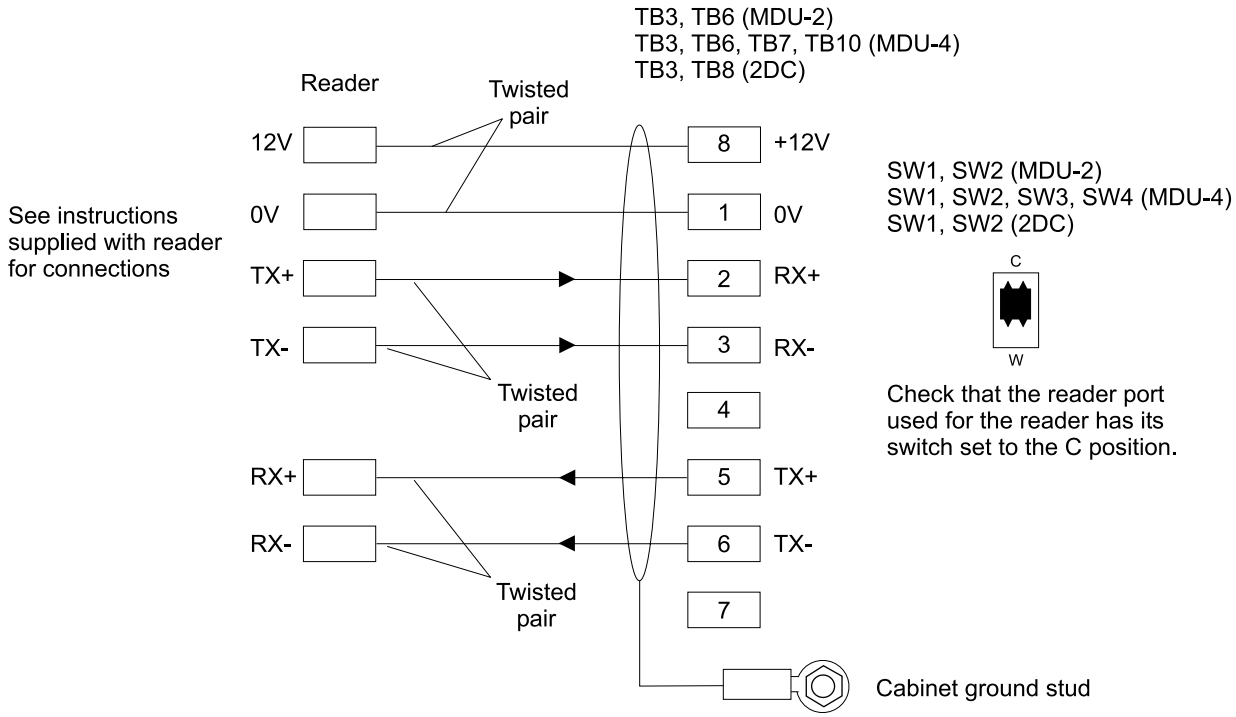


Figure 2-17 - Connections to 20mA Readers

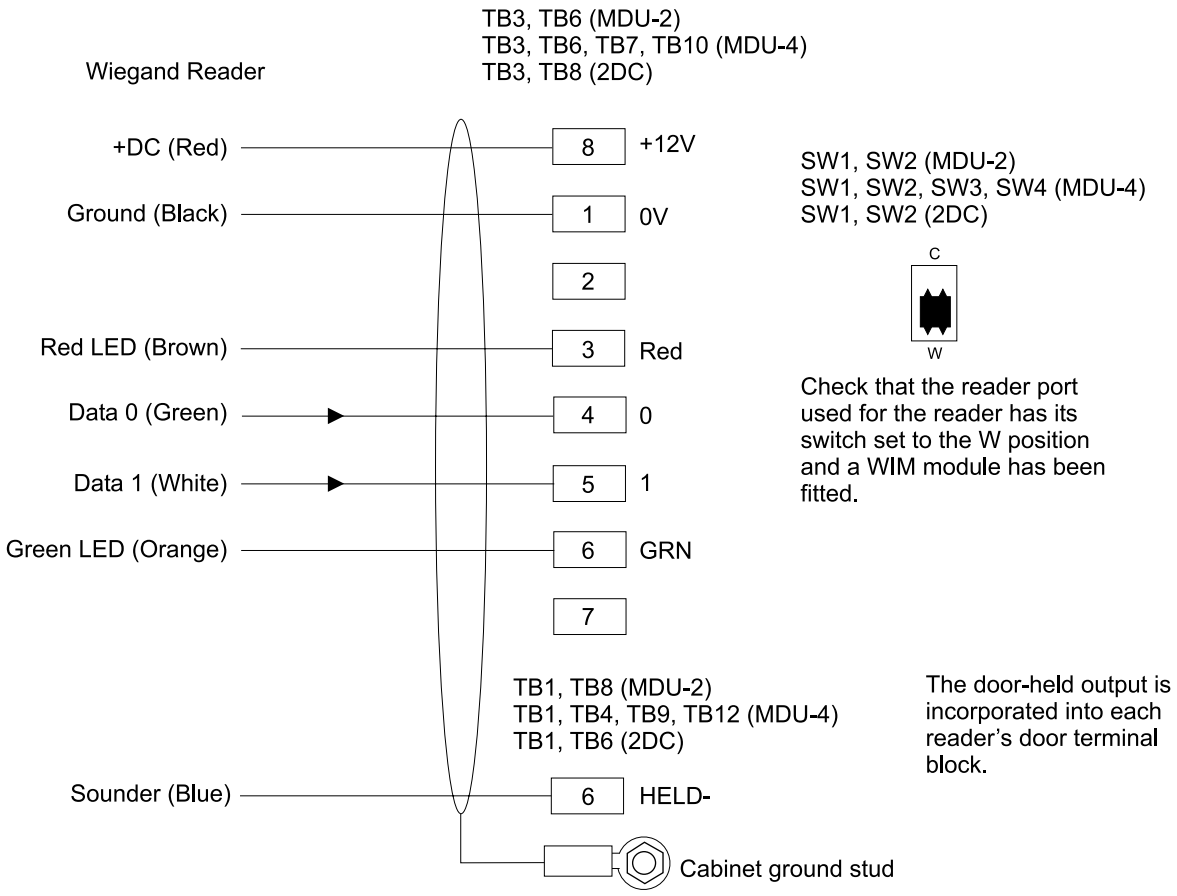


Figure 2-18 - Typical Connections for Wiegand readers

Two Readers at One Door

Two readers, one for entry and the other for exit, can be used at a single door. To achieve this, an odd-numbered reader must be used for the entry reader and the next even-numbered reader must be used for the exit reader. The corresponding odd-numbered door (Step 10) should then be used for connection to the door furniture. Connections are not required to the even-numbered door terminals.

Reader Numbers

Each reader controlled by an MDU-4 or MDU-2 has a unique reader number, which must be entered when setting up the reader in the access-control software.

The reader numbering starts with the readers that are connected directly to an MDU-4 or MDU-2 and continues through the readers connected to any 2DCs used. Refer to the following table.

Reader No.	MDU-4	MDU-2
1	Reader 1 on MDU-4	Reader 1 on MDU-2
2	Reader 2 on MDU-4	Reader 2 on MDU-2
3	Reader 3 on MDU-4	Reader 1 on 2DC with address 3-4
4	Reader 4 on MDU-4	Reader 2 on 2DC with address 3-4
5	Reader 1 on 2DC with address 5-6	
6	Reader 2 on 2DC with address 5-6	
7	Reader 1 on 2DC with address 7-8	
8	Reader 2 on 2DC with address 7-8	

The 2DC address is specified by the ADR0 and ADR1 links on the 2DC board (see page 26).

Door-Held Sounders

Held+ and Held- terminals are provided for each door, which can be connected to a purpose-made external door-held sounder (30 mA max). The Held+ terminal provides a constant +12 Vdc, whereas the Held- terminal is normally at +12 V, then pulses towards 0 V during a door-held condition.

There should be no need to use a separate door-held sounder if the readers used have an internal sounder. 20 mA readers with an internal sounder receive the door-held condition via the normal communication connections and require no connection to the Held terminals. Wiegand readers that have an integral sounder require a connection to the Held- terminal.

Step 10 - Connecting the Door Furniture and Bypass Circuits

Connect the door's release device, exit-request button, door monitor and bypass circuit to the appropriate door terminal block, as shown in this step. The exit-request button and bypass circuits are optional.

You can use any spare capacity available from the internal power supply to power door-release devices. Refer to page 42 for further details.

Make sure you connect to the correct door terminal block. "Door 1" is controlled by "Reader 1" (see Step 9 - Connecting the Readers) on the same MDU-4, MDU-2 or 2DC board. "Door 2" is controlled by "Reader 2", etc.

Refer to the board layout figures (from page 5) for the locations of the terminal blocks.

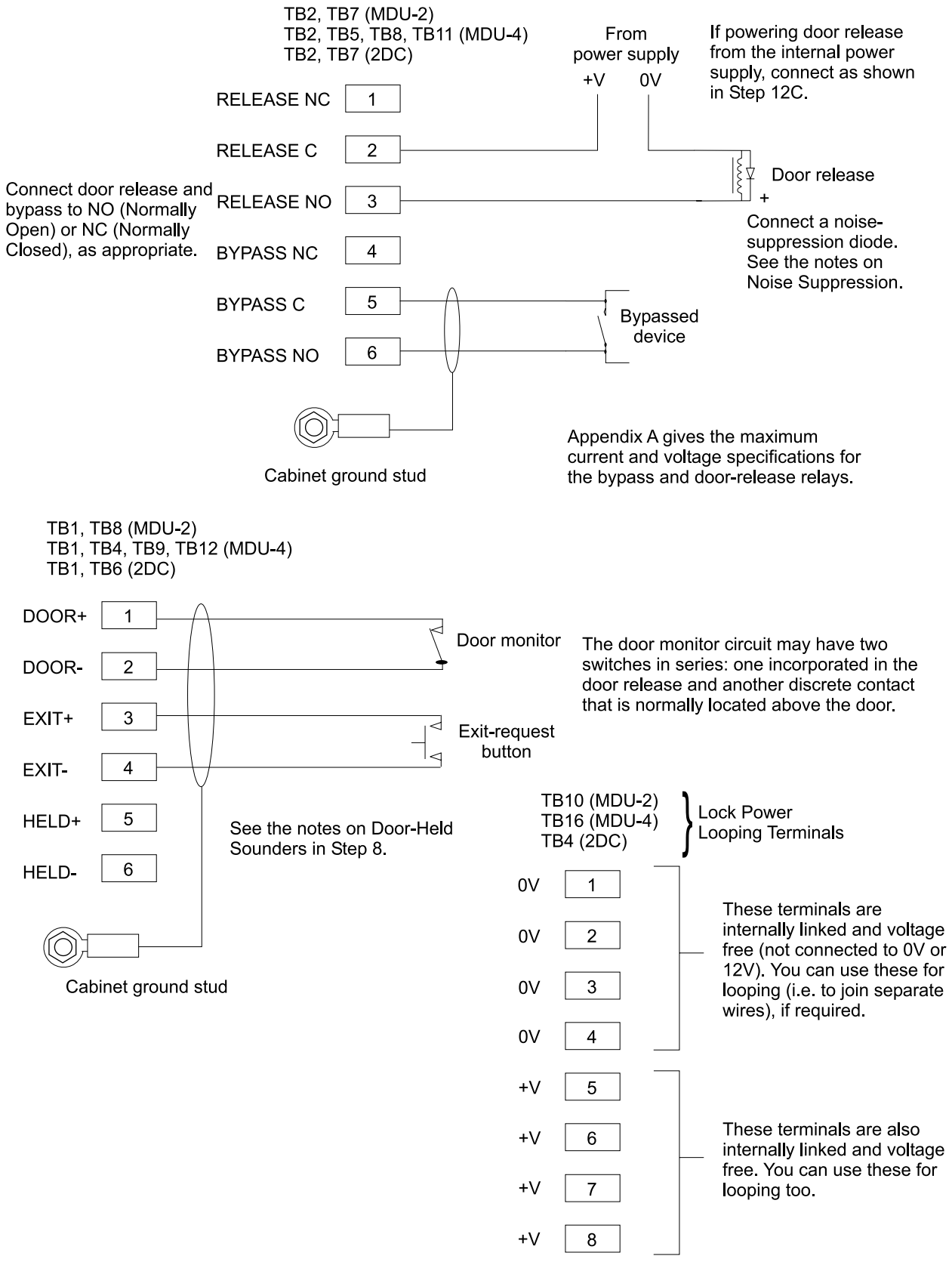


Figure 2-19 - Connections to Door Furniture

Noise Suppression

Locks or other inductive loads (including relays) must contain noise suppression circuitry. Some locks (e.g. Abloy Magneguard) already contain a metal-oxide varistor (MOV) to suppress noise. In this case, no additional circuitry should be fitted, or the lock may fail. In all other cases, an IN4004 suppression diode must be fitted across the coil connections (cathode bar to positive), as shown in Figure 2-20.

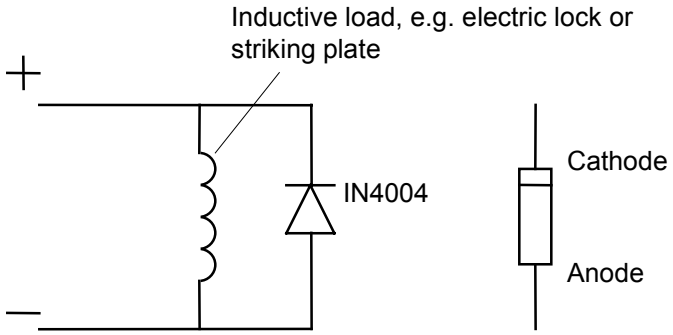


Figure 2-20 - Connecting a Noise Suppression Diode

Cable Supervision

The cables to door monitors, exit-request buttons and monitor points can be monitored for short and open circuits by adding terminating resistors to the end of the cable (i.e. as near as possible to the monitor-point contact, etc.). The resistor configuration determines whether three-state or four-state supervision is in use.

- In the case of four-state supervision, both short-circuits and open-circuits on the cable can be detected.
- If three-state supervision is used and the contact is normally open, only an open circuit on the cable can be detected. If the contact is normally closed, only a short-circuit can be detected.

The term "two-state supervision" means that the cable is not monitored for faults.

Figure 2-21, Figure 2-22 and Figure 2-23 show how to set up two-, three- and four-state supervision. The level of supervision can be different for each contact, and must be configured using the access-control software.

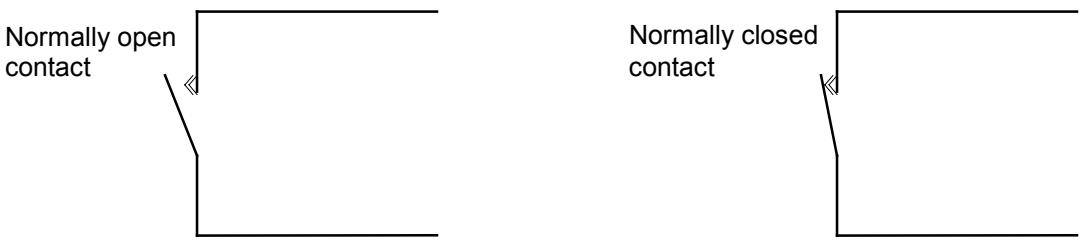


Figure 2-21 - Two-State Supervision

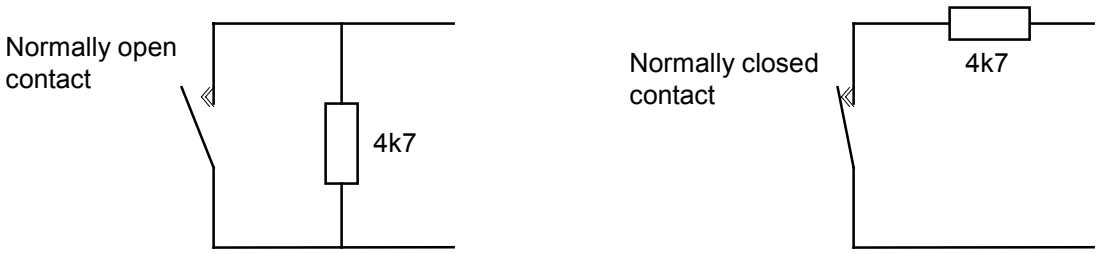


Figure 2-22 - Three-State Supervision

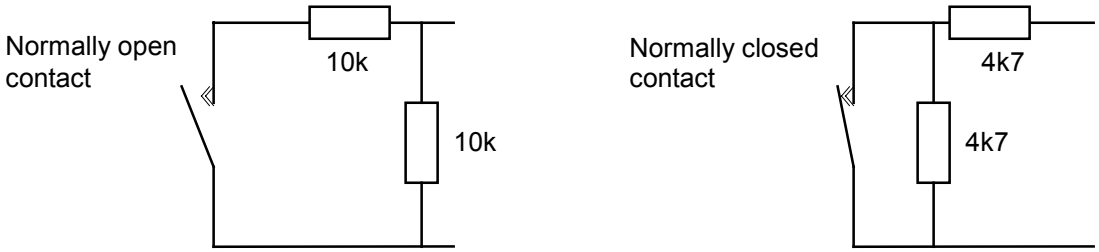


Figure 2-23 - Four-State Supervision

Step 11 - Connecting Auxiliary Outputs and Monitor Points

An MDU-4 board can have two Input/Output (I/O) modules fitted. An MDU-2 or 2DC board can have a single Input/Output module fitted. Each I/O module has 8 monitor-point inputs and 4 auxiliary outputs.

Fitting an I/O Module

Refer to Figure 2-24, Figure 2-25 or Figure 2-26. Fit three of the four supplied plastic spacers to the module, then push the module fully home into its socket. Using the screw provided, secure the module to the metal spacer (required for grounding).

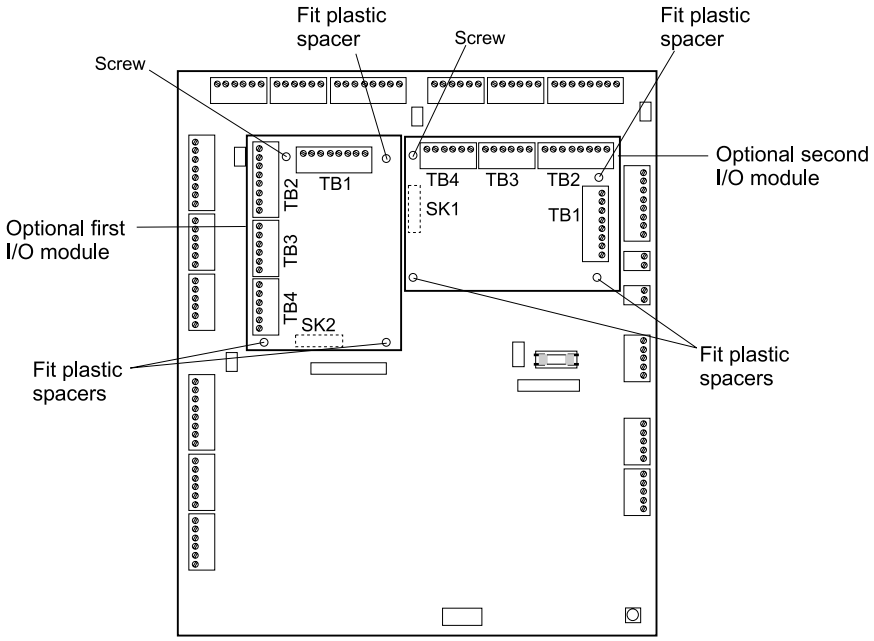


Figure 2-24 - Location of the I/O Modules on the MDU-4 Board

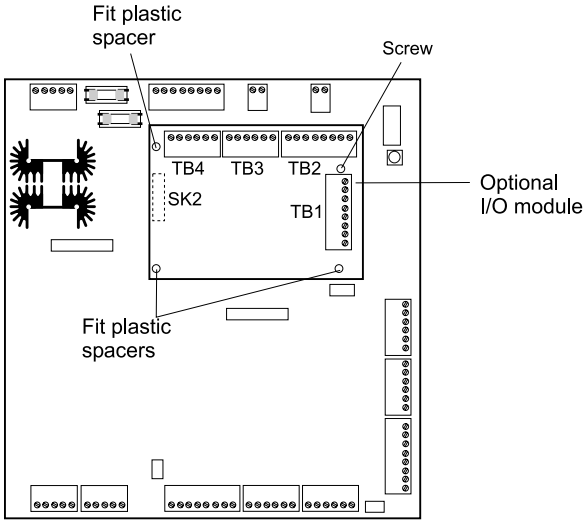


Figure 2-25 - Location of the I/O Module on the MDU-2 Board

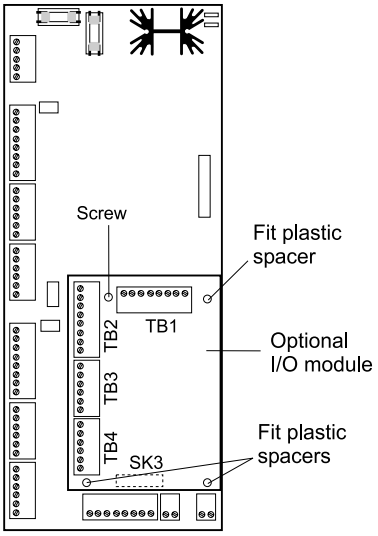


Figure 2-26 - Location of the I/O Module on the 2DC Board

Connecting Monitor Points to the I/O Module

Connect the monitor points to TB1 and TB2 as shown in the following diagram.

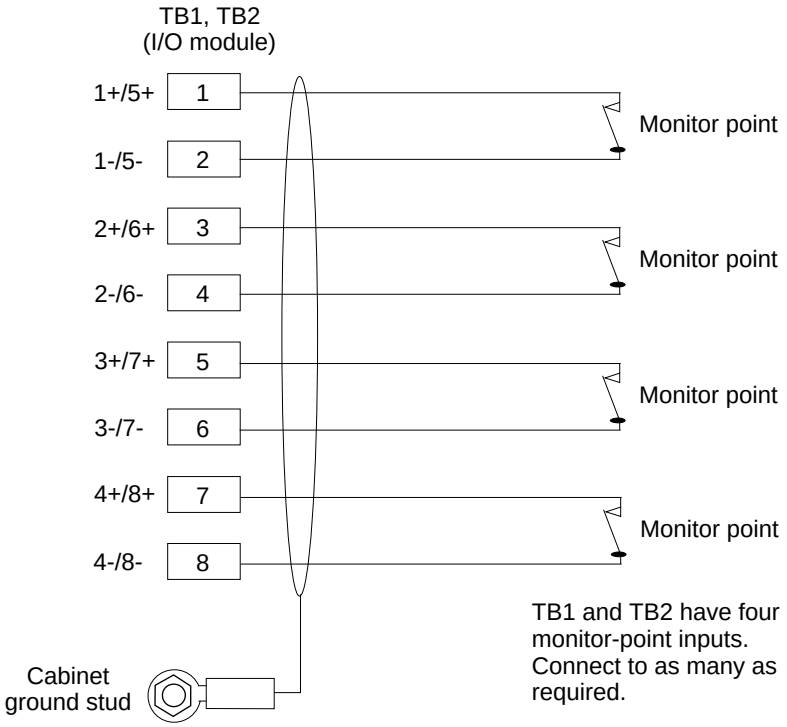


Figure 2-27 - Connections to Monitor Points

The cables to monitor points can be monitored for short and open circuits in the same way as for cables to door monitors and exit-request buttons. Refer to page 32.

Monitor Point Numbers

Each monitor point has a unique number, which must be entered when setting up the monitor point in the access-control software.

The monitor point numbering starts with the monitor points that are fitted to an I/O board on the MDU-4 or MDU-2 and continues through the I/O boards connected to any 2DCs used. Refer to the following table.

Monitor Point Number	MDU-4	MDU-2
1-4	TB1 of first I/O module on MDU-4	TB1 of I/O module on MDU-2
5-8	TB2 of first I/O module on MDU-4	TB2 of I/O module on MDU-2
9-12	TB1 of second I/O module on MDU-4	TB1 of I/O module on first 2DC
13-16	TB2 of second I/O module on MDU-4	TB2 of I/O module on first 2DC
17-20	TB1 of I/O module on 2DC with address 5-6	
21-24	TB2 of I/O module on 2DC with address 5-6	
25-28	TB1 of I/O module on 2DC with address 7-8	
29-32	TB2 of I/O module on 2DC with address 7-8	

The 2DC address is specified by the ADR0 and ADR1 links on the 2DC board (see page 26).

Connecting Auxiliary Outputs to the I/O Module

Connect the auxiliary outputs to TB3 and TB4 as shown in Figure 2-28.

The internal power supply has some spare capacity to power the auxiliary-output devices (see page 42), although it is unusual to power most types of auxiliary-output devices in this way.

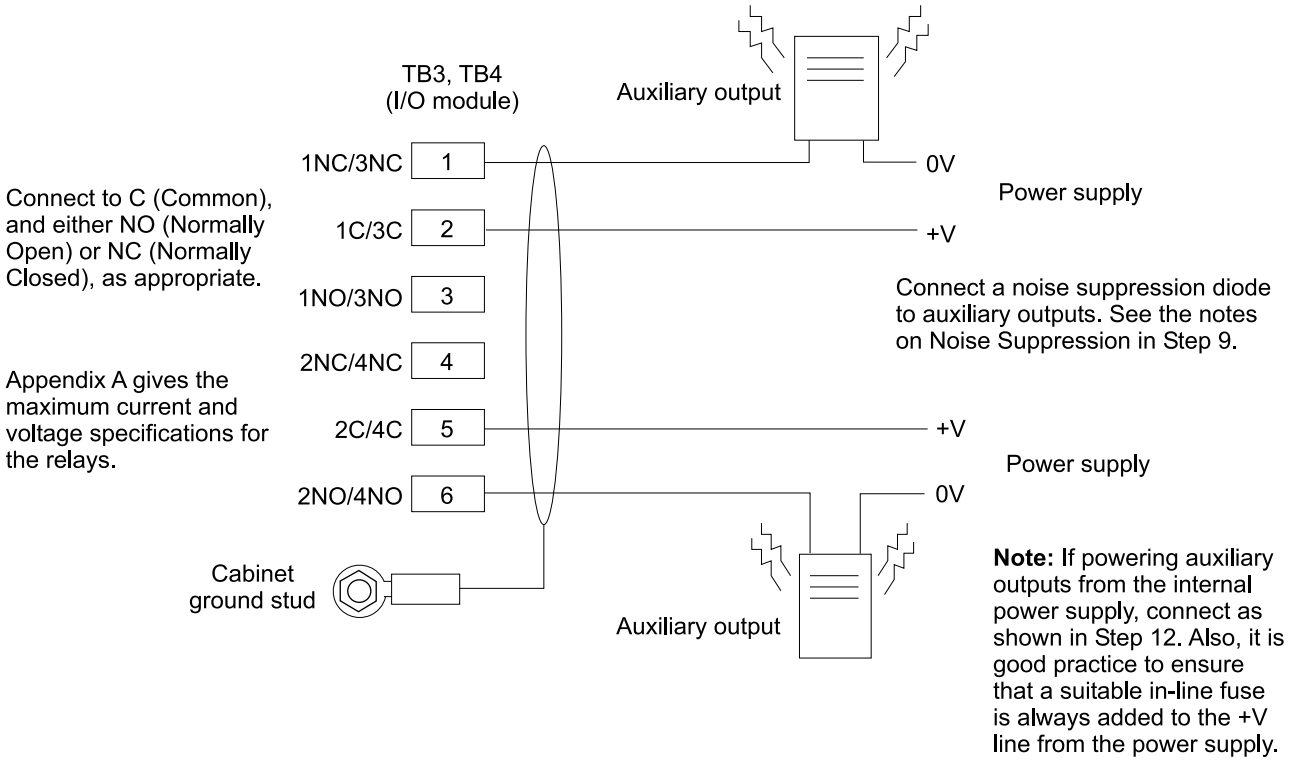


Figure 2-28 - Connections to Auxiliary Outputs

Auxiliary Output Numbers

Each auxiliary output has a unique number, which must be entered when setting up the auxiliary output in the access-control software.

The auxiliary output numbering starts with the auxiliary outputs that are fitted to an I/O board on the MDU-4 or MDU-2 and continues through the I/O boards connected to any 2DCsused. Refer to the following table.

Auxiliary Output Number	MDU-4	MDU-2
1-2	TB3 of first I/O module on MDU-4	TB3 of I/O module on MDU-2
3-4	TB4 of first I/O module on MDU-4	TB4 of I/O module on MDU-2
5-6	TB3 of second I/O module on MDU-4	TB3 of I/O module on first 2DC
7-8	TB4 of second I/O module on MDU-4	TB4 of I/O module on first 2DC
9-10	TB3 of I/O module on 2DC with address 5-6	
11-12	TB4 of I/O module on 2DC with address 5-6	
13-14	TB3 of I/O module on 2DC with address 7-8	
15-16	TB4 of I/O module on 2DC with address 7-8	

The 2DC address is specified by the ADR0 and ADR1 links on the 2DC board (see page 26).

Step 12 - Connecting Power

Carry out the following instructions in the order given. Refer to the board layout figures (from page 5) for the locations of the terminal blocks and fuse holders.

Step 12A - Make the Power Connections

With the node's supply voltage switched off and isolated, make the power connections as shown in Figure 2-29 and Figure 2-30. Refer to page 10 for power cable specifications.

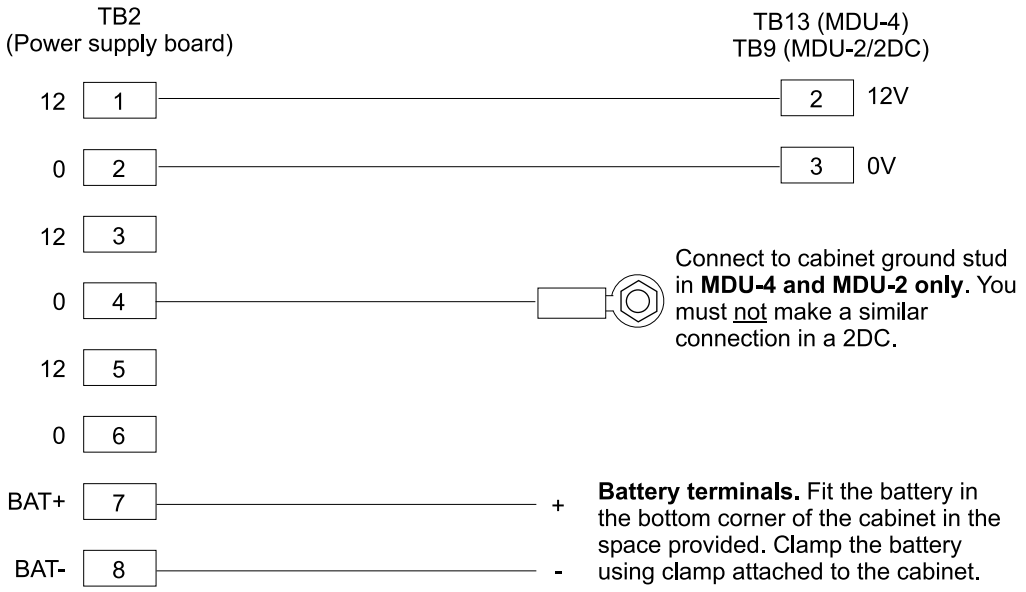


Figure 2-29 – Connections to the Power Supply Board

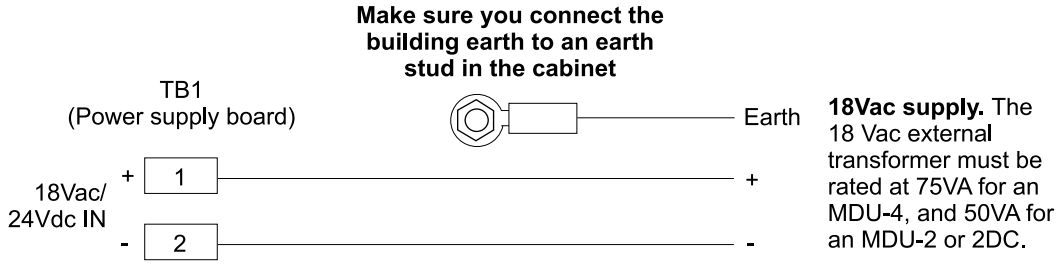


Figure 2-30 – Input Power Connections

Step 12B - Fit the On-Board Battery Link in the MDU-4/MDU-2

Make sure that the jumper is fitted across the battery link terminals (LK10 on the MDU-4, or LK8 on the MDU-2). This connects the on-board data-retention battery. All other links on the board are for future use.

Step 12C - Make Power Connections for Door Releases and Auxiliary Outputs

The power supply board may have spare capacity to power 12 Vdc door release devices and auxiliary outputs (see page 42). If the power supply board is to be used for this purpose, connect power to the door release or auxilary output as shown in Figure 2-31.

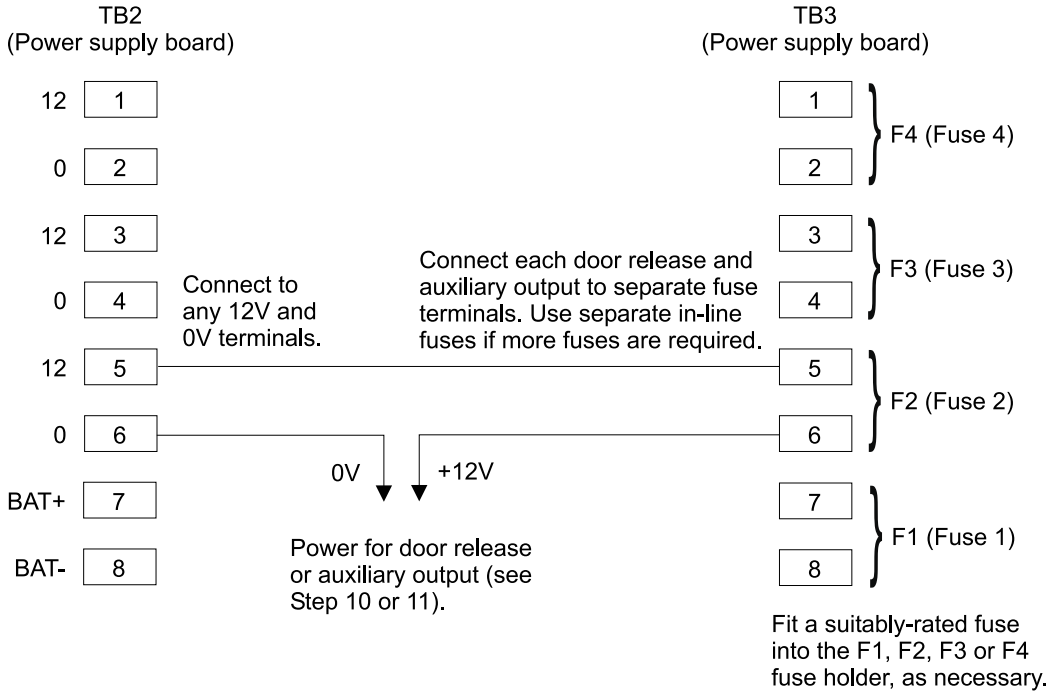


Figure 2-31 – Sourcing Door Release and Auxiliary Output Power from the Node

Step 12D - Refit cover and Switch on the External Power Supply

Make sure that an earth lead connects the cabinet cover to an earth stud in the cabinet, then refit the cover.

Now that all electrical connections have been made, the external supply voltage to the MDU-4, MDU-2 or 2DC can be switched on. The hardware is ready for use.

Appendix A: Specifications

Node Specifications

General

Maximum cable distances: see *Step 1 - Installing the* Cabling.

Cabinet dimensions: see *Step 2 - Mounting the Equipment*.

Door-release relays: rated at 28 Vdc, 3A maximum.

Bypass relays: rated at 28 Vdc, 3A maximum.

Door-held output: maximum of 30mA.

Reader port: 12 Vdc supply, maximum of 200mA per reader port.

Card capacity with standard 256K memory fitted: from 1,000 to 10,000 cards (software selectable).

Maximum buffered offline transactions with standard 256K memory fitted: 12,500 for 1,000 card capacity. 200 for 10,000 card capacity.

Card capacity with extended 1MB memory fitted: from 5,000 to 20,000 cards (software selectable).

Maximum buffered offline transactions with extended 1MB memory fitted: 56,000 for 5,000 card capacity. 35,000 for 20,000 card capacity.

Operating temperature: 32°F to 122°F (0°C to 50°C).

Operating humidity: 15% to 90% humidity, non-condensing.

Optional modules:

- **RS232 module** - For direct serial or dial-up communications with an access-control PC (an external RS232-to-20mA converter can be used instead).
- **Network interface card (NIC module)** - For Ethernet communications to an access-control PC.

- **I/O modules** - Up to two I/O modules can be fitted to each MDU-4 board. One I/O module can be fitted to an MDU-2 or 2DC. Each module provides 8 monitor-point inputs and 4 auxiliary outputs. The auxiliary-output relays are rated at: 28 Vdc, 3A maximum.
- **WIM-4 module** - To support connection of Wiegand-interfaced readers to the MDU-4.
- **WIM-2 module** - To support connection of Wiegand-interfaced readers to the MDU-2 or 2DC.

Node Power

The node requires an external 18 Vac supply. The external transformer must have a minimum rating of 75VA for an MDU-4, and 50VA for an MDU-2 or 2DC.

The power supply board provides an integral recharger for a 12 V 7AH sealed battery to maintain operation during a temporary mains failure.

Using the Internal Power Supply

The 12 Vdc provided by the power supply board powers the PCB electronics and recharges the optional 12 V 7AH sealed battery. There is also spare capacity to power readers, door locks (Figure 2-19) and auxiliary outputs (Figure 2-28). In the normal worst-case scenario where all applicable modules are fitted (including the NIC module on an MDU-4 or MDU-2), all relays being permanently energized and the battery requiring a full recharge, the following current is available:

- **MDU-4** - 2.52 A available, e.g. for 4 readers and 4 locking devices.
- **MDU-2** - 2.80 A available, e.g. for 2 readers and 2 locking devices.
- **2DC** - 3.21 A available, e.g. for 2 readers and 2 locking devices.

The current required for each reader type is given in the sections that follow.

If the node does not use all available optional modules, you may like to calculate the available current yourself. You can use the following information to do this:

Power supply board provides:	4000 mA maximum.
MDU-4 board uses:	450 mA.
MDU-2 board uses:	280 mA
2DC board uses:	180 mA
Worst-case battery recharge uses:	500 mA.
NIC module uses:	310 mA
RS232 module uses:	80 mA
Each I/O module uses:	110 mA

Example - MDU-4 is fitted with a NIC module and two I/O modules:

Battery uses:	500 mA
MDU-4 board uses:	450 mA
NIC module uses:	310 mA
Two I/O modules use:	220 mA
TOTAL CURRENT REQUIRED	1480 mA
Power supply provides:	4000 mA
TOTAL AVAILABLE:	2520 mA (e.g. to power 4 readers and locks)

Reader Specifications

S620 Reader (20mA Magstripe Reader with Keypad)

Input current: 100mA @ nominal 12 Vdc.

Integral sounder for door-held and other feedback (signaled via reader communications).

Operating temperature: -4°F to 122°F (-20°C to 50°C) without heater.

Operating humidity: 15% to 90%, non-condensing.

Optional heater and gasket kit for outside mounting.

S635 Reader (20mA Mullion Magstripe Reader, no Keypad)

Input current: 100mA @ nominal 12 Vdc.

Integral sounder for door-held and other feedback (signaled via reader communications).

Operating temperature: -4°F to 122°F (-20°C to 50°C) without heater.

Operating humidity: 15% to 90%, non-condensing.

Optional heater and gasket kit for outside mounting.

S640 Reader (20mA Keypad-Only Reader)

Input current: 50mA @ nominal 12 Vdc.

Integral sounder for door-held and other feedback (signaled via reader communications).

Operating temperature: -4°F to 122°F (-20°C to 50°C) without heater.

Operating humidity: 15% to 90%, non-condensing.

Optional heater and gasket kit for outside mounting.

S670 Reader (20mA Proximity Reader Without Keypad)

Input current: 100mA @ nominal 12 Vdc.

Integral sounder for door-held and other feedback (signaled via reader communications).

Operating temperature: -4°F to 122°F (-20°C to 50°C) without heater.

Operating humidity: 15% to 90%, non-condensing.

Optional heater and gasket kit for outside mounting.

S671 Reader (20mA Proximity Reader With Keypad)

Input current: 100mA @ nominal 12 Vdc.

Integral sounder for door-held and other feedback (signaled via reader communications).

Operating temperature: -4°F to 122°F (-20°C to 50°C) without heater.

Operating humidity: 15% to 90%, non-condensing.

Optional heater and gasket kit for outside mounting.

S680 Reader (20mA Mullion Proximity Reader, no Keypad)

Input current: 100mA @ nominal 12 Vdc.

Integral sounder for door-held and other feedback (signaled via reader communications).

Operating temperature: -4°F to 122°F (-20°C to 50°C).

Operating humidity: 15% to 90%, non-condensing.

For internal or external mounting.

S682 Reader (Wiegand Mullion Proximity Reader, no Keypad)

Input current: 100mA @ nominal 12 Vdc.

Integral sounder for door-held and other feedback. To use door-held feedback, a connection must be made to the Held terminal; see page 28.

Operating temperature: -4°F to 122°F (-20°C to 50°C).

Operating humidity: 15% to 90%, non-condensing.

For internal or external mounting.

S710 Reader (20mA Smart-Card Reader Without Keypad)

Input current: 150mA @ nominal 12 Vdc.

Integral sounder for door-held and other feedback (signaled via reader communications).

Operating temperature: -4°F to 122°F (-20°C to 50°C) without heater.

Operating humidity: 15% to 90%, non-condensing.

Optional heater and gasket kit for outside mounting.

S711 Reader (20mA Smart-Card Reader With Keypad)

Input current: 150mA @ nominal 12 Vdc.

Integral sounder for door-held and other feedback (signaled via reader communications).

Operating temperature: -4°F to 122°F (-20°C to 50°C) without heater.

Operating humidity: 15% to 90%, non-condensing.

Optional heater and gasket kit for outside mounting.

Appendix B: LEDs, Fuses and Resetting the Node

LED Meanings

If appropriate, check the operation of the LEDs on the NIC module, or on the MDU-4, MDU-2 or 2DC board for unusual activity or inactivity.

LEDs on the NIC Module

The LED furthest from the reset button flashes green approximately every two seconds to show that the module is active, and occasionally red as packets are sent and received. The LED closest to the reset button is solidly lit green when there is a valid Ethernet connection.

LEDs on the MDU-4 Board

LED2/3/5/8 (Tx) - Illuminated when transmitting data to a 20mA reader (off for Wiegand).

LED1/4/6/7 (Rx) - Illuminated when receiving data from a 20mA reader (off for Wiegand).

LED9 (POWER) - Lit steadily while power is applied.

LED10 (DCP OK) - When the unit's door control processing is functioning correctly, this should flash at two-second intervals (one second on and one second off).

LED11 (DCP COMMS Rx) - Illuminated when receiving data from a 2DC.

LED12 (DCP COMMS Tx) - Illuminated when transmitting data to a 2DC.

LED13 (DBP OK) - When database processing is functioning correctly, this should flash at two-second intervals (one second on and one second off).

LED14 (DATA B Tx) - Flashes when there is a node connected to the Host Comms B port. Otherwise, the LED is not illuminated.

LED15 (DATA B Rx) - Flashes when there is a node connected to the Host Comms B port. Otherwise, the LED is permanently illuminated.

LED16 (DATA A Tx) - Flashes when there is a node connected to the Host Comms A port. Otherwise, the LED is not illuminated.

LED17 (DATA A Rx) - Flashes when there is a node connected to the Host Comms A port. Otherwise, the LED is permanently illuminated.

LEDs on the MDU-2 Board

LED2/3 (Tx) - Illuminated when transmitting data to a 20mA reader (off for Wiegand).

LED1/4 (Rx) - Illuminated when receiving data from a 20mA reader (off for Wiegand).

LED5 (DATA A Rx) - Flashes when there is a node connected to the Host Comms A port. Otherwise, the LED is permanently illuminated.

LED6 (DATA A Tx) - Flashes when there is a node connected to the Host Comms A port. Otherwise, the LED is not illuminated.

LED7 (DATA B Rx) - Flashes when there is a node connected to the Host Comms B port. Otherwise, the LED is permanently illuminated.

LED8 (DATA B Tx) - Flashes when there is a node connected to the Host Comms B port. Otherwise, the LED is not illuminated.

LED9 (DBP OK) - When database processing is functioning correctly, this should flash at two-second intervals (one second on and one second off).

LED10 (DC COMMS Tx) - Illuminated when transmitting data to a 2DC.

LED11 (DC COMMS Rx) - Illuminated when receiving data from a 2DC.

LED12 (DCP OK) - When the unit's door control processing is functioning correctly, this should flash at two-second intervals (one second on and one second off).

LED13 (PWR) - Lit steadily while power is applied.

LEDs on the 2DC Board

LED1 (OK) - When the unit's door control processing is functioning correctly, this should flash at two-second intervals (one second on and one second off).

LED2 (POWER) - Lit steadily while power is applied.

LED3 (TXD) - Illuminated when transmitting data to an MDU-4/MDU-2.

LED4 (RXD) - Illuminated when receiving data from an MDU-4/MDU-2.

LED5/7 (Rx) - Illuminated when receiving data from a 20mA reader (off for Wiegand).

LED6/8 (Tx) - Illuminated when transmitting data to a 20mA reader (off for Wiegand).

Fuses

If appropriate, check the fuses, and replace any blown fuse. The following fuses are fitted:

It is good practice to disconnect battery power and the external supply voltage before replacing any fuses in the node.

MDU-4

FS1 (2A Fast) – 12 V input fuse.

MDU-2

FS1 (1A Fast) – 12 V input fuse.

FS2 (1A Fast) – 24 V input fuse (not used).

2DC

FS1 (1A Fast) – 24 V input fuse (not used).

FS2 (1A Fast) – 12 V input fuse.

Power Supply

F1 – Fuse for door release or auxiliary output connected to F1 terminal on TB3.

F2 – Fuse for door release or auxiliary output connected to F2 terminal on TB3.

F3 – Fuse for door release or auxiliary output connected to F3 terminal on TB3.

F4 – Fuse for door release or auxiliary output connected to F4 terminal on TB3.

F5 (4A Time Delay) – Input fuse.

F7 (5A resettable) – Output fuse.

Warm and Cold Resets

A warm reset of an MDU-4 or MDU-2 can be achieved by pressing then immediately releasing the reset button, which is SW6 on the MDU-4 board, and SW3 on the MDU-2 board. A warm reset restarts the processor. It does not clear data from the node, such as card and other data that has been downloaded from the access-control software.

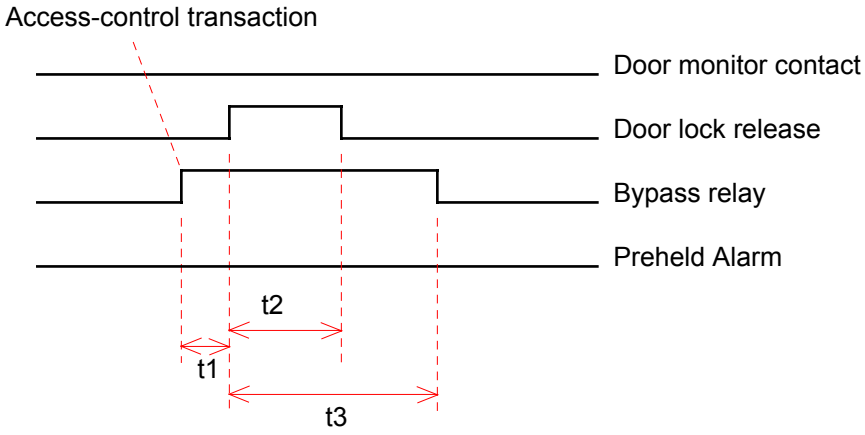
A cold reset can be achieved at an MDU-4 or MDU-2 by pressing then holding down the reset button for at least ten seconds. A cold start clears the node's memory to factory-set defaults and should be performed only as a last resort. After a cold reset, card and other data needs to be downloaded to the node using the **Install/Download a Node** option in the access-control software.

Under normal circumstances, there should be no need to perform a warm or cold reset.

Appendix C: Door Timing

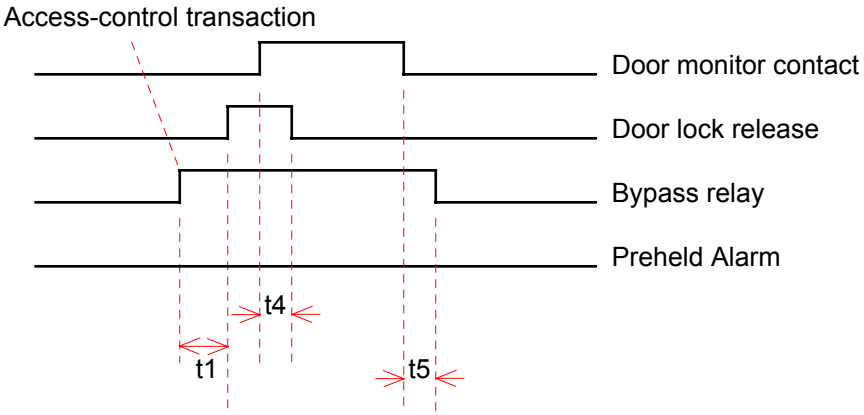
This appendix gives details of the door monitor, door release, bypass and preheld-alarm timings. The timings are dependent on the options selected in the Doors and Options tabs in the Install/Reader Definitions screen in the access-control software. For further information, refer to the online help in the access-control software.

Timing Diagram 1: Valid Card Re-Lock Options = Door Opens Door not opened



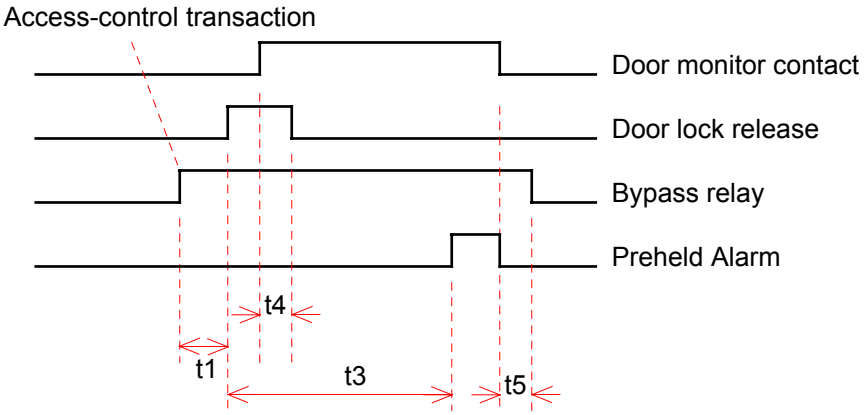
t1=delay time, t2=unlock time, t3=open time

Timing Diagram 2: Valid Card Re-Lock Options = Door Opens
Door closed before open time expires



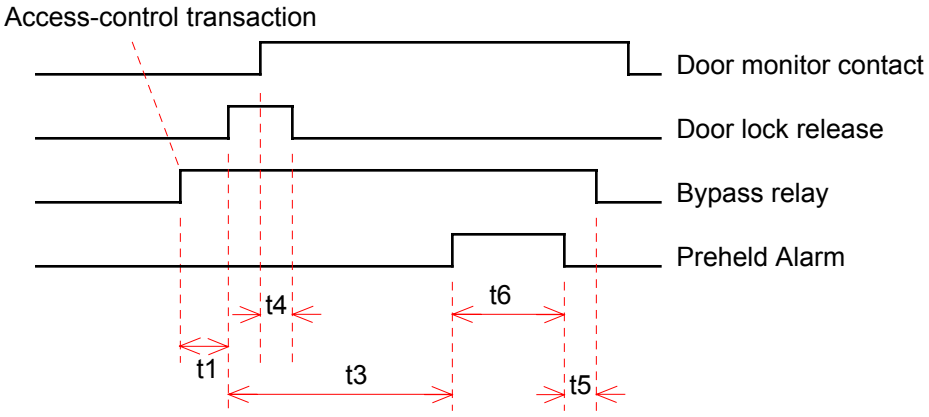
t1=delay time, t4=keep time, t5=hold time

Timing Diagram 3: Valid Card Re-Lock Options = Door Opens
Door closed before preheld time expires



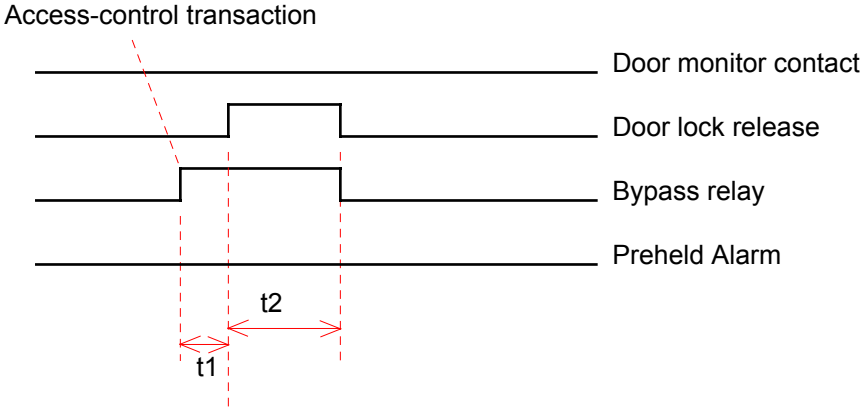
t1=delay time, t3=open time, t4=keep time, t5=hold time

Timing Diagram 4: Valid Card Re-Lock Options = Door Opens
Door closed after preheld time expires



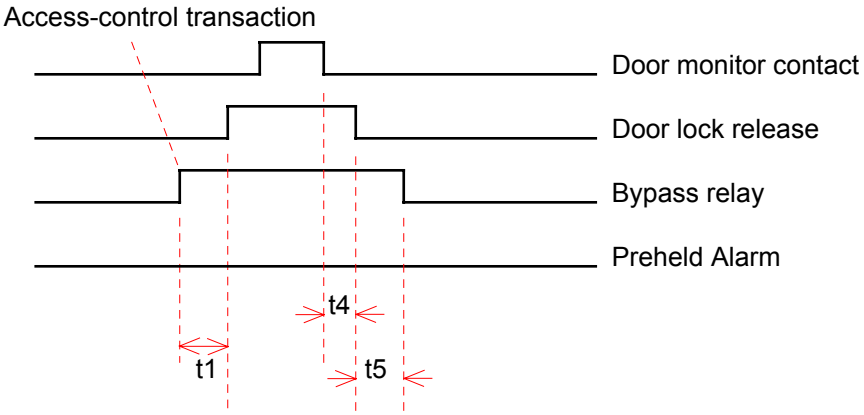
t1=delay time, t3=open time, t4=keep time, t5=hold time, t6=preheld time

Timing Diagram 5: Valid Card Re-Lock Options = Door Closes
Door not opened



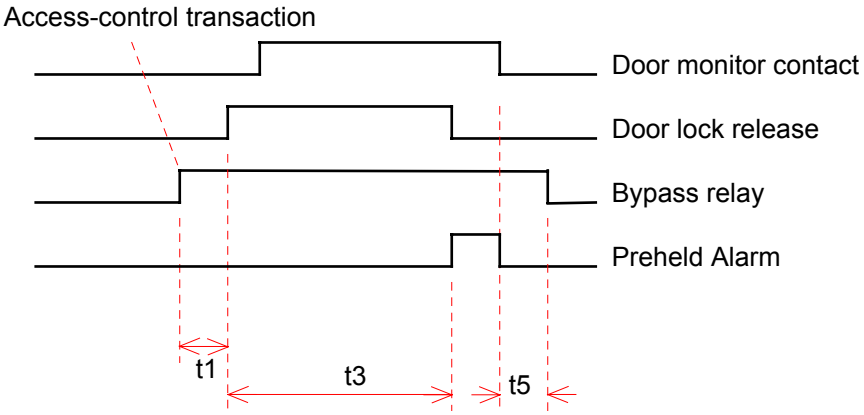
t1=delay time, t2=unlock time

Timing Diagram 6: Valid Card Re-Lock Options = Door Closes
Door closed before open time expires



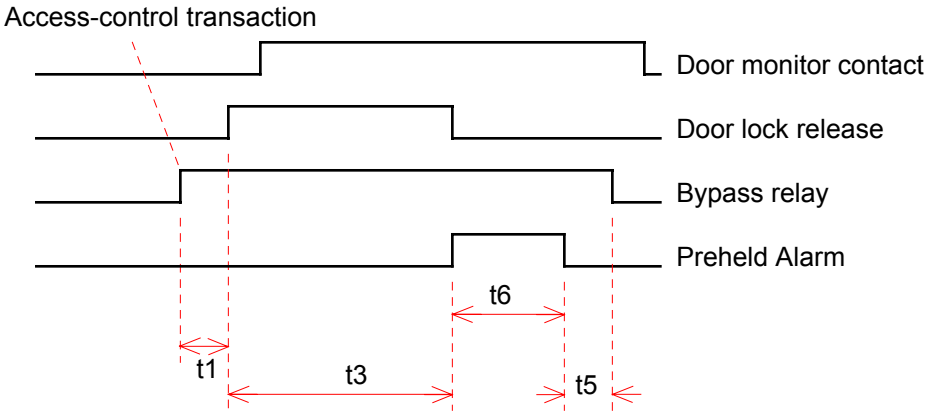
t1=delay time, t4=keep time, t5=hold time

Timing Diagram 7: Valid Card Re-Lock Options = Door Closes
Door closed before preheld time expires



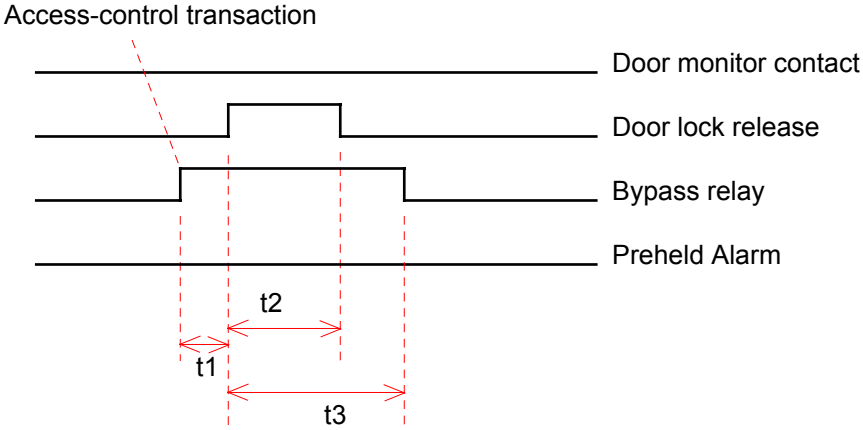
t1=delay time, t3=open time, t5=hold time

Timing Diagram 8: Valid Card Re-Lock Options = Door Closes
Door closed after preheld time expires



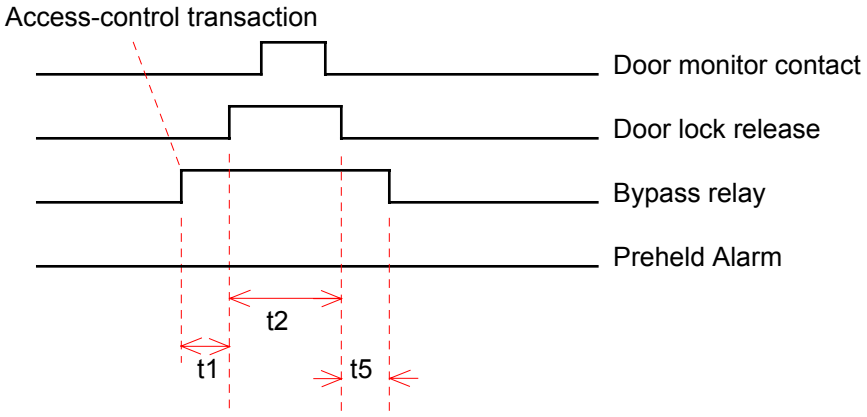
t1=delay time, t3=open time, t5=hold time, t6=preheld time

Timing Diagram 9: Valid Card Re-Lock Options = Unlock Time Expires
Door not opened



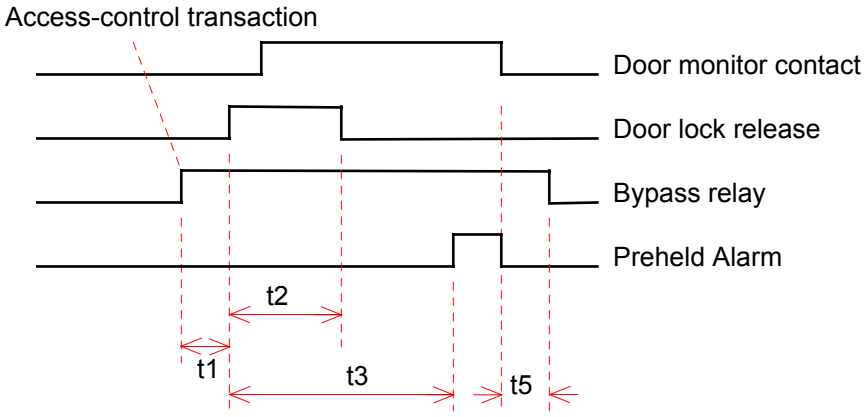
t1=delay time, t2=unlock time, t3=open time

Timing Diagram 10: Valid Card Re-Lock Options = Unlock Time Expires
Door closed before open time expires



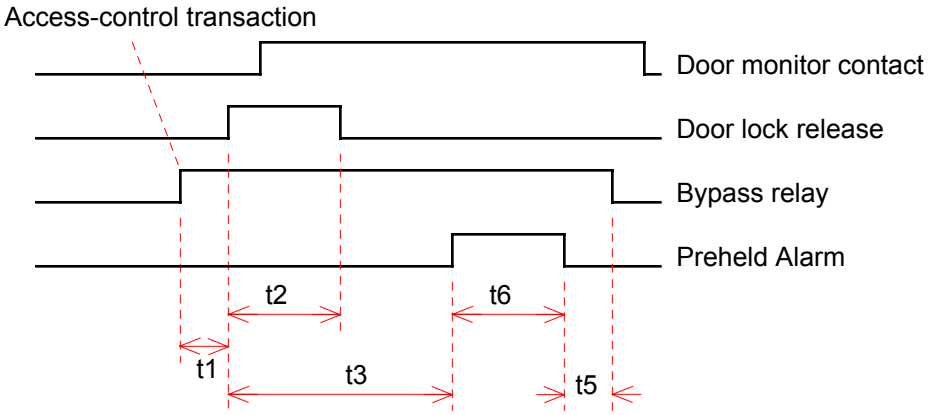
t1=delay time, t2=unlock time, t5=hold time

Timing Diagram 11: Valid Card Re-Lock Options = Unlock Time Expires
Door closed before preheld time expires



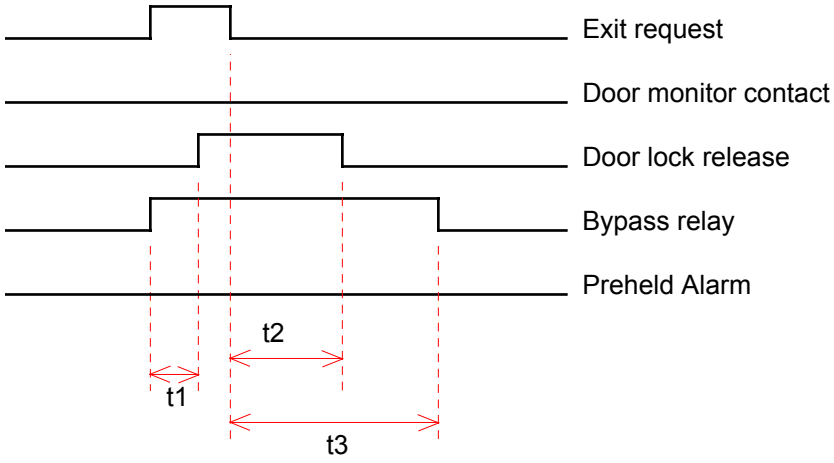
t1=delay time, t2=unlock time, t3=open time, t5=hold time

Timing Diagram 12: Valid Card Re-Lock Options = Unlock Time Expires
Door closed after preheld time expires



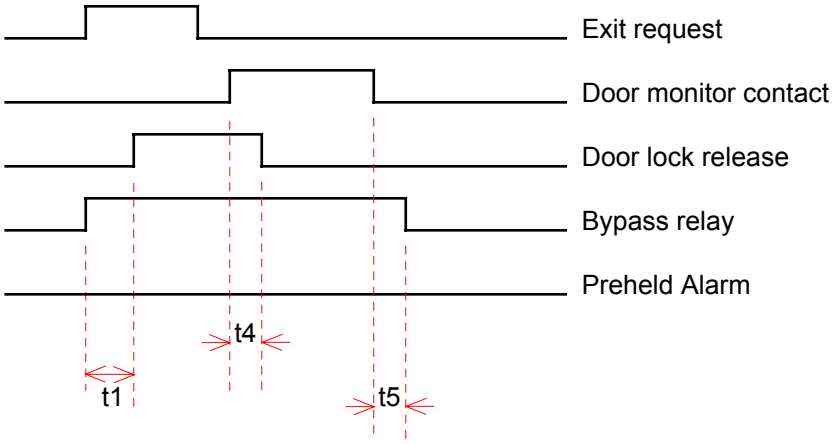
t1=delay time, t2=unlock time, t3=open time, t5=hold time, t6=preheld time

Timing Diagram 13: Valid Card Re-Lock Options = Door Opens
Exit Request Re-Lock Options = Follow Exit Request
Door not opened



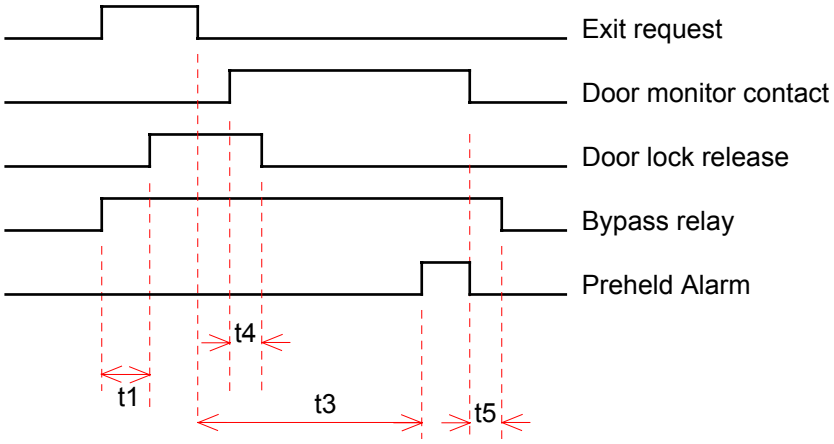
t1=delay time, t2=unlock time, t3=open time

Timing Diagram 14: Valid Card Re-Lock Options = Door Opens
Exit Request Re-Lock Options = Follow Exit Request
Door closed before open time expires



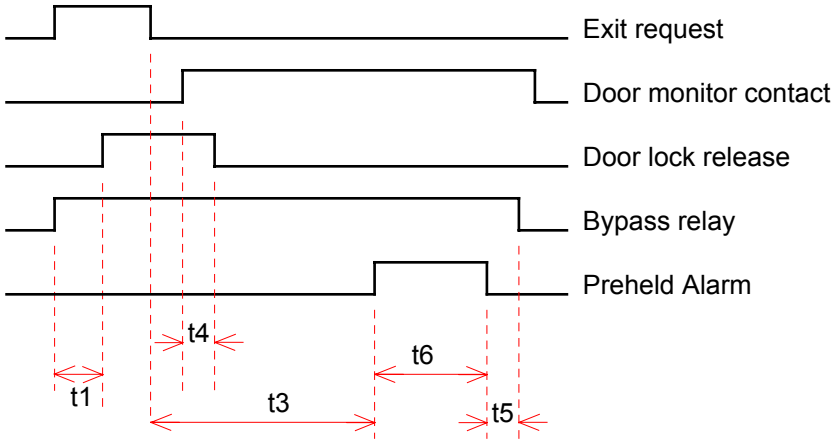
t1=delay time, t4=keep time, t5=hold time

Timing Diagram 15: Valid Card Re-Lock Options = Door Opens
Exit Request Re-Lock Options = Follow Exit Request
Door closed before preheld time expires



t1=delay time, t3=open time, t4=keep time, t5=hold time

Timing Diagram 16: Valid Card Re-Lock Options = Door Opens
Exit Request Re-Lock Options = Follow Exit Request
Door closed after preheld time expires



t1=delay time, t3=open time, t4=keep time, t5=hold time, t6=preheld time