

LIMITED SCOPE GRANT PROJECT AGREEMENT

Between the United States of America, acting through
the Agency for International Development (AID)

AND

The Government of Guyana

Ministry of Economic Planning and Finance

(Grantee)

1. Project Title Evaluation of a Photovoltaic-Powered Medical Refrigerator	2. AID Project Number (PASA Number) NASA/DSB-5710-2-79
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The above-named parties hereby mutually agree to carry out the Project described in this Agreement in accordance with (1) the terms of this Agreement, including any annexes attached hereto, and (2) any general agreement between the two governments regarding economic or technical cooperation.

3. Amount of AID Grant Not to Exceed in \$ 20,000 kind	4. Grantee Contribution to the Project \$ Facilities and Services	5. Project Assistance Completion Date July, 1983 (est.)
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6. This Agreement consists of this title page ~~and~~ Annex A, Project Description; Annex B, Implementation Plan; Annex C, Standard Provisions

7. For the Grantee Typed Name H. Desmond Hoyte	8. For the Agency for International Development Typed Name David A. Cohen
Signature <i>H. Desmond Hoyte</i>	Signature <i>David A. Cohen</i>
Title Vice President for Economic Planning and Finance	Title Acting Director, USAID/Guyana
Date <i>7th April, 1982</i>	Date <i>April 6, 1982</i>

AID 1330-17 (5-79) - Cover Page

For: Ministry of Health

Typed Name: Richard Van West Charles

Signature *Richard Van West Charles*

Title: Minister of Health, Environment and Water Supply

Date: *17th March 1982*

ANNEX A - PROJECT DESCRIPTION

Project Title: Evaluation of a Photovoltaic-Powered Medical Refrigerator

A.I.D. Project Number: PASA NASA/DSB-5710-2-79

Project Purpose:

The purpose of this project is to field-test and evaluate the use of a photovoltaic (PV)-powered medical refrigerator* as part of the vaccine cold chain at a rural health center in Guyana.

Project Description:

This project consists of: 1) the installation and field-testing of a PV-powered medical refrigerator at the Schepmoed (Region 6) health facility in Guyana; 2) the provision of training for appropriate host country personnel in the operation, maintenance and repair of the PV refrigerator; and 3) a technical and economic evaluation of the PV-refrigerator operation. The estimated period of performance of the project will be approximately 17 months from the signing of this agreement.

The United States Agency for International Development (AID) shall provide the services of the National Aeronautics and Space Administration Lewis Research Center (NASA LeRC), who shall assume overall management responsibility for the project within the provisions of PASA NASA/DSB-5710-2-79. The implementing agency for the Government of Guyana shall be the Ministry of Health. The roles and responsibilities of the participating parties and estimated resources and implementation schedule are outlined in Annex B - Implementation Plan.

*The PV-powered medical refrigerator consists of a solar cell array, controls, battery, wiring, instrumentation and a 100 liter (approx.) refrigerator/freezer designed to WHO and CDC specifications for use in the vaccine cold chain system.

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ANNEX B

IMPLEMENTATION PLAN

Evaluation of a Photovoltaic-Powered Medical Refrigerator

Introduction

This Implementation Plan outlines the respective roles and responsibilities, and financial and in-kind contributions of all parties to the Agreement. This Plan also sets out the general agreed upon timetable for implementation of the activity. The contents of this plan can be modified or expanded upon by Implementation Letters, or by other correspondence countersigned by all the parties.

Roles and Responsibilities of Participating Parties

The participating agency for the Government of Guyana (henceforth referred to as the Grantee) under the activity shall be Ministry of Health.

USAID/Guyana will represent the government of the United States and provide the services of NASA LeRC, who shall assume overall management responsibility for this project. The specific roles and responsibilities of the parties are outlined below:

- (1) NASA LeRC shall:
 - (a) Assume overall management responsibility for
 - (b) Provide site selection criteria to assist the identifying a site for the PV-powered medical hereafter referred to as a refrigerator system health facility has been selected as the site
 - (c) Procure the services of and technically direct a U.S. based contractor who will provide the:
 - (i) A PV-powered refrigerator system including array,* battery, controls, wiring, and installation, and refrigerator/freezer unit of 10 (approx.) volume.
 - (ii) Shipping and installation of the refrigerator at the Schepmoed rural health facility.

*A PV array is an assembly of solar cell modules mechanically to a supporting frame.

(Note: All costs associated with in-country personnel travel and per diem, and equipment transportation and storage shall be paid for by the NASA LeRC contractor out of project funds.)

- (iii) System checkout and start up, and supervision of initial operation of the refrigerator system.
 - (iv) Technical manuals and training of user personnel in operation, maintenance, repair, and monitoring of the refrigerator system.
- (d) Provide data collection forms and mailing envelopes to host country personnel to facilitate monitoring of refrigerator system operation.
 - (e) In collaboration with the Grantee and USAID, participate in project evaluation; and receive, analyze, and publish all performance data supplied by the Grantee. Information will be disseminated to the international health community through the World Health Organization.
 - (f) Provide, either through the contractor or directly, the spare parts and technical assistance necessary to insure continued operation of the refrigerator system for 12 months following installation and acceptance by NASA, and an additional one-year warranty of the system exclusive of the refrigerator/freezer unit.
- (2) The Grantee shall:
- (a) Select the specific location of the activity at Schepmoed, based on technical siting requirements from NASA LeRC. (Note: A clear unshaded area at the project site sufficient to accommodate a PV array of approximately 1.2 meters by 4.5 meters is required.)
 - (b) Install a fence (including provision of materials and labor) around the array for physical security.
 - (c) Provide the labor and materials (cement, gravel and sand for 3/4 cubic yard of concrete) required for the mounting of the array.
 - (d) Provide an indoor medical facility at Schepmoed to accommodate the refrigerator system.
- 4.

- (e) Provide NASA LeRC with the requisite site data including location, meteorological data such as solar radiation (if available), topography, site plan and other pertinent logistical information.
- (f) Assist the U.S. contractor with regard to receiving all materials, supplies and equipment required for installation of the refrigerator system including procurement of import licenses, customs clearance at the port of entry, transportation of the goods to a storage site, temporary storage of the goods (if required) and arrangement for transportation of personnel and all goods to the project site. (Note: The costs associated with personnel travel, per diem and in-country equipment storage and transportation shall be borne by the U.S. contractor.)
- (g) Provide suitable, qualified personnel to be trained as users and service personnel for the operation, monitoring and maintenance/repair of the refrigerator system.
- (h) During the term of the project, provide for regular data collection and transmittal to NASA LeRC for analysis. Data collection will consist of daily recording of readings from six meters supplied with the refrigerator system.
- (i) Provide a written evaluation of the refrigerator system field experience including its operational effectiveness, problems encountered, and suggestions for future units.
- (j) Assume full responsibility for the refrigerator system following the completion of the NASA LeRC follow-on responsibilities per (1) (f) above per Standard Provision H. (1) of Annex C of this Agreement.

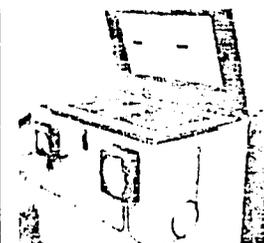
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ESTIMATED RESOURCES FOR EACH REFRIGERATOR SYSTEM

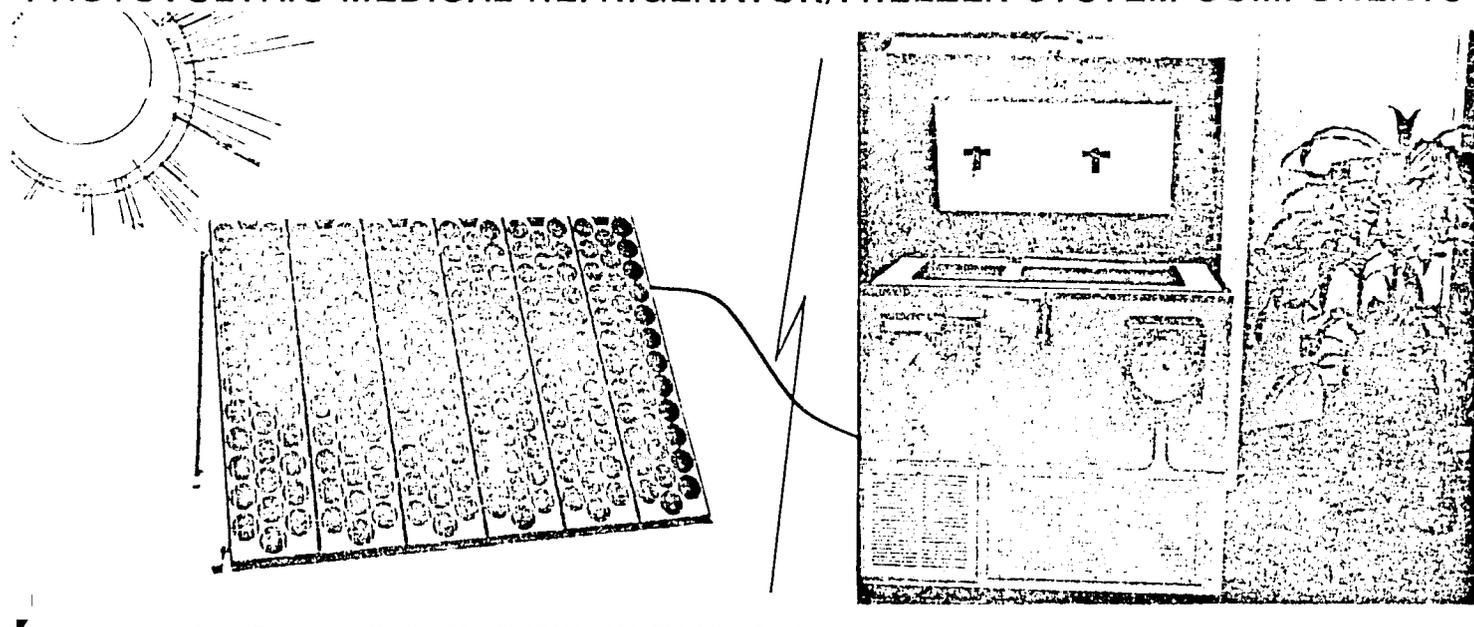
	Funding (In Kind) In Thousands of U.S. Dollars		
	US AID	Grantee	Total
<u>Direct Materials:</u> Refrigerator/Freezer, PV Array, Spare Parts, Ancillary Hardware, G&A	6.5	Fence and 3/4 yd ³ of concrete	
<u>Direct Labor:</u> Engineering, Management, Media/Translations, Overhead, G&A	3.0	Labor for installation of fence and mounting array	
<u>Travel:</u> Air Fare, Per Diem, Local Transportation, G&A	5.5	Expenses of MOH Personnel involved	
<u>Other Direct Costs:</u> Packaging, Shipping, G&A	3.0		
<u>Contingency</u>	2.0		
Totals	20.0		

ESTIMATED IMPLEMENTATION SCHEDULE

Activity	Responsibility	Estimated Date of Completion
1. Site selection and site-specific information collection	Grantee/AID/NASA	November 1981
2. Project definition finalized	Grantee/AID/NASA	December 1981
3. Selection of US-based contractor	NASA	January 1982
4. Project Agreement signed	AID/Grantee	February 1982
5. Materials, supplies and equipment procurement and fabrication/checkout	Contractor/NASA	May 1982
6. Site preparation complete	Grantee/Contractor	July 1982
7. Receipt of all goods in-country and installation of system(s)	Contractor/Grantee	July 1982
8. Training of intended users	Contractor/NASA/Grantee	July 1982
9. Interim project evaluation	NASA/AID/Grantee/Contractor	January 1983
10. Final project evaluation	NASA/AID/Grantee/Contractor	July 1983
11. Activity completed	NASA/AID/Grantee/Contractor	July 1983



PHOTOVOLTAIC MEDICAL REFRIGERATOR/FREEZER SYSTEM COMPONENTS



SPC REFRIGERATOR/FREEZER SYSTEM DESIGN

REFRIGERATOR/FREEZER SYSTEM DESIGN

The Solar Power Corporation Refrigerator/Freezer System, Model SPC-RF1 is a stand alone, modular system providing reliable refrigeration for medical or personal requirements. No additional power source is required. SPC-RF1 system meets and exceeds the specifications of NASA-I.ERC, The Center for Disease Control, and the World Health Organization. SPC's PV R/F system has passed NASA's qualification and acceptance tests in accordance with the requirements of Section 7.5 of the ANSI procedure and the W.H.O. Standard Test Procedure for Refrigerators and Freezers for use in the Cold Chain - Draft 10.4.80.

I. PHOTOVOLTAIC GENERATOR (LG-SERIES)

Design

- Thermo-mechanically matched components
- 12, 6, 4 volt module configurations
- Silicon cells bonded with copper-clad invar buses
- Low-iron content tempered glass module cover
- Multi-layered backsheet
- Rear junction box
- Triple bypass diode design
- Variable tilt angle adjustment
- Sleek, lightweight
- Environmentally tested to U.S. Dept. of Energy JPL document 5101-16 specifications

II. REFRIGERATOR/FREEZER

Design

- Integral unit of SPC-RF1 box, compressor, condensor, battery complement, electronic controls and instrumentation
- Chest type (top opening)
- Six inches insulation
- Adjustable thermostatic control with temperature indication
- Hinged, selfclosing, lockable outer lid
- Hinged interior lids
- Triple seal of outer, inner lid gaskets and interfacing gasket.
- Production output of 2.0 kg ice/day.

Materials

- Interior of an aluminum, one-piece extrusion
- Exterior of an F.D.A. approved epoxy coated aluminum
- Liner seal of an aluminum mylar film vapor barrier
- 15.24 cm (6.0") insulation of polyurethane, 2.0 lb. density closed cell
- Interior refrigerator/freezer lids of plexiglass
- Finned copper-coated, rust-proof condensor
- Non-corrosive fasteners
- Primed baked enamel finishes
- Rollbonded aluminum, primary surface evaporator

REFRIGERATOR/FREEZER SYSTEM SPECIFICATIONS

A. MECHANICAL

1. Dimensions

- Height of assembly 43" 109.30 cm
- Length of assembly 43" 109.30 cm
- Width of assembly 27" 68.63 cm

2. Capacity

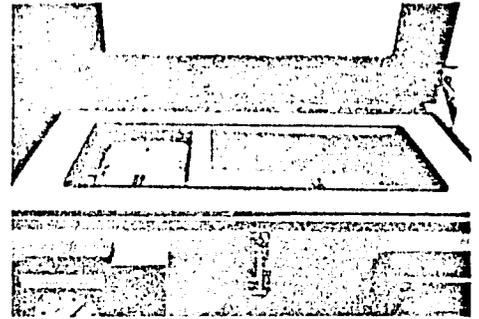
- Refrigerator only, gross volume 103.24 Litres
- Refrigerator only, net usable volume 93.77 Litres
- Refrigerator/freezer unit, freezer gross volume 34.41 Litres
- Refrigerator/freezer unit, freezer net usable volume 25.47 Litres
- Refrigerator/freezer unit, refrigerator gross volume 68.82 Litres
- Refrigerator/freezer unit, refrigerator net usable volume 68.30 Litres

3. Weight (Less Batteries)

- Assembly 210 lbs. 95.20 kg

4. Shipping Specs (Less Batteries)

- Volume/Weight/Number of Packages 28.9 cu. ft./260 lbs./one
.81 cu. m./117.9 kg/one



Top View, Plexiglass Surfaced
Freezer/Refrigerator Units

B. ELECTRICAL

1. Performance

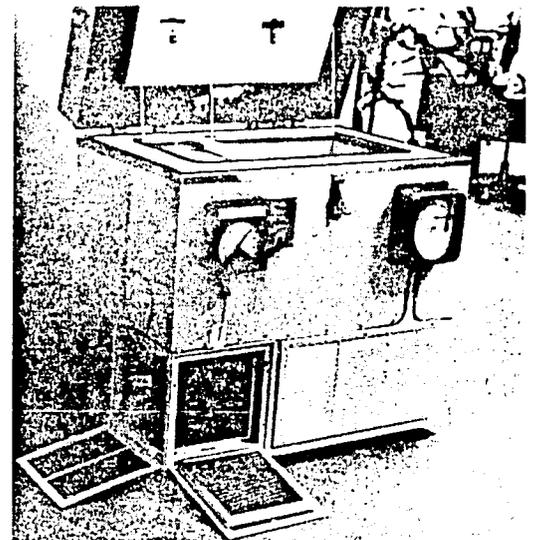
- Operable from 10.5 to 15.0 VDC at 5.2 amperes nominal current
- Freezer temperature regulation range: -25° to -15°C (-13° to 5°F)
- Refrigerator temperature regulation range: +4° to 8°C (39° to 47°F)
- Condensing unit: 12 VDC at 5.4 amperes under designed operating conditions

2. Regulation & Monitoring

- Shorting type (12V, 30 amps nominal)
- Regulation 14.4V full charge volts
- Standby (quiescent) current 3 milliamps typical
- System (array/battery) volt and current meter
- Amp-hour meter (load/array/current)
- Elapsed timer for compressor run-time

3. Protection

- Low voltage cutout: 10.5 VDC
- Low voltage cutin: 11.5 VDC
- Circuit breaker (automatic trip)
- Over-voltage cutout: 15.5 - 16.0 VDC
- Over-current cutout: 10.0 amperes nominal
- Reverse polarity protection



SPC-RF1 Condenser and
Compartment Controls

C. BATTERIES

- Lead calcium single cell type
- "No-Sun Days" storage capacity
- Externally connected

NOTE: Output cable requirements for the solar generator/regulator connection vary with each system. SPC supplies this cable at an additional cost if customer specified.

ADLER-BARBOR

LIMITED WARRANTY

- 0 The DCM-12SM is warrantied to remain free from defects in materials and workmanship, under normal intended use and with reasonable care, for one (1) year from date of purchase.
- 0 This warranty extends to the original purchaser only, is not transferable, and is limited to the purchase price of the equipment. Repair or at our option replacement subject to the conditions below will be made to any unit which is determined upon examination to have been defective in materials or workmanship during this period provided the unit is returned, properly packed in its original shipping carton (or as per the packing instruction in the Operation Manual), to the factory or one of our Authorized Warranty Repair Centers, with all transportation charges prepaid. Any repair approved hereunder will be made without charge to the original owner for parts or labor.
- 0 Claims under this limited warranty must be accompanied by the Original Sales Invoices or Shipping Documents to establish date of purchase.
- 0 The return to us of the Original Purchaser Warranty Registration Card is required to make valid the term of the warranty coverage. If the card is not returned to us within ninety (90) days of purchase date we may at our option commence the warranty period on date of manufacture at our factory as indicated by the date code entered on the warranty card.

EXCLUSIONS:

- 0 This warranty is invalid if the DCM-12SM refrigerator freezer unit is subjected to misuse, accident, fire, flood, civil disturbance, war, and other Acts of God.
- 0 This warranty is invalid if the DCM-12SM is damaged by improper installation, customer adjustments that are not covered by the Operation Manual, or if serial numbers are missing or altered.
- 0 This warranty does not cover the cost of removing or reinstalling the product for repair.
- 0 Owner shall indemnify and save Adler-Barbour harmless from any claims and liabilities arising out of the use, maintenance, transportation, or installation of the warranted DCM12-SM Solar Photovoltaic Powered Refrigerator Freezer, and Adler-

Limited Warranty - Cont'd. -2-

Barbour shall have no liabilities for general, special or consequential damages or for negligence, and there are no guarantees either expressed or implied by the parties to this agreement or by law, other than those expressly stated herein.

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TWO YEAR LIMITED WARRANTY FOR GLASS FACED MODULES AND ELECTRONIC ACCESSORIES

Solar Power Corporation warrants for a period of two (2) years from the date of shipment from Solar Power's place of manufacture, that the equipment manufactured by Solar Power will be free from defects in material and workmanship and that the photovoltaic modules included in the system design, when such system is engineered by Solar Power and installed correctly by the Buyer and used in conjunction with the recommended type and quantity of storage capacity, will be capable of providing the necessary power for the electrical load and location as specified to the Buyer at the time of purchase as a result of sizing done by Solar Power Corporation at the Buyer's specific request. Solar Power will be the sole judge of correct installation. In the event of a suspected defect Buyer shall notify Solar Power within thirty (30) days after discovery by registered letter mailed to Solar Power's principal place of business, provided that no claim made after the two (2) year warranty period shall be covered hereby, and further provided that Buyer shall, within thirty (30) days after receipt of each shipment of equipment hereunder, examine such equipment for any damage in transit. All claims, for any cause, which reasonably would have been discovered upon such inspection shall be deemed waived unless made in writing and received by Solar Power within sixty (60) days after the date of shipment from Solar Power. SINCE ALL SHIPMENTS ARE FOB FACTORY, DAMAGE SUFFERED IN TRANSIT IS NOT COVERED BY THIS WARRANTY.

Upon receipt of Buyer's notification of suspected defect, Solar Power may require, at its option, that the equipment in question either be returned in whole or part to Solar Power or that a designated Solar Power representative will inspect the equipment at the site of installation. IN NO EVENT SHALL EQUIPMENT BE RETURNED TO SOLAR POWER WITHOUT ITS PRIOR WRITTEN AUTHORIZATION.

If a warranty claim is made based on the alleged failure of the system to provide the required power for the original load, the seller may, at his option, require the buyer to give proof that the system was sized by Solar Power Corporation or by Solar Power Limited in order to have the claim investigated.

If Solar Power determines that the equipment is defective, and Buyer is not in default in any of its obligations hereunder, Solar Power will repair, or at its option, replace the defective parts. In either case, Solar Power's responsibility under this warranty will continue in effect until the expiration of the two year period applicable to the original equipment supplied by Solar Power.

Transportation charges only from the destination to which the equipment in question was originally shipped according to Buyer's purchase order, as well as those associated with the return of repaired or replaced parts by Solar Power to the same destination, will be reimbursed or paid by Solar

Power Corporation if, upon inspection by an authorized Solar Power representative, the Buyer's claim under this warranty is found justified. Custom's duty and any other taxes or similar impositions will not be covered by this warranty nor will Buyer be entitled to any reimbursement of costs incurred by the Buyer for dismantling equipment, preparing it for shipment, shipping to the common carrier, reinstallation or other cost except for the transportation charges as previously described.

During the period of this warranty, the Buyer must properly maintain the equipment and determine the array performance in accordance with procedures as specified in the Solar Power Installation and Maintenance Manual. Any breakage, deterioration or destruction of the equipment caused by any act of the Buyer including, but not limited to improper installation or maintenance, overload, abuse or imprudence, or caused by war (whether an actual declaration thereof is made or not), sabotage, insurrection, riot or other act of civil disobedience, act of a public enemy, act of any government or any agency or sub-division thereof, judicial action, labor dispute, accident, Act of God including without limitation fire, explosion, flood and storm are hereby explicitly excluded from this warranty. Solar Power shall not be liable for, and Buyer assumes responsibility for, all personal injury and property damage connected with the handling, transportation, possession, processing, further manufacture, other use or resale of the equipment whether the equipment is used alone or in combination with any other material.

Under no circumstances will the integrity of the glass face of the module be warranted unless it can be proven to the satisfaction of Solar Power Corporation that the integrity of the glass was compromised before shipment of the module.

SOLAR POWER'S LIABILITY FOR ANY LOSS OR CLAIM WHATSOEVER SHALL BE LIMITED AS PROVIDED HEREIN AND IN NO EVENT SHALL SOLAR POWER BE LIABLE FOR ANY AMOUNT IN EXCESS OF THE PRICE OF THE EQUIPMENT PLUS TRANSPORTATION CHARGES PREVIOUSLY DESCRIBED COVERED HEREBY; FOR ANY INDIRECT, SPECIAL, OR INCIDENTAL OR CONSEQUENTIAL DAMAGES; OR FOR DAMAGES BASED ON THE REPRESENTATIONS OF RETAIL SELLERS.

THE FOREGOING STATES THE ENTIRE LIABILITY OF SOLAR POWER WITH RESPECT TO DEFECTS IN THE EQUIPMENT DELIVERED HEREUNDER, IS IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND SOLAR POWER MAKES NO OTHER WARRANTIES EXCEPT AS EXPRESSLY SET FORTH IN THIS LIMITED WARRANTY.