PTI SECURITY SYSTEMS

Remote Power Supply

Installation Manual

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SECURITY **ACCESS** **CONTROL** **VIDEO**

Revision D - June 2017

Thank you for purchasing the Remote Power Supply. While every effort has been made to ensure the accuracy of the information in this document, PTI Security Systems assumes no liability for any inaccuracies contained herein. We reserve the right to change the information contained herein at any time and without notice.

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 in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio TV technician for help.

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user, at his/her own expense, will be required to take whatever measures may be required to correct the interference.

With the RS485 communication scheme, a keypad can be located as far as 4000 feet from the controller, therefore shielded twisted pair cable with ground wire is required for optimal operation. Additionally, larger gauge wire must be used the farther the device is from the controller,

Incorrect installation of electrical components can result in damage to electronics as well as personal injury.

Cross-wiring the AC power with the DC power will damage the electronics.

Cross-Wiring the Power wires with the Data wires will damage the electronics

Cross-wiring the positive and negative on the DC part of the system will damage the electronics.

Do NOT run low voltage system wires in the same conduit as high voltage wiring

The system will not operate properly if the voltage is below 12VDC. Extreme care should be taken when choosing a power supply voltage and current rating. Long distance runs may require a remote power supply to be installed in line with an RB5 relay to ensure proper operation.

Warning: The User should follow all installation, operation, and maintenance instructions. The User is strongly advised to conduct product and systems tests at least once each week. Changes in environmental conditions, electric or electronic disruptions and tampering may cause the product to not perform as expected.

PTI Security Systems warrants its Product to the User. The User is responsible for exercising all due prudence and taking necessary precautions for the safety and protection of lives and property wherever PTI Security Systems products are installed. PTI Security Systems does not authorize the use of its products in applications affecting life safety.

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Introduction

The PTI Security Systems Remote Power Supply converts 120VAC power to 14VDC nominal output for powering access interface (AI devices). These devices include keypads, wired and wireless door alarm interfaces, relay boards and door controllers. Each power supply is equipped with a battery to provide backup power in the event of a AC input power interruption.

This installation guide is for installing a Remote Power Supply. Please read this entire document before proceeding and follow all steps in order

The remote power supply comes in five sizes (1, 2, 4, 6, and 10 amp) based on the amperage needed for the installation. Multiple power supplies may be required to fit the needs of a particular setup.

PTI recommends that installation and setup of any PTI Security Systems equipment be done by a certified, licensed, qualified technician. PTI can recommend local dealers and installers, but it is the customers' responsibility to verify qualifications and negotiate any pricing or contracts (unless PTI Security Systems has been specifically contracted in writing to do so on behalf of the customer).

With any setup or installation, some troubleshooting and adjustment of the configuration may be required. This will differ with every installation due to site-specific variables. Troubleshooting and configuration may include the purchase of additional equipment. PTI Security Systems is not responsible for any damages either incidental or consequential based on these recommendations.

The User should follow all installation, operation, and maintenance instructions. The User is strongly *advised* to conduct product and systems tests at least once each week. Changes in environmental conditions, electric or electronic disruptions and tampering may cause the product to not perform as expected

Technical Specifications

	1.2 Amp supply	2.5 Amp supply	4 Amp supply	6 Amp supply	10 Amp supply
Input connection	wall transformer	wall transformer	power cord	power cord	power cord
Output Voltage with AC power	14VDC nominal				
Output Voltage on Battery Backup	Battery Voltage. No voltage drop from switch over				
Maximum DC output load *	1.2A	2.5A	4.0A	6.0A	10A
Output Protection	Short circuit and thermal overload protection				
Battery Type	Sealed, low maintenance, lead acid or gel type				
Battery Capacity	4AH	4AH	7AH	7AH	7AH
Battery Charge Current (Max)	300 mA	300 mA	300 mA	700 mA	700 mA
Storage Temperature (min to max)	– 20° C to 70° C (–4° F to 158° F)				
Operating Temperature (min to max)	0° C to 49° C (32° F to 120° F)				
Maximum Relative Humidity	85%				

* Specified at 25°C ambient

Location

The ideal location to mount the power supply should protect it from weather and maintain it within its operating temperature range. It should keep it secure from vandalism but also be easily accessible for maintenance or repair. It must have appropriate AC power to power the supply.

Plan the mounting locations for the system's power supplies very carefully throughout the site. The right location greatly contributes to consistent, high-quality performance of the device. Considerations include:

- Availability of AC Power outlet at the desired mounting location.
- Protection from the elements.
- Maintaining ambient temperature within the limits of the operating temperature.
- Length of cable required to connect the AI devices (loads) that the supply will be powering.
- Number of devices to be powered from the power supply unit.
- Power losses (voltage drop) in the cable.
- Gauge of wire used to connect the power supply to the AI devices.
- Adequacy of battery backup.
- Protection from tampering.
- Ease of access for maintenance.

Supply Selection

It is good practice to vary the wiring design to accommodate the limits of any device, this applies to power supplies as well.

- Ensure your design supplies enough amps to support the number of remote units being installed.
- Always plan to have a higher amp capacity than the design requires.

PTI recommends that the design use no more than 75% of the supply capacity.

This table shows the maximum recommended load for all PTI remote power units.

	1.2 Amp Supply	2.5 Amp Supply	4 Amp Supply	6 Amp Supply	10 Amp Supply
Max. recommended load	0.9A	1.9A	3A	4.5A	7.5A

Below are examples showing how to design for correct amperage supply.

Example A:

The installation calls for an entrance and exit keypad at the front gate, plus an exit keypad at the back gate.

A review of the specifications for these devices show that each keypad draw 0.3A so the total load is 0.9A.

0.3 + 0.3 + 0.3 = 0.9A

This does not exceed the maximum recommended load for the **1.2A** *power supply so it could be used in this application.*

Example B:

The installation calls for an entrance and exit keypad at the front gate, an elevator keypad, plus an 8-channel relay board for elevator control.

A review of the specifications for these devices show that the keypads draw 0.3A each and the 8-channel relay board draws 0.5A for a total load of 1.4 A.

0.3 + 0.3 + 0.3 + 0.5 = 1.4A

This exceeds the maximum recommended load for a single 1.2A supply.

This application will require either **two 1.2A** *supplies or a* **single 2.5A** *supply.*

Two supplies may be a better choice using one for the entrance and exit keypads and another for the 8-Channel relay board and elevator keypad.

In addition to providing better battery backup, one supply could be used for the entrance / exit and one for the elevator control. This allows cables to be kept short minimizing losses.

Cable Voltage Loss

It is important to consider the voltage loss when using long cables between the power supply and the AI device loads. Voltage loss can be significant and if it not taken into consideration when planning power supply, the loss can prevent the system from working or cause erratic behavior. These problems are difficult to troubleshoot.

There are four system characteristics to consider when calculating voltage loss:

How much voltage loss can the system tolerate?

Most PTI AI devices require a minimum of 12V DC to operate properly. PTI factory settings are 14.01 – 14.04DVC. This allows for about 2 volts of headroom for voltage loss from the cable (based on a nominal supply output).

We recommend designing for no more than a 2 Volt drop due to cable loss.

What are the AI device loads (in current)?

Each PTI AI device load is provided in the product manual. Most PTI keypads require 300mA, but boards with relays require the most amperage. The loads given in the product datasheets are worst case scenario and to achieve the highest system reliability PTI recommends planning the system to withstand taking the highest possible load.

Note that measuring the current consumption of an idle device will produce a reading much lower than the specification in the manual. Always use the loads in the PTI documentation.

What gauge wire will be used?

Wire gauge affects voltage drop considerably. While 18 AWG is popular and frequently used, it limits the cable length in heavy load situations. Gauges smaller than 18AWG are not recommended.

What is the length of the power wire?

The wire length is the distance between the AI device mounting location(s) and power supply mounting location. Options for these locations may be limited, so it is important that an installer is involved in the early design stages of the property to specify the locations of equipment rooms and power outlets.

Remember, the voltage drop occurs in the supply and return path of the wire.

Calculate Voltage Drop

The following equations can be used to determine the voltage drop of a paired cable. Where:

D = distance in feet.
I = load current in Amperes.
V = voltage drop in volts.

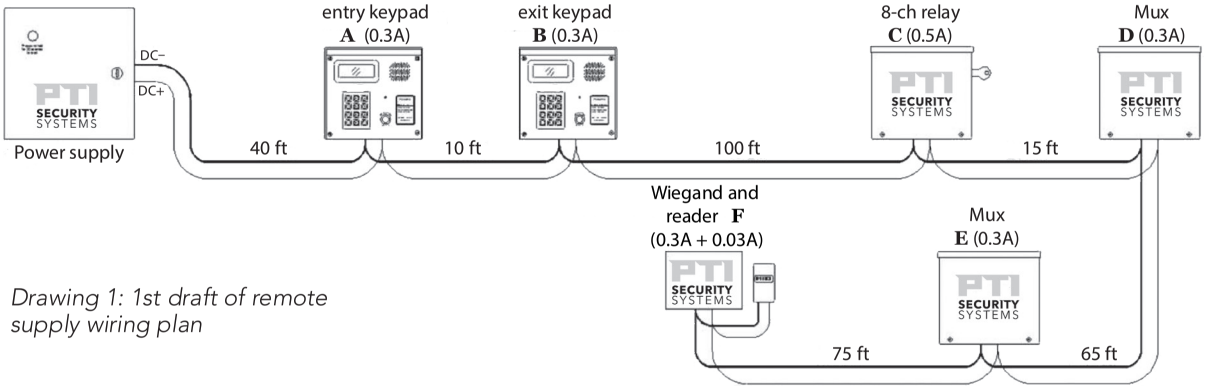
16 AWG	18 AWG
$V = D \times I \times 0.008$ $D = \frac{V}{I \times 0.008}$	$V = D \times I \times 0.0128$ $D = \frac{V}{I \times 0.0128}$

The following table can be used to estimate voltage drop for various lengths of 16 and 18 AWG paired wire.

Table of maximum paired wire length in feet for ≤ 2V drop		
Load (Amps)	Length (ft)	
	16 AWG	18 AWG
0.5	500	313
1	250	156
2	125	78
4	63	39
6	42	26
8	31	20

Example C:

Given the wiring plan below, will there be sufficient voltage at all devices?
*All devices require 0.3A except the 8-Ch relay (**C**) which requires 0.5A*



Drawing 1: 1st draft of remote supply wiring plan

The following table shows that 18 AWG wire will not be sufficient for this installation, given the cable lengths and circuit loads

Cable	Current	Voltage Drop	Total Voltage Drop
Power to keypad	A + B + C + D + E + F = 2.03 0.3+0.3+0.5+0.3+0.3+0.33 = 2.03	40 × 2.03 × 0.0128 = 1.04	1.04
Keypad A to B	B + C + D + E + F = 1.73 0.3+0.5+0.3+0.3+0.33 = 1.73	10 × 1.73 × 0.0128 = 0.22	1.04 + 0.22 = 1.26
Keypad B to Relay C	C + D + E + F = 1.43 0.5 + 0.3 + 0.3 + 0.33 = 1.43	100 × 1.43 × 0.0128 = 1.83	1.04 + 0.22 + 1.83 = **3.09** ✗

Example C cont...

This table shows that switching to 16 AWG wire will allow us to add the 8-Ch but no more. This is not an adequate solution.

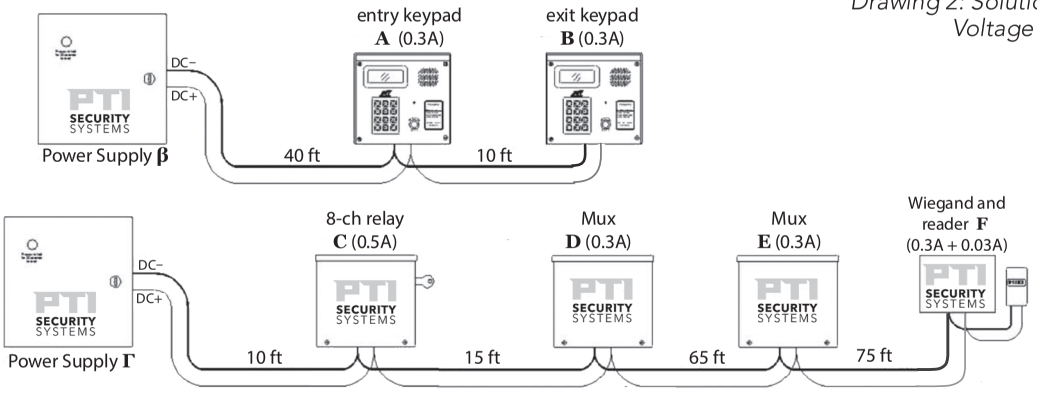
Cable	Current	Voltage Drop	Total Voltage Drop
Power to keypad A	A + B + C + D + E + F = 2.03 0.3+0.3+0.5+0.3+0.3+0.33= 2.03	40 × 2.03 × 0.008 = 0.65	0.65
Keypad A to B	B + C + D + E + F = 1.73 0.3+0.5+0.3+0.3+0.33= 1.73	10 × 1.73 × 0.008 = 0.14	0.65 + 0.14 = 0.79
Keypad B to Relay C	C + D + E + F = 1.43 0.5 + 0.3 + 0.3 + 0.33 = 1.43	100 × 1.43 × 0.008 = 1.14	0.65 + 0.14 + 1.14 = **1.93** ✘

At this point, consider some design alternatives.

- *Keeping the 18 AWG is desirable as it comes in convenient 18 x 4 cable.*
- *It is also clear that continuing with a single power supply requires multiple wire runs and possibly larger gauge wire in the longer runs.*

Example C cont...

Below is another design alternative:



Drawing 2: Solution for Voltage Drop

These calculations are for Power Supply ß, voltage drop is well with the 2V drop limit

Cable	Current	Voltage Drop	Total Voltage Drop
Power to keypad A	A + B = 0.6 0.3 + 0.3 = 0.6	40 × 0.6 × 0.0128 = .31	0.31
Keypad A to B	B = 0.3 0.3	10 × 0.3 × 0.0128 = .04	0.31 + 0.04 = **0.35** ✓

Example C cont...

The calculations for the Power Supply Γ powering the 8CH Relay (C), Mux (D) and (E) and Wiegand Reader (F) are shown below with the Wiegand reader well within the 2V voltage drop limit.

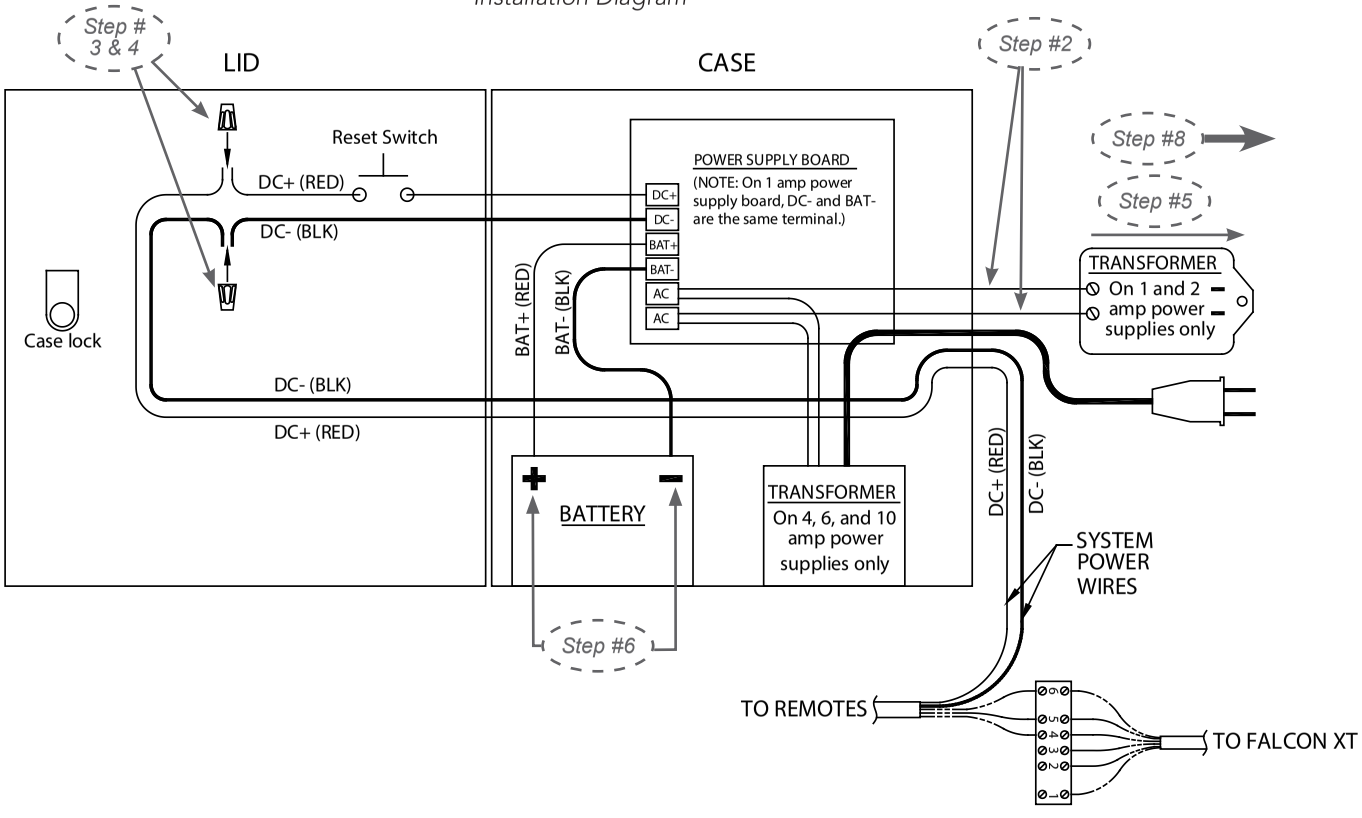
Cable	Current	Voltage Drop	Total Voltage Drop
Power to Relay C	C + D + E + F = 1.43 0.5 + 0.3 + 0.3 + 0.33 = 1.43	10 × 1.43 × 0.0128 = 0.18	0.18
Relay C to Mux D	D + E + F = 0.93 0.3 + 0.3 + 0.33 = 0.93	15 × 0.93 × 0.0128 = 0.18	0.18 + 0.18 = 0.36
Mux D to Mux E	E + F = 0.63 0.3 + 0.33 = 0.63	65 × 0.63 × 0.0128 = 0.52	0.18 + 0.18 + 0.52 = 0.88
Mux E to Wiegand F	F = 0.33 0.33	75 × 0.33 × 0.0128 = 0.32	0.18 + 0.18 + 0.52 + 0.32= **1.2** ✓

The optimal power supplies for this application would be one 1.2A and one 2.5A. The loads are well within the 80% recommended maximum.

Some observations about this implementation:

- The device with the largest load (the 8CH Relay) has a power supply located close by only requiring a short 10 ft. cable. By keeping the cable short, we minimize the voltage drop effects of this branch of power which carries the largest amount of current.
- Using a single supply would have required a 4A Power supply which has a single 7AH battery. This implementation gives us a total of 8AH of reserve power from the two 2.5A supplies, increasing the battery backup time for these AI devices.

Drawing 3: Remote Power Supply Device Installation Diagram



Installation Instructions

The following are instructions for installing a single Remote Power Supply to provide power for remote access devices. Please read this entire document before proceeding and follow the steps in order.

If you need assistance or have questions about this installation, please contact technical support at http://tickets.ptisecurity.com.

1 Mount the power supply case on the wall with solid anchoring devices:

- Do not remove or install the power supply battery and circuit board separately, they should be left in the case as manufactured.
- Install power supply cases indoors, they are not weatherproof.
- When selecting locations for the power supplies, the length of wire needed to connect to the load must be considered. See "Cable Voltage Loss" on page 6. They should be installed in a secure area that will be accessible for service or maintenance.
- Each remote power supply should be clearly labeled inside the cover to show which remotes are powered from it. If multiple power supplies are being installed, refer to "Drawing 4: Remote Power Supply Device Installation Diagram" on page 13.
- Never power cameras, door strikes, or sirens from the same power supply as remote keypads and multiplexers as these items can cause power spikes, under-powering the other remotes.

- Power supplies should be installed near a 120 V wall outlet.

2 Feed the power or **transformer cable** through one of the four knockouts on the sides of the power supply case using the correct bushing.

Spade connectors must be used on all connections (do not wrap wires around terminal connections)

- On **1 and 2 amp** power supplies, connect the transformer cable to the AC terminal connections on the power supply circuit board. The transformer cable should be 2-conductor cable with 18 gauge or larger conductors. Larger gauge wire may be required for longer wire runs.

  The **4, 6, and 10 amp** power supplies have an internally mounted transformer with an electrical cord and plug attached.

3 Feed the **system power** wires through one of the four knockouts on the sides of the power supply box using the correct bushing.

4 Connect system power wires to the stripped wires in the power supply box ('+' to '+' and '−' to '−'). Secure this connection using wire nuts or crimped connectors and seal with electrical tape. Whenever possible, these splices should also be soldered for increased reliability.

Do not connect the battery or transformer power until ready for use.
Allow 48 hours of constant power for the battery to charge completely for battery backup.

5 On **1 and 2 amp** power supplies, connect the transformer cable to the wall transformer terminals.

Spade connectors must be used on all connections (do not wrap wires around terminal connections)

6 After the access control system has been wired, remove the plastic insulating cover from the positive battery terminal and connect the battery wires from the power supply circuit board to the battery terminals. Be sure to connect '+' to '+' and '−' to '−')

7 The unit is ready for use. Plug the transformer into a 120 V outlet. The transformer can be plugged into an uninterruptible power supply (UPS) or other surge protector for added protection.

8 On **1 and 2 amp** power supplies, connect the large external transformer to the outlet using the screw provided on top of the transformer. This prevents the transformer from falling out of the socket and disconnecting power to the system.

The **4, 6, and 10 amp** power supplies have an internally mounted transformer with a standard electrical plug that does not require a screw mount.

9 When Secondary Power Supplies are installed, note their location on the inside lid of the main power supply with a sticker or permanent marker for future reference.

Do not plug the power supply into 120V until ready for use.

Troubleshooting With LED Diagnostics

There are two light emitting diodes (LEDs) on the power supply circuit board that can be used for troubleshooting. The red LED indicates DC power and the green LED indicates AC power.

Red (DC)	Green (AC)	Troubleshooting Indication
ON	**ON**	Power supply is operating normally
ON	**OFF**	Loss of AC power, battery backup is supplying power
OFF	**ON**	No DC output, indicating a short circuit or thermal overload
OFF	**OFF**	Loss of AC power. Battery backup is not functioning – battery disconnected or discharged

Battery Operation

When the Power Supply input power is interrupted, the Power Supply will automatically switch to using the battery as the power source. Several factors will influence the amount of time that the battery will keep the system operational including load, temperature, age of the battery, minimum voltage requirement and charge state. The following chart can be used to estimate backup time based on average current load.

Backup time (hours)	Average Current Load	
	4AH Battery	7AH Battery
11	0.25A	0.35A
5	0.45A	0.63A
3	0.85A	1.2A
2	1.25A	1.75A

For a security system battery backup function to be effective, any gate or door strike must also have a separately powered battery backup.

Battery Maintenance

The batteries supplied with the power units are sealed to prevent any spills and maintenance-free. The only servicing they require is a regular monthly check-up for power to ensure they have ≥ 12V and regular recharge.

The battery life also depends on the same variables listed above but when used as a backup function in PTI equipment, a battery may last 3-5 years.

Warranty & Disclaimer

PTI Security Systems warrants its products and equipment to conform to its own specifications and to be free from defects in materials and workmanship, under normal use and service, for a period of one year from the date of shipment. Within the warranty period, PTI Security Systems will repair or replace, at its option, all or any part of the warranted product which fails due to materials and/or workmanship. PTI Security Systems will not be responsible for the dismantling and/or re-installation charges. To utilize this warranty, the customer must be given a Return Materials Authorization (RMA) number by PTI Security Systems. The customer must pay all shipping costs for returning the product.

This warranty does not apply in cases of improper installation, misuse, failure to follow the installation and operating instructions, alteration, abuse, accident, tampering, natural events (lightning, flooding, storms, etc.), and repair by anyone other than PTI Security Systems.

This warranty is exclusive and in lieu of all other warranties, expressed or implied, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. PTI Security Systems will not be liable to anyone for any consequential or incidental damages for breach of this warranty or any other warranties.

This warranty will not be modified or varied. PTI Security Systems does not authorize any person to act on its behalf to modify or vary this warranty. This warranty applies to PTI Security Systems products only. All other products, accessories, or attachments used in conjunction with our equipment, including batteries, will be covered solely by their own warranty, if any. PTI Security Systems will not be liable for any direct, incidental, or consequential damage or loss whatsoever, caused by the malfunction of product due to products, accessories, or attachments of other manufacturers, including batteries, used in conjunction with our products. This warranty does not cover the replacement of batteries that are used to power PTI Security Systems products.

The customer recognizes that a properly installed and maintained security system may only reduce the risk of events such as burglary, robbery, personal injury, and fire. It does not ensure or guarantee that there will be no death, personal damage, and/or damage to property as a result. PTI Security Systems does not claim that the Product may not be compromised and/or circumvented, or that the Product will prevent any death, personal and/or bodily injury and/or damage to property resulting from burglary, robbery, fire, or otherwise, or that the Product will in all cases provide adequate warning or protection.

PTI Security Systems products should only be installed by qualified installers. The customer is responsible for verifying the qualifications of the selected installer.

PTI Security Systems shall have no liability for any death, injury, or damage, however incurred, based on a claim that PTI Security Systems Products failed to function. However, if PTI Security Systems is held liable, directly or indirectly, for any loss or damage arising under this limited warranty or otherwise, PTI Security Systems's maximum liability will not in any case exceed the purchase price of the Product, which will be fixed as liquidated damages and not as a penalty, and will be the complete and exclusive remedy against PTI Security Systems

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Notice. Some PTI Security Systems products use 900Mhz wireless technology. Other devices at the site such as cordless telephones or alarm components may cause interference that will disrupt the operation of the system or may be interfered with by the system. PTI Security Systems assumes no liability for any problems caused by interference. It is the sole responsibility of the user to identify and correct such problems.

PTI SECURITY SYSTEMS


SECURITY


ACCESS


CONTROL


VIDEO

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