TS1066 Network Access Controller Installation Manual

STOP!

Before you begin

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WEEE compliance

For proper recycling, dispose all the batteries and the packaging as required by local ordinances or regulations

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Important information

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Installation in accordance with these manual, applicable codes and the instructions of the authority having jurisdiction is mandatory.

The customer is responsible for testing and determining the suitability of this product for specific applications. The customer is responsible for testing the product at least once every three months.

While every precaution has been taken during the preparation of this manual to ensure the accuracy of its contents, Carrier Fire & Security assumes no responsibility for errors or omissions.

Agency compliance

This product conforms to the standards set by Standards Australia on behalf of the Australian Communications and Media Authority (ACMA).

Ensure that enclosure covers are fitted to maintain ACMA compliance.

Notice! This is a Class B product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Contact information

For contact information, see https://www.firesecurityproducts.com.au/.

Product overview

This manual applies to the following models:

- **TS1066** Network Access Controller
- **TS1066-4** Network Access Controller 4 door

All features and functionality between these models is identical, with the exception of the total number of doors. For the purposes of this manual, unless otherwise specified ‘TS1066’ and ‘TS1066B’ shall refer to all models generically.

Up to 12 Network Access Controllers can be connected to a Challenger*Plus* panel’s RS-485 system LAN. Challenger*Plus* panels have two RS-485 system LANs and can have a total of 24 Network Access Controllers.

The Network Access Controller can operate independently of a Challenger*Plus* panel, depending on its operating mode.

The Network Access Controller, in addition to its Tecom bus, has two RS-485 buses (local LANs) to connect readers for doors, as well as RASs, DGPs, and Tecom peripherals.

Network Access Controllers provide enhanced access control functionality to the Challenger*Plus* system. This manual describes:

- How to install the Network Access Controller
- How to connect other equipment to the Network Access Controller

This manual is intended for use only by trained Challenger installation and configuration technicians.

Refer to the MAPROG-TS1066 Network Access Controller Programming Manual for more details on supported system configurations.

Specifications

Mechanical	Physical dimensions		
	(W x D x H)	mm	254 x110 x55
	Weight		
	product	g	330
	boxed	kg	12
Electrical	AC input voltage		
	Nominal	Vrms	19
	Limits*	Vrms	15 to 24.5
	Battery requirements		
	Type		SLA(Sealed Lead Acid)/ VRLA(Valve regulated Lead Acid)
	Terminal voltage		
	Nominal	V	12
	Maximum	V	15 (severely overcharged)
	Charging current limit	A	>1.5
	Compliance		AS/NZS 2201.1:2007, Appendix C
	Battery cable fuse		M205 (5x20 mm) Time lag (slow blow)
	Current	A	8
	Voltage	VAC	250
	Example parts		Bel Fuse 0655R8000-19 Schurter 0034.3126 Shanghai Fullness GTL1800200
	OR		
	Battery cable fuse		3AG slow blow
	Current	A	8
	Voltage	VAC	250
	Example parts		Bel Fuse 3SB 8-R Schurter 8020.5020 Littelfuse 0313008.HXP
Environmental	Room temperature		
	Storage	°C	-20 to +80
	Operating**	°C	0 to +50
	Relative humidity	%	0 to 93 non-condensing
	Location		Indoor. Dry area.
	Pollution Class		2 or lower
	Altitude	m	≤ 2000
Enclosure details	Compatible enclosure		ENC-LGE

* Includes all tolerances and Mains supply variations.

**Refer to Appendix C: Operating temperature.

Product contents

Inspect the package and contents for visible damage. If any components are damaged or missing, do not use the unit; contact the supplier immediately. If you need to return the unit, you must ship it in the original box.

Table 1 lists the items that are shipped with a TS1066 Network Access Controller.

Table 1: TS1066 shipping list

Quantity	Item
1	TS1066B board
1	*TS1066 Network Access Controller Installation Manual*
7	M3 x 10 pan head screws
6	Standoff board mounts
12	3-way plug-on screw terminal connectors
14	2-way plug-on screw terminal connectors
2	Battery leads (combined negative and fused positive)
1	1K 1/4 watt resistor
16	10K 1/4 watt resistors
5	Link jumpers

Warning

Take appropriate precautions if working on an active or recently de-powered device.

The circuit board and the heatsink on the Network Access Controller board may be hot.

Do not touch.

Related documentation

The *ChallengerPlus Installation and Quick Programming Manual* and *ChallengerPlus Programming Manual* provide detailed information about configuring and programming a Challenger*Plus* system.

The *ENC-LGE Large Enclosure Installation Manual* provides instructions for installing the ENC-LGE Large Enclosure.

The *TS1066 Network Access Controller Programming Manual* provides detailed information about configuring and programming the Network Access Controller.

The Challenger system is modular. Refer to the documentation that is shipped with each module that you intend to use.

Before you begin

When installing a Network Access Controller, or any other parts of the system, you need to be aware of requirements for cabling and earthing, and plan accordingly. Refer to “Appendix D: Cabling requirements” on page 36.

Notice! A qualified service person, complying with all applicable codes, should perform all required hardware installation.

The customer is responsible for testing and determining the suitability of this product for specific applications. The customer is responsible for testing the product at least once every three months.

Disclaimer: This manual contains recommendations based on Australia and New Zealand codes. It is not an authoritative reference regarding codes and has not been reviewed by the responsible authorities. The codes may change and may not be reflected in this document.

Safety Warnings

Field wiring errors or damage may present hazardous voltages inside the enclosure. Treat all wires and boards in the enclosure as hazardous until checked and validated as safe.

Carrier Fire & Security recommends the use of personal protection equipment, such as gloves, glasses, voltage detectors and meters for all installation and maintenance operations.

Enclosure Access Restrictions

To comply with Australian standard AS/NZS 60950-1, access to the interior of the enclosure:

- Must be restricted to suitably trained and qualified installation and maintenance technicians.
- Must require the use of a tool.

These restrictions can be met by implementing one or more of the following options:

- Fit a lock to the enclosure. Ensure that the unit is locked when unsupervised.
- Tighten the door screws ¼ turn beyond finger tight (i.e. > 2Nm) using a tool.
- Secure the door with M6 standard or tamper proof screws (not supplied), firmly tightened.

Installing the Network Access Controller

Installation guidelines

Installers must adhere to any country dependent requirements and local applicable standards.

- Installation must be performed in accordance with AS/NZS 2201.
- The installation environment must comply with environmental specifications.
- The Network Access Controller, as well as all other boards with earth terminals must be earthed according to the recommendations in the section “System earthing" in Appendix D: Cabling requirements on page 36.
- The batteries used with this unit must comply with the requirements provided in the section “Batteries” on page 17.
- Avoid loops of wire inside the enclosure, and route cables so that they do not lie on top or underneath the printed circuit board. The use of cable ties is recommended and improves neatness of the wiring within the box. All wires entering the enclosure should be secured near point of entry, as required by applicable codes.

Installation procedure

The Network Access Controller must be installed in an approved, compatible enclosure, as detailed in the Specifications table on page 7. Ensure the enclosure has been mounted on the wall and the transformer is installed in the enclosure before mounting the Network Access Controller. Refer to the enclosure installation manual for the details.

Mounting Network Access Controller in the enclosure

The installation procedure is as follows:

1. Install six standoff board mounts for the TS1066B board in the enclosure. Refer to the enclosure installation for standoff mount location and fitment.
2. Remove the TS1066 board from its antistatic bag.
3. Use six M3 x 10 pan head screws to fix the board to the enclosure’s standoffs. Refer to Figure 2 on page 13 for the mounting hole locations.
4. Combine terminal blocks as appropriate (e.g. 2 x 3-way, 2-way + 3-way, 2 x 2-way) and attach to the headers (e.g. 6-way, 5-way, 4-way) around the periphery of the board.
5. If the Network Access Controller is to be connected to a Challenger*Plus* then its address must be configured. Refer to “DIP switch settings” on page 11.

DIP switch settings

If a Network Access Controller is connected to a Challenger*Plus* panel's system LAN, then it must be addressed as a DGP in the range 1 to 12. Use the four-segment Address DIP switch (Figure 2 on page 13, item 37) to set the address.

Figure 1: Address DIP switch

Table 2: DIP switch settings

LAN	Address	Polled as	S1-1	S1-2	S1-3	S1-4
LAN 1	1	DGP 1	I	O	O	O
LAN 1	2	DGP 2	O	I	O	O
LAN 1	3	DGP 3	I	I	O	O
LAN 1	4	DGP 4	O	O	I	O
LAN 1	5	DGP 5	I	O	I	O
LAN 1	6	DGP 6	O	I	I	O
LAN 1	7	DGP 7	I	I	I	O
LAN 1	8	DGP 8	O	O	O	I
LAN 1	9	DGP 9	I	O	O	I
LAN 1	10	DGP 10	O	I	O	I
LAN 1	11	DGP 11	I	I	O	I
LAN 1	12	DGP 12	O	O	I	I
LAN 2	1	DGP 17	I	O	O	O
LAN 2	2	DGP 18	O	I	O	O
LAN 2	3	DGP 19	I	I	O	O
LAN 2	4	DGP 20	O	O	I	O
LAN 2	5	DGP 21	I	O	I	O
LAN 2	6	DGP 22	O	I	I	O
LAN 2	7	DGP 23	I	I	I	O
LAN 2	8	DGP 24	O	O	O	I
LAN 2	9	DGP 25	I	O	O	I
LAN 2	10	DGP 26	O	I	O	I
LAN 2	11	DGP 27	I	I	O	I
LAN 2	12	DGP 28	O	O	I	I

Legend: I = ON, O = OFF

Connections

Figure 2 on page 13 identifies the locations and details of the connectors and other items. See “Appendix D: Cabling requirements” on page 36 for recommendations for the application and wiring of Challenger equipment.

Figure 2: TS1066B board details

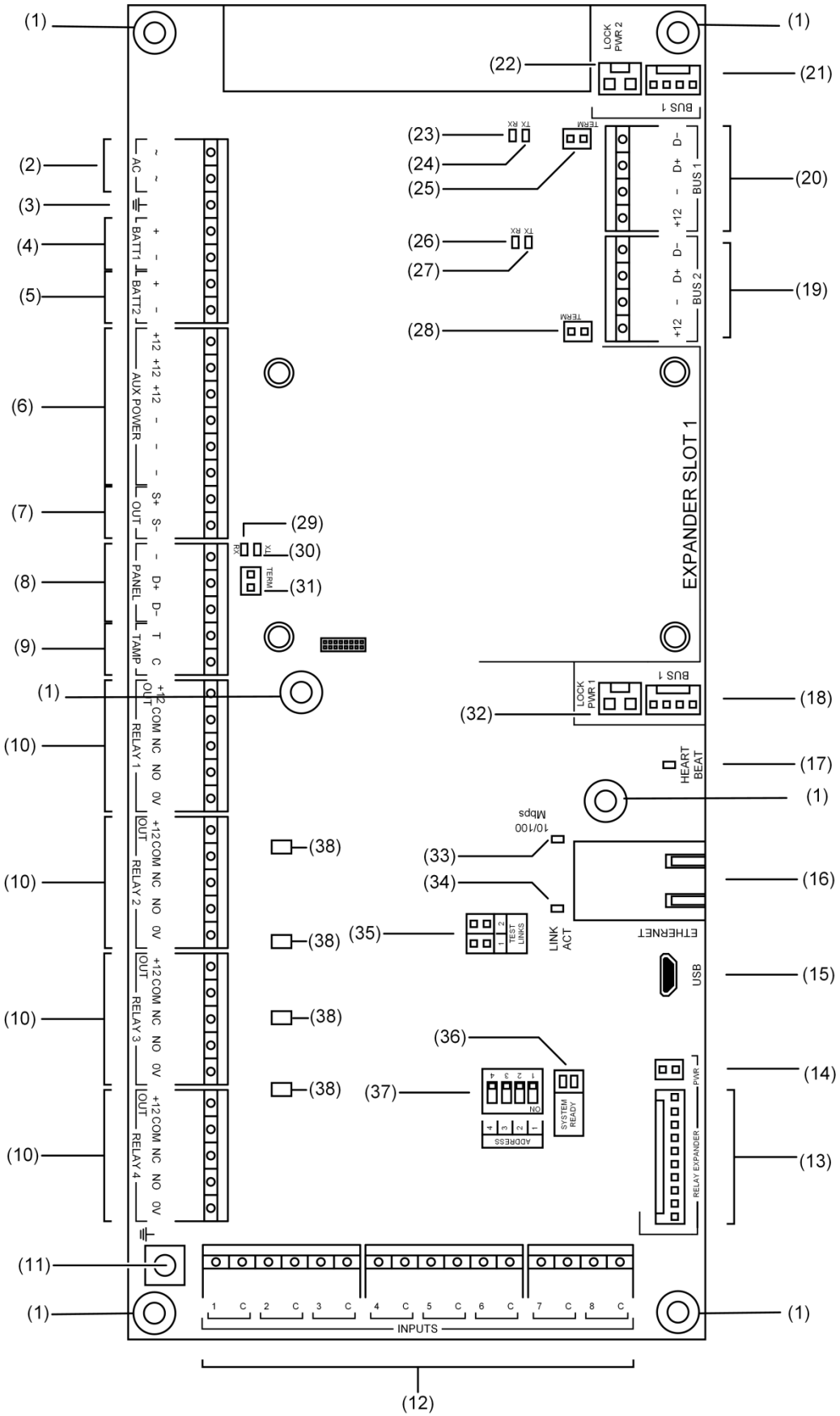


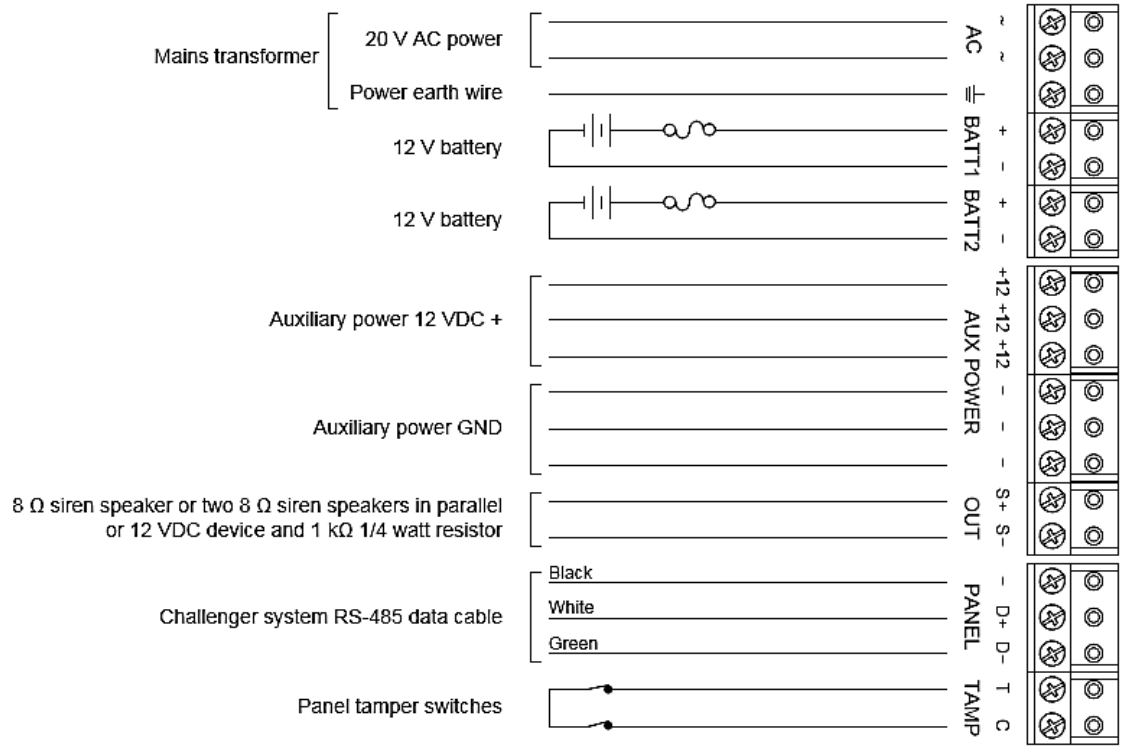
Figure 2 legend

Item	Description
1.	Mounting Hole. Ensure all standoffs are used.
2.	AC power input terminals. Details provided in Specifications.See Power Input on page 16.
3.	Earth terminal. Connect the power earth wire from the enclosure's mains transformer to the earth terminal. See System earthing in Appendix D: Cabling requirements. Data cable shields can also be connected.
4.	Battery 1 terminals. See Batteries on page 17.
5.	Battery 2 terminals. See Batteries on page 17.
6.	Auxiliary power output. See Auxiliary power terminals on page 19.
7.	Siren Output. See Siren on page 20.
8.	ChallengerPlus LAN interface See: RS-485 Networks on page 21. Appendix D: Cabling requirements on page 36
9.	Tamper switch input. Connect the TAMP T and TAMP C terminals to the panel tamper switch in the enclosure. Short circuit for sealed, open circuit for unsealed. Must be sealed if not used. Can only be used with normally closed contacts such as the panel tamper switches. See enclosure manual for tamper switch details.
10.	Relay and lock power connections for four doors. Refer to Door lock relay wiring on page 26
11.	Earth terminal. Connection point for cable shields or for earthing other boards connected to the TS1066B in the enclosure. Preferred length should be approximately 60mm. Refer to System earthing in Appendix D: Cabling requirements
12.	Input terminals. See Inputs on page 26.
13.	Relay expansion connector. 10 pin plugin cable socket for relay expansion modules. See Relay expansion on page 28.
14.	PWR Link Power link for relay expansion cards. Refer to Relay expansion on page 28.
15.	Micro-B USB port (USB cable not supplied).
16.	Ethernet port (Ethernet cable not supplied).
17.	Heartbeat LED. See LED indicators on page 29.
18.	Bus 1 quick connect header See RS-485 buses on page 21 Note: This connector is not a STU port.
19.	BUS 2 connector See RS-485 buses on page 21
20.	BUS 1 connector See RS-485 buses on page 21
21.	Bus 1 quick connect header See RS-485 buses on page 21 Note: This connector is not a STU port.

Item	Description
22.	Lock power 2 quick connect header See Lock power on page 25
23.	BUS1 Rx LED. See Connecting to Aperio on page 29 and LED indicators on page 29.
24.	BUS 1 Tx LED. See Connecting to Aperio on page 29 and LED indicators on page 29.
25.	Bus 1 TERM link. See Terminating the RS-485 on page 25.
26.	BUS 2 Rx LED. See Connecting to Aperio on page 29 and LED indicators on page 29.
27.	BUS 2 Tx LED. See Connecting to Aperio on page 29 and LED indicators on page 29.
28.	Bus 2 TERM link. See Terminating the RS-485 on page 25.
29.	ChallengerPlus LAN Rx LED. See Connecting to Aperio on page 29 and LED indicators on page 29.
30.	ChallengerPlus LAN Tx LED. See Connecting to Aperio on page 29 and LED indicators on page 29.
31.	ChallengerPlus LAN TERM link. See Terminating the RS-485 on page 25.
32.	Lock power 1 quick connect header. See Lock power on page 25.
33.	Ethernet 10/100 Mbps LED. See Connecting to Aperio on page 29 and LED indicators on page 29.
34.	Ethernet Link Active LED. See Connecting to Aperio on page 29 and LED indicators on page 29.
35.	Test links (not fitted during normal operations). Refer to Defaulting the Network Access Controller on page 31.
36.	System Ready LEDs. See Connecting to Aperio on page 29 and LED indicators on page 29.
37.	Address selection DIP switch (If connecting to a Challenger*Plus* panel). Refer to DIP switch settings on page 11.
38.	Relay coil active LED. See Connecting to Aperio on page 29 and LED indicators on page 29.

Figure 3 below details the wiring for terminal blocks in **Figure 2**, items 2 through 9.

Figure 3: Connection details for terminal blocks



Power Input

AC power input for the NAC is provided via the two unpolarised AC terminals. Power is typically provisioned from the transformer fitted to the enclosure in which the NAC is installed.
The NAC AC voltage requirements are specified in Specifications.
The enclosure installation manual provides further details for the transformer, along with fuse location and specifications.

Notice! Transformers supplied by Carrier Fire & Security have internal thermal fuses. Shorting the AC leads together may blow the thermal fuse before the replaceable fuse can react, rendering the unit inoperative.

Notice! In case of a worn, pinched or otherwise damaged transformer lead, the transformer must be replaced in order to avoid hazard.

The transformer leads supply high currents to the board. Poor connections lead to excessive voltage drop and can affect system performance.

At the board connection, the installer must ensure that:

a) Terminal wiring is performed with the transformer power input disconnected

b) The bare wire ends are neatly dressed and fully inserted into the terminal housing. Less than 2mm of exposed wire should be visible after termination.

c) The complete bundle of wire strands is inserted into the screw terminal. No broken strands should be visible.

d) There are no free strands outside of the metal block in the terminal housing.

e) The retaining screw is correctly torqued.

Batteries

The Network Access Controller requires battery backup to maintain functionality when primary power is lost. Two independent battery channels are provided for this purpose.
Key battery requirements are listed in the Electrical section of Specifications on page 5. The table does not specify battery dimensions, capacity and temperature ratings as they are installation dependent. The installer is responsible for ensuring that:

a) The specified battery or batteries, in conjunction with the configured system load and TS1066 charger settings, provide the required system backup and recharge times.

b) The battery operating temperature range is compatible with the specific TS1066 installation environment; a minimum range of 0°C to +40°C is recommended.

c) The batteries fit into the system enclosure and are oriented so that there is no possibility of their uncovered terminals being bridged by metal when the leads are not attached.

d) The system enclosure is properly sited and mounted to handle the configured system weight and allow for safe installation and removal of the batteries in compliance with the warnings in this manual and all local codes and OHS requirements.

e) For scheduling on-going battery system checks as required by the applicable standards and codes to ensure user safety, battery integrity and system performance; a 3 monthly interval is suggested.

A fuse is required in the positive lead of each battery, as fitted in the supplied battery leads; a spare is not provided. Refer to the label on the battery cable to identify the suitable fuse options specified in the Electrical section of Specifications on page 7.

The battery leads are provided with receptacles to suit the 4.75mm Fast-On tabs commonly used on 12V SLA batteries with 7Ahr and 12Ahr capacities. Higher capacity batteries will have different terminal types, necessitating the use of adaptors or modifications to the leads. When modifying the leads:

a) Disconnect leads from the NAC.

b) Take care not to damage the fuse holder.

c) Add sleeving or covers to any exposed metal on the modified battery connection arrangement.

Notice! Batteries can supply very high currents. This can happen when terminals are bridged by metalwork, wires, tools, jewelry, etc. The bridging metal can get very hot, melt, or vaporize, leading to damage and serious injuries.
Take all necessary precautions to ensure safety, including covering bare terminals, when transporting or replacing batteries.

Notice! Batteries can be large, heavy and have slippery cases. These factors contribute to mishandling incidents such as slipping and dropping. Impact damage can rupture the battery case, releasing hazardous chemicals. Slips and drops can allow terminals to contact metal, or cause injuries to the installer or others nearby. Take all necessary precautions to ensure safety, including not working overhead or blind in cramped areas, covering bare terminals, and using appropriate means to safely handle the awkward and heavy units.

Notice!
Worn, pinched or otherwise damaged battery leads must be replaced in order to avoid hazard.

Battery fitment and replacement

The battery leads supply high currents to the board during fault conditions. Poor connections lead to excessive voltage drop and can affect system performance.
At the board connection, the installer must ensure that:

a) Terminal wiring is performed with the battery disconnected.

b) The bare wire ends are neatly dressed and fully inserted into the terminal housing. Less than 2mm of exposed wire should be visible after termination.

c) The complete bundle of wire strands is inserted into the screw terminal. No broken strands should be visible.

d) There are no free strands outside of the metal block in the terminal housing.

e) The retaining screw is correctly torqued.

f) On completion, the polarity is verified at the board (red to positive, black to negative) prior to battery connection.

At the battery connection, the installer must ensure that:

a) The positive lead (red) is the first wire connected and the last wire disconnected.

b) The battery terminal polarity and open terminal voltage is validated prior to a connection being made.

c) The battery tab and receptacle mate firmly and completely. It should not be possible to remove the terminal with gentle force.

d) If a custom battery terminal is in use, the checks in the prior section regarding wire dress, strand damage and connection firmness are appropriately applied.
New batteries must be clearly marked with the date of installation in order to facilitate future maintenance activities.
When batteries are replaced, the board should be queried using the control software to validate the newly installed units.
When making voltage measurements at the battery terminals to establish battery state, healthy batteries that have not been discharged in the preceding 48hrs should measure >13.5V

The installer is responsible for identifying and specifying batteries within an operating temperature range that measures up with the specific TS1066 installation environment; a minimum range of 0°C to +40°C is recommended. The installer (or user) is responsible for scheduling on-going battery system checks as required by the applicable standards and codes to ensure user safety, battery integrity and system performance; a 3 monthly interval is suggested.

The battery leads are designed to suit 4.75mm Fast-On tabs. SLA batteries with 7Ahr and 12Ahr capacities are available with these tabs as standard from many suppliers.

Higher capacity batteries will have different terminal types, necessitating the use of adaptors or modifications to the leads. In these situations, sleeving or covers should be added to cover exposed metal on the battery tabs or connections.

Battery charging current

Nominal charging current is 600mA.

Auxiliary power terminals

Connect the AUX POWER +12 and AUX POWER − output terminals to devices that require 12V DC power, such as detectors. Three sets of auxiliary power output terminals are provided: if you need more than three connections, you can use a TS0844 Power Distribution Board or TS1044 Power Distribution Board to increase the number of terminals.

Note: Network Access Controller system design should consider the fuse partitioning and load limitations specified in Appendix B: Output fusing and user current limits on page 34.

Siren

Connect the OUT S+ and OUT S– terminals to an 8 Ω siren speaker or two 8Ω siren speakers in parallel. Alternatively, connect a device requiring 12VDC power.
The OUT S+ terminal is always powered. The OUT S- terminal is switched according to the Siren SW settings.
A 1K 1/4 watt resistor (supplied) should be connected across the OUT S+ and OUT S– terminals:

a) At the load side when driving digital inputs or other light loads.

b) At the terminals when no device is connected.

Note: Network Access Controller system design should consider the fuse partitioning and load limitations specified in Appendix B: Output fusing and user current limits on page 34.

Warning: The siren type must be configured correctly in CTPlus. Specifying a siren type of DC Volts when there is an 8 Ω siren connected to the Network Access Controller may damage the siren.

RS-485 Networks

The TS1066 provides three RS485 networks;

- The Challenger*Plus* Lan (Figure 2, item 8)
- RS485 BUS1 (Figure 2, item 20)
- RS485 BUS2 (Figure 2, item 19)

All network interfaces have similar wiring requirements which are detailed below in section RS485 cabling.

Challenger*Plus* LAN

The PANEL (TECOM BUS) connector is used to connect the Network Access Controller to a ChallengerPlus LAN, if required by its operating mode.
There is no power terminal on this interface: the Network Access Controller is a slave device on the ChallengerPlus LAN, so it is not expected to power the host, and its operating current is too high to be supplied by the host.

RS-485 buses

The Network Access Controller can have up to 16 RAS devices such as keypads, card readers, arming stations, or Smart Door Controllers on each BUS (local LAN). The Network Access Controller can also have up to 15 DGP devices on BUS 1 and up to 16 DGP devices on BUS 2.

Each BUS supports protocols other than Tecom, namely OSDP v2 (Open Supervised Device Protocol), SALLIS by SALTO, and Aperio. The protocol to be used on each BUS can be independently configured.

All network interfaces have similar wiring requirements which are detailed below section RS485 cabling.

Note: Devices connected to the RS-485 buses and powered by the Network Access Controller must comply with Appendix B: Output fusing and user current limits on page 34

Devices can be connected to the Network Access Controller via the 4-pin RS-485 terminals for BUS 1 (Figure 2 on page 13, item 20) or BUS 2 (Figure 2 on page 13, item 19).

Alternatively, devices can be connected to BUS 1 via the 4-pin plug-in RS-485 sockets (Figure 2 on page 13, items 18 and 21). The sockets are for easy connection to the expander boards that support the connection such as the TS1061 Dual Wiegand Interface.

RS-485 cabling

Carrier Fire & Security recommends that the RS485 network wiring comply with the following:
* Use 2 pair twisted shielded data cable such as Belden 8723.
* Keep the total length of wire on each RS-485 network below1.5 km.
* Networks must not span buildings or separate earth zones without the use of LAN isolation devices such as TS0893.

Using the screw terminal interfaces:

The wire colours below assume the use of the recommended cable and follow the ChallengerPlus LAN conventions.

For communications, the following connections are required:

- The - terminal is the interface 0V reference. Connect it to the black wire.
- The D+ terminal is data positive. Connect it to the white wire.
- The D- terminal is data negative. Connect it to the green wire.
- The data cable shield should be connected or insulated according to the system earthing plan. Earthing points are identified figure 2 as items 1 and 11.
  On the RS485 BUS1 and BUS2 interfaces, the +12 terminal is able to provide +12 V to RASs or other remote devices. Connect the +12 terminal to the red wire when using this feature.

  Note: Devices connected to the RS-485 buses and powered by the Network Access Controller must comply with Appendix B: Output fusing and user current limits on page 34

  When multiple devices are to be connected to the same network, the use of TS0844 or TS1044 Power Distribution Boards is recommended to increase the number of terminals and simplify the wiring effort.

  To prevent failures, false alarms and hazards, all wires inside the enclosure should be insulated up to the point of contact. Typically less than 2mm of bare conductor should be exposed outside of the screw terminal blocks and all conductor strands bound by the crew.

  Damaged insulation, poor workmanship and other observed faults must be corrected as soon as possible.

Using the plug-in BUS 1 sockets:

To easily connect a Tecom peripheral to BUS 1, connect a 4-way RS-485 cable (supplied with the Tecom peripheral) to one of the 4-pin plug-in RS-485 cable sockets (Figure 2 on page 13, items 18 and 21).

Refer to Figure 4 on page 23 for example connections of 4-way RS-485 cables from a Network Access Controller to a Tecom peripheral (items B and D).

Figure 4: Example TS1066 to TS1061 cable connections for RS-485 and lock power

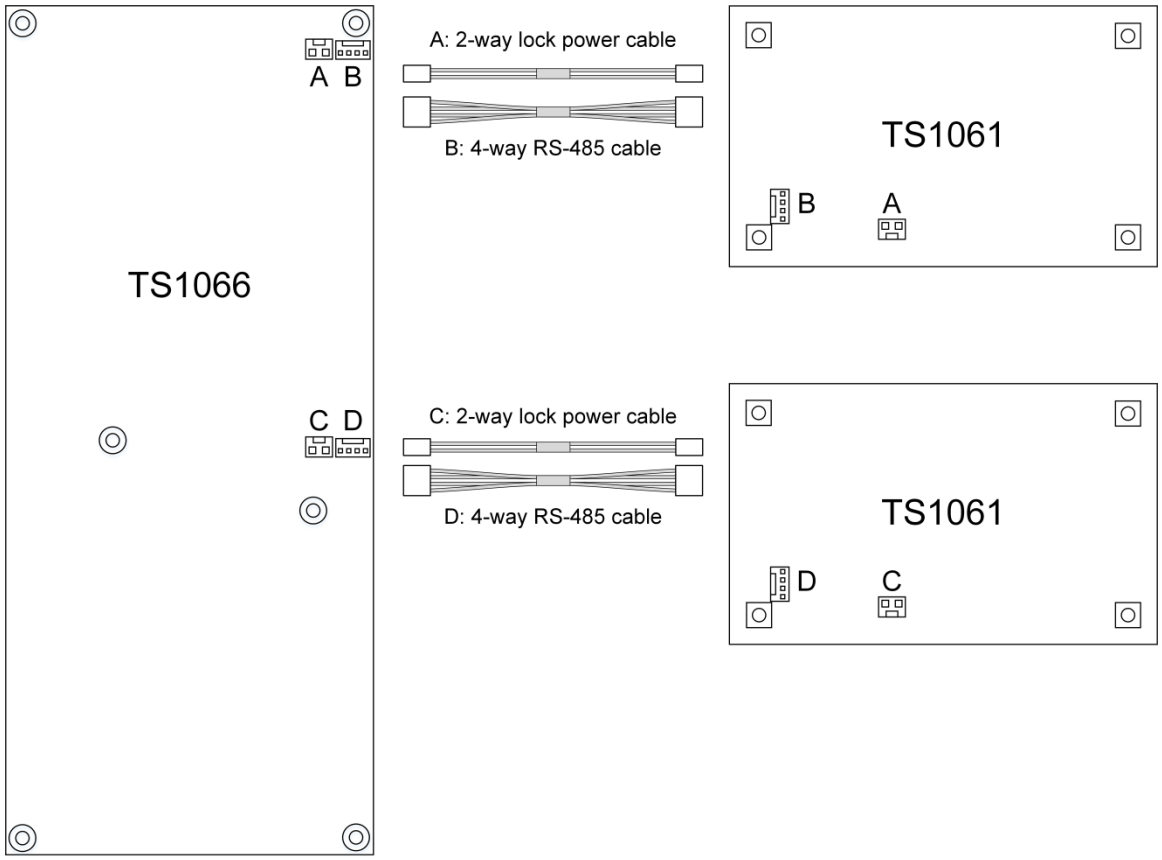


Figure 5 External Power Supply Connection to RAS

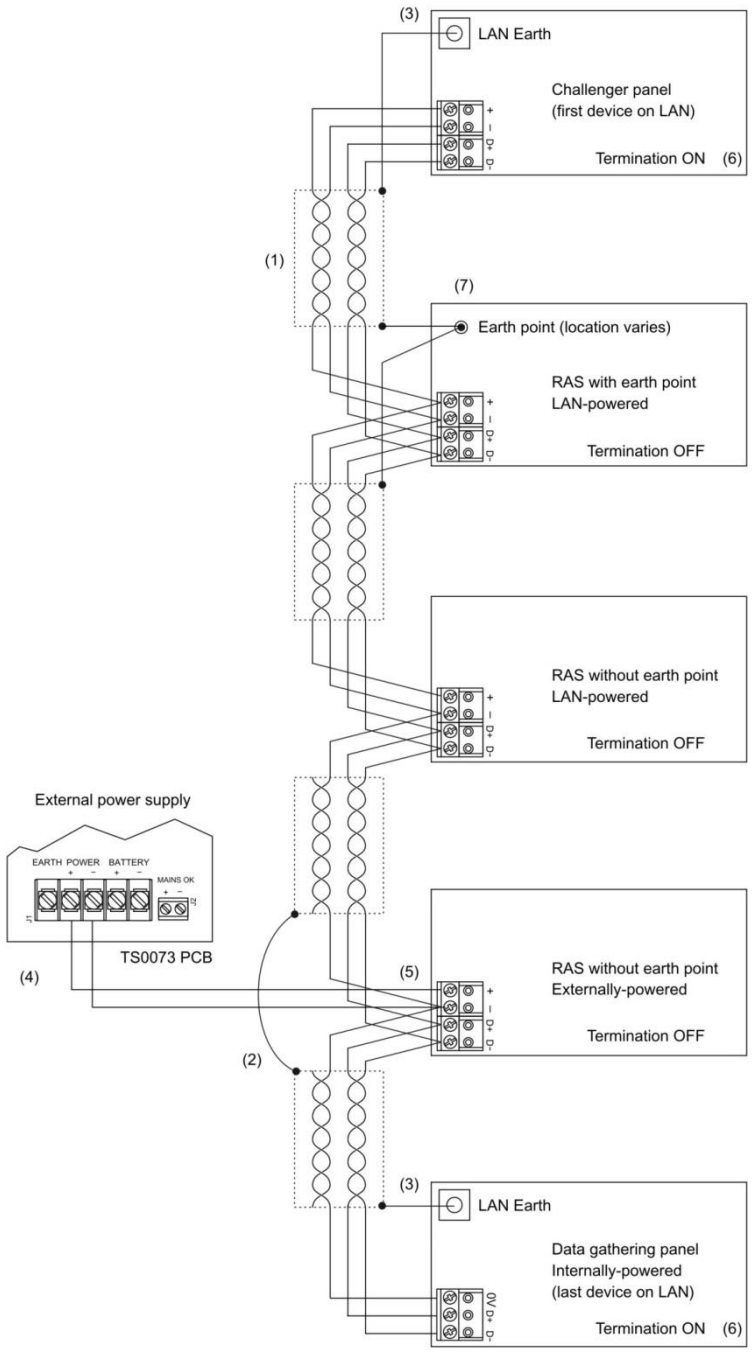
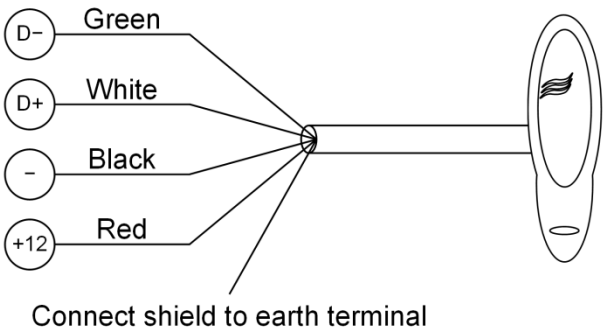


Figure 6: Connecting a Smart Card Reader to the one of the buses



Terminating the RS-485

All RS-485 devices (including the panel) use a 470 Ω RS-485 termination resistor where required. RS-485 termination resistors are used to set the impedance of the RS-485 to around 220 Ω in order to minimise noise. The termination resistor may be external or on-board (devices with an on-board resistor use a link to set the RS-485 termination to ON).

A RS-485 should have only two devices with the RS-485 termination set to ON (or the RS-485 termination resistor fitted):

- In a straight RS-485 configuration, the TERM links are ON at the Challenger*Plus* panel and the most distant device.
- In a star RS-485 configuration, the TERM links are ON at the two devices that are the furthest apart (and OFF at the Challenger*Plus* panel).

In a completely connected (but powered down) system, you can check for correct LAN termination by measuring the resistance across the D+ and D− terminals:

- 0 Ω indicates a short circuit in the cabling
- 160 Ω or less indicates that too many devices are terminated
- 220 Ω is good
- 470 Ω or more indicates that not enough devices are terminated

Lock power

There are two cable sockets providing extra lock power (Figure 2 on page 13, items 22 and 32), if required. The sockets are for easy connection to Tecom peripheral that support the connection, such as the TS1061 Dual Wiegand Interface.

Connect a 2-way lock power cable (supplied with the Tecom peripheral) to one of the 2-pin plug-in lock power sockets.

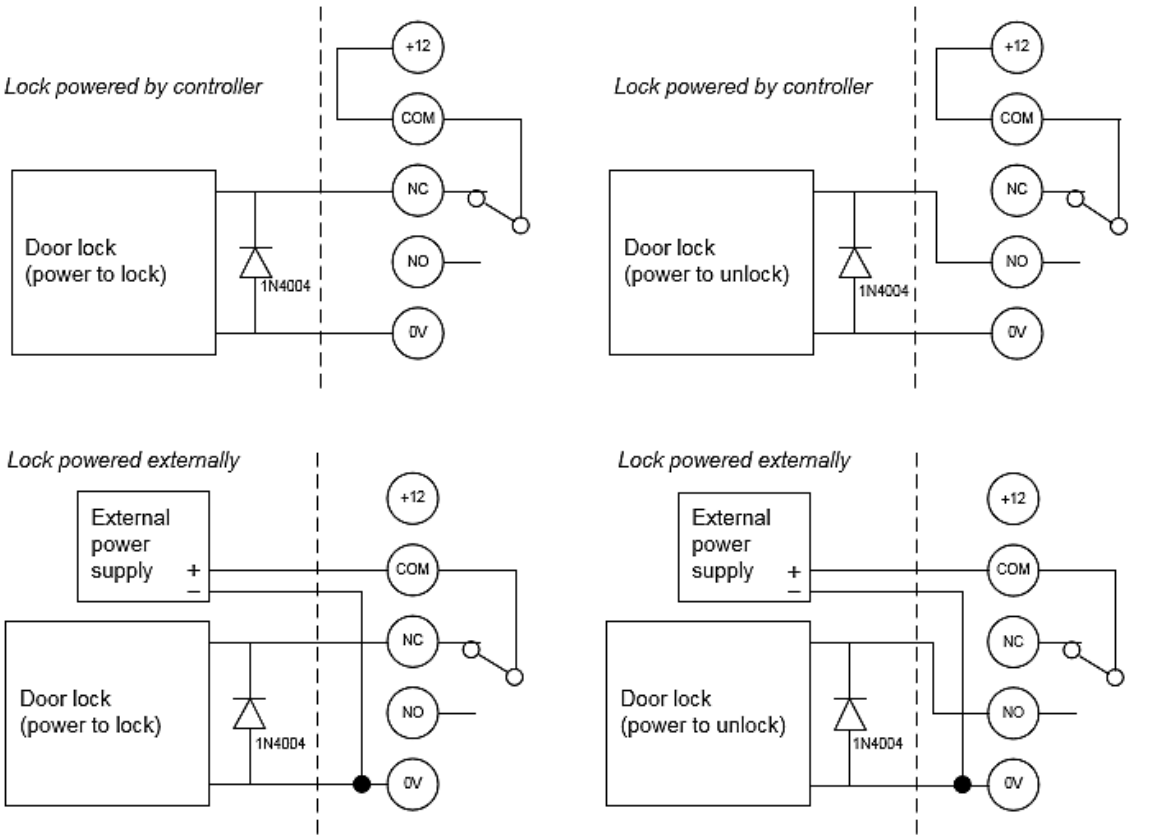
Refer to Figure 4 on page 23 for example connections of 2-way lock power cables from a Network Access Controller to a Tecom peripheral (items A and C).

Note: Devices connected to the RS-485 buses and powered by the Network Access Controller must comply with Appendix B: Output fusing and user current limits on page 34

Door lock relay wiring

Figure 7 below details the wiring for the relay terminal blocks.

Figure 7:



Note: A suppression diode such as 1N4004 must be used in door lock circuits. The diode must be co-located with the lock.

When using on board 12V power for locks, refer to Appendix B: Output fusing and user current limits on page 34.

When powering locks from an external power supply or using the relays for other purposes, the relay contact rating must be observed.

Maximum switching capacity (resistive/load):3A, 30VDC.

Minimum switching capacity: 100mA, 5VDC

Inputs

Inputs can be configured as an alarm input if the Network Access Controller is connected to a Challenger*Plus* system via the LAN.

A Challenger system can receive alarm signals from:

- The Challenger panel's on-board inputs
- Inputs connected to Data Gathering Panels (DGPs)

Each pair of input terminals may be connected to a device such as a detector or reed switch.

The Network Access Controller can monitor its input circuits for four states (sealed, unsealed, open circuit, and short circuit). This is accomplished by using two end-of-line (EOL) resistors in each input circuit, as shown in Figure 8 below.

Note: A Network Access Controller can have various EOL resistor values for input tamper monitoring (the default is 10 kΩ resistors).

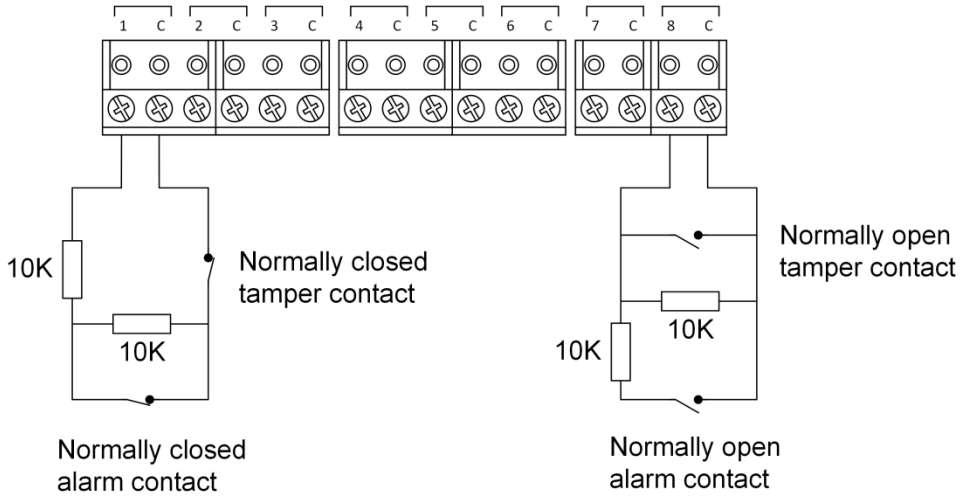
Install EOL resistors in input circuits at the end of the circuit.

If an alarm device is connected, place the EOL resistors at the device's connections.

If an input is not used, you do not need to connect an EOL resistor.

Tip: Use sleeves on the resistor leads to prevent accidental shorting.

Figure 8: Four-state monitored input circuits



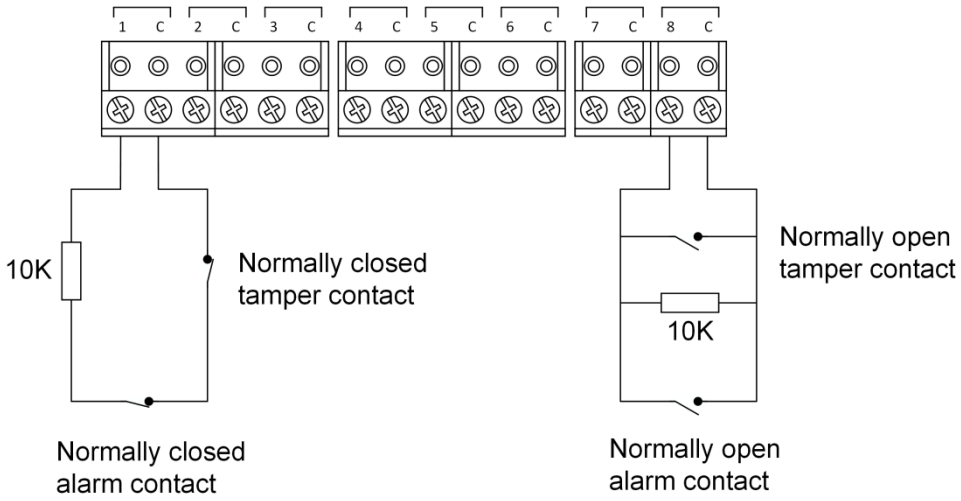
When four-state monitoring is used, the panel uses the circuit's resistance to determine the state of the input. In this example, 10 kΩ EOL resistors have been used:

- 10 kΩ indicates sealed
- 5 kΩ or 20 kΩ indicates unsealed
- Open circuit indicates input tamper
- Short circuit indicates input tamper

To use four-state monitoring, input tamper monitoring must be set to Yes (Install menu option 7, System Options) for the Challenger*Plus* panel, and tamper monitoring must be enabled for the Network Access Controller. See the *TS1066 Network Access Controller Programming Manual* for information on enabling tamper monitoring.

Alternatively, the Challenger*Plus* system can be configured to monitor inputs for two states (sealed and unsealed). This is accomplished by using one resistor in each circuit, as shown in Figure 9 below.

Figure 9: Two-state monitored input circuits



The panel uses the circuit's resistance to determine the state of the input. In this example, 10 kΩ EOL resistors have been used:

- 10 kΩ indicates sealed
- Open circuit or short circuit indicates unsealed

To use two-state monitoring, tamper monitoring must be disabled for the Network Access Controller. See the *TS1066 Network Access Controller Programming Manual* for information on disabling tamper monitoring.

Note: Two-state monitoring is not compatible with input types 33 or 40. See the *MAPROG-TS1066 Network Access Controller Programming Manual* for details.

Connecting expansion modules

Relay expansion

The Network Access Controller has four onboard relays that are assigned the first four relay numbers.

If relay expansion cards are used, additional relays are numbered according to their physical address, starting at 5. The Network Access Controller allows for relay mapping to be programmed such that a physical relay number (e.g. 5) can be mapped to a relay number in the Challenger*Plus* system (e.g. 21).

One TS0840 Four-Way Relay Card may be connected to the Relay Expander (Figure 2 on page 13, item 13) to add four relays. Alternatively, TS0841 Eight-Way Clocked Relay Expansion Boards or TS0842 16-Way Clocked Open Collector Expansion Boards may be connected to the Relay Expander individually or daisy-chained to add eight relays per card (for TS0841) or 16 open collector outputs per card (for TS0842).

Note: If TS0841 and/or TS0842 boards are used, then a value for Relay Controllers must be programmed for the Network Access Controller in CTPlus, where 1 represents each eight relays or open collector outputs. Refer to the *TS1066 Network Access Controller Programming Manual* or CTPlus online help for details.

The PWR link (Figure 2 on page 13, item 14) enables the Network Access Controller to power a connected relay expansion module. Remove the link if the relay card is powered from an external 12 V supply. **Note**: If two relay boards are used, link should be removed and the relay boards should be powered from external supply.

Note: Devices connected to the RS-485 buses and powered by the Network Access Controller must comply with Appendix B: Output fusing and user current limits on page 34

Connecting to Aperio

The Aperio® protocol is a short distance wireless communication protocol designed to link an access control system with an Aperio enabled mechanical lock.

A single Aperio hub can be connected to each local bus on the NAC. For connecting to either local bus, configure the address on the Aperio hub to 1.

Refer to the Aperio hub's installation manual for information on configuring the bus termination resistors.

LED indicators

LEDs on the printed circuit board indicate the state of the Network Access Controller, the Challenger*Plus* system LAN, the local LANs (BUS 1 and BUS 2), and Ethernet activity.

Table 3 below shows the LEDs for each of the items above. The numbers in the Item number column indicate the LED location on the Network Access Controller as shown in Figure 2 on page 13.

Table 3: LED indications

Item	LED	Item number	Description
Network Access Controller	Heart Beat	17	Slow flashing indicates normal operation. Rapid flashing if firmware update or Network Access Controller default is in process.
	System Ready	36	Not currently used.
System LAN	Rx	29	Flashing indicates polling data being received from the Challenger*Plus* panel on the system LAN.

Item	LED	Item number	Description
	Tx	30	Flashing indicates the Network Access Controller is replying to polling from the Challenger*Plus* panel on the system LAN. Off indicates that the Network Access Controller is not correctly addressed, the Challenger*Plus* panel is not programmed to poll the DGP address, or there is no Challenger*Plus* panel connected.
BUS 1	Rx	23	Flashing indicates remote units, such as readers, replying to polling on BUS 1
	Tx	24	Rapid flashing if a remote unit is connected to BUS 1. Off if no remote unit is connected to BUS 1.
BUS 2	Rx	26	Flashing indicates remote units replying to polling on BUS 2.
	Tx	27	Rapid flashing if a remote unit is connected to BUS 2. Off if no remote unit is connected to BUS 2.
Ethernet	Link Active	34	Flashing indicates Ethernet activity.
Relay	10/100 Mbps	33	On indicates Ethernet speed is 100Mbps.
	Relay coil active LED	38	On when relay coils is energized.

Powering up the Network Access Controller

In case the Network Access Controller will be connected to a Challenger*Plus* panel

- Ensure the Challenger*Plus* system LAN is connected to the Panel terminals (Figure 2 on page 13, item 8)
- Ensure the Network Access Controller's address is set. (Refer to DIP switch settings on page 11).

Ensure that jumpers on board are set correctly and that TEST LINKS are not fitted.

After power-up, check the Heart Beat LED (Figure 2 on page 13, item 17). See LED indicators on page 29.

Note: Devices connected to the RS-485 buses and powered by the Network Access Controller must comply with Appendix B: Output fusing and user current limits on page 5.

Refer to the *TS1066 Network Access Controller Programming Manual* for information on configuring the Network Access Controller.

Defaulting the Network Access Controller

You may want to perform a "default" to reset the Network Access Controller to its factory default state and erase all programming.

To default the Network Access Controller:

1. Remove power to the Network Access Controller and wait for all LEDs to turn off.
2. Fit test link 1 (Figure 2 on page 13, item 35) and repower the system. The Heart Beat LED (Figure 2 on page 13, item 17) illuminates for about 20 seconds, flashes quickly for about 20 seconds to indicate reset mode, and then flashes slowly to indicate normal mode.

   Note: The Network Access Controller can only be defaulted in the 20-second interval when the Heart Beat LED is flashing quickly (in reset mode). The Network Access Controller returns to normal mode automatically to help protect against accidental reset.

3. Remove test link 1 when the Heart Beat LED is flashing quickly to default the Network Access Controller.

Defaulting the USB Comms Path

You may want to perform a “default” for USB Comms Path Connection.

To default the USB:

1. Access the NAC panel PCB.
2. Fit test link 1 (Figure 2 on page 13, item 35) momentarily, and then remove the link.

On-Board Memory Retention

In the absence of any power source, the on-board capacitor storage will maintain the real-time clock and system configuration/logs for 5 days under typical circumstances.

Programming the Network Access Controller

Refer to the *TS1066 Network Access Controller Programming Manual* for detailed information about programming the Network Access Controller.

Appendix A: Standalone current draw

The current draw of the TS1066 running from battery power only is provided below for bare configuration:

- Battery charging is off
- Siren is not active
- The tamper input is sealed (wire link, 0 Ω)
- All eight inputs are sealed (10 kΩ EOL resistors)
- The four on-board relays are not active
- There is no relay card attached
- USB is not connected
- The RS-485 system LAN is terminated and is connected to a terminated Challenger*Plus* panel Comms port.
- The local LANs (BUS 1 and BUS 2) are not terminated and not active (no connection)
- Ethernet is not active.

Consumption = 226mA (whilst battery voltage is 12.0V)

- Active Ethernet adds 25mA.
- Each active relay coil adds 55mA.

Note: Relay coil current forms part of the allowable user current draw. Refer to Appendix B: Output fusing and user current limits on page 34.

Appendix B: Output fusing and user current limits

The current draw on the Network Access Controller for all user devices must not exceed 2.85 A. This value excludes battery charging and standalone board current.

The Network Access Controller will shut down if this is exceeded.

In some environments, further restrictions on user current apply as detailed in Appendix C.

On-board fuses provide over-current protection for devices as described in Table 4 below. The numbers in the Item number column refer to items in Figure 2 on page 13.

Table 4: Maximum current draw per output

Device	Item number	Maximum current draw
Auxiliary power	6	0.81 A
Siren output	7	1.25 A
Four onboard relays	10	1.7 A each (when using lock power 12v and 0v)
Active relay coil	10	55 mA
Relay card	13	0.5 A
BUS 1	18, 20, and 21	1.0 A total
BUS 2	19	0.5 A
Lock power 1	32	1.9 A
Lock power 2	22	1.25 A

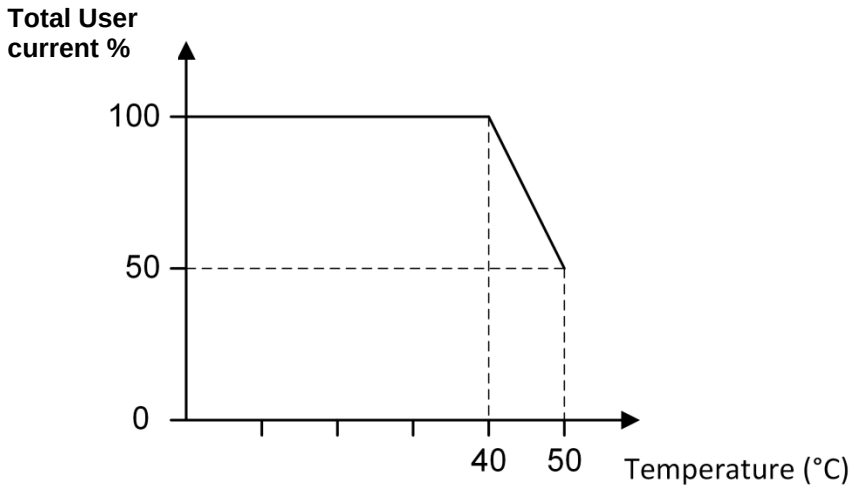
Consider the maximum current draw from the devices above when calculating the total user current draw.

Appendix C: Operating temperature

The operating ambient (room) temperature for the Network Access Controller is 0 to 50°C.

If the Network Access Controller is to operate for prolonged periods in an environment with an ambient temperature above 40°C, de-rate the user current drawn from the Network Access Controller according to the chart in Figure 10 below.

Figure 10: Power derating chart



Appendix D: Cabling requirements

This section contains recommendations for installers and electricians for the application and wiring of Challenger equipment with respect to:

- System earthing
- Ethernet cabling

System earthing

The following requirements are essential to the reliable operation of the Challenger system.

- The earth connection is provided in the enclosure transformer output lead. Do not extend this wire to any device outside of the enclosure.
- Install LAN isolation devices between multiple buildings and maintain independent earthing systems. For example, use TS0893, TS0894, or TS0896 Isolation Interface modules to provide electrical isolation and/or to extend distance.

Ethernet cabling

To comply with Class B radiated emissions the Ethernet cable should be cable tied to the enclosure rear for a minimum length of 40cm.This can be a straight run or a number of loops.

Power supply to RS-485 devices (refer to Figure 5 External Power Supply Connection to RAS on page 24)

Devices on the Network Access Controller's buses may be supplied from the Network Access Controller's 12V DC LAN output. Use an external 12V power supply (such as TS0073 2 A Power Supply) when:

- The device is more than 100 m (data cable length) from the panel
- Electrical isolation is required
- More power is needed than can be provided by the LAN

When powering a LAN device from an external 12 V power supply:

- Connect the external power supply '+' terminal to the device '+' terminal. Do not connect the power supply '+' to the LAN '+'.
- Connect the external power supply '−' terminal to the device '−' terminal.
- Connect the LAN cable black wire '−' to the device '−' terminal.