

PAS

Personal Alarm System

PAS Design Guide

TODA0109-001, Rev A
First edition
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INTRODUCTION

This manual has been developed to help you understand, and design the Magal-Senstar PAS Personal Alarm System. The PAS is a truly state-of-the-art personal alarm system providing excellent alarm coverage and freedom from false alarms. However, the key to a truly professional system is the system design and subsequent installation. This manual provides information to assist you in understanding the PAS operation, system design, equipment placement and connection with other alarm systems. For system installation and operation information, please refer to the PAS Installation and Operation Manual.

Two different PAS system configurations are available to match the type of installation needed for your facility. While each system utilizes the proven Magal-Senstar dual coded ultrasonic alarm transmission system, different alarm and control features allow you to design and install the most cost effective system.

This manual is meant only as a guide. Please feel free to contact either Magal-Senstar or your local representative for assistance with the design and pricing for your first PAS System.

OVERVIEW

The MSI PAS Personal Alarm System utilizes a unique two frequency ultrasonic alarm transmission system which has proven to be practically false alarm free. The ultrasonic signal method of sending personal alarms is preferred because the signal is confined to the area of the alarm enabling accurate rapid locating of the person in trouble. Further, the optional addition of the "man-down" feature allows automatic alarm reporting if the wearer is accidentally knocked to a horizontal position.

Two PAS system configurations are available. While the ultrasonic personal alarm receiving system is identical and the alarm coverage is the same, different alarm collection/communication capabilities are provided. Table 1 summarizes the features of each type system. For more detailed information refer to the SYSTEMS DESCRIPTION Section or the Installation and Operations Manual

FEATURE	SYSTEM	
	03RM	PAS-120
False alarm-free ultrasonic alarm	X	X
Tamper alarm	X	X
Audio listen-in on alarm		X
Self-test	X	X
Local power supply	X	X
Central power w/backup		X
Aux alarm relay	X	X
Multiplex Communications		X
Display		X
Integrated video	X	X

Table 1. PAS Systems Features Summary

SYSTEM DESCRIPTION

The following is a brief operational description of each of the PAS Personal Alarm Systems. This brief description is provided to help you understand the features and the installation requirements of each system. For more detailed information on the theory of operation and function of each of the system components, please refer to the Installation and Operations Manual. Each Magal-Senstar Personal Alarm System operates with the MSI PAT/S or PAT/C personal alarm transmitters utilizing the proven dual frequency ultrasonic transmission system.

03RM Stand-alone Receiver

The stand-alone 03RM receiver module consists of a combination alarm receiver/decoder with a relay type alarm output. The 03RM receiver module mounts in a 2.125 inch deep double gang box and requires only 12-24 VDC power to operate. When an alarm occurs, the alarm relay is activated. The independent auxiliary alarm contact is provided for local control of other devices. A tamper alarm is also available. The Stand-alone receiver is usually installed with other systems that are capable of monitoring and displaying the alarm conditions such as the MSI LAP. Also, an existing facility that wishes to install a personal alarm system and already has a monitor and control system in place can usually use it to annunciate 03RM zones. The 03RM stand-alone receivers can be economically added to the existing system.

03RM/WP 03RM/WPH Receiver Modules

In addition to the basic 03RM receiver, there are 3 variants available for special situations. The 03RM/WP and 03RM/WPH receiver units utilize a moisture barrier material which allows sound waves to penetrate, but seals out moisture. This product does not reduce the receiving range of the unit. All 03RM printed circuit boards are conformally coated to provide extra protection from moisture and humidity, and are rated for operation down to 0°C. The 03RM/WP is recommended for use in showers and outdoor applications in temperate climates. The 03RM/WPH includes a thermostatically controlled heater for applications where receivers are subjected to temperatures below 0°C.

03RM/IV Receiver Module

The 03RM/IV incorporates a miniature CCD video camera to the basic 03RM providing remote visual as well as audible alarm assessment. The video signals from 03RM/IV units can be routed individually to a central monitoring and recording station, or utilize the PARC-3/IV to switch the video signal on to a video bus. A mounting box deeper than 2.125 is recommended for the 03RM/IV for additional cable clearance.

Personal Alarm Transmitters (See Figures 1 & 2)

The PAS Personal Alarm System features two types of personal alarm transmitters, PAT/S; with and without a “man-down” feature or the PAT/C compact unit. Each unit is manufactured to be compact and rugged containing long life lithium batteries. Pressing the large alarm button locks it in place and sends the alarm signal. The transmitter will continue to alarm until the button is reset.

The “Man-down” option adds an automatic alarm which activates whenever the wearer is in a prone position for more than a few seconds. The feature is selectable on or off with a small switch. When selected on, a warning tone will sound when the unit is tilted beyond about 60 degrees from vertical. If the unit is not returned to vertical within the 4-second warning period, an alarm is sent. The alarm and the warning tone will continue until the unit is reset by switching off the “man-down” selection switch.

The PAT/C also has a “keeper pull-pin” activation which can be attached to clothing or a break-away necklace to automatically activate the unit if snatched away.



Figure 1. PAT/S Transmitter



Figure 2. PAT/C Compact Transmitter

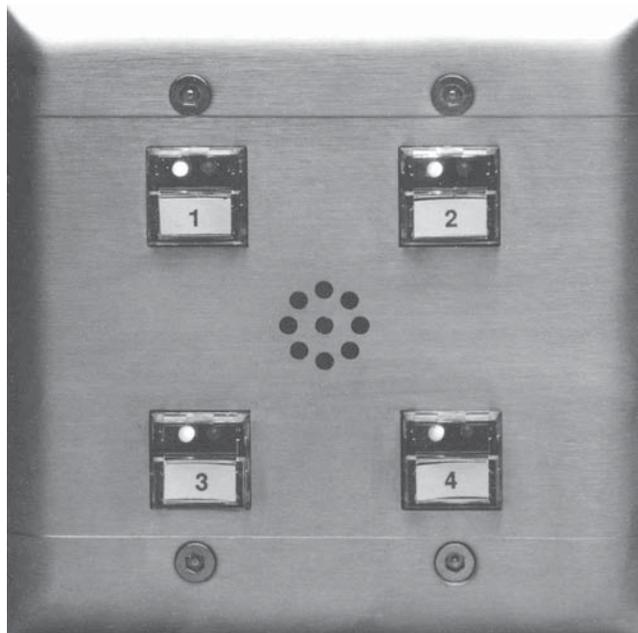


Figure 3. LAP Local Annunciation Panel

LAP Local Annunciation Panel

The LAP Local Annunciation Panel permits alarm annunciation of up to four personal alarm zones in a compact package for mounting in a standard double-gang box. It can be used as either the primary annunciation device for relatively small PAS installations, or as an auxiliary local annunciation device for larger PAS-120 Systems. When used as a primary annunciation device, the LAP accepts Normally Closed alarm contacts from the 03RM receivers, and shares the same 12 - 24 VDC power supply. The LAP indicates alarms with flashing red LED's for the respective zones and a beeping alert tone. Separate push-button controls (one for each zone) allow the operator to acknowledge each alarm and silence the audio tone. A subsequent push of the button resets the zone. Secure zones are indicated by a green LED.

When used in conjunction with the PAS-120 System, the LAP functions as a local auxiliary annunciation device. Thus, nearby personnel can be notified of an alarm situation at the same time the alarm is indicated at the central control location. The alarm is indicated on the LAP by a flashing red LED and beeping alert tone. Alarms are acknowledged (silences alert tone) and reset locally. Acknowledging and resetting alarms on the LAP does not affect the central control alarm annunciation and command functions. When used in a PAS 120 system, the LAP draws power and receives alarm information from the remote alarm outputs of a PARC-3, requiring a 6 conductor interconnecting cable. As supplied, LAP zones are labeled on their respective control buttons as zones one through four. Custom zone designations can be easily applied to the clear plastic front control buttons. See Figure 3.

PAS-120 Personal Alarm System (See Figure 4)

The PAS-120 system utilizes the 03RM receiver in combination with the MX-2000 supervised alarm and control station to provide a complete personal alarm system. The MX-2000 will monitor up to 120 personal alarm zones plus tamper alarms and has full annunciation and interface capabilities. Each alarm zone can have several 03RM receivers.

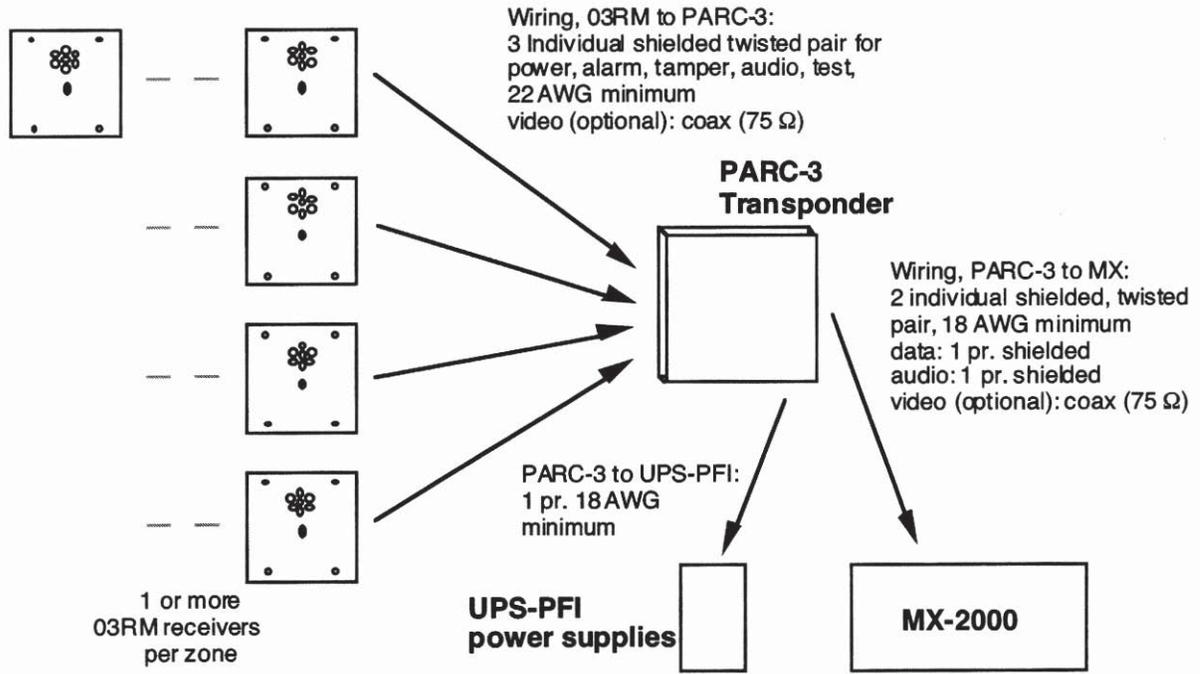


Figure 4. PAS-120/MX-2000 Systems Installation

The wiring from the 03RM's is routed to a MSI/PARC-3 transponder mounted nearby. The PARC-3 simultaneously monitors up to 4 alarm zones and transmits alarm and tamper conditions to the MX-2000 alarm and control station using the proven CEnDe multiplex system. The MX-2000 automatically routes the audio signal from the alarm receiver to the security control panel by way of the local PARC-3 whenever an alarm occurs. In addition to audio, the PARC-3/IV automatically routes video signals from alarm zones. The self-test functions are activated at the MX-2000 control panel and test the entire system beginning with a simulated alarm signal at each zone. An auxiliary alarm relay contact is available to provide local control of other devices at each receiver. Auxiliary outputs are also available from the PARC-3. The complete PAS installation can be powered from the central equipment location, for very small systems, or local power can be connected to each PARC-3 transponder. The MX-2000 supervises all wiring from the MX-2000 to the PARC-3's.

Site Considerations

There are several basic considerations when designing a personal security system.

1. The system is being installed for the protection of officers or employees of a facility where there is reason to believe that the personnel are in danger of being harmed. In most cases, the personnel are alone and are unable to reach a phone when they may be in need of assistance. This means the personal security system must summon help in time of need. When installed properly, the personal security system will pinpoint a person's location when help is needed.
2. Personnel will come to rely on the personal alarm system, so alarm coverage must be sufficient to cover areas where personnel are susceptible to harm. In most cases, facility management will assist in determining the type of coverage desired.
3. The personal alarm system uses ultrasonic frequencies to transmit the alarm from an individual transmitter to the ceiling or wall-mounted receiver devices. The characteristics of ultrasonic signal transmission must be considered when coverage is being planned.

Ultrasonic Alarm Transmission

Ultrasonic signals are defined as pressure vibrations with a frequency above the normal human hearing range, typically above 20 kHz. These signals possess some unique characteristics particularly suited for personal alarm transmission.

1. Ultrasonic signals will not penetrate walls.
2. Ultrasonic signals tend to reflect off hard surfaces, such as concrete or dry wall, but are absorbed by soft surfaces, such as carpets and drapes.
3. The reflectivity or "bounce" of the ultrasonic signal actually enhances the ability for an alarm to "bounce" around the room and "find" the alarm receiver, while confining the alarm signal to that area only.
4. The construction that makes a room sound like an echo (reverberation) will actually aid transmission of the ultrasonic alarm signal. The "bounce" will allow ultrasonic alarm signals to fill a room and allow alarm transmission from corners and alcoves. However, rooms with carpet, drapes, or fabric on the walls will not provide as much "bounce" as the hard-surfaced areas.
5. Outdoor applications are complicated by several factors. The outdoor environment is less favorable for ultrasound transmission. There are fewer reflective surfaces and the environment can effect the transmission. Receivers also must be protected from the elements. Two weather protected versions of the 03RM are available with and without a thermostatically controlled heater (required in cold climates).

System Planning

Proper system planning is key to providing a successful installation. A properly planned installation serves the customer, installer, and service personnel making the sale more profitable. System planning need not be completed by someone with extensive technical knowledge as long as the person doing the planning has been schooled on the system and follows some simple guidelines.

Protected Area

1. The first consideration is the area to be protected. The customer's desires are very important here. The best method consists of using a facility blueprint or a scaled drawing to show the areas to be protected. A highlight marker can frame the areas needing coverage.
2. Following establishment of the coverage area, the areas need to be divided into zones. A zone will be the area shown in alarm. Personnel will respond to this area, so care must be taken that each zone is not too large. Typically, small rooms have their own zone, while larger rooms (such as dayrooms) may have several detectors reporting as one zone. It is common to have many detectors report as one zone each. This is because a small room such as an office with the door closed must provide individual alarm identification if rapid response is to be expected. Long hallways and similar areas should be divided into zones so that each zone is completely visible by the responding personnel. In this way, the responding personnel can immediately go to the person in trouble.

Receiver Placement

After zones are established, receivers can be placed to provide the desired area coverage. Facility conditions can help determine where receivers can be placed. Examples are:

1. A facility under construction will normally place receivers in ceilings, with wiring in conduit. High ceiling areas may require receivers be placed in walls.
2. A facility, new or existing, with suspended ceilings will normally place receivers in the ceiling, with or without a conduit system depending on code requirements.
3. Existing facilities with limited access may require the use of wall-mounted detectors and Wiremold-type wire protection.
4. These items and others must be considered when receivers are placed. It is usually best to "walk" an existing facility with the architect or the facility maintenance personnel to determine the best installation method.

The PAS system was specifically designed to be more powerful than earlier systems to provide coverage of normal zones with one or two receivers. One alarm receiver (03RM) mounted in a typical ceiling location will typically provide coverage in a 50-foot radius from the receiver. From this, you can see that most normal-sized rooms can be covered with one receiver.

The largest possible area coverage for a 03RM Receiver can be obtained by mounting it in the ceiling in the center of the room. This allows a single 03RM to protect a large room up to 70 x 70 feet. In most cases other circumstances must be considered in locating receivers. For instance, if a protected room abuts a hallway which is also protected, the room's receiver should be located as far from the door way as possible while still assuring detection from all corners in the room. This will minimize the probability that alarms from the hallway will "spill" into the room if the door is open.

Do not place receivers in the direct path of high velocity air currents from heating ducts or fans, especially if the audio output is utilized.

If 03RM/IV Receivers are used, camera placement considerations typically dictate receiver location. The standard camera lens supplied has a view angle of 120°. For a rectangular room, locate the 03RM/IV in the ceiling as close to a corner as possible with the camera mount angled toward the center of the room. This mounting provides the best view of the room, but always make sure alarm detection is adequate from all points in the room. If ceiling mounting is not possible, locate the 03RM/IV in a corner as high on the wall as possible with the camera mount angled toward the center of the room.

Large areas and hallways will still require more detectors. Typical spacing could be as far as 100 feet between devices. However, we recommend typical spacing of no more than 80 feet so "dead" spots are eliminated.

As receiver locations are assigned, it is best to place the zone number adjacent to each receiver. This will keep your zone count consistent and assure that you have accounted for all zones.

03RM Stand-Alone Receiver

The 03RM stand-alone receiver is designed to provide dry contact outputs to either a third party alarm reporting system, or the MSI LAP.

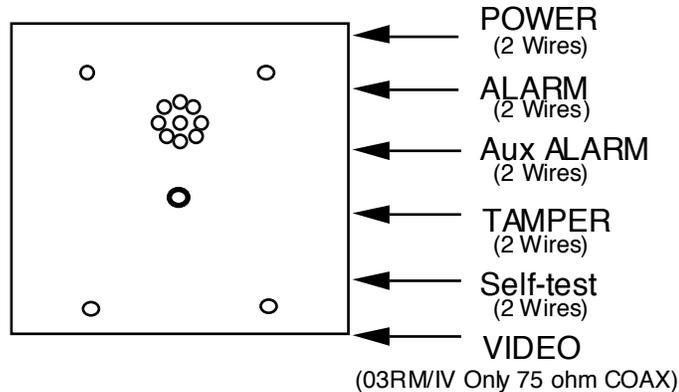


Figure 5. 03RM Stand-alone Installation

03RM connections are as follows:

- (a) **POWER.** The power source must furnish a DC voltage at the 03RM input terminals that is between 12 and 24 volts. Each 03RM or 03RM/WP draws about 40 mA. The 03RM/IV model draws 120 mA. The 03RM/WPH (includes heater) draws from .5 A at 12 VDC to 1.0 A at 24 VDC. These are the peak current values when the thermostatically controlled heater is operating. This voltage must be well regulated and not shared with any other system. Since the alarm relay is normally energized, any significant transient drop in the supply voltage may result in a nuisance alarm.
- (b) **ALARM OUTPUT** The alarm output contacts can be programmed on the 03RM to be either normally open (NO) or normally closed (NC) where “normally” refers to the condition when no alarm exists. A jumper selects 3K ohm supervision if desired.
- (c) **TAMPER** The 03RM has two integral magnetic reed switches which are maintained in the normally closed (NC) state by two self-adhesive permanent magnets which must be fixed to the sides of the backbox. As the 03RM is removed from its enclosure, the reed switch contacts open providing the tamper indication. For proper tamper switch operation the magnets must be located correctly, so a marking template is provided with each 03RM for this purpose. The self-adhesive backed magnets are designed for direct application to any clean, smooth surface (normally a metal or plastic backbox). If no backbox is used or if it is recessed far below the wall or ceiling surface some alternative method for mounting the magnets may be required.
- The tamper output is normally closed (NC) and opens upon removal of the unit from its enclosure.
- (d) **AUXILIARY ALARM OUTPUT** In many cases a local indication of an alarm may be desired. You may want to activate a light or horn outside the door or in the corridor. This auxiliary contact may be programmed either (NC) or (NO) and changes state for the time that the receiver is in alarm. This contact is rated for 30 volts at 1 amp current (non-inductive). It should be used only for control purposes. If these contacts are used to activate a power relay make sure a transient suppression diode is used across the coil of this power relay.

(e) **VIDEO OUTPUT (03RM/IV Only)** The video output signal is 1.0v peak to peak, negative sync, 75 ohm(unbalanced). Coax connection is by two screw terminals on 03RM/IV or BNC connector provided.

Twisted shielded pair should be used for the PAS wiring in order to minimize the noise induced into the system.

(f) **REMOTE TEST** When 12-24 vdc (relative to the power return) is applied to the test terminals, a test signal is generated within the 03RM, thereby producing an alarm. The 12-24 test voltage should be maintained for a minimum of 5 seconds.

PAS-120 SYSTEM

The PAS 120 is an advanced multiplex system designed to control and display the outputs of up to 120 PAS zones. This system employs the MX-2000 Controller and is capable of driving wall maps, digitized voice response systems (RANS), Touch Screen Controllers such as the MSI PSYCON and interfacing with other system computers over various data bus outputs.

The PAS 120 system uses the 03RM receiver as the input device and accommodates both the audio output and the self-test functions, and with optional equipment the video output as well.

PARC-3 The PARC-3 collects the alarm and tamper signals and supplies power and self-test signals to four (4) zones of 03RM's. The PARC-3 provides data to and receives commands from the MX-2000 over a common data bus. The PARC-3 also switches the audio from the 03RM on to the loop audio bus. Jumpers on the PARC-3 board allow this audio switching to:

- (a) be disabled
- (b) occur locally only when an alarm occurs
- (c) occur under command of the MX automatically when an alarm occurs or when selected by the MX operator.

These switching provisions are made by zone to allow a mix of operations to accommodate various privacy considerations.

The PARC-3 also provides auxiliary local alarm outputs for each zone. These are open collectors (normally high) with emitter reference available. The PARC-3's auxiliary alarm outputs can be utilized in conjunction with a LAP (Local Annunciation Panel) to provide a local indication of PAS zone status.

Normal wiring from each 03RM to the PARC-3 is 6 conductors configured as 3 twisted, individually shielded pairs consisting of Power (2), Alarm (1), Test (1), Tamper (1) and Audio (1). The Audio and Tamper should be paired as well as the Alarm and Test. The common terminals of the tamper and alarm should be tied to power minus. The shields should be floating at the 03RM and tied to ground at the PARC-3. The auxiliary local alarm contact can also be taken from the 03RM.

If 03RM/IV's are utilized and local video switching is required, specify the PARC-3/IV. Video from up to 4 03RM/IV's is routed to the PARC-3/IV via coax cable and switched to a common video bus on command from the MX-2000. This approach reduces cabling costs significantly compared to running each 03RM/IV video output to some central location.

Each PARC-3 will support up to four zones of receivers. For best results, the PARC-3 should be located within a wire length of 200 feet from the receivers. Establish each transponder location with this in mind. For more information regarding wire size, distance and power require The MX-2000 Multiplex Control Center design includes two additional data communication bus outputs: RS-232 and RS-422. These outputs are designed to provide an easy interface to other computer systems. If one of these interfaces is desired, please contact the factory for protocol information.

ments, see Power Section.

Count the number of PARC-3's required by counting the number of zones reporting to each transponder location.

Generally, PARC-3's require a local power supply.

Up to 10 PARC-3's (40 zones) can be connected on a single cable set running from the central control point. The first 40 zones will connect to the first cable set, the next 40 zones to the second cable set, and so on. The cable length per set can be up to 20,000 feet, so length from the central point is not normally a factor. The cable set may branch in a "star" if desired. The wiring from each PARC-3 to the MX-2000 central control unit requires one pair (shielded) for multiplex data, and one pair (shielded) for audio. Since each PARC-3 is powered from a local source, no power cable to the MX-2000 is required. The data and audio cables can be "daisy chained" through up to 10 PARC-3's per communications loop as noted above.

Central Control Equipment Placement

There are two aspects to be considered when locating the central control equipment: operation of controls and serviceability.

Normal installation of the PAS-120 system will use the MX-2000 Multiplex Control Center as the central control equipment. The MX-2000 is a self-contained unit suitable for mounting in either a 19-inch EIA standard equipment enclosure or in its own desktop enclosure.

The MX-2000 should be mounted within easy reach of the operator. The operator will need to see the front panel annunciator and LCD display and operate the key pad.

Maintain adequate space at the rear of the MX-2000 for future service. If the unit is to be mounted in an equipment enclosure, provide rear access for service without removing the unit from its mountings.

Refer to the MX-2000 Series, Installation and Operation Instructions for additional mounting information.

Many installations use a graphic annunciator to show alarm locations in addition to the MX-2000 front panel annunciator. Graphic annunciators are typically wall mounted and connected to the MX-2000 with a multiconductor cable. If a graphic annunciator is considered, please consult the factory.

Some installations will use the CEnDe Multiplex Communication System. In these cases, the Data Collection Unit is either mounted in the control room (small systems) or mounted in an equipment room for connection to display equipment by others. For installation information, please refer to the Installation and Operation Instructions for the CEnDe Multiplex Communication System.

Power Requirements

In addition to the Central Control equipment, the PAS-120 system consists of 03RM receivers powered by the respective PARC-3's.

NOTE: THE HEATERS ON 03RM/WPH MODELS SHOULD NOT BE POWERED FROM THE PARC-3. RUN A SEPARATE 12 VDC POWER CIRCUIT FOR THE HEATERS

The PARC-3's are powered individually or in groups depending on the number of 03RM's connected to each PARC-3 and the relative location of the PARC-3's in your system. Regardless of which method you select, each PARC-3 requires a dedicated DC supply (not shared with any other system) of from **12 to 16** volts. Each PARC-3 draws approximately 35 milliamps (with no 03RM's connected). Each 03RM requires **11 VDC minimum** and draws about 40 milliamps; 03RM/IV units draw approximately 120 milliamps. **Only** uninterruptible type power supplies are recommended for powering the PARC-3's.

The MSI UPS-PFI is a battery backed, uninterruptible DC power supply designed to power one or more PARC-3's. It also provides a dry contact output to indicate when its AC supply voltage is lost. The UPS-PFI is supplied with a plug-in, class 2, transformer and a 12 V, 1 Amp-Hour battery pack, but it can accommodate a battery pack of up to 20 Amp-Hours. The UPS-PFI has a rated output of 1.2 Amps.

When utilizing the UPS-PFI (or any power supply with a 12V battery back-up), locate it in the immediate vicinity of the PARC-3(s) to minimize the voltage drop between supply and PARC-3. The distance between the UPS-PFI and its plug-in transformer is less critical, but should be within 100 feet. The minimum recommended wiring size for PARC-3 power connections is 18 AWG. A single UPS-PFI can power multiple PARC-3's if:

- (a). PARC-3's are grouped together in one location
- (b). Total combined PARC-3 and 03RM current load is less than 1.2 Amp rating
- (c). Battery capacity is sufficient to meet minimum back-up requirement for total combined load.

The following chart is provided to assist you in determining the total current load of each PARC-3:

PARC-3 alone035 Amps

No. _____ 03RM and 03RM/WP X .040 = _____ Amps

No. _____ 03RM/IV X .120 = _____ Amps

Total current load per PARC-3..... = _____ Amps

The AC voltage status at the UPS-PFI can be monitored at the Central Control by connecting the UPS-PFI's Normally Closed contact to the PARC-3's Auxiliary Tamper input. If AC power is lost at the UPS-PFI location, the Central Control will indicate a tamper condition on all zones associated with that PARC-3. Meanwhile, the battery back-up will maintain system operation until AC power is restored.

Since the 03RM's are powered by their respective PARC-3's, voltage drop considerations are also important here. The supply voltage at the 03RM's must be 11 VDC minimum. The minimum recommended wire size for 03RM connections is 22 AWG (typical resistance 3.0 ohms per 100 feet). The 03RM's should be located within 200 feet of the PARC-3. If a zone consists of one 03RM, 03RM/WP or 03RM/IV and is within the 200 foot limit utilizing 22 AWG wire, voltage drop is not a concern. If multiple 03RM's are powered from a single wire pair from the PARC-3, the voltage drop must be considered (see PAS 120 Installation Instructions for calculation). Excessive voltage drop situations can be remedied by increasing wire size, reducing wiring distance or running individual power pairs to 03RM's.

Equipment List/System Cost

Now that you have developed a system installation, you can proceed to either prepare a cost proposal or assemble the information to order the equipment and start the installation. In either case, you need an equipment list.

We have listed the steps below as a guideline when assembling either a system price or an equipment list. Table 2 provides a convenient means of preparing the equipment list and double checking to make sure you have remembered all the equipment needed.

The steps below and Table 2 are only guidelines. You must determine the necessary quantities once you fully understand the proposed installation. If you have any doubt, consult your factory representative. Magal-Senstar assumes no responsibility for pricing methods or prices other than those listed on current Magal-Senstar authorized price sheets.

Step 1 Determine the area of coverage requested by the customer. Refer to the Device Placement section. Use a facility floor plan drawing or make a sketch. Shade or color the areas needing coverage.

Step 2 Locate devices in the area to be covered. Refer again to the Device Placement section. Overlapping coverage is better than too little. Mark devices on plan or sketch. Determine mounting method for each device and mark this next to the device location. The mounting method will determine backbox type and mounting hardware required.

Step 3 Assign zone numbers.

Step 4 Determine the PAS system type to be installed in your facility. Refer to the System Description Section. If you will be using 03RM stand-alone receivers, skip to step 7.

Step 5 Determine appropriate locations for each PARC-3 transponder. Where possible, each PARC-3 should be located centrally to the receivers (03RM's) it will serve.

Step 6 Determine how many alarm zones will be connected to each PARC-3 location. (Remember, four zones to each PARC-3.) More than one PARC-3 can be mounted at each location. Mark the zones that will connect to that transponder location.

Step 7 Count the number of receivers required. Enter that number on Table 2. List your backbox and mounting hardware on the blank spaces provided.

Step 8 Determine the quantity of PARC-3's and enclosures required. Enter on Table 2 (PAS-120).

Step 9 If 03RM stand-alone receivers and/or PARC-3's are to be locally powered, add UPS-PFI power supplies with battery backup as needed at each location.

Step 10 Add the number of zones in the total system to determine the type of equipment to be used at the central control point. This decision may be affected by other factors. You may wish factory assistance. Remember that 10 PARC-3's can be connected on a cable set running to central control.

Step 11 Determine the type and size of the central control system and enter on Table 2. We have listed several. You will probably use one of those listed. However, if there is any question about the central control configuration, contact your factory representative.

Step 12 Determine the quantity of personal transmitters that the customer requires. You may select standard transmitters, transmitters with the optional "man-down" feature, compact transmitters, or some of each type. Enter on Table 2. Determine if the customer requires spare batteries or carrying cases and add to Table 2.

Step 13 A minimum of one PTU (PAT test unit) is recommended for all PAS installations. Enter on Table 2.

Step 14 Measure and record the lengths of cable required to connect the 03RM's to the transponders and the transponders to the Central Control point. We have listed the normal cable type requirements; however, you may have different requirements.

Step 15 Double check all your counts and add any special installation equipment or mounting hardware.

Step 16 Obtain pricing for all components and enter on your pricing sheet. If you are also figuring installation labor, some space is provided for this on the right side of Table 2.

Step 17 Table 2 will assist you in developing a priced list of materials. Your company policies must determine other factors such as mark-up, warranty documentation, test equipment, personnel training, etc.

If you have questions while preparing the information for Table 2, you may want to FAX a copy to the factory before calling for technical assistance.

WIRING CHART

APPLICATION	NO. OF CONDUCTORS	DESCRIPTION	SOURCE
PAS 120 03RM to PARC-3	6	3, individually shielded, twisted pairs, 22 AWG, stranded, with drains & overall PVC jacket *	Belden 8777 West Penn 431
PAS 120 MX to PARC-3(s)	4	2, individually shielded, twisted pairs, 18 AWG, stranded, with drains and PVC jacket *	Belden 9368 West Penn 440
PAS 120 PARC-3 to UPS-PFI	2	2 conductor, 18 AWG, stranded	
PAS 120 PARC-3 to LAP (optional)	6	6 conductor, 22 AWG, stranded with PVC jacket	West Penn 270
Stand alone 03RM or 03RM/IV	2 - Power 2 - Tamper 2 - Alarm 2 - Aux. Alarm 2 - Self-test	22 AWG stranded wire (See Figure 5)	
	2 - Audio (if used)	twisted, shielded pair 22 AWG	
	1 - Video Coax (03RM/IV)	RG59/U	

***NOTE: This is for known dry, interior installations ONLY. If wet conditions exist, cable with a High Density Polyethylene jacket is required. If a high electrical noise environment is anticipated, cable with an overall shield may be required. Avoid running multiple data cables in the same conduit.**

<p style="text-align: center;">TABLE 2 PAS-120 LAYOUT AND PRICING GUIDELINE</p>								
Project Name: _____		Date: _____						
LINE	DESCRIPTION	PART NO.	QTY.	PRICE EACH	TOTAL			
1	03RM RECEIVERS	02RM						
2	03RM/WP RECEIVERS							
3	03RM/WPH RECEIVERS							
4	03RM/IV RECEIVERS							
5	PARC-3/IV							
6	PARC-3 TRANSPONDER/ENCLOSURE							
7	LAP (Local Alarm Panel)							
8	UPS - PFI							
9	CENTRAL CONTROL EQUIPMENT							
10	MX-2040-40 ZONE							
11	MX-2080-80 ZONE							
12	MX-2120-120 ZONE							
13	PRINTER OPTION							
14	BATTERY BACKUP OPTION							
15	PERSONAL ALARM TRANSMITTERS							
16	STANDARD TRANSMITTER							
17	COMPACT TRANSMITTER							
18	W/MAN-DOWN OPTION							
19	SPARE BATTERIES							
20	CARRYING CASES							
21	PAS TRANSMITTER TEST UNIT							
22								
23								
24	MISC.							
	TOTALS							