

# **OWNER'S OPERATING MANUAL**

## **INTERNATIONAL VOLTAGE & FREQUENCY CONVERTER**

**FOR MODELS:**

**ED-1000-x/xLC**

**ED-1500-x/xLC**

**ED-1250-X/1LCSP (400Hz output)**

**ED-2000-x/xLC**

**ED-3000-x**

**ED-4000-x**



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## INTRODUCTION

Congratulations! You have selected the highest quality voltage and frequency conversion for your equipment today. This unit offers a quiet and compact package with superior performance you can depend on. You now own a member of the ED family which is a proud part of the very reliable and versatile **FALCON®** ED Series.

This Users Manual is provided with your new ED unit. It will enhance your understanding of the product and its functions. Read this handbook carefully in the order it is presented prior to operating your unit. This will save you time and effort in your installation and application. The illustrations will also familiarize you with the ED's operating modes and indications. Always operate the unit within the guidelines and specifications given to maximize the unit's efficiency and lifetime. Also, your understanding of the product is essential in providing you years of service for your back-up power requirements.

Refer to the cross-reference table below to understand which unit with it's power capability corresponds to your particular model number.

### CROSS REFERENCE TABLE

MODEL NUMBER	OUTPUT POWER (VA)
ED-1000-x/xLC	1000
ED-1250-x/1LCSP	1250 (400Hz output)
ED-1500-x/xLC	1500
ED-2000-x/xLC	2000
ED-3000-x	3000
ED-4000-x	4000

## IMPORTANT SAFETY INSTRUCTIONS, SAVE THESE INSTRUCTIONS

This manual contains important safety instructions that should be followed during installation and maintenance of the Optional ED batteries.

## UNDERSTANDING HOW IT WORKS

The **FALCON®** ED Series represents one of the smallest and most compact units of the **FALCON®** Voltage and Frequency Converter product line. In the tradition of all **FALCON®** products, it maintains the highest reliability and the most complete on-line, sinewave power conversion and protection available. An on-line, sinewave topology is the only total solution to the complex frequency conversion problem. It effectively provides just what it says, true frequency conversion. Voltage conversion transformers alone can not provide the necessary frequency conversion necessary to allow the operation of frequency dependant equipment in 50/60 or 60/50 Hz international applications. The **FALCON®** ED Frequency and Voltage Converter is engineered with the latest MOSFET/PWM technology for high efficiency and reliability. With the incorporation on optional external battery packs, the ED Frequency and Voltage Converter will also function as a Regenerative On-Line Uninterruptible Power Supply, providing back-up power.

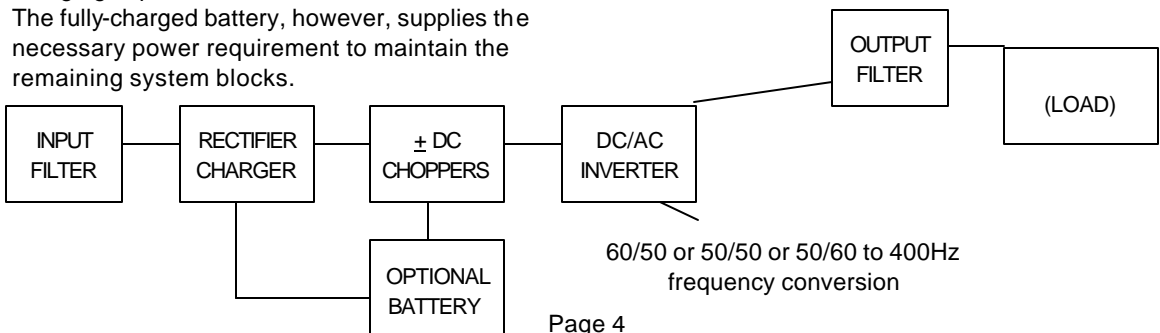
Refer to the simplified block diagram, **Figure 1**, for a system description. The AC source is rectified and provides energy for the DC  $\pm$  Choppers and a float charge to a standby Battery. These DC Choppers then supply the power to operate the DC/AC Inverter.

With optional external battery pack(s), during a utility power-loss, the AC rectification and battery charging capabilities of the ED become inactive. The fully-charged battery, however, supplies the necessary power requirement to maintain the remaining system blocks.

The **FALCON®** ED on-line topology is unique to other on-line systems, in that, it is designed to meet the needs of non-linear loads. A computer, with its switching power supply, is considered a non-linear load which can be very abusive to most power protection equipment and could decrease its life-expectancy. The **FALCON®** ED unit is specially devised to accept these loads and protect them efficiently without any of the output waveform degradation.

Referring again to the figure below, you will notice a built-in safeguard. If the unit inadvertently experiences an extreme over temperature situation that causes inverter malfunction, it will shutdown the inverter to protect the inverter.

ED-3000-x & ED-4000-x models incorporate the same topology, except in a dual parallel scheme using a parallel controller board providing a common frequency clock.



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## INSIDE THE BOX

Your ED Voltage and Frequency Converter has been carefully packaged to withstand most abuse sustained during shipment. If there is significant damage to the carton, or if there is any physical damage to this unit, report this to your carrier.

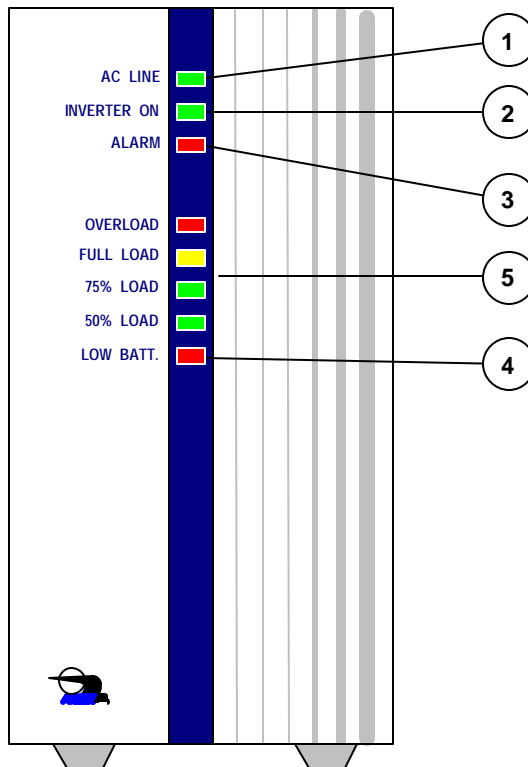
These units are encapsulated in a protective wrap that unfolds once the ED is removed from the shipping carton. Save all packing material for future use.

Take extra precaution when removing or returning it to the box as they can be quite heavy. Never attempt to unpackage the equipment unassisted.

Packaging also contains important information on use and care as well as valuable warranty information. Read all materials before discarding any literature.

## PHYSICAL DESCRIPTION

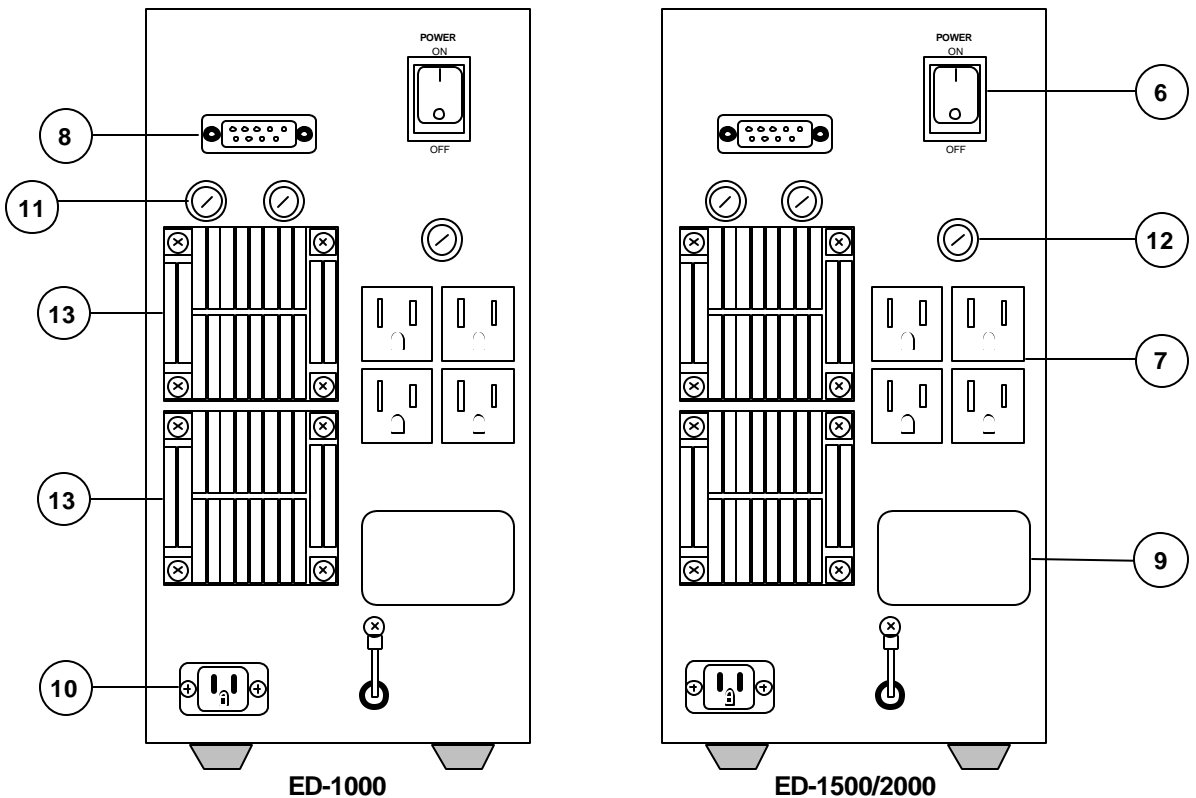
The following illustrations depict the actual configuration of the **FALCON®** ED SERIES units. Reference the SUMMARY OF INDICATORS AND CONTROLS for a further description of the call-outs.



**FIGURE 2: TYPICAL FRONT VIEW OF THE ED SERIES UNIT**

- 1. AC-** AC LINE INDICATOR
- 2. INV-** INVERTER OPERATING
- 3. ALM-** ALARM STATUS INDICATOR
- 4. LOW BATT.-** LOW BATTERY WARNING INDICATOR
- 5. OVERLOAD/ FULL LOAD/ 75% LOAD/ 50% LOAD -** LOAD LEVEL INDICATORS

(LOW BATTERY IS USED ONLY WITH BATTERY OPTION)



**FIGURE 3: REAR VIEWS OF THE ED SERIES**

- 6. POWER ON/OFF SWITCH
- 7. ED OUTPUT- INVERTER OUTPUT TO CRITICAL LOAD
- 8. SIGNAL- 9 PIN "D" SUBMINIATURE CONNECTOR
- 9. IDENTIFICATION LABEL
- NOTE INPUT/OUTPUT VOLTAGE AND FREQUENCY**
- 10. INPUT- INPUT CORD INLET (AMP TYPE CONNECTOR)
- 11. FUSES- INPUT LINE FUSES (2)
- 12. FUSE- OUTPUT LINE FUSE
- 13. COOLING FAN

**NOTE: ED-3000-X & ED-400-X MODELS USE A DIFFERENT REAR PANEL SCHEME INCORPORATING A HARDWIRE INPUT AND OUTPUT**

## SUMMARY OF INDICATORS AND CONTROLS

**AC** - A green L.E.D. that is illuminated when both the power On/Off switch is "ON" and there is utility power present at the input of the **FALCON®** ED unit.

**INV** - A green L.E.D. that illuminates when the ED's Inverter is operating and powering the load outlets.

**ALM** - A red L.E.D. that illuminates if the Inverter malfunctions and is no longer supplying power to the load outlets.

**OPTIONAL LOW BATT.** - A red L.E.D. that illuminates when the ED unit has been operating in the battery mode and the back-up time has almost been depleted. This indicator is a warning that the ED will discontinue operation shortly.

**LOAD** - Two green L.E.D.s one yellow L.E.D. and one red L.E.D. that illuminate to indicate the amount of load the Inverter is powering at the load outlets. The green L.E.D. represents approximately 50% and 75% of full load, respectively. The yellow L.E.D. represents full load. The red L.E.D. indicates an OVERLOAD situation and the ED will discontinue operation shortly.

**SIGNAL** - A DB-9, subminiature, female connector provided for sophisticated computer monitoring systems. See SIGNALS AND INTERFACING Section for specific pin-out. Other interface and pin outs are available upon request.

**OUTPUT** - Output receptacles provided for critical loads. Continuous power is provided here and the amount is monitored by the **LOAD** L.E.D.s as long as the Inverter is functioning. NEMA 5-15R (120V output) or 6-20R (230V output) receptacles are provided.

**Identification Label** - The **FALCON®** ED's model and serial numbers are located here. Always refer to this information during correspondence with the factory.

**INPUT** - The power inlet for utility power to operate the unit. The six foot power cord provided with a special unique Amp style connector to prevent missconnection of the unit.

**FUSE** - This is the input protection line fuse to the ED unit.

**FUSE** - This is the output protection fuse to the load.

**Cooling Fans** - These devices force cool air into the ED unit so it can maintain longer and more efficient operation.

**Power ON/OFF Switch** - The system power switch that allows utility power to activate the Inverter.

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## STORAGE & INSTALLATION

If the unit is to be stored and has optional battery pack(s), it is recommended to refresh the internal battery at least once every 90 days. To do this, plug the system in, turn the power On/Off switch "ON" and allow to idle for at least 24 hours.

The ED unit is designed for installation in a protected environment. The system is lightweight and can be easily moved. Some important points to consider when positioning a unit for operation:

- \* A properly rated (preferably dedicated) outlet is accessible for the six foot power cord supplied with the unit. It is not recommended to modify the supplied cord in any way nor should an extension cord of any kind be used. The cord paths in the system installation should remain clear of foot traffic or anything else that may disturb permanent connection.
- \* The installation site should maintain an ambient air temperature of less than 104°F (40°C). When the environment for the system remains cooler during operation, there is less stress on the batteries and the internal electronics.

- \* The air inlets, vents and fan should not be obstructed or blocked in any way. The more breathing space the system has, the cooler it operates.
- \* The air should remain free from excessive dust and chemical fumes.
- \* The unit may be placed on a desktop with your computer equipment or along side the desk or console. It may be placed in any position, except upside down, provided that all the above requirements are maintained.

Once a location has been selected and the unit is installed, it is ready for operation.

**IF OPTIONAL BATTERY PACK(S) ARE TO BE USED, ALLOW AT LEAST 24 HOURS, AFTER THE SYSTEM IS FIRST INSTALLED, TO FULLY CHARGE THE INTERNAL BATTERY TO A MAXIMUM STATE.**

## OPERATION

The **FALCON**® ED unit is very simple to use.

- Be sure the power cord is plugged into the nearest available, appropriately rated wall outlet.
- Activate the power switch to the "**ON**" position.
- The green **AC** light illuminates.
- The green **INV** light illuminates.

**If optional battery packs are installed**, leave the power switch "**ON**" and unplug the power cord from the wall. This will simulate a power loss to test battery operation.

- The green **AC** light will shut off.
- An intermittent audible alarm will sound.

The system will continue to operate. If this were to continue for a long while, the red **LOW BATTERY** light would illuminate, indicating that battery back-up time is ending and system shutdown is imminent. The intermittent alarm will become continuous at this point. The ED unit will auto-matically shut itself off to avoid excessive battery discharge. When power returns, normal operation of the ED unit resumes without any operator adjustment.

The duration of actual battery back-up time and the low battery condition varies depending on the amount of load, charge on the battery, and condition of the battery. See SPECIFICATIONS Section for approximate hold-up times at 100% and 50% loads.

Plug the system power cord in again and turn the power switch "**OFF**".

Turn off the devices you wish to plug into the ED. Plug them into the outlets labeled **OUTPUT** at the rear of the ED unit.

- Activate the ED unit power switch to the "**ON**" position.
- Turn "**ON**" each of your devices.
- Some of the **LOAD** indicators may illuminate. The amount of load determines the actual number of indicators lit.

The bottom green L.E.D. signifies approximately 50% of load capacity. The second green L.E.D. represents approximately 75% of load capacity. If the yellow L.E.D. illuminates, full load has been achieved. If the red light illuminates, an **OVERLOAD** condition is present. If this situation continues for about 15 seconds, the unit will automatically shut off.





If the system overheats or the Inverter should fail, the alarm sounds a continuous tone and the red **ALM** light will illuminate.

To escape this condition, the problem must first be corrected then turn the ED unit power switch "**OFF**", then back "**ON**".



**WARNING:** The power switch acts as a system **ON/OFF** switch. When this switch is turned "**OFF**", power is lost to the entire unit including all outlets at the rear of the ED unit.

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## MODES OF OPERATION


YELLOW   
GREEN   
RED   
INDICATES ON 

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AC INV ALM                      LOAD                      LOW BATT.  
                            




**NORMAL OPERATION AT NO LOAD**

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AC INV ALM                      LOAD                      LOW BATT.  
                            









**NORMAL OPERATION AT 50% LOAD**

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AC INV ALM                      LOAD                      LOW BATT.  
                            

**NORMAL OPERATION AT FULL LOAD**

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AC INV ALM                      LOAD                      LOW BATT.  
                            

**LOW BATTERY INDICATION AT 75% LOAD (OPTIONAL BATTERY PACK ONLY)**

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AC INV ALM                      LOAD                      LOW BATT.  
                            

**OVERLOADED CONDITION**

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AC INV ALM                      LOAD                      LOW BATT.  
                            

**INVERTER MALFUNCTION**

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## SIGNALS AND INTERFACING

The **FALCON**® ED unit is designed to be compatible with all sophisticated operating systems when they feature a Shutdown monitoring function. These signals are made available through a DB-9 subminiature, female connector at the rear of the unit. Interfacing cables are available. Below is a diagram of the 9-pin jack and its pin-out:

- 1 - **+12V SOURCE RETURN**
- 2 - **UTILITY INTERRUPT**,  
Normally Open Contact
- 3 - **UTILITY INTERRUPT**,  
Normally Closed Contact
- 4 - **COMMON**, Contact Closures
- 5 - **LOW BATTERY**,  
Normally Open Contact
- 6 - **AUTOMATIC SHUTOFF  
CIRCUIT (ASC)**
- 7 - **ASC RETURN**
- 8 - **+ 12VDC @ 30ma SOURCE**
- 9 - **- 12VDC @ 30ma SOURCE**

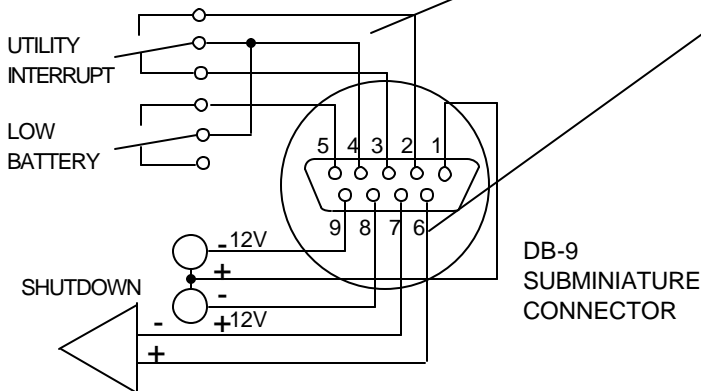
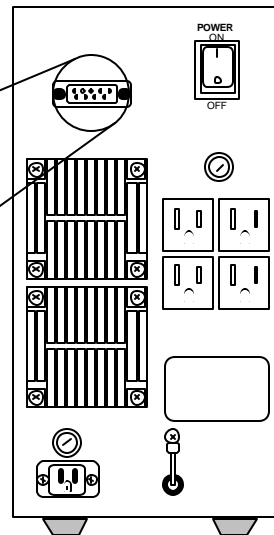


FIGURE 4: DB-9 INTERFACE CONNECTOR

## NOTES:

1. Contacts rated 2A @ 28VDC.
2. A +5 to +12VDC signal applied to pin 6 with respect to pin 7 for at least one millisecond when no utility power is present will cause the ED to shutdown. The current drawn is about 2ma @ 5VDC and 5ma @ 12VDC. The 12VDC source provided at pins 8 to 1 may be utilized for this function. Upon the return of utility power, restart is automatic.
3. NORMAL contact states are maintained with system power "ON" and the Inverter operational or with system power completely "OFF".



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## CARE & MAINTENANCE

The **FALCON**® ED International Volatge and Frequency Converter is designed to be maintenance-free. It can be cleaned with a damp cloth or nonabrasive cleanser.

Be sure filters, vents and fans are kept free from accumulation of dust, dirt or lint.

Your optional battery pack(s) contains sealed maintenance-free batteries. When situated in the proper environment, with the proper charging and limited cycling, these batteries can last many years.

**WARNING:** Never attempt to service optional batteries. High voltage exists within the unit which could cause electrical shock. Servicing of batteries should be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries. When replacing batteries, use the same number and type batteries.

**CAUTION** - Do not dispose of battery or batteries in a fire. The battery may explode.

**CAUTION** - Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.

**CAUTION** - A battery can present a risk of electrical shock and high short circuit current. The following precautions should be observed when working on batteries.

1. Remove watches, rings, or other metal objects.
2. Use tools with insulated handles.
3. Wear rubber gloves and boots.
4. Do not lay tools or metal parts on top of batteries.
5. Disconnect charging source prior to connecting or disconnecting battery terminals.
6. Determine if the battery is inadvertently grounded. If inadvertently grounded, remove source of ground. Contact with any part of a grounded battery can

result in electrical shock. The likelihood of such shock will be reduced if such grounds are removed during installation and maintenance.

## OPTIONAL FEATURES

Your **FALCON**® ED unit can be purchased with optional batteries, they are simply connected to the existing box. .

The separate enclosure is connected to the ED unit via a supplied interface cable. The size of the battery enclosure is the same as the standard ED enclosure..

## SERVICE AND REPAIR

Your **FALCON®** ED unit is backed by one of the finest customer service teams assembled. Write or call them at any time to obtain information about your unit.

**FALCON® ELECTRIC**  
**5106 Azusa Canyon Road**

**Irwindale, CA 91706**  
**1-800-846-6940**

If a problem should occur, it is important that you obtain a Return Material Authorization (RMA) number from the Service Department to process any unit returned to the factory. In consulting the factory, always have the unit model number and serial number at hand. This information is located on the identification label and is essential in retrieving your units performance and history record.

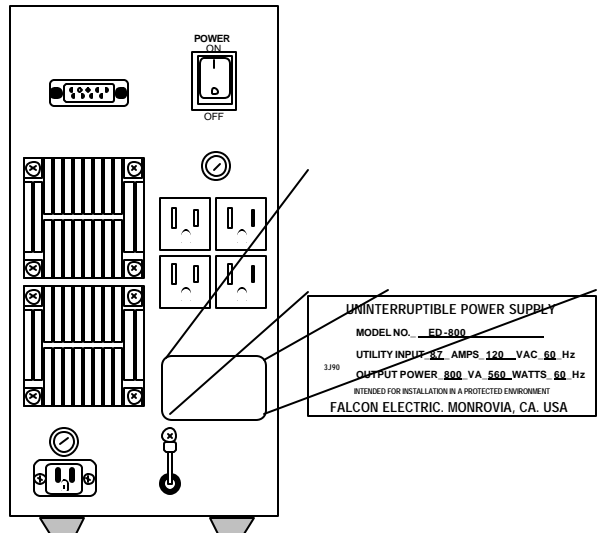
The RMA number issued to you should appear on the outside of the carton, if the unit is returned, or on any correspondence regarding your unit. When shipping a unit back to the factory, try to use the original packing container and shipping materials. The Service Department cannot take responsibility for any unit damaged in return shipment. All units must be returned prepaid to:

**FALCON® ELECTRIC**  
**5106 Azusa Canyon Road**

**Irwindale, CA 91706**  
**1-800-846-6940**

This equipment generates and uses radio frequency energy and if not installed and used properly in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. All units in this manual have been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection

against such interference in a commercial installation. However, there is no guarantee that interference will not occur in a particular



**FIGURE 5: IDENTIFICATION LABEL**

installation. If this equipment does cause interference to radio and 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 the receiving antenna.
- ☐ Relocate the ED unit with respect to the receiver.
- ☐ Move the ED unit away from the receiver.
- ☐ Plug the ED unit into a different outlet so that the ED unit and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

"How To Identify and Resolve Radio-TV Interference Problems"

This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 00400003454.

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# WARRANTY

## 1. TIME AND SCOPE OF WARRANTY:

- 1.1 FALCON® ELECTRIC hereby warrants parts shipped under this Agreement to be free from defective workmanship for a period of 1 year following date of shipment. Accidental damage, misuse or normal wear and tear shall not be construed as a defect.
- 1.2 The date of shipment as used herein will be the date on the Bill of Lading. If no Bill of Lading is issued the date of shipment shall be shown on seller's shipping document.
- 1.3 No provision of this warranty shall cover equipment which has been altered or modified from the original specifications to which same was manufactured unless authorized in writing.
- 1.4 No provision of this warranty shall cover batteries. However, battery manufacturer's warranties will be passed through to the customer whenever applicable.

## 2. LIMITS OF "IN WARRANTY" SERVICE LIABILITY:

- 2.1 FALCON® is obligated during the in-warranty period to provide service and/or adjustments to equipment returned to the factory at the expense of buyer (the term "factory" as used here-in shall also include any field service centers which may be established by FALCON®) and to repair or replace any part(s) thereof which in the opinion of authorized FALCON® personnel are found to have been defective.
- 2.2 Equipment requiring in-warranty services must be returned to the factory with all transportation charges prepaid, clearly tagged, stating the nature of the trouble experienced, and the disposition of the equipment after repair. The equipment will be returned collect by FALCON® to the location specified via the best least expensive carrier available or via customer's shipping instructions.
- 2.3 The nature of certain equipment installations may be such that it would be impractical or technically infeasible to remove the FALCON® portion of the equipment from the customer's premises to the FALCON® factory. In such cases, and at the request of the buyer, FALCON® will perform such service as can be satisfactorily rendered at buyer's location. The buyer will be charged only for travel expenses incidental to the service call, provided that the warranty is applicable.
- 2.4 During the in-warranty period, no service charges shall be payable by the buyer for service performed other than for service necessitated by accident, misuse, theft, abnormal line or source voltage fluctuations, abnormal conditions of operation, damage by the elements or damage resulting from adjustments, repairs, modifications made by other than FALCON® Authorized personnel, or the buyer's failure to reasonably maintain the equipment.

**THE FOREGOING WARRANTY IS EXCLUSIVE AND IS GIVEN AND ACCEPTED IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE REMEDIES OF BUYER SHALL BE LIMITED TO THOSE PROVIDED HEREIN. IN NO EVENT WILL SELLER BE LIABLE FOR COLLATERAL OR CONSEQUENTIAL DAMAGES.**

No person is authorized to assume in behalf of FALCON® any obligation or liability in connection with the sale, warranty or service policy of any products manufactured and/or marketed by FALCON® ELECTRIC beyond the warranty description on the face hereof.

- 3.1 FALCON® ELECTRIC reserves the right to make changes, additions, and/or improvements in its products without incurring any obligation to install them on its products previously sold. This Warranty is valid for product as sold.



