

ARK-501 + PinProx Proximity Readers

Models

ARK-501 +

ARK-501 +, 3 x 4 Matrix

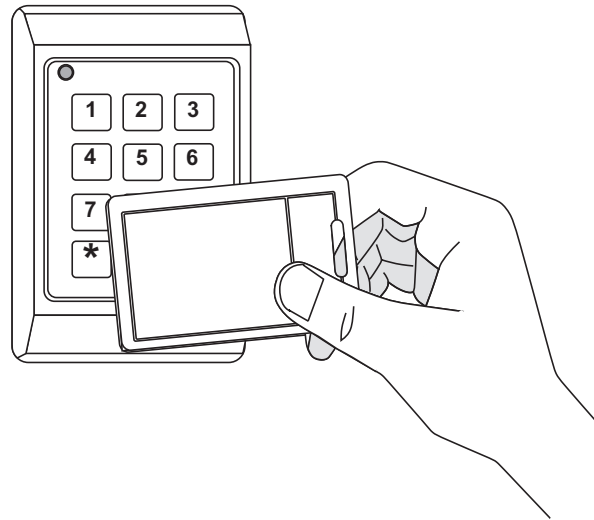


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1.0 Product Specification

- Input Voltage: 4.0 VDC to 16 VDC (at the reader)
- Input Current/Power

<i>Parameter</i>	<i>Description</i>	<i>ARK-501+, 3 x 4</i>	<i>ARK-501+</i>
Input Current	Typical with card present and metal mounted	70 mA (5.5 to 16 VDC/100 mA@ 4.9 VDC	75 mA (5.5 to 16 VDC/100 mA@ 4.9 VDC
Power Required	Typical with card present and metal mounted.	1.10 W @ 16 VDC/1.60 W @4.9 VDC	1.20 W @ 16 VDC/1.70 W @4.9 VDC

Table 1 Current and Power Requirements

- Power Supply:
 - Description: Regulated Linear power supply
 - Recommendation: Power One, model HA15-0.9-A
- Read Range:
 - With ASC-121T *LifeTime™* Card: Up to 4.0" (10 cm)
 - With ASK-116T *KeyTag*: Up to 2.5" (6 cm)
 - With AVC-132 *Image100™*: Up to 4.0" (10 cm)
- Frequency: 125 KHz
- Operating Temperature Range: -30° C to +65° C
- Color: Black/Beige
- Material: UV resistant, ABS (UL 94V0) plastic
- Weight:
 - ARK-501+ is 6 oz. (167g)
 - ARK-501+, 3 x 4 is 7 oz. (195.5 g)
- Dimensions: 4.4" H x 2.82"W x 0.65"T (11.18 x 7.16 x 1.69 cm)
- Keypad Dry Contact Specifications (ARK-501+ 3x4 only)
 - Maximum Operating Voltage: 8 VDC
 - Maximum Operating Current: 80 mA.
 - Contact Resistance on switch closure: < 100 Ω
 - Passive switching source.
 - Recommended scan rate: 14.4 kHz.
 - Recommended debounce time: 20 msec.
- Certification: UL-294 FCC Part 15, and CE.



	<i>ARK-501+, 3 x 4 Matrix</i>	<i>ARK-501+</i>
Keypad Data	Dry contact between the corresponding row and column for each key. Keypad is accessed through the auxiliary cable	8 bit output in either Wiegand or ABA Track II Magstripe over the main I/O cable after each keypress.
Number of User I/O Cables	2	1
Card/Tag Data	Wiegand and ABA Track II Magstripe formats are available. Data is transmitted over the main I/O cable.	

Table 2 Output Data

Notes

- Tri-color LED and audio "beeper" tone are standard features.
- Read Range is stated in an undisturbed electrical environment, with card presented parallel to reader, and reader installed in accordance with Motorola Indala instructions. Read range may vary after installation.
- Mounting the ARK-501+ directly on metal decreases the read range by approximately 30%.
- Power supply, reader, and controller must be on the same ground, connected to earth.
- Follow Motorola Indala's wire type and length recommendations.
- ASP *Advantage Series Proximity*[™] equipment is not compatible with ESP *ElectroStatic Proximity*[™] or ESP *E-Series Proximity*[™].
- Approved by major regulatory agencies throughout the world.
- Specifications subject to change without notice.
- ©1998 ~~Motorola~~ Indala Corporation.



2.0 Introduction

All ARK-501+ *PinProx* reader models are single piece units. Each ARK-501+ *PinProx* reader consists of a card or tag reader and a keypad. The reader can be mounted on any surface material and mounts conveniently to single-gang, metal or plastic, electrical box world wide.

In reference to the figure below, when the reader is powered, a low-frequency, low-level, radio frequency (RF), electromagnetic field is continuously radiated by the reader. When a card is presented within the field of the reader, the microchip (embedded in the card) is activated and it transmits a unique pre-coded identification (ID) number back to the ARK-501+ reader. The reader decodes and converts this data to Wiegand or Magstripe format and sends this code to an external controller through the data cable. With this information, the controller determines what action is to be taken as a response to the card presentation.

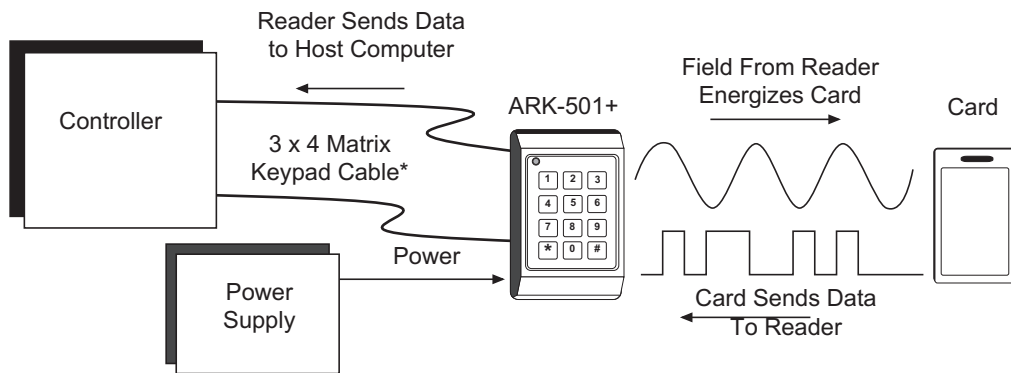
There are two types of keypads, dependent upon factory configuration. These are distinguished by the model names ARK-501+, and ARK-501+, 3x4 Matrix.

Key features of each model variation are highlighted below:

- ARK-501+:**
- Buffered mode 26-Bit Wiegand with 4-digit PIN
 - Buffered mode Magstripe with 4-digit PIN and LSB-MSB bit order
 - Buffered mode Magstripe with 4-digit PIN and MSB-LSB bit order
 - Buffered mode Magstripe with 5-digit PIN and LSB-MSB bit order
 - Buffered mode Magstripe with 5-digit PIN and MSB-LSB bit order
 - Unbuffered mode Wiegand with 8 bit burst
 - Unbuffered mode Wiegand with 4 bit burst

ARK-501+, 3x4 Matrix: Auxiliary cable provided for dry contact switch matrix of 3 columns by 4 rows. *QuickFlash*[™] (page 5) is not an option. **The host must provide for row and column scan, debounce and decode. The suggested scan rate is 14.4 kHz. The suggested debounce time is 20 msec. ProxSmith cannot be used to configure ARK-501+ 3x4 matrix keypad features.**





* The 3x4 matrix cable is only available on the ARK-501+, 3x4 matrix model.

Figure 1 ARK-501+ Block Diagram

2.1 Guidelines

As this technology is based on radio frequency, one must exercise some extra care installing these products. The following observations apply:

1. Metal affects radio signals.
2. Care must be exercised to reduce or eliminate unwanted signals from external sources. **The external sources, such as sources of RF signal transmitters (portable two way radio, cellular phones, etc.), and/or nearby EMI noise producers may contribute to disturbing the electrical environment of the reader. Depending on the external noise signal strength of the nearby transmitter, the read range maybe reduced or the card signal maybe masked by the external signal, resulting in a no read.**
3. The read range is proportional to the type of card used. Larger cards read at greater distances than smaller cards.
4. The rules and regulations of the Federal Communication Commission (FCC) and other regulatory agencies in various countries limit the RF power level and frequency. ~~Motorola~~ Indala RFID readers are of the type accepted under FCC Part 15.

2.2 Features

Audio “Beeper” Tone All ARK-501+’s include an audio “beeper” tone built-in as a standard feature. The beeper is activated during power-up, in the SelfTest mode, and when an access credential is successfully read.

Tri-Color LED ASP Advantage Series Proximity readers come standard with a tri-color LED (red, green, and amber). Both single line and dual line versions of LED control available.

Single LED Control Line The LED is red when the LED control line is high. The LED turns green when the LED control line is pulled low. If the line is toggled high/

low at a 100 Hz to 1.0 kHz rate, 50% duty cycle, the LED color will be amber. There is no LED "off" state in this configuration.

Dual LED Control Lines The red and green LED colors each have separate control lines, which when pulled low activate the appropriate color. If both are pulled low simultaneously, the LED color will be amber. Even if the controller has only one LED output, the "Dual Line" scheme can be utilized simply by using only one of the control lines to give either off/red or off/green.

QuickFlash™ When a card is presented, the LED will flash, and the audio tone (beeper) will be activated for approximately 100 milliseconds, regardless of the card's access status. This gives the user immediate feedback that the card was read and the data was sent to the controller. After the 100 millisecond QuickFlash period, the controller takes over LED and beeper control as usual.

SelfTest™ ASP readers have both an internal diagnostic routine to assure reader operation at start-up, as well as a means to test the integrity of the data lines. When power is first applied to a reader, it will "beep and flash" twice to let the installer know that it has performed an internal check and appears to be functioning properly. If the reader start-up routine determines one of the critical memory devices inside the reader has failed, the reader will emit a "chirping" sound for approximately 8 seconds.

The reader can be put into "line test mode" by holding a SelfTest Card in front of the reader. The reader will respond with an alternately flashing LED and an audio signal to let the installer know it is in the line test mode. It will remain in this mode until the installer takes it out of line test by presenting the SelfTest card a second time. While in this mode the reader will toggle the data lines at a 1 Hz rate which can be measured at the controller end with a volt meter. If the pulses are not present, then there is probably a break or short in the line. If the pulses are present and the system is still not working, in all probability the reader is not connected to the controller properly, the controller/system is incorrectly programmed, or the controller is defective. To return the reader to its normal operating mode, simply present the SelfTest card to the reader.



3.0 The Keypad

The keypad can be configured to be Buffered or Unbuffered. During the boot-up sequence the keypad identifies itself as either Buffered or Unbuffered by inspecting the configuration byte in the reader EEPROM. The keypad can be programmed using ProxSmith™. Please refer to the ProxSmith™ User Manual on “How to program the keypad”.

3.1 Buffered Mode

This is a new output format that is supported now in the ARK-501+ series keypad readers. The following 26 bit Wiegand data format is sent each time a PIN number is entered. But the user can enter a smaller size PIN, by using the # key as the terminator. e.g. A PIN of 123 should be entered as [1][2][3][#]. Use the * key to clear your entry. Each key press is confirmed with a tone.

P _e	F	F	F	F	F	F	F	F	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	P _o	
1	2							9	10																	25	26

Bit 1 is even parity for the following 12 bits. The sum of bits 1-13 is even.

Bits 2-9 are the Facility Code. This can range from 0 - 255 and is selected using ProxSmith™.

Bits 10 - 25 is the binary value of the PIN entered. Leading zeroes are added as required. Bit 10 is the MSB.

Bit 26 is odd parity over the previous 12 bits. The sum of bits 14-25 is odd.

Example: A facility code of 99 and a PIN of [1][2][3][4] will generate the following output:

0 01100011 0000010011010010 0

Note that 99d =63h =01100011b and that 1234d = 04D2h = 0000010011010010b

Pressing the # key with no preceding digits is equivalent to pressing any number of only zeroes. Do not program your panel to accept a PIN of all zeroes.



3.1.1 Buffered Mode Magstripe with 4-digit PIN and LSB-MSB Bit Order.

The following Magstripe data is sent each time a PIN number is entered. The reader has to be configured as a 4-digit PIN and LSB-MSB using ProxSmith™. Each character is entered LSB first with a following odd parity. The PIN size is 4 digits, but a shorter PIN can be entered by terminating with a # key. The * key clears the user inputs and each key press is confirmed with a tone.

For a 4-digit PIN

SS1	ID1	ID2	ID3	ID4	ID5	DS1	DS2	CC	K1	K2	K3	K4	SS2	LRC
11010	10011	10011	10011	10011	10011	00001	00001	10110	xxxxx	xxxxx	xxxxx	xxxxx	11111	yyyyy

For a 3-digit PIN followed by #

SS1	ID1	ID2	ID3	ID4	ID5	DS1	DS2	CC	K1	K2	K3	SS2	LRC
11010	10011	10011	10011	10011	10011	00001	00001	10110	xxxxx	xxxxx	xxxxx	11111	yyyyy

For a 2-digit PIN followed by #

SS1	ID1	ID2	ID3	ID4	ID5	DS1	DS2	CC	K1	K2	SS2	LRC
11010	10011	10011	10011	10011	10011	00001	00001	10110	xxxxx	xxxxx	11111	yyyyy

For a 1 digit PIN followed by #

SS1	ID1	ID2	ID3	ID4	ID5	DS1	DS2	CC	K1	SS2	LRC
11010	10011	10011	10011	10011	10011	00001	00001	10110	xxxxx	11111	yyyyy

Where:

SS1 is the Start Sentinel character “D”, “11010” in LSB first.

ID1-5 “99999”, “10011. . . 10011” are the 5 digits Facility ID characters.

DS1-2 Data Separator characters, “00”, “0000100001”

CC “D”, “11010” is the Control Character in LSB first.

K1-4 are the four keypad input characters.

SS2 is the End Sentinel character, “F”, “11111”.

LRC is the longitudinal redundancy check character which is computed by an Exclusive “OR” of all the characters preceding the LRC.

Each character is 5 bits including the odd-parity at the LSB.

K1-4 are in packed BCD form with LSB first

Table 3 shows the K_n Values Assigned to Keys.



<i>Key</i>	<i>K_n</i>
[0]	00001
[1]	10000
[2]	01000
[3]	11001
[4]	00100
[5]	10100
[6]	01101
[7]	11100
[8]	00010
[9]	10011

Table 3 *K_n Values Assigned to Keys*

3.1.2 Buffered Mode Magstripe with 4-digit PIN and MSB-LSB bit order.

The following Magstripe data is sent each time a PIN number is entered. The reader has to be configured as a 4-digit PIN and MSB-LSB using ProxSmith™. Each character is entered MSB first with a following odd parity. The PIN size is 4 digits, but a shorter PIN can be entered by terminating with a # key. The * key clears the user inputs and each key press is confirmed with a tone.

For a 4-digit PIN

```
SS1 ID1 ID2 ID3 ID4 ID5 DS1 DS2 CC K1 K2 K3 K4 SS2 LRC
11010 10011 10011 10011 10011 10011 00001 00001 10110 xxxxx xxxxx xxxxx xxxxx 11111 yyyyy
```

For a 3-digit PIN followed by #

```
SS1 ID1 ID2 ID3 ID4 ID5 DS1 DS2 CC K1 K2 K3 SS2 LRC
11010 10011 10011 10011 10011 10011 00001 00001 10110 xxxxx xxxxx xxxxx 11111 yyyyy
```

For a 2-digit PIN followed by #

```
SS1 ID1 ID2 ID3 ID4 ID5 DS1 DS2 CC K1 K2 SS2 LRC
11010 10011 10011 10011 10011 10011 00001 00001 10110 xxxxx xxxxx 11111 yyyyy
```

For a 1-digit PIN followed by #

```
SS1 ID1 ID2 ID3 ID4 ID5 DS1 DS2 CC K1 SS2 LRC
11010 10011 10011 10011 10011 10011 00001 00001 10110 xxxxx 11111 yyyyy
```

Table 4 shows the *K_n Values Assigned to Keys*

<i>Key</i>	<i>K_n</i>
[0]	00001
[1]	10000
[2]	01000
[3]	11001
[4]	00100
[5]	10100
[6]	01101
[7]	11100
[8]	00010
[9]	10011

Table 4 K_n Values Assigned to Keys

3.1.3 Buffered Mode Magstripe With 5-digit PIN and LSB-MSB Bit Order

The following Magstripe data is sent each time a PIN number is entered. The reader has to be configured as a 5-digit PIN and LSB-MSB using ProxSmith™. Each character is entered LSB first with a following odd parity. The PIN size is 5 digits, but a shorter PIN can be entered by terminating with a # key. The * key clears the user inputs and each key press is confirmed with a tone.

Note that in this mode only one data separator is used to help the panel distinguish this mode from the 4-digit PIN mode.

For a 5-digit PIN

```
SS1 ID1 ID2 ID3 ID4 ID5 DS1 CC K1 K2 K3 K4 K5 SS2 LRC
11010 10011 10011 10011 10011 10011 00001 10110 xxxxx xxxxx xxxxx xxxxx xxxxx 11111 yyyy
```

For a 4-digit PIN

```
SS1 ID1 ID2 ID3 ID4 ID5 DS1 CC K1 K2 K3 K4 SS2 LRC
11010 10011 10011 10011 10011 10011 00001 10110 xxxxx xxxxx xxxxx xxxxx 11111 yyyy
```

For a 3-digit PIN followed by #

```
SS1 ID1 ID2 ID3 ID4 ID5 DS1 CC K1 K2 K3 SS2 LRC
11010 10011 10011 10011 10011 10011 00001 10110 xxxxx xxxxx xxxxx 11111 yyyy
```

For a 2-digit PIN followed by #

```
SS1 ID1 ID2 ID3 ID4 ID5 DS1 CC K1 K2 SS2 LRC
11010 10011 10011 10011 10011 10011 00001 10110 xxxxx xxxxx 11111 yyyy
```



For a 1 digit PIN followed by #

SS1	ID1	ID2	ID3	ID4	ID5	DS1	CC	K1	SS2	LRC
11010	10011	10011	10011	10011	10011	00001	10110	xxxxx	11111	yyyyy

3.1.4 Buffered Mode Magstripe With 5-Digit PIN and MSB-LSB Bit Order

The following Magstripe data is sent each time a PIN number is entered. The reader has to be configured as a 5-digit PIN and MSB-LSB using ProxSmith™. Each character is entered MSB first with a following odd parity. The PIN size is 5 digits, but a shorter Pin can be entered by terminating with a # key. The * key clears the user inputs and each key press is confirmed with a tone.

Note that in this mode only one data separator is used to help the panel distinguish this mode from the 4-digit PIN mode.

For a 5-digit PIN

SS1	ID1	ID2	ID3	ID4	ID5	DS1	CC	K1	K2	K3	K4	K5	SS2	LRC
11010	10011	10011	10011	10011	10011	00001	10110	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx	11111	yyyyy

For a 4-digit PIN

SS1	ID1	ID2	ID3	ID4	ID5	DS1	CC	K1	K2	K3	K4	SS2	LRC
11010	10011	10011	10011	10011	10011	00001	10110	xxxxx	xxxxx	xxxxx	xxxxx	11111	yyyyy

For a 3-digit PIN followed by #

SS1	ID1	ID2	ID3	ID4	ID5	DS1	CC	K1	K2	K3	SS2	LRC
11010	10011	10011	10011	10011	10011	00001	10110	xxxxx	xxxxx	xxxxx	11111	yyyyy

For a 2-digit PIN followed by #

SS1	ID1	ID2	ID3	ID4	ID5	DS1	CC	K1	K2	SS2	LRC
11010	10011	10011	10011	10011	10011	00001	10110	xxxxx	xxxxx	11111	yyyyy

For a 1 digit PIN followed by #

SS1	ID1	ID2	ID3	ID4	ID5	DS1	CC	K1	SS2	LRC
11010	10011	10011	10011	10011	10011	00001	10110	xxxxx	11111	yyyyy



3.2 Unbuffered Mode

Unbuffered mode sends data to the host as each key is pressed in either an 8-bit or a 4-bit burst format.

3.2.1 Unbuffered Mode Wiegand With 8-Bit Burst

In this mode every key press is sent to the host as 8-bit data. The [*] and [#] keys also output code or are disabled using ProxSmith™.

The output from the reader is shown in Table 5

Key	Output in Hex	Output in Binary
[0]	F0	11110000
[1]	E1	11100001
[2]	D2	11010010
[3]	C3	11000011
[4]	B4	10110100
[5]	A5	10100101
[6]	96	10010110
[7]	87	10000111
[8]	78	01111000
[9]	69	01101001
[*]	5A	01011010
[#]	4B	01001011

Table 5 8-Bit Burst Output From Reader



3.2.2 Unbuffered Mode Wiegand with 4-bit Burst

In this mode every key press is sent to the host as 4-bit data. The [*] and [#] keys also output code or are disabled using ProxSmith™.

The output from the reader is shown in Table 6

<i>Key</i>	<i>Output in Hex</i>	<i>Output in Binary</i>
[0]	0	0000
[1]	1	0001
[2]	2	0010
[3]	3	0011
[4]	4	0100
[5]	5	0101
[6]	6	0110
[7]	7	0111
[8]	8	1000
[9]	9	1001
[*]	A	1010
[#]	B	1011

Table 6 4-Bit Burst Output From Reader



3.3 Model ARK-501 +, 3 x 4 Matrix

Mode of operation is dry contact. Refer to Figure 2 and Table 7 The suggested scan rate is 14.4 kHz. The suggested debounce rate is 20 msec. The scan and decode functions are Host System functions. The output is accomplished with a separate cable connected to the Keypad array.

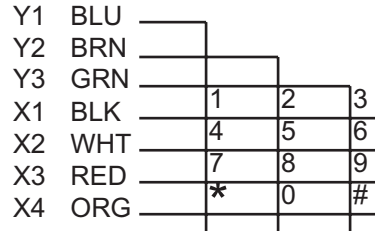


Figure 2 The Keypad

Table 7 indicates which wires on the Keypad are connected to each other for each key.

Key	Connection
1	BLU to BLK (Y1 to X1)
2	BRN to BLK (Y2 to X1)
3	GRN to BLK (Y3 to X1)
4	BLU to WHT (Y1 to X2)
5	BRN to WHT (Y2 to X2)
6	GRN to WHT (Y3 to X2)
7	BLU to RED (Y1 to X3)
8	BRN to RED (Y2 to X3)
9	GRN to RED (Y3 to X3)
*	BLU to ORG (Y1 to X4)
0	BRN to ORG (Y2 to X4)
#	GRN to ORG (Y3 to X4)

Table 7 Keypad Dry Contact



4.0 Quick Hook-Up Procedure

The following is a simple hookup procedure to assist you in testing the reader system before installation:

1. Unpack the equipment and become familiar with the components.
2. Read the pre-installation hints for mounting and metal mounting the reader as detailed on page 17
3. Place the reader at least 3.5' (1.1 m) from any CRT (monitor).
4. Locate and read the appropriate wiring diagram detailed on page 21 through page 25.
5. Connect the reader to the host controller according to instructions shown on the wiring diagram.
6. Connect reader to the appropriate linear power supply, refer to page 19.
7. Connect to earth ground as noted in the instructions on page 20.
8. Apply power.
9. Present the access card parallel to the reader as described in the card presentation section (on this page). The card code should now be displayed on the controller screen indicating that the card was read, the data was transmitted to the controller, and the controller responded. Note the range at which this occurs.
10. IF the read range is not per specifications, make sure any monitor is far enough away from the reader.
11. If no code is present, you have a communications problem with the controller.
12. Press all keys on the keypad and verify reception of codes (per the tabulated data on page 7 through page 12) at the controller end.
13. If anything appears abnormal, please answer the questions on the Troubleshooting Data Form (page 26) prior to calling for technical support at 1-800-M-INDALA (1-800-646-3252).



4.1 Card Presentation

To obtain maximum read range, present the card to the reader as shown in the figure below. Keeping the card parallel to the face of the reader, move it slowly toward the reader until a *QuickFlash*[™] is obtained (refer to page 5) This is the point at which the card is read, the data is transmitted to the controller, and the controller responded. To read the card again, remove it from the reader field and present it again. During normal use, the card can be presented to the reader at any angle, although this will result in a reduced read range.



Figure 3 Presenting the Card

5.0 Physical Dimensions

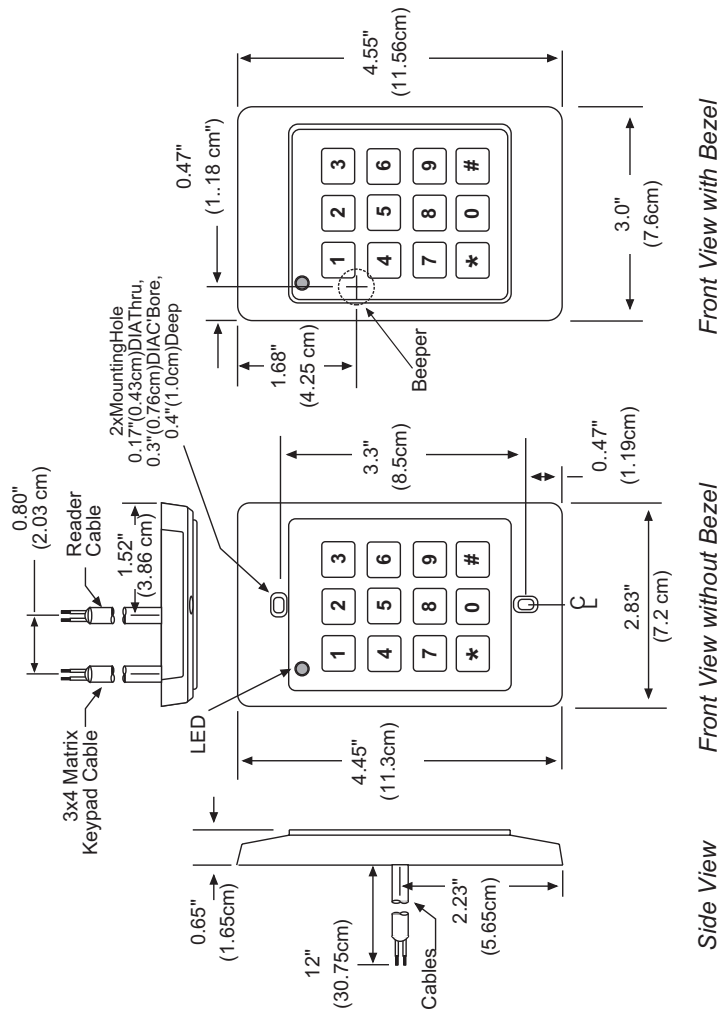


Figure 4 Physical Dimensions

Notes

- Multi-color LED and audio "beeper" are standard with the ARK-501+ reader.
- ASP Advantage Series Proximity™ equipment is not compatible with ESP ElectroStatic Proximity™ or ESP E-Series Proximity™.
- Refer to your system manufacturer's instructions for its exact installation specifications.
- Specifications subject to change without notice.
- © 1998 Motorola Indala Corporation.

6.0 Pre-Installation Hints

6.1 Mounting

Nearby external sources of electrical interference, such as sources of RF signal transmitters (portable two way radio, cellular phones, etc.), and/or nearby EMI noise producers may contribute to disturbing the electrical environment of the reader. Depending on the external noise signal strength of the nearby transmitter, the read range may be reduced or the card signal may be masked by the external signal, resulting in a no read.

Below is a list of possible installation problems that should be considered in the reader installation and wiring:

- Do not place the reader wiring bundled in conduit with AC power cables, lock power, or signal wiring.
- Maintain all reader wiring 12" (30 cm) minimum distance away from other wiring including, and not limited to, AC power, silicon controlled rectifiers (SCR) for dimming lighting or for controlling motor speed, computer data wiring, telephone wiring, or wiring to electric locking devices, etc.
- Do not install the reader in areas where sources of broad spectrum EMI noise may be present. Examples of EMI broad spectrum noise producers are motors, pumps, generators, DC-AC converters, uninterruptable power supplies, AC switching relays, light dimmers, computer monitors, and CRTs.
- Do not install the reader within 3.5' (1.1 m) of computer CRTs (monitors).

6.2 Metal Mounting

The ARK-501+ reader may be mounted on any surface/material. It can be mounted on any U.S.A. or Australian, metal or plastic, single gang, electrical switch box. If the reader must be mounted on a metal plate, separate the reader from the metal plate by a minimum of 3" (7.6 cm). If the reader must be framed by metal (e.g. installed in a metal enclosure, such as a parking stanchion), insure that the surrounding metal stands off by at least 1.6" (4 cm) on each side. Mounting the reader directly on metal causes a 30% reduction in read range. Do not cover the face of the antenna with metal of any kind.



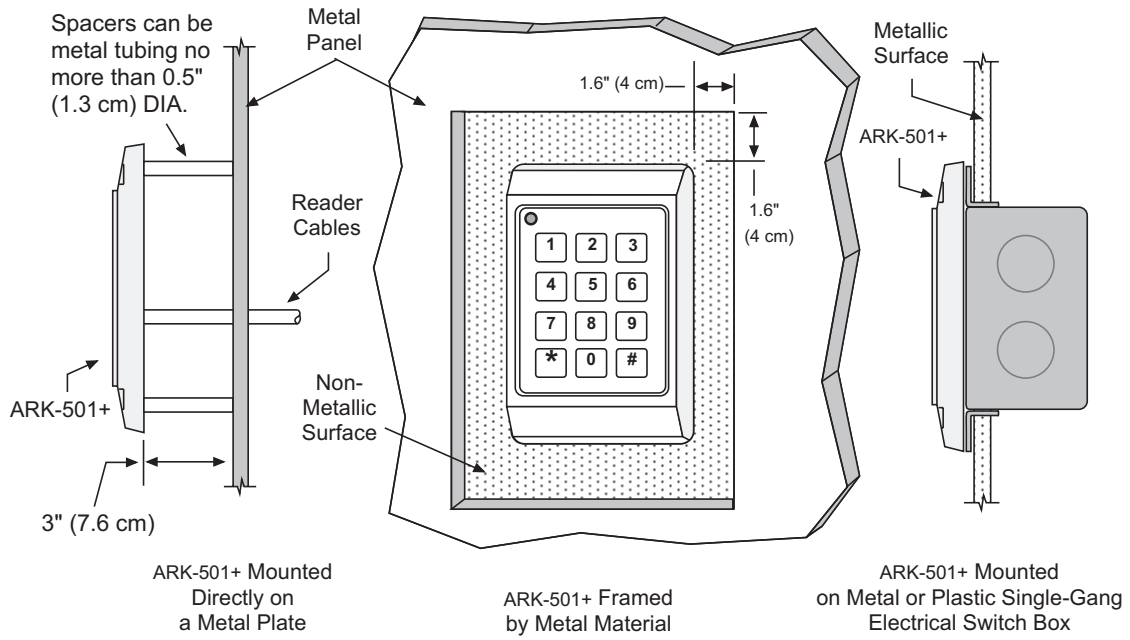


Figure 5 Metal Mounting

7.0 Power and Cabling

7.1 Power Supply Recommendations

~~Motorola~~ Indala's ARK-501+ PinProx Proximity Reader requires the use of a reasonable quality, linear, series pass, regulated power supply. Use of other than the recommended type of power supply can result in reduced read range. While these are quality power supplies and widely used in many computer-related industries, they may prove unsatisfactory if used with the ARK-501+ readers. The recommended power supply is Power One, model HA15-0.9-A.

SWITCHING POWER SUPPLIES ARE NOT RECOMMENDED DUE TO A POSSIBILITY OF REDUCED READ RANGE.

It is not advisable to use the proximity readers' power supply to power other equipment. This is especially true when operating switched inductive loads such as motor control relays and solenoids, e.g., magnetic locks, latch or strike. Doing so will affect the reader operation. Always use a separate dedicated power supply to power ~~Motorola~~ Indala proximity readers.

7.2 Power Cable Type

The recommended cable types to use between the power supply and the reader are as follows:

- 0.60mm Dia., three conductor, with an overall foil shield (24 AWG, Belden 9533 or equivalent).
- 0.80mm Dia., two conductor, with an overall foil shield (22 AWG, Alpha 5192 or equivalent).
- 1.20mm Dia., two conductor, with an overall foil shield (18 AWG, Alpha 5382 or equivalent).

7.3 Power Cable Maximum Length

The ARK-501+ reader requires a minimum voltage of 4 VDC ***at the reader input***. Voltage drops, caused by the cable resistance, can be made up by increasing the power supply voltage (DO NOT SET THE POWER SUPPLY VOLTAGE TO HIGHER THAN 16 VDC WITHOUT FIRST CONTACTING THE FACTORY). In noisy environments, use shorter cable runs. The following are the maximum cable lengths for cables connecting the power supply to the reader (**DO NOT USE CABLES LESS THAN 24 AWG**):

- AWG 24, up to 200 feet
- AWG 22, up to 300 feet
- AWG 20, up to 400 feet
- AWG 18, up to 500 feet



8.0 Earth Grounding

Connecting the ARK-501+ PinProx proximity reader to a reliable earth ground is very important to their overall operation. An electrical ground is not necessarily a good earth ground. If in doubt, connect the reader to an earth grounded cold water metal pipe (not the copper fire sprinkler system, as it has non-conductive couplings), or steel frames (building beams) that connect to earth. Earth ground can also be established by driving a copper clad ground rod into the earth. Make certain the DC resistance between your established earth ground and the system ground is less than 50 Ohms.

It is important to connect both the cable shield and the negative line of the power supply to only one common earth ground point. Exercise care in the overall grounding scheme to ensure that no ground loops exist. A ground loop can result when one connects two different points to separate earth grounds. That condition may exhibit problems in many different ways (e.g., no operation, poor read range, and communications line interference resulting in no code or improper code being seen by the controller).

In a multiple reader installation, it is critical that all readers connect to a single earth ground reference point (common ground). The following figure is an example of proper grounding for a multiple reader installation.

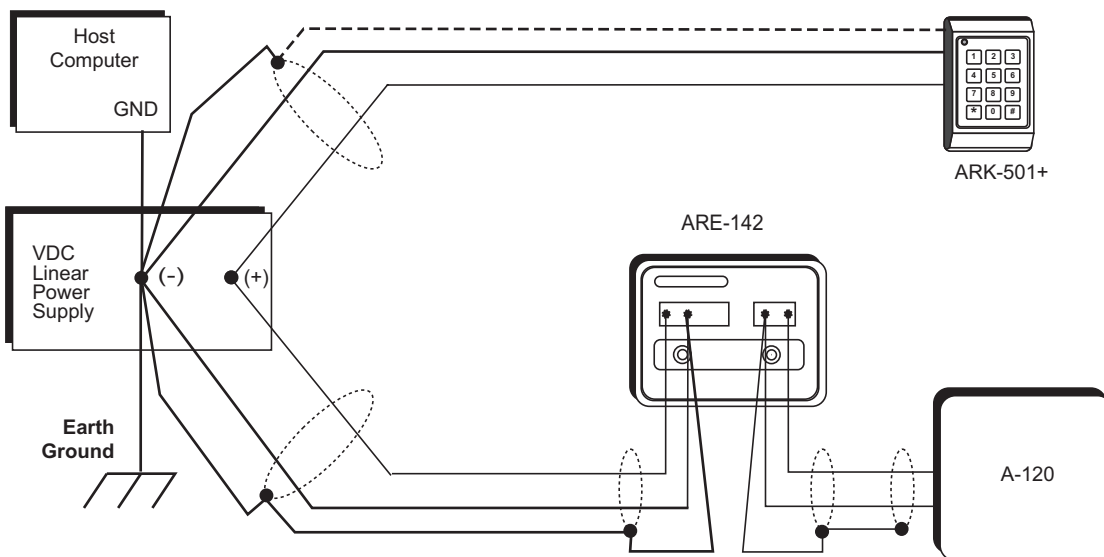


Figure 6 Establishing Common Ground for Multi-Reader Installation

Notes

- Your system must have a single earth ground point.
- Use only linear power supply for the ARK-501+ PinProx proximity reader.
- ASP Advantage Series Proximity™ equipment is not compatible with ESP E-Series Proximity™ or ESP ElectroStatic Proximity™.
- Refer to your system manufacturer's instructions for its exact installation specifications.

9.0 Single LED Control Line Configuration

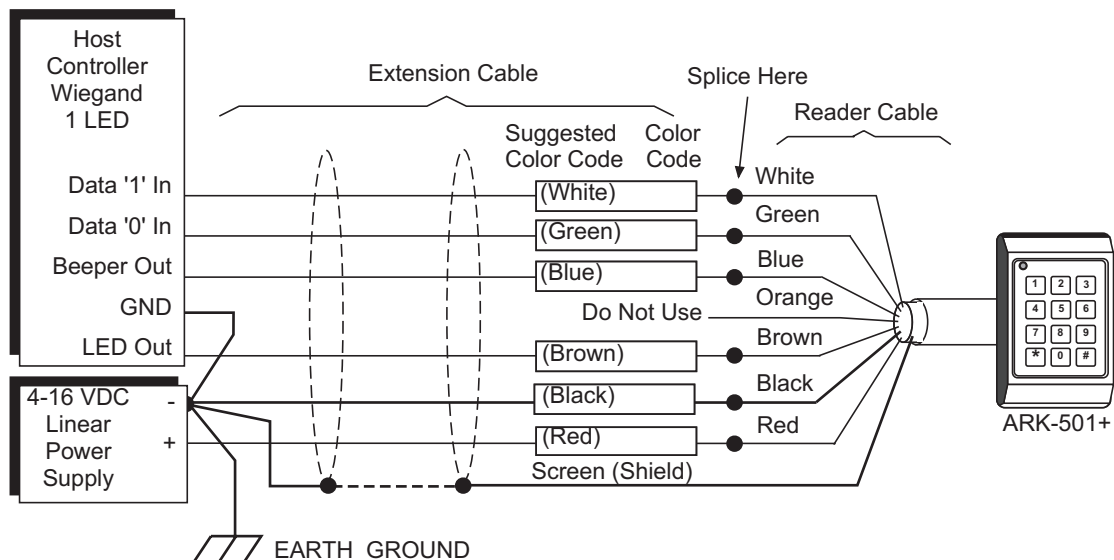


Figure 7 Single LED Control Line

Notes

- Your system must have a single earth ground point.
- The shield must run continuous throughout the installation. **Do not connect screen (shield) to black wire at ARK-501+ Key pad proximity reader cable splice.**
- Do not use twisted pair with Wiegand output format.
- There is no LED "off" state in this configuration. LED is normally red when the brown wire is high (at min. +5 VDC or not connected).
- Pull brown wire low to change LED color to green.
- Toggle the brown wire high-low at a rate of 100 Hz to 1 kHz, 50% duty cycle, to produce amber LED color.
- Pull blue beeper wire low to activate audio 'beep' tone.
- Power supply should be regulated linear power supply (refer to page 19).
- Follow ~~Motorola~~ Indala's wire length and type recommendations (**refer to page 25**).
- Refer to your system manufacturer's instructions for its exact specification.

10.0 Dual LED Control Line Configuration

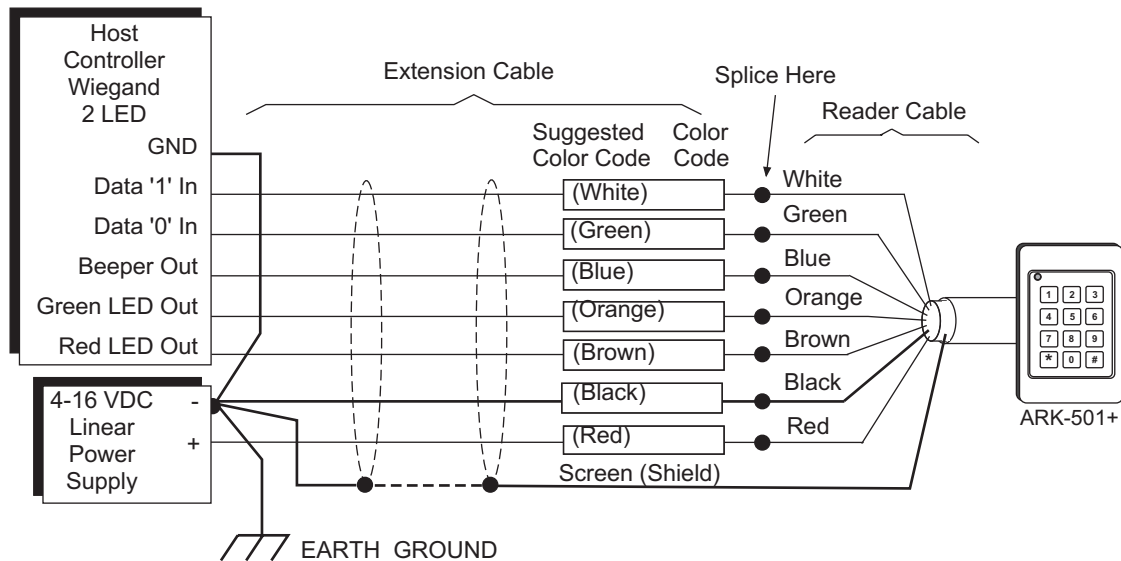


Figure 8 Dual LED Configuration

Notes

- Your system must have a single earth ground point.
- The shield must run continuous throughout the installation. **Do not connect screen (shield) to black wire at ARK-501+ Key pad proximity reader cable splice.**
- Do not use twisted pair with Wiegand output format.
- LED is normally "off" (when 5 VDC or open circuit at orange and brown wires).
- Pull orange wire low to activate green LED. Pull brown wire low to activate red LED.
- Pull both orange and brown wire low to activate amber LED.
- Pull blue beeper wire low to activate audio 'beep' tone.
- Power supply should be regulated linear power supply (refer to page 19).
- Follow [Motorola Indala's](#) wire length and type recommendations (**refer to page 25**).
- Refer to your system manufacturer's instructions for its exact specification.

11.0 Magnetic Stripe Output Wiring Diagram

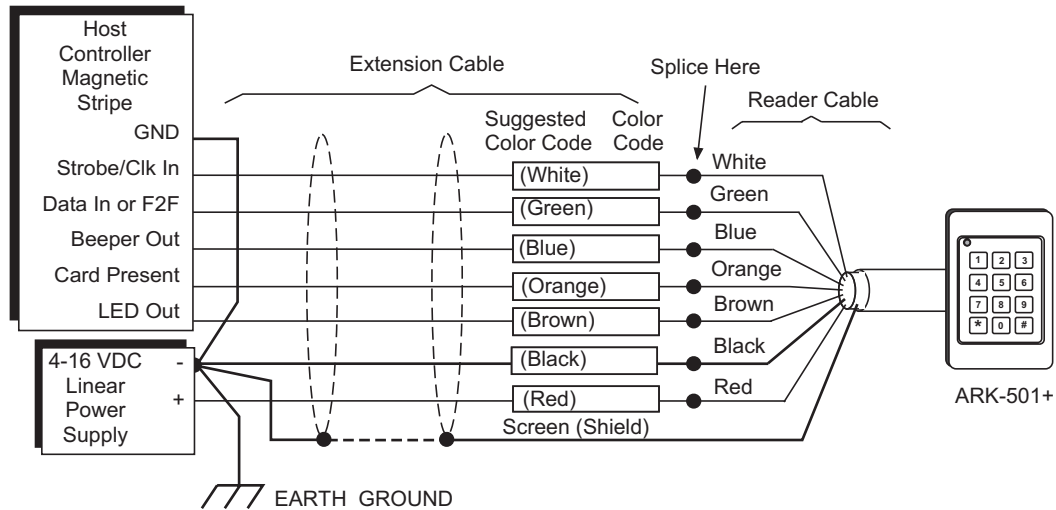


Figure 9 Magnetic Stripe Output Wiring Diagram

Notes

- Your system must have a single earth ground point.
- The shield must run continuous throughout the installation. **Do not connect screen (shield) to black wire at ARK-501+ reader cable splice.**
- There is no LED "off" state in this configuration. LED is normally red when the brown wire is high (at min. +5VDC or not connected).
- Do not use "twisted pair" type cable with magnetic stripe output format.
- Pull brown wire low to change LED color to green.
- Toggle brown line high-low at a rate of 100 Hz to 1 kHz, 50% duty cycle, to produce amber LED color.
- Pull blue beeper wire low to activate audio 'beep' tone.
- Power supply should be regulated linear power supply (refer to page 19).
- Follow Motorola Indala's wire length and type recommendations (**refer to page 25**).
- For open collector (non-terminated output) consult your system manufacturer for correct cable length and type.
- The data out internal circuit configuration is as shown in Figure 10 .
- Refer to your system manufacturer's instructions for its exact specification.

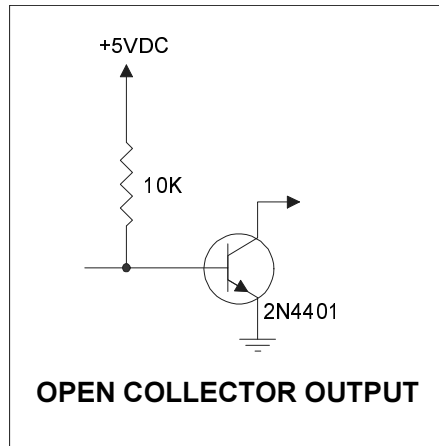


Figure 10 Data Out Internal Circuit Configuration

12.0 Wire Types and Lengths

For Wiegand and Magnetic Stripe output wiring refer to the table below to determine the recommended wiring type at various maximum distances. Variations in distances require different wire gauges. Because of system data termination differences, contact your system manufacturer for its exact requirements.

12.1 Recommended Wire Types

- 24 AWG (0.60 mm), six or seven conductor, with an overall foil shield, Belden 9536, 9537 or equivalent.
- 22 AWG (0.80 mm), six or eight conductor, with an overall foil shield, Alpha, 5196, 5198 or equivalent.
- 18 AWG (1.20 mm), six or eight conductor, with an overall foil shield, Alpha 5386, 5388 or equivalent.

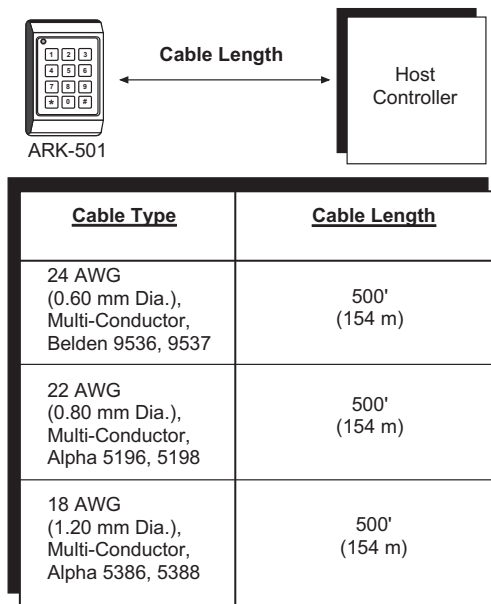


Figure 11 Cable Length Definition

Notes

- The input voltage should be 4 VDC to 16 VDC **at the reader** (refer to **Power Cable Maximum Length** on page 19).
- Refer to your system manufacturer's instructions for their exact wire type specifications.
- Installation to be in accordance with National Electric Code ANSI/NFPA 70.

13.0 Troubleshooting

If the reader does not function properly when installed according to instructions, please complete this form and fax it to the factory before calling for assistance.

FAX

From: _____

To: Technical Support

Phone: _____

Model: ARK-501+

Fax: _____

Fax: (408) ~~434-7057~~

Product S/N: _____

Date: _____

Dead Reader

1. Is the unit wired according to instructions? Yes No
2. Is the recommended power supply being used? Yes No
3. Is the DC voltage correct? Yes, _____ volts No
4. Is the DC current correct? Yes _____ mA No
5. What is the cable length between the power supply and the reader? _____ feet
6. Is the cable type according to specifications? Yes No

Short Read Range

1. Is the reader wired according to instructions? Yes No
2. Is earth ground connected according to instructions? Yes No
3. Is the cable shield connected according to instructions? Yes No
4. Is the recommended power supply being used? Yes No
5. Is the DC voltage correct? Yes, _____ volts No
6. Is the DC current correct? Yes _____ mA No
7. Is there a CRT (computer monitor) nearby? Yes _____ feet No
8. Is the card presentation according to instructions? Yes No
9. What is the card tag number? _____ Card model number: _____

Data Incorrect or Non-existent

1. Is the unit wired according to instructions? Yes No
2. Is earth ground connected according to instructions? Yes No
3. Is the cable shield connected according to instructions? Yes No
4. Is there a CRT (computer monitor) nearby? Yes _____ feet No
5. Is the card presentation according to instructions? Yes No
6. What is the output format? _____ Format: _____



14.0 Additional Information

14.1 RMA (Return Material Authorization)

Goods returned for repair, warranty or non-warranty, must be assigned an RMA (Return Material Authorization) number. The customer is to provide a description of the specific problem. The customer is to include serial numbers, formats, card ID numbers, and correct facility codes with the items to be returned. If exact duplicates of returned cards or tags are requested, the customer must provide Motorola Indala with the exact format and ID numbers needed.

In the event no defect is found during evaluation, a U.S.A. \$50 minimum charge will be applied to any unit, warranty or otherwise, for labor expended. For units returned and not covered by the warranty (due to age, misuse and/or damage), a quote for repairs will be issued, and no work will be performed until a valid purchase order is received. The rate for repairs is \$50 per hour, plus materials. Units left over 30 days without a repair authorization and a purchase order will be returned with evaluation charges and shipping costs applied.

14.2 Patents

Indala Corporation reserves all Patents, Copyrights, Trademarks, Trade Names, and all other intellectual property rights worldwide.

Products are covered by United States patent 4818855, Canadian patent 1253591, and other patents pending worldwide. ASP *Advantage Series Proximity*[™], ESP *ElectroStatic Proximity*[™], ESP *E-Series Proximity*[™], *HyDrive*[™], and the Indala Logo are internationally recognized and registered trademarks of the Indala Corporation.

Indala Corporation reserves the right to change any product description and/or specification contained here without prior notice. © 1998 ~~Motorola~~ Indala Corporation.

14.3 CE Mark

This product complies with the European Community Council Directive 89/336/EEC if the installer/user adheres to the instructions detailed in this manual. This product is in compliance with ETS 300 683 with the referenced standards EN 55022 (class B), EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, and EN 61000-4-6.

14.4 Warning

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



residential area is likely to cause interference in which case the user will be required to correct the interference at his own expense.

The user is cautioned that changes and modifications made to the equipment without the approval of manufacturer could void the user's authority to operate this equipment.

It is suggested that the user use only shielded and grounded cables to ensure compliance with FCC Rules.



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