Applied Wireless Identifications Group, Inc.

SENTINEL-PROX LR-911

LONG-RANGE TAG READER

Installation & Operation Manual - 006-99-A

Your Best Option for Long Range UHF Readers

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NOTE: READ AND USE THIS MANUAL.

FAILURE TO DO SO MAY RESULT IN POOR READER PERFORMANCE OR EVEN PERMANENT DAMAGE TO READER, WHICH COULD VOID THE READER WARRANTY.

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1.0 INTRODUCTION:

AWID's Sentinel-Prox LR-911 Reader is a long-range (9 to 11 feet) reader that works with paper-thin passive windshield mounting tags or credit card size tags. This reader comes with a unique combination of long read range, small size and low power consumption. LR-911 has an internal power DC/DC converter, allowing it to work with wide range of supply inputs without affecting its performance. With a 16 V DC supply, its current consumption is less than 400 mA, making it possible to be powered directly from the supply in the access control panel, thereby eliminating the need for an external supply. LR-911 has simultaneous Wiegand and RS-232 outputs, its primary applications are automated parking garage entrance control, hands-free access control, asset tracking and asset management applications.

1.1 General Descriptions:

- Wall mount or post mount reader
- Indoor or outdoor installation

1.2 Special Features:

- Thin passive tags with long range performance
- Designed for automated operation with tags mounted on automobile's windshield
- Simultaneous Wiegand (Access Control) and RS-232 (transaction control) outputs
- Permanently sealed electronics for indoor or outdoor applications
- UV stabilized plastic housing

1.3 Suggested Applications

- Garage Gate Control
- Asset Management
- Item Tracking
- RFID

2.0 PRINCIPAL OF OPERATION

This Radio Frequency Identification (RFID) reader uses radio frequency to identify, locate and track people and objects that carry the appropriate transponders. RFID readers can work in none line-of-sight situations and in darkness, bright sun light or through dirt, grime and smudges.

A typical RFID system consists of three components – an interrogator or reader, a transponder or card and a data processing panel and/or computer combination. Most RFID readers have an internal micro-controller, transmitter, receiver and a shared transmit/receive antenna. The card is usually passive (no internal battery) and consists of an antenna and RFID ASIC (Application Specific Integrated Circuit). During operation, the transmitter sends out an electromagnetic wave to establish a zone of surveillance. When a transponder enters this zone, the electromagnetic energy from the reader begins to energize the IC in the

transponder. Once the IC is energized, it goes through an initialization process and is ready to accept further commands. Upon receiving a command to broadcast its identity, the RFID ASIC begins to broadcast its identity through a low energy back-scattering technology that selectively reflects or backscatters the electromagnetic energy back to the reader. The receiving circuits in the reader senses and decodes this back-scattered signal and hence determines the identity of the transponder.

3.0 SPECIFICATIONS

- Input voltage……………………………. +6V to + 16V DC
- Input current……………………………... 1.2 to 0.40 A typical
- Read range:
  Nominal (Line of Sight) 10 feet
  Transmit frequency……………………… 902-928 MHz
- Receiver frequency……………………… 902-928 MHz (Amplitude Modulated)
- Operating temperature range……………-30° C to +55° C
- Color…………………………………………. Dark Gray and Beige
- Output formats available……………….. Simultaneous Wiegand & RS-232 (Standard)
  (Others are available upon request)

3.1 Measuring Read Distance

The transponder for this Reader is designed for windshield mounting. To measure the read range between the Reader and the transponder, the transponder must be placed behind a piece of glass of about 0.25 inches in thickness and the transponder must be flat against the glass. Grasp the transponder by the edges and hold the transponder in the same orientation as indicated in the transponder. Move the transponder toward the Reader, with the card surface parallel to the Reader, until confirmed data detection occurs. This indicates that the Reader has successfully read the transponder. In order to read again, the card must be fully withdrawn from the Reader's field of view and then approached again.

NOTE: FAILURE TO FOLLOW THE INSTALLATION GUIDE MAY RESULT IN POOR PERFORMANCE OR EVEN CAUSE PERMANENT DAMAGE TO THE READER, THUS VOIDS THE PRODUCT WARRANTY.

4.0 PREPARATION FOR INSTALLATION

4.1 Site Survey:

Always conduct a site survey before starting installation, avoid any possible sources of interference. If the Reader is not installed properly, the performance will be degraded or more seriously the Reader may be damaged. The following is a list of installation procedures that should be followed during installation:

- Do not install the Reader in an area where sources of broadband electromagnetic noise may exist. Avoid mounting the reader facing a cellular phone tower or in close proximity to the base station of a 900 MHz wireless telephone.
- Keep all the Reader wiring at least 12 inches (30 cm) away from all other wiring, which includes but is not limited to, AC power, computer data wiring, telephone wiring and wiring to electrical locking devices.
- Do not operate the reader in close proximity to any 900 MHz wireless equipments.

4.2 Preferred Reader Installation Practices

- Avoid mounting reader under direct sun light. Sun light in some locations may cause the reader to be operating at temperatures well above the 55 degrees Celsius limit.
- Make sure that the supply voltage of the Reader is within specification.
- Use cables with over-all braid or shield.
- For best results, run the cable in an individual conduit, at least 12 inches from AC power, computer data cables and cables for electrical locking devices.
- Use recommended cable. Do not use any un-shielded "Twisted Pair" type cable.
- Use the largest wire gauge possible (22AWG and thicker).
- Use a dedicated power supply, where necessary.
- Use Single Point Grounding (Earthing) for black wire of cable. No ground loops. Outer shield of cable should not be grounded.

4.3 Mounting Preference

The LR-911 has a unidirectional antenna with an antenna beam width of about 60-70 degrees. The radiation pattern is a cone shaped beam, which should be aimed to the location where the transponders will pass. For best results, the antenna should be mounted on a post; about 6 to 7 feet from pavement with the antenna angled slightly downward.
With a vehicle passing through the drive lane, the center of the antenna radiation pattern should project to the windshield directly in front of the passenger side.

Be sure to elevate the antenna slightly to accommodate sport utility vehicles and minivans. Fig. 4.3-1 is a typical mounting arrangement that should work in most single lane and multi-lane cases.

4.4 General Wiring Requirements

All the Reader wiring must be continuously shielded. AWID recommends using #22 AWG up to #18 AWG, six or seven-conductor shielded cables. Longer distances and higher current consumption on the power supply line may require larger gauge wires. Due to system data termination differences, contact your panel manufacturer for the proper wire sizes to meet their specific requirements.

TABLE 4.4-1: Data Line's Wiring Requirement

WIRE SIZE	#22 AWG (0.6mm Dia.)	#18 AWG (1.2mm Dia.)
WIEGAND	500 ft (152 meters)	980 ft (300 meters)
RS-232	45 ft (15 meters)	45 ft (15 meters)

4.5 Power Supply

For consistent performance, choose a Low Noise/High Efficiency switching power supply

4.7 Grounding

Grounding is critical for proper operation of the Reader. When installing the Reader, it is crucial to assure that the earth ground is the best ground available. If you elect to use the AC main power ground, conduct a test by measuring its resistance relative to a known good ground, such as a cold water pipe or a structural steel that is in direct contact with the ground. The resistance should be less than 50 ohms. If you find that the AC main power does not provide adequate earth ground, try using a solid connection to a cold water pipe.
Outer shield of cable should not be grounded.

For multiple Reader installations, it is critical that all Readers are connected to the same grounding system. Using different grounding systems will create secondary current paths or ground loops that can affect the performance and cause damage to the Reader.

4.8 Wiring Diagrams
See Fig's 5.2-1,2,3

5.0 INSTALLATION PROCEDURE

Verify that all item listed in Section 5.1 of this manual are present before starting the installation.

5.1 Parts List

A.	Installation sheet, P/N: 006-99-A	QTY=1
B.	Sentinel-Prox LR-911 Reader, P/N: 004-20-A	QTY=1
C.	#6-32 x 1" Machine screw, P/N: 0616MPP	QTY=4
D.	#6-32 Hex Machine Screw Nuts, P/N: 06NH	QTY=5 (1 spare)
E.	#6 External Tooth Lockwashers, P/N: 06WE	QTY=5 (1 spare)
F.	Screw hole plug, P/N: 004-27-A	QTY=5 (1 spare)

AWID APPLIED WIRELESS ID

5.2 Installation Steps

Installation Procedure

1.) Position the Reader (Item b on Parts List) at the desired mounting position on a mounting post or a mounting surface. Use Figure. 1 as guide. For straight mounting, drill four small holes for mounting screws, and one clearance hole for reader cable. The installer determines the size of the mounting holes and the clearance hole.
2.) For straight mounting, insert both cable slot plugs (item g on Parts List) to bottom cover.
3.) For side mounting, bend and press the cable into the curved channel and guide the cable out on the desired side of the LR-911. Insert one cable slot plug to the other side of the bottom cover with no cable coming out.
4.) For Wiegand output, connect the Reader and the Panel together according to Figure 2. Install reader onto the mounting surface with items c, d, and e on Parts List. (For other data format, see Note 3.)
5.) Read Note 1 and below then insert item f. on Parts List into the four screw clearance holes to conceal the screws.

5.3 Verification

a. Power up the PANEL, Connect a PC, which has the special test program installed, at the RS-232 output port.
b. Place a "good" card in front of the Reader and keep it in that position. The reader program will confirm that the data has been detected.

c. The reader uses an internal micro-controller to manage its many functions, and the micro-controller must be initialized properly. When the reader show evidence of malfunctioning, turn off the reader and wait for ten seconds before energize the reader again.

Fig 5.2.1 Wiring Diagram For Wiegand Output Format

READER	Braid	PANEL
Ext Data (Yellow)		
Data1 (White)		Data1
Data0 (Green)		Data0
RS Ground (Blue)		
Reset (Brown)		
Transmit (Violet)		
Receive (Orange)		
Ground (Black)		Ground
6-16 VDC (Red)		Power
Shield Drain)		Chassis Ground

Earth Ground
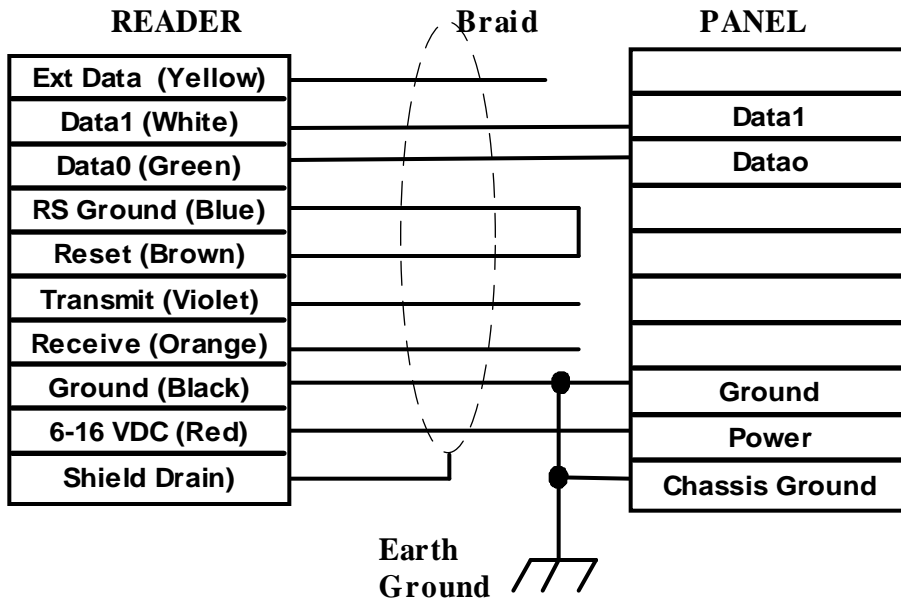
Fig 5.2.2 Wiring Diagram For RS-232 Output Format

READER	Braid	PANEL
Ext Data (Yellow)		RS Ground
Data1 (White)		DSR
Data0 (Green)		DTR
RS Ground (Blue)		CTS
Reset (Brown)		RTS
Transmit (Violet)		RXD
Receive (Orange)		TXD
Ground (Black)		Ground
6-16 VDC (Red)		Power
Shield Drain)		Chassis Ground

Earth Ground
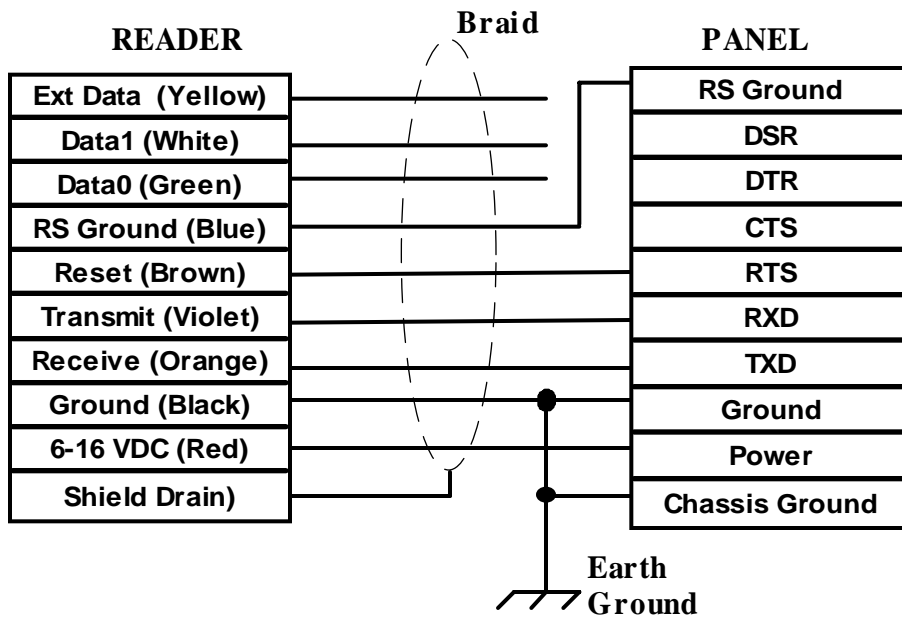
Fig 5.2.3 Wiring Diagram For RS-232 & Wiegand Output Format

RS-232 PANEL

RS Ground
DSR
DTR
CTS
RTS
RXD
TXD
Ground
Power
Chassis Ground

Braid

Earth Ground

READER

Ext Data (Yellow)
Data1 (White)
Data0 (Green)
RS Ground (Blue)
Reset (Brown)
Transmit (Violet)
Receive (Orange)
Ground (Black)
6-16 VDC (Red)
Shield Drain)

Wiegand PANEL

Data1
Data0
Ground
Power
Chassis Ground

Earth Ground
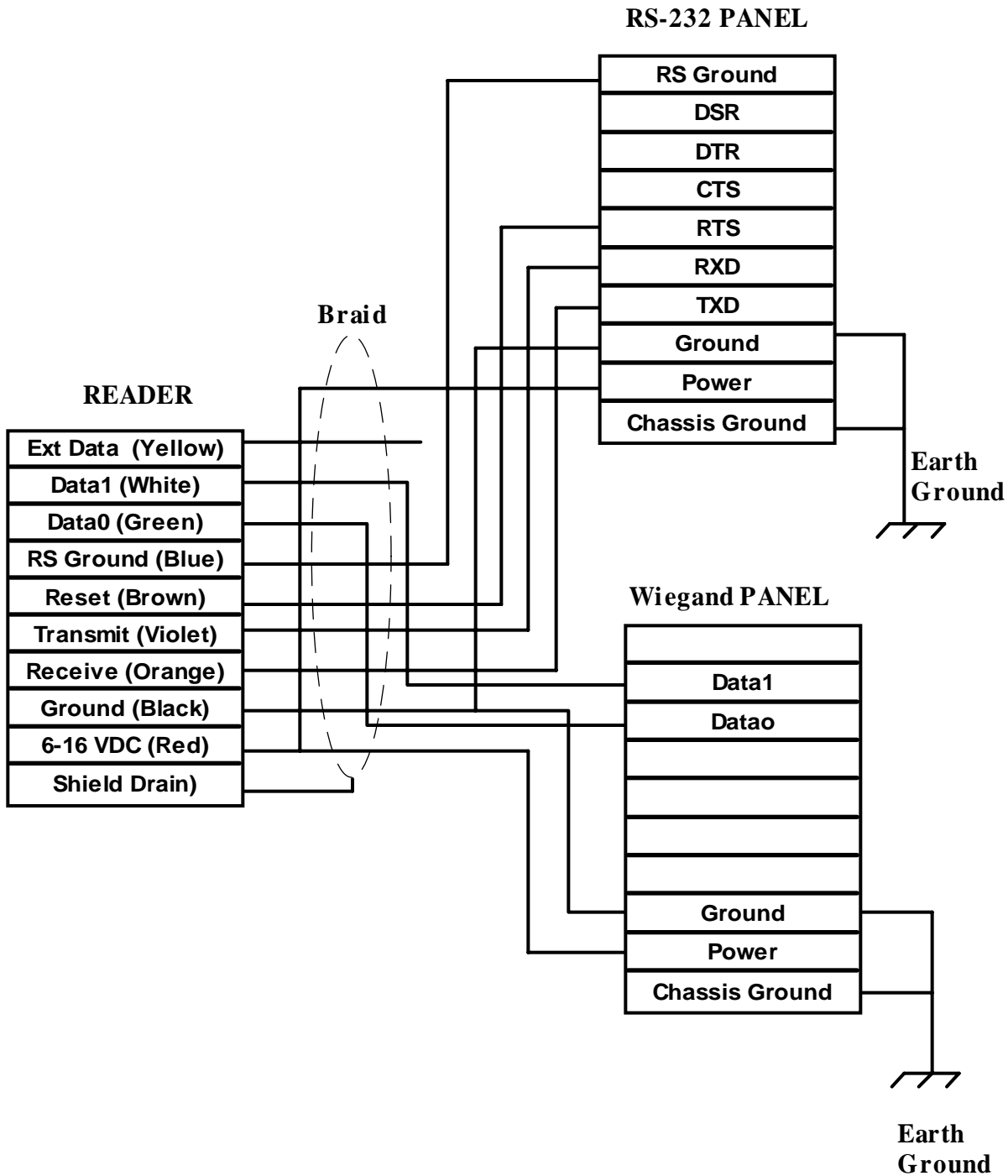
5.4 Mounting

a. Check to ensure all connections are secure. Feed all wires through the cable access hole to the rear or the side of the mounting position.
b. Mount the Reader with the four #6-32 x 1" Machine screws, P/N: 0616MPP and the four #6-32 Hex Machine Screw Nuts, P/N: 06NH (Item c and d on Parts List).
c. Insert the Screw hole plugs (Item d on Parts List) into the screw clearance holes to conceal the screws. **Note: screw hole plugs are designed for one-time use only! Once the plugs are seated, they cannot be removed without damaging the plugs.**

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5.5 FCC RF Exposure compliance

Caution: to meet FCC RF Exposure compliance, operator(s) should not be closer than 10.27 inches to a transmitting antenna.

Antennas must be labeled indicating minimum separation distance per FCC RF Exposure requirements . If the information on the label is not clearly visible, a sign with the same information must be posted within 36 inches of the antenna.

Radio Frequency (RF) exposure

In order for this device to comply with FCC-adopted RF exposure limits, precautions must be taken. To meet the requirements of the FCC's Maximum Permissible Exposure (MPE) guidelines, persons should not be closer than 10.27 inches (26.1 cm) to a transmitting antenna. For installations where an operator must handle a tag or diagnostic tool closer than 9.88 inches to the transmitting antenna, the operator should ensure that the RF antenna is not transmitting prior to positioning the tag or tool. Once the operator has positioned the tag or diagnostic tool, and moved away a minimum of 10.27 inches from the antenna, the antenna can be re-activated. For all installations labels must be placed on individual antennas, or signs must be displayed, indicating "CAUTION: A minimum separation distance of 10.27 inches must be maintained between an antenna and persons for meeting FCC RF Exposure compliance. See Users manual for details on operation requirements." For more information on RF Exposure, where incidental exposure may exceed the above guideline, please refer to the FCC Office of Engineering and Technology Bulletin 65, Supplement C, Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields, available online at:

http://www.fcc.gov/oet/info/documents/bulletins/

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6.0 WARRANTY

AWID's products are warranted to the original purchaser to be free of defects in material and workmanship for the life of the product. Any tampering or modification to the product will void this product warranty. AWID does not warrant any product as to its merchantability or suitability of use. AWID's sole and complete responsibility under this warranty is expressly limited to repair or replacement of the warranted product.

7.0 RETURN MATERIAL AUTHORIZATION (RMA)

AWID monitors and tracks the life cycle performance of our product through our RMA system. All customers must obtain a RMA number from AWID Customer Service Department prior to returning the merchandise. After the customer provides AWID Customer Service Department with the serial number and a description of the returning item, a RMA number will be issued. **This RMA number must be clearly marked on the outside of the returned package and noted on the paperwork attached to the returned merchandise.**

When obtaining a RMA number for RFID tags, please provide AWID's Customer Service Department with the serial numbers, card identification numbers, facility codes, etc. If exact duplicates of returned cards or tags are requested, the customer must provide AWID with the numbers needed. AWID reserves the option to replace or repair returned merchandise. Items returned to AWID without the proper authorization will be returned to the originators at their own expense.

8.0 TROUBLESHOOTING

This unit, if not installed in strict compliance with AWID's installation instructions, may not function to specifications. Use the checklist below to identify the problem:

- Is the tag valid and working?   - Try a different tag
- Is the reader wired correctly?   - Check All Wiring and Connections
- Is the unit grounded properly?   - DRAIN-EARTH: less than 50 Ohms
- Is the card presented correctly?   - Card face parallel to reader face
- Is a power supply correct?   - Check voltage at power supply
- Is reader voltage/current correct? - 6V/1.2A…16V/0.4 A typical
- Is the environment free from electromagnetic interference?   - Run cable away from other data carrying cables and the reader away from electromagnetic interference sources!

When troubleshooting, try to identify the source of the problem to a unit level. "Is the problem originating from the panel?" Or "is the problem originating from the Reader? " Maybe the problem "is the power supply?"

All AWID's readers will need only a power supply and a valid card to work properly. If the reader is connected with RED (+6…16V) and BLACK (Ground), and presented with a valid card, the reader will successfully display valid data at the test computer.

To check the validity of the output data in the absence of a panel, you will need to build a patch cable between the reader and a PC. Call AWID's Technical Support for details.

If a problem persists, consult the system manufacturer. If problem is the reader, consult AWID's Technical Assistance Department. AWID help desk is opened from 8:00 AM to 8:00 PM Eastern Standard Time, and can be reached by dialing 1-800-369-5533.

9.0 PATENTS AND APPROVALS

AWID products are covered by United States patent _____, patent pending.

AWID logo is a registered trademark of Applied Wireless Identifications Group, Inc.

Where required, AWID's products are approved by the appropriate regulatory agencies:

U. S. Federal Communications Commission:	Part 15
Underwriter Laboratory:	Designed to meet UL 294
Designed to Comply with:	CE, UL, VDE, BZT, DTI & PTT

Information To The User

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.