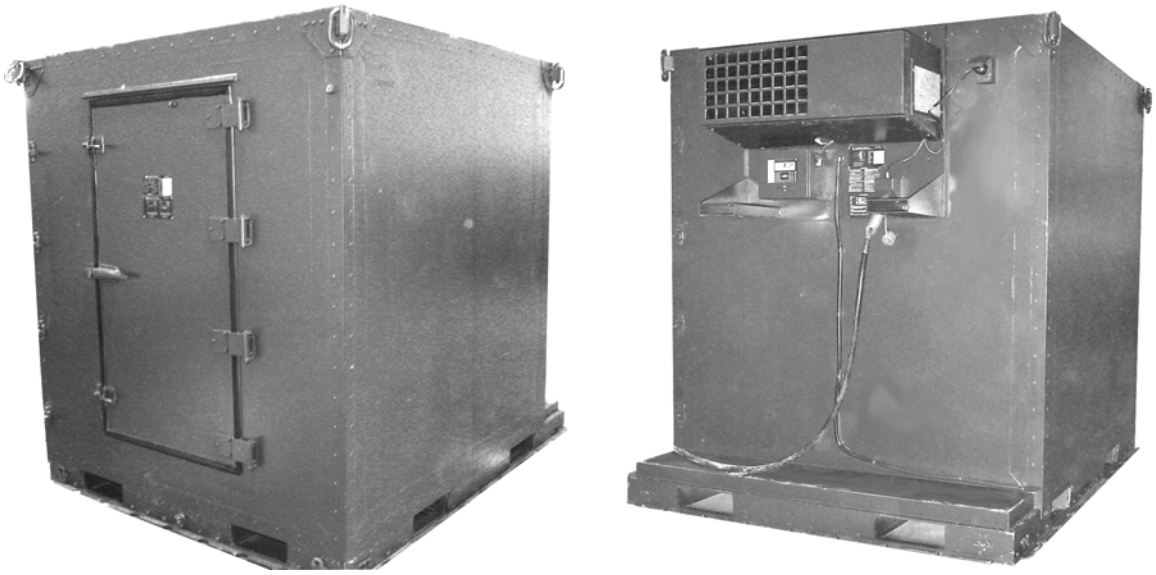
*ARMY TM 10-4110-262-13&P
AIR FORCE TO 40R7-6-1

TECHNICAL MANUAL
OPERATOR'S, UNIT, AND DIRECT SUPPORT
MAINTENANCE MANUAL
(INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST)
FOR

ADVANCED DESIGN REFRIGERATOR, 300 Cubic Foot (ADR-300)
NSN 4110-01-465-4158 (Green)
NSN 4110-01-465-4564 (Tan)



* This manual supercedes TM 10-4110-262-13&P dated 31 March 2004.

HEADQUARTERS, DEPARTMENTS OF THE ARMY AND AIR FORCE

7 February 2007

WARNING SUMMARY

This warning summary contains general safety warnings and hazardous materials warnings that must be understood and applied during operation of this equipment. Failure to observe these precautions could result in serious injury or death to personnel. Also included are explanations of safety and hazardous materials icons used within the technical manual.

EXPLANATION OF SAFETY WARNING ICON

ELECTRICAL - electrical wire to arm with electricity symbol running through human body shows that shock hazard is present.

EXPLOSION - rapidly expanding symbol shows that the material may explode if subjected to high temperatures, sources of ignition or high pressure.

FLYING PARTICLES - arrows bouncing off face with face shield shows that particles flying through the air will harm face.

HEAVY OBJECT - human figure stooping over heavy object shows physical injury potential from improper lifting technique.

HEAVY PARTS - heavy object on human figure shows that heavy parts present a danger to life or limb.

HEAVY PARTS - heavy object pinning human figure against wall shows that heavy, moving parts present a danger to life or limb.

HEAVY PARTS - foot with heavy object on top shows that heavy parts can crush and harm.

HELMET PROTECTION - arrow bouncing off head with helmet shows that falling parts present a danger.

HOT AREA - hand over object radiating heat shows that part is hot and can burn.

MOVING PARTS - hand with fingers caught between gears shows that the moving parts of the equipment present a danger to life or limb.

POISON - skull and crossbones shows that a material is poisonous or is a danger to life.

SHARP OBJECT - pointed object in hand shows that a sharp object presents a danger to limb.

VAPOR - human figure in a cloud shows that material vapors present a danger to life or health.

GENERAL SAFETY WARNINGS DESCRIPTION

WARNING

Some ADR-300 components are heavy. Applicable warnings and instructions are contained in the set-up and maintenance procedures, calling for the required number of persons needed to lift these components. To prevent injuries ensure that the required number of people is on hand for the lift. Be sure to lift with your legs, and not your back, to prevent injury.

WARNING

During some maintenance procedures electrical wires must be cut and some metal parts of the ADR-300 may have sharp edges. Be careful when handling and assembling the ADR-300 components to prevent injuries from cuts.

WARNING

The ADR-300 equipment operates at high voltages. Use extreme caution. Touching a live wire can cause serious injury or death. Connecting the power supply to the ADR-300 can be performed only by qualified civilian or military personnel in MOS 51 R, 52C, 52D, or 52G. Follow warnings contained in the operational and maintenance procedures to prevent serious injuries to personnel.

WARNING

The ADR-300 container's maximum gross lifting weight is I0,000 pounds. Lift and move the container only with material handling equipment of at least 10,000 lb capacity. Observe all safety precautions. Never stand under an ADR-300 container when it is being lifted.

WARNING

Personnel should never be left inside the container with the door closed and/or locked. Ensure that all personnel are accounted for before locking the container for shipment. Personnel left inside of the container may suffer serious injury or death due to hypothermia and/or suffocation.

The ADR-300 may shift during flight on an aircraft. Ensure that the container's internal framework on the pallet base is not structurally damaged. During flight the container should only be closed by the main door handle. The hook and handle assemblies should be left unlocked to allow pressure relief to prevent implosion/explosion of equipment in the aircraft.

WARNING

During some maintenance procedures, personnel will be required to use isopropyl alcohol. They should take precautions such as adequate ventilation and protection. Isopropyl alcohol is toxic if consumed internally and vapors are inhaled. Avoid all sources of ignition as this chemical is flammable.

WARNING

Personnel may perform some maintenance procedures with hot surfaces and tubing. Allow them to cool before handling to prevent burns.

CHANGE NO. 1

HEADQUARTERS, DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 15 FEBRUARY 2008

TECHNICAL MANUAL

OPERATOR'S, UNIT AND DIRECT SUPPORT MAINTENANCE MANUAL (INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST) FOR ADVANCED DESIGN REFRIGERATOR, (ADR-300) 300 Cubic Foot NSN: 4110-01-465-4158 (Green) NSN: 4110-01-465-4564 (Tan)

DISTRIBUTION STATEMENT A. - Approved for public release; distribution is unlimited.

TM 10-4110-262-13&P, 07 February 2007, is updated as follows:

1. File this sheet in the front of the manual for reference.

2. This change incorporates updated maintenance and supply information.

3. New or updated text is indicated by a vertical bar in the outer margin of the page.

4. Added Illustrations are indicated by a vertical bar adjacent to the figure number.

5. Remove old pages and insert new pages as indicated below:

Remove Pages	Insert Pages
Cover	Cover
A/(B Blank)	A/(B Blank)
i through viii	i through viii
Electronic DA 2028	Electronic DA 2028
Sample DA 2028	Sample DA 2028
DA 2028	DA 2028
DA 2028	DA 2028
DA 2028	DA 2028

6. Replace the following work packages with their revised version.

Work Package Number	Work Package Number
WP 0001	WP 0060
WP 0024	WP 0061
WP 0055	WP 0062
WP 0056	WP 0063
WP 0057	WP 0065
WP 0058	WP 0066
WP 0059	

7. Add the following new work packages.

Work Package Number

By Order of the Secretaries of the Army and Air Force:

GEORGE W. CASEY, JR.
General, United States Army
Chief of Staff

Official:

JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army
0802828

T. MICHAEL MOSELY
GENERAL, USAF
Chief of Staff

Official:
BRUCE CARLSON
General, USAF
Commander, Air Force Materiel Command

DISTRIBUTION: To be distributed in accordance with initial distribution number (IDN) 256789 requirements for TM 10-4110-262-13&P.

LIST OF EFFECTIVE PAGES/WORK PACKAGES

NOTE: This portion of text affected by the change is indicated by a vertical bar in the outer margins of the page. Changes to illustrations are indicated by a vertical bar adjacent to the title. Zero in the "Change No." column indicates and original page or work package.

Date of issue for the original manual, revised manual, and changed pages/work packages are:

Original 31 March 2004

Revision 1 07 February 2007

Change 1 15 February 2008

TOTAL NUMBER OF PAGES FOR FRONT AND REAR MATTER IS 72 AND TOTAL NUMBER OF WORK PACKAGES IS 71 CONSISTING OF THE FOLLOWING:

Page/WP No.	Change No.	Page/WP No.	Change No.
Front Cover	0	WP 0036 (2 pgs)	0
Warning	0	WP 0037 (2 pgs)	0
i-viii	1	WP 0038 (2 pgs)	0
Chp 1 title page (2 pgs)	0	WP 0039 (2 pgs)	0
WP 0001 (4 pgs)	1	WP 0040 (2 pgs)	0
WP 0002 (8 pgs)	0	WP 0041 (4 pgs)	0
WP 0003 (8 pgs)	0	WP 0042 (2 pgs)	0
Chp 2 title page (2 pgs)	0	WP 0043 (2 pgs)	0
WP 0004 (8 pgs)	0	WP 0044 (4 pgs)	0
WP 0005 (22 pgs)	0	WP 0045 (4 pgs)	0
WP 0006 (4 pgs)	0	WP 0046 (2 pgs)	0
Chp 3 title page (2 pgs)	0	WP 0047 (4 pgs)	0
WP 0007 (4 pgs)	0	WP 0048 (2 pgs)	0
Chp 4 title page (2 pgs)	0	Chp 7 title page (2 pgs)	0
WP 0008 (2 pgs)	0	WP 0049 (8 pgs)	0
WP 0009 (2 pgs)	0	WP 0050 (4 pgs)	0
WP 0010 (4 pgs)	0	WP 0051 (6 pgs)	0
WP 0011 (2 pgs)	0	WP 0052 (4 pgs)	0
WP 0012 (2 pgs)	0	WP 0053 (4 pgs)	0
WP 0013 (2 pgs)	0	WP 0054 (4 pgs)	0
WP 0014 (2 pgs)	0	WP 0055 (4 pgs)	1
Chp 5 title page (2 pgs)	0	WP 0056 (4 pgs)	1
WP 0015 (4 pgs)	0	WP 0057 (4 pgs)	1
WP 0016 (4 pgs)	0	WP 0058 (4 pgs)	1
WP 0017 (2 pgs)	0	WP 0059 (4 pgs)	1
WP 0018 (6 pgs)	0	WP 0060 (4 pgs)	1
WP 0019 (2 pgs)	0	WP 0061 (4 pgs)	1
WP 0020 (4 pgs)	0	WP 0062 (2 pgs)	1
WP 0021 (4 pgs)	0	WP 0063 (2 pgs)	1
WP 0022 (4 pgs)	0	Chp 8 title page (2 pgs)	0
WP 0023 (6 pgs)	0	WP 0064 (2 pgs)	0
WP 0024 (8 pgs)	1	WP 0065 (4 pgs)	1
Chp 6 title page (2 pgs)	0	WP 0066 (2 pgs)	1
WP 0025 (8 pgs)	0	WP 0067 (4 pgs)	0
WP 0026 (6 pgs)	0	WP 0068 (2 pgs)	0
WP 0027 (2 pgs)	0	WP 0069 (2 pgs)	0
WP 0028 (8 pgs)	0	WP 0070 (2 pgs)	0
WP 0029 (14 pgs)	0	WP 0071 (2 pgs)	0
WP 0030 (4 pgs)	0	Glossary-1—Glossary 4	0
WP 0031 (8 pgs)	0	Index-1—Index 4	0
WP 0032 (2 pgs)	0	FO-1	0
WP 0033 (4 pgs)	0	FO-2	0
WP 0034 (6 pgs)	0	FO-3	0
WP 0035 (4 pgs)	0	Back Cover	0

HEADQUARTERS,
DEPARTMENTS OF THE ARMY AND AIR FORCE
WASHINGTON, D.C., 07 February 2007

TECHNICAL MANUAL

OPERATOR'S, UNIT, AND DIRECT SUPPORT MAINTENANCE MANUAL (INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST)

FOR

ADVANCED DESIGN REFRIGERATOR (ADR-300)

NSN 4110-01-465-4158 (GREEN)
NSN 4110-01-465-4564 (TAN)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Service should be submitted as follow:

Army – Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms), located in the back of this manual directly to: Commander, TACOM Life Cycle Management Command, ATTN: AMSTA-LC-SECT. Kansas Street, Natick, MA 01760-5052. You many also send in your recommended changes via electronic mail or by fax. Our fax number is 256-5205. Our e-mail address is soldier.pubs@natick.army.mil. A reply will be furnished to you.

Air Force – By Air Force AFTO Form 22, Technical Order Improvement Report and Reply, through your headquarters for routing to WR-ALC/LEET, 295 Byron Street, Robins AFB GA 31098-1611.

* This manual superseded TM 10-4110-262-13&P dated 31 March 2004.

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TABLE OF CONTENTS

HOW TO USE THIS MANUAL

HOW TO OBTAIN TECHNICAL MANUALS

When a new system is introduced to the Army inventory, it is the responsibility of the receiving units to notify and inform the Unit Publications Clerk that a Technical Manual is available for the new system. Throughout the life cycle of the new system, the Publications Proponent will also provide updates and changes to the Technical Manual.

To receive new Technical Manuals or change packages to existing Technical Manuals (TM) for fielded equipment, provide the Unit Publications Clerk the full Technical Manual number, title, date of publication, and number of copies required. The Unit Publications Clerk will justify the request through the Unit Publications Officer. When the request is approved, the Unit Publications Clerk will use DA Form 12-R to order the series of Technical Manuals from the Army Publishing Directorate (APD).

Instructions for Unit Publications Clerk

Obtain DA Form 12-R and request a publications account from the APD Web site at http://www.apd.army.mil. Once on the Website, click on the "Orders/Subscriptions/Reports" tab. From the dropdown menu, select "Establish an Account," then select "Tutorial" and follow the instructions in the tutorial presentation.

Complete information for obtaining Army publications can be found in DA PAM 25-33.

Organization of This Manual

This manual contains General Information, Operating Instructions, Operator Preventive Maintenance Checks and Services (PMCS), Troubleshooting, and Maintenance/Repair instructions for the Advanced Design Refrigerator, 300 Cubic Feet (ADR-300).

Chapter 1 contains introductory information on the ADR-300 and its associated equipment as well as a Theory of Operation. Chapter 2 includes operating instructions under usual and unusual conditions. Chapter 3 presents troubleshooting procedures. Chapter 4 describes service requirements for a newly received ADR 300, preventive maintenance checks and service and operator maintenance. Chapters 5 and 6 outline maintenance activities that may be completed by the operators and at the unit and direct support maintenance levels, respectively. Chapter 7 includes the Repair Parts and Special Tools List (RPSTL) that identifies those parts or tools, which are unique to the operation and maintenance of this equipment. Chapter 8 contains references, the Maintenance Allocation Chart (MAC), and other supporting information.

Manual Organization and Page Numbering System. The manual is divided into eight major chapters that detail the topics mentioned above. Within each chapter are work packages covering a wide range of topics. Each work package is numbered sequentially starting at page 1. The work package has its own page numbering scheme and is independent of the page numbering used by other work packages. Each page of a work package is numbered according to the form XXXX -ZZ where XXXX is the work package number (e.g. 0010 is work package 10) and ZZ represents the number of the page within that work package. A page number such as 0010 -1/2 Blank means that page 1 contains information but page 2 of that work package has been intentionally left blank. Each page of a work package with a revision number is numbered in the form XXXX.Y-ZZ where Y is the revision number.

Finding Information. The Table of Contents permits the reader to find information in the manual quickly. The reader should start here first when looking for a specific topic. The Table of Contents lists the topics contained within each chapter and the Work Package Sequence Number where it can be found.

Example: If the reader were looking for instructions on preventive maintenance, an operator maintenance topic, the user would locate the Operator Maintenance section of the Table of Contents. Scanning down the listings for Chapter 4, 'Preventive Maintenance Checks and Services" information can be found in Work Package 0010 (i.e. WP 0010).

The RPSTL lists and authorizes spares and repair parts; special tools; special test, measurement, and diagnostic equipment (TMDE); and other special support equipment required for performance of the specified maintenance level maintenance of the item name. It authorizes the requisitioning, issue, and disposition of spares, repair parts, and special tools as indicated by the source, maintenance, and recoverability (SMR) codes. The work packages containing lists of spares and repair parts authorized by this RPSTL for use in the performance of maintenance. These work packages also include parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups in ascending alphanumeric sequence, with the parts in each group listed in ascending figure and item number sequence. Sending units, brackets, filters, and bolts are listed with the component they mount on. Bulk materials are listed by item name in FIG. BULK at the end of the work packages. Repair parts kits are listed separately in their own functional group and work package. Repair parts for reparable special tools are also listed in a separate work package. Items listed are shown on the associated illustrations.

An Alphabetical Index can be found at the back of the manual. It lists specific topics with the corresponding work package. In addition, a glossary of terms is provided to assist the user in defining the terms used in the manual.

CHAPTER 1
GENERAL INFORMATION, EQUIPMENT DESCRIPTION AND THEORY OF OPERATION FOR ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)

OPERATOR' S, UNIT, AND DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
GENERAL INFORMATION

SCOPE

This technical manual contains information and instructions for the operation, preventive maintenance and corrective maintenance of the Advanced Design Refrigerator (ADR-300) (Figures 1 and 2). The ADR-300 is considered non-organizational equipment and must be requested through Air Force or Army support channels.

The purpose of the ADR-300 is to provide refrigerated storage for a wide range of commodities including food, medical supplies and cadavers that may require low temperature storage. The system also provides thermal protection for stored items during transport including air shipment. It provides 281 cubic feet of storage space and can maintain interior temperatures as low as 0 °F (-18 °C) at 110 ºF ambient temperature. The system does not require any specific MOS personnel for normal operation. However, MOS 52C (Utilities Equipment Repairer), MOS 51R (Interior Electrician), and AFSC 3E1X1 (HVAC Repair) may be required for some maintenance operations. The system may be identified as follows:

Equipment Name:	Advanced Design Refrigerator (ADR-300)
Manufacturer's Model Number:	56149-000 (Green) 56249-000 (Desert Sand)

Figure 1. ADR-300 Front View.

Figure 2. ADR-300 Rear View.

MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by(as applicable) DA PAM 750-8, The Army Maintenance Management System (TAMMS) Users Manual; DA PAM 738-751, Functional Users Manual for the Army Maintenance Management Systems - Aviation (TAMMS-A); or AR 700-138, Army Logistics Readiness and Sustainability.

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your ADR-300 needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. If you have Internet access, the easiest and fastest way to report problems or suggestions is to go to https: //aeps.ria.army.mil/aepspublic.cfm (scroll down and choose the “Submit Quality Deficiency Report” bar). The Internet form lets you choose to submit an Equipment Improvement Recommendation (EIR), a Product Quality Deficiency Report (PQDR) or a Warranty Claim Action (WCA). You may also submit your information using an SF 368 (Product Quality Deficiency Report). You can send your SF 368 via e-mail, regular mail, or facsimile using the addresses/facsimile numbers specified in DA PAM 750-8 The Army Maintenance Management System (TAMMS) Users Manual.

CORROSION PREVENTION AND CONTROL (CPC)

Corrosion prevention control (CPC) of military materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.

While corrosion is typically associated with rusting metals, it can also include deterioration of other materials, such as rubber or plastic. Unusual cracking, softening, swelling or breaking of these materials may be a corrosion problem.

If a corrosion problem is identified, it may be reported using SF 368. Use key words such as corrosion, rust, deterioration, or cracking will ensure that the information is identified as a CPC problem. This form should be submitted to the address specified in DA Pam 750-8.

DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

For procedures to destroy this equipment to prevent its use by the enemy, refer to TM 750-244-3, Procedures for Destruction of Army Material to Prevent Enemy Use.

PREPARATION FOR STORAGE OR SHIPMENT

Refer to WP 0005 for shipment and movement (WP 0005) procedures that ensure safe movement and shipment of the ADR-300.

WARRANTY INFORMATION

The ADR-300 is warranted for one year. The warranty starts on the date found in block 23 of DA Form 2408-9, Equipment Control Record. Report all defects to your supervisor, who will take appropriate action.

The basic warrantee includes all parts and labor and shall (at a minimum) warrantee the ADR-300 comprised of an ADR/IC and an ADR/RU to be free from defects in material, workmanship, design, and essential performance characteristics.

NOMENCLATURE CROSS-REFERENCE LIST

Names used in this manual for ADR-300 components are those that are used in the Repair Parts and Special Tools List (RPSTL) (WPs 0050 – 0061). Common names are not used in this manual. The following (Table 1) relates abbreviations and acronyms that are used in this manual to the meaning of each term.

Table 1. List of Acronyms/Abbreviations.

µm	micron	HVAC/R	Heating, Ventilation, Air Conditioning and Refrigeration
A	Ampere	IAW	In Accordance With
AC	Alternating Current	IC	Insulated Container
ADR	Advanced Design Refrigerator	in.	Inch
Btu	British Thermal Unit	inHg	Inch of Mercury
Btu/h	British Thermal Unit per Hour	Hz	Hertz (cycles per second)
CARC	Chemical Agent Resistant Coating	Kg	Kilogram
cm	Centimeter	kPa	Kilo Pascal
cm3	Cubic Centimeter	kW	Kilo Watt
CMC	Compressor Motor Contactor	lb	Pound
CPC	Corrosion Prevention and Control	LED	Light Emitting Diode
ºC	Degrees Celsius	LPCO	Low Pressure Cutout Switch
ºF	Degrees Fahrenheit	SDDC-TEA	Surface Deployment Distribution Command-Test & Evaluation Agency
DC	Direct Current	MHE	Material Handling Equipment
DSV	Discharge Service Valve	NEMA	National Electrical Manufacturers' Association
EPA	Environmental Protection Agency	OFS	O-Ring Face Seal
ESD	Electrostatic Discharge	oz	ounce
FRP	Fiberglass Reinforced Plastic	PCB	Printed Circuit Board
ft-lbf	Foot – Pound Force	PMCS	Preventive Maintenance, Checks and Services
g	gram	POE	Polyol Ester
h	Hour	PR	Power Relay
HPCO	High Pressure Cutout Switch	psi	Pounds per Square Inch
HSL	Helicopter Sling Lift	psig	Pounds per Square Inch - gauge

Table 2. List of Acronyms/Abbreviations – Continued.

rpm	Revolution per Minute	TMDE	Test, Measurement, and Diagnostic Equipment
RU	Refrigeration Unit	USAF	United States Air Force
SMR	Source, Maintenance, and Recoverability	VAC	Volts, Alternating Current
SSV	Suction Service Valve	VDC	Volts, Direct Current
TEV	Thermostatic Expansion Valve	W	Watt

SAFETY, CARE AND HANDLING

Always pay attention to Warnings, Cautions and Notes appearing throughout the manual. They appear prior to applicable procedures. Carefully read and understand their content to prevent serious injury to yourself and others, or damage to equipment.

END OF WORK PACKAGE

OPERATOR'S, UNIT, AND DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
EQUIPMENT DESCRIPTION AND DATA

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

Salient characteristics of the ADR-300 include:

- Maintains interior temperatures as low as 0 °F in an outside ambient temperature of 110 °F
- Interior volume of 281 cubic feet
- Compatible with 463L cargo system
- Exterior dimensions 108 x 88 x 96 inches (L x W x H)
- System empty weight 3,285 lb
- Maximum payload 6,715 lb
- Maximum gross weight 10,000 lb
- Replaceable single piece refrigeration unit
- Exterior paint is non-CARC

Refer to Table 1 for more equipment data.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

Insulated Container (IC) – The insulated container is constructed from aluminum-skinned composite panels (Figure 1) mounted on a formed aluminum skid (Figure 1). The skid includes forklift pockets (Figure 2) and replaceable cargo rails (Figure 2) on all four sides. The cargo rails are compatible with the 463L air cargo system.

The door-end of the IC includes a 36 x 67-in. door (Figure 1) supported by four hinges on the right side of the door. The door is closed with a lever-activated container door lock on the left side of the door. The door is further secured with two rotating door handle unit assemblies (Figure 1). Directly above the door, a drip-edge deflects water run-off from the open door. Also mounted above the door is a light indicator (Figure 1) to indicate when the light fixture is energized.

At the refrigerator end, the container wall is recessed from the pallet edge to provide an aisle between adjacent containers when loaded in an aircraft. The key feature of this wall is the refrigeration unit (RU) (Figure 2) that is mounted on the top of the wall panel. Also, to the right of the RU, is an electrical plug that mates with a power cord on the RU, providing power to the IC light fixture.

Sling rings (Figure 1) are attached to the four top corners of the container. These are used to lift the system either by crane or helicopter sling.

Inside the IC, the floor surface (Figure 3) includes a tread pattern to reduce slipping and improve traction. Racks of five removable/adjustable shelves (Figure 2 and 3) stand parallel to each side wall. Each rack consists of 15 deck sections, five frames, two front (vertical) supports and two rear (vertical) supports. Two horizontal shelf assemblies span the aisle between the two shelf racks providing additional stability.

The IC interior is lighted by a single light fixture located above the door. The light is controlled by a switch mounted above the door next to the light fixture.

The RU includes the refrigerator assembly, power supply, and control components, all mounted on a composite skinned skid, welded aluminum base structure. Power is supplied to a connector on the mounting plate just below the condenser section. This connector provides power to the refrigerator electrical enclosure from which it is distributed to the compressor and fan motors as well as the various control components. Another cable from the condenser enclosure terminates in a three-prong, twist-lock receptacle and supplies power to the IC interior light circuit. The RU control panel is mounted in a weatherproof enclosure to the left side of the mounting plate.

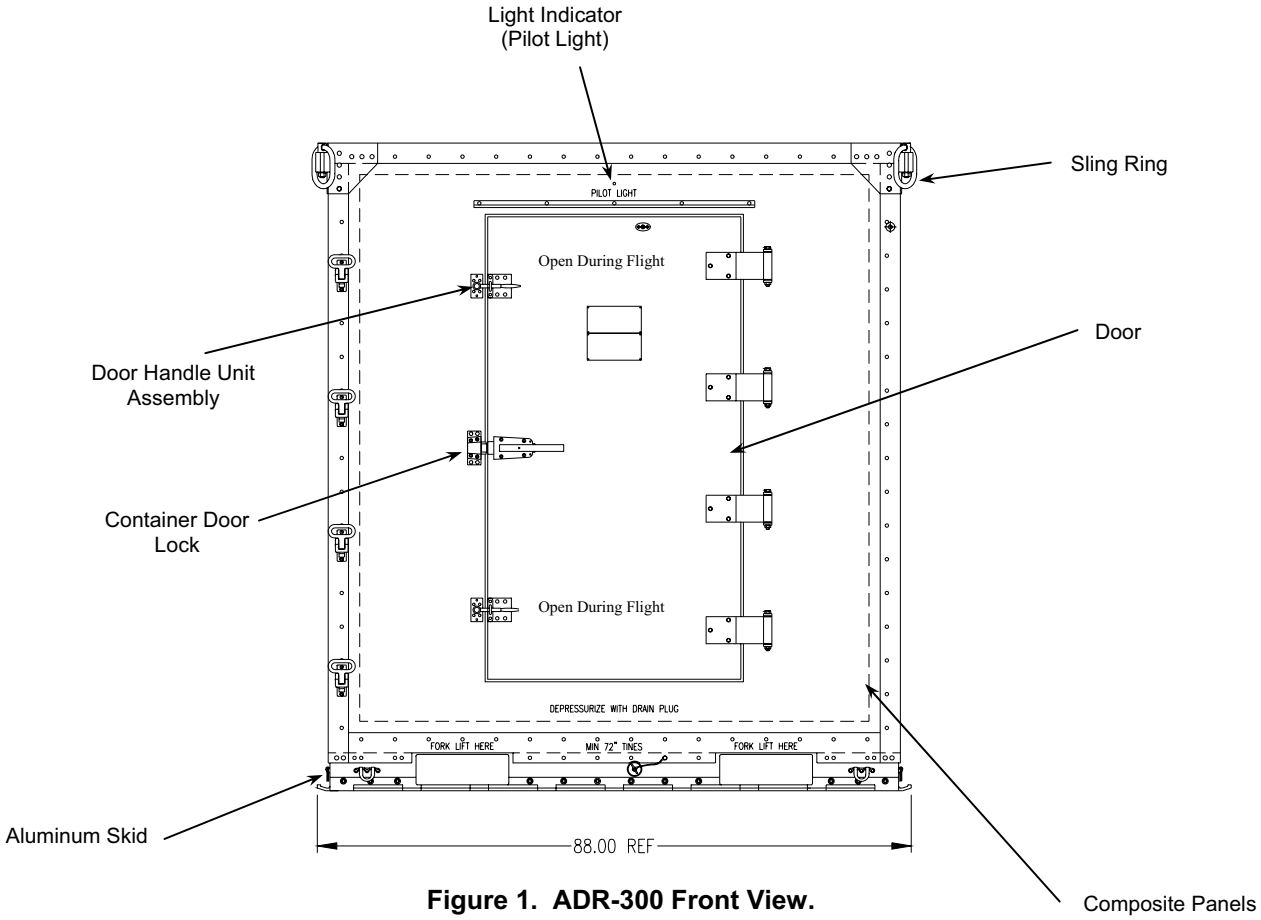


Figure 1. ADR-300 Front View.

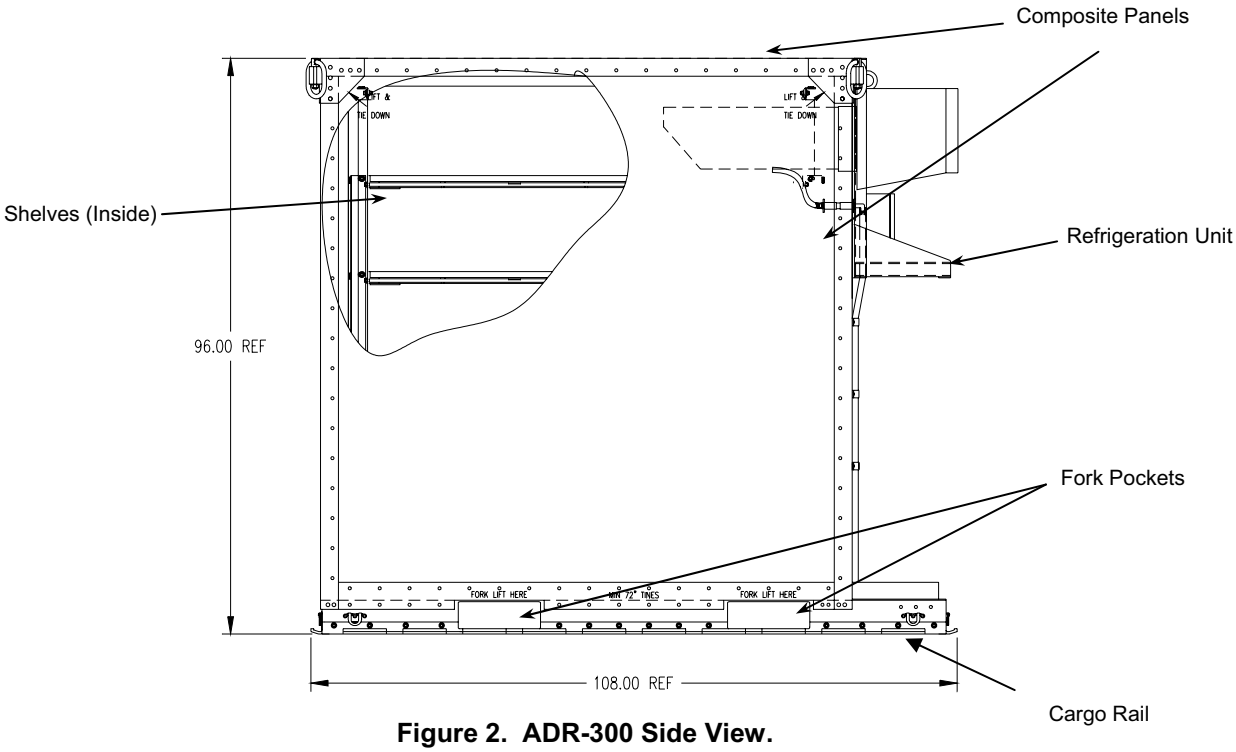


Figure 2. ADR-300 Side View.

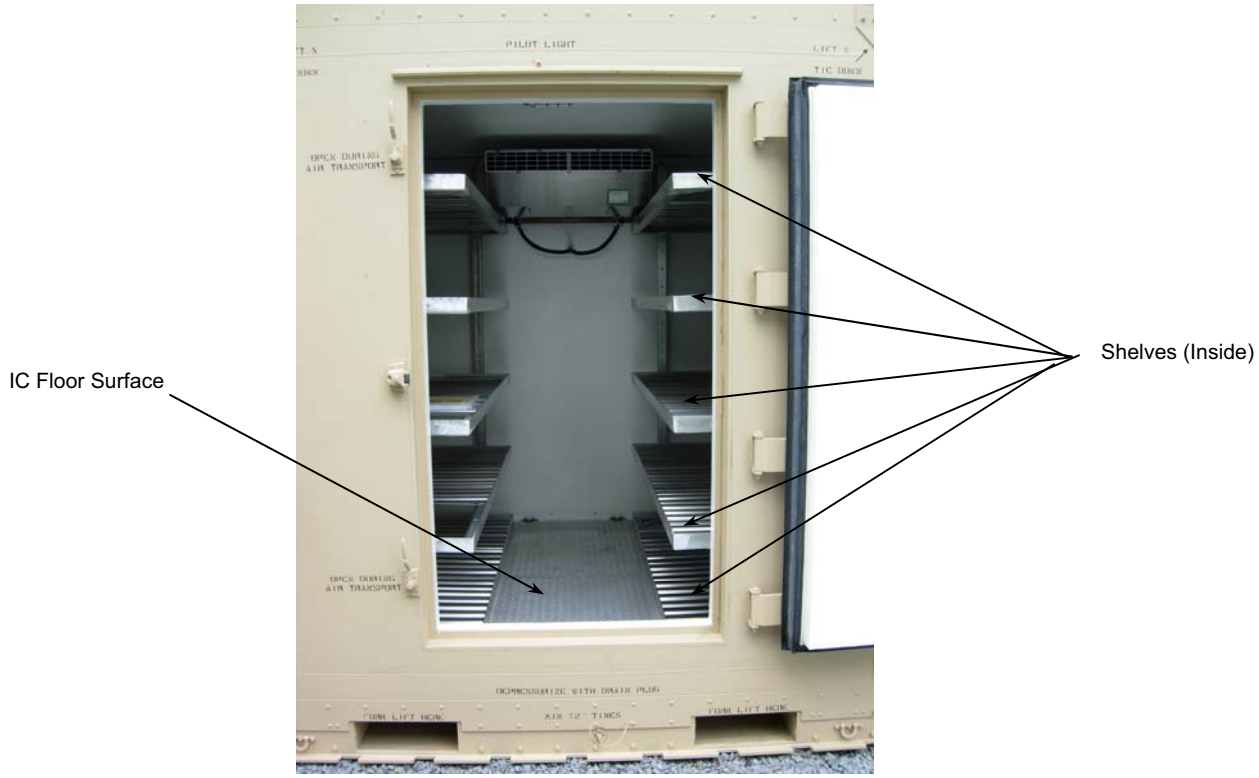


Figure 3. ADR-300 Inside View (with door open).

EQUIPMENT DATA

Table 1. ADR-300 Technical Characteristics.

External Dimensions		
Height	96 in.	244 cm
Width	88 in.	224 cm
Depth	108 in.	274 cm
Interior Dimensions		
Height	81 in.	206 cm
Width	75 in.	191 cm
Depth	80 in.	203 cm
Weights		
Empty	3,285 lb	1,490 kg
Maximum Gross	10,000 lb	4,536 kg
Electrical Power	208/230 VAC, 3-phase, 50-60 Hz	
Refrigeration Unit		
Compressor	Direct Drive, Semi-hermetic	
Compressor Oil Charge	42.2 oz (1250 cc)	
Compressor Oil Type	Polyol Ester	
Defrost Method	Hot Gas	
Defrost Timer	Initiation Interval: Adjustable, 1 min. to 10 hr. (default 4 hr.) Termination Interval: Temperature controlled (48±5.4ºF, 8.9±3 ºC)	
Defrost Initiation Maximum Evaporator Outlet Temperature	36 ºF	
Refrigeration System		
Refrigerant Charge and Type	4.62 lb (2.1 kg) R-404A (also refer to Table 2)	
System Capacity (External ambient temperature 110°F, 230 VAC, 60 Hz, 3-phase power supply)	Inside Temperature 35 °F: 9000 Btu/h Inside Temperature 0 °F: 5000 Btu/h	
High Pressure Cutout (HPCO) Switch	Opens 450 ± 10 psi (3120 ± 69 kPa) Closes 375 ± 38 psi (2585 ± 262 kPa)	
Low Pressure Cutout (LPCO) Switch	Opens 5 – 11 in.Hg (-17 - -37 kPa) Closes 4 – 7 psi (27.6 – 48.3 kPa)	
Suction Pressure Regulator	65 psig	
Electrical System - Fuses		
Fuse 1 Evaporator Fan Motor	10 A	
Fuse 2 Evaporator Fan Motor	10 A	
Fuse 3 Circulating (Condenser) Fan Motor and Electromagnetic Relay (Defrost Solenoid)	15 A	
Fuse 4/1 Control Panel (located in control panel enclosure)	3 A	
Fuse 4 Control Panel (located on circuit card assembly in RU electrical enclosure)	3 A	
Fuse 5 Transformer	4 A	

Table 1. ADR-300 Technical Characteristics – Continued.

Circulating (Condenser) Fan Motor				
Voltage	26 VDC			
Power	180 W			
Rpm	2800			
Full Load Current	6.5A			
Evaporator Fan Motors (2 motors)				
Voltage	26 VDC			
Power	100 W			
Rpm	2800			
Full Load Current	4.1 A each			
Electromagnetic Relay (Hot Gas Solenoid Coil)				
Voltage	24 VDC			
Current	1.3 A			
Resistance	20 ohm			
Compressor Motor				
Voltage	208/230 VAC			
Phase	3			
Frequency	50 - 60 Hz			
Horsepower	2.0 (1.5 kW)			
Full Load rpm	1740			
Full Load Current (@ 230 VAC)	14.1 A			
Electric Heater				
Voltage	230 VAC			
Power	1500 W (2 x 750 W)			
Exterior Paint	Non-CARC			
Primer	MIL-P-23377F Type I, CLC or MIL-PRF-85582 Type I, CLC2			
Paint	MIL-PRF-85285 Type II (Non-CARC)	Desert Tan	33446	FED-STD-595
		Green	34094	FED-STD-595

R-404A Saturation Temperature and Pressure

The following (Table 2) presents temperatures and corresponding pressures for saturated refrigerant R404A.

Table 2. R-404A Saturation Temperature and Pressure.

Temp °F	Temp °C	PSIG	Temp °F	Temp °C	PSIG	Temp °F	Temp °C	PSIG	Temp °F	Temp °C	PSIG
-50	-45.6	0.0	0	-17.8	32.8	50	10.0	103.7	100	37.8	234.7
-48	-44.4	0.9	2	-16.7	34.4	52	11.1	107.7	102	38.9	241.5
-46	-43.3	2.0	4	-15.6	36.8	54	12.2	111.7	104	40.0	248.5
-44	-42.2	2.7	6	-14.4	38.9	56	13.3	115.8	106	41.1	255.7
-42	-41.1	3.6	8	-13.3	41.1	58	14.4	120.0	108	42.2	262.9
-40	-40.0	4.5	10	-12.2	43.3	60	15.6	124.3	110	43.3	270.3
-38	-38.9	5.5	12	-11.1	45.6	62	16.7	128.8	112	44.4	277.9
-36	-37.8	6.5	14	-10.0	48.0	64	17.8	133.3	114	45.6	285.6
-34	-36.7	7.6	16	-8.9	50.4	66	18.9	137.9	116	46.7	293.5
-32	-35.6	8.6	18	-7.8	52.9	68	20.0	142.7	118	47.8	301.5
-30	-34.4	9.9	20	-6.7	55.5	70	21.1	147.5	120	48.9	309.7
-28	-33.3	11.1	22	-5.6	58.1	72	22.2	152.5	122	50.0	318.0
-26	-32.2	12.3	24	-4.4	60.9	74	23.3	157.6	124	51.1	326.5
-24	-31.1	13.6	26	-3.3	63.7	76	24.4	162.8	126	52.2	335.2
-22	-30.0	14.9	28	-2.2	66.5	78	25.6	168.1	128	53.3	344.0
-20	-28.9	16.3	30	-1.1	69.5	80	26.7	173.5	130	54.4	353.0
-18	-27.8	17.7	32	0.0	72.5	82	27.8	179.1	132	55.6	362.1
-16	-26.7	19.2	34	1.1	75.6	84	28.9	184.7	134	56.7	371.5
-14	-25.6	20.7	36	2.2	78.8	86	30.0	190.5	136	57.8	381.0
-12	-24.4	22.3	38	3.3	82.1	88	31.1	196.5	138	58.9	390.6
-10	-23.3	23.9	40	4.4	85.5	90	32.2	202.5	140	60.0	400.5
-8	-22.2	25.5	42	5.6	89.0	92	33.3	208.7	142	61.1	410.5
-6	-21.1	27.3	44	6.7	92.5	94	34.4	215.0	144	62.2	420.7
-4	-20.0	29.1	46	7.8	96.2	96	35.6	221.4	146	63.3	431.1
-2	-18.9	3.1	48	8.9	99.9	98	36.7	228.0	148	64.4	441.7
									150	65.6	452.5

Table 3. ADR-300 Thermal Resistor Calibration Data.

Temperature (ºC)	Resistance (Ohms)
-50	515
-30	624
-20	684
-10	747
0	815
10	886
20	961
30	1040
40	1122
50	1209
70	1392
90	1591
100	1696
150	2211

END OF WORK PACKAGE

OPERATOR'S, UNIT, AND DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
THEORY OF OPERATION

General

The ADR-300 is designed to provide refrigerated storage for a variety of items and commodities ranging from food to medical supplies to cadavers. The system can operate worldwide while maintaining interior temperatures between 0 °F and 60 °F. The system will operate continuously given an external source of electrical power. It is also designed to minimize heat leakage to maintain interior temperature for an extended period with no externally-supplied power.

The system consists of two main subsystems, the insulated container (IC) and the refrigeration unit (RU). These subsystems are described below.

Insulated Container (IC)

The IC (Figure 1) is an insulated box constructed from foam-filled, fiberglass protruded panels mounted on an aluminum skid. Access to the interior is through the cargo door on one end of the container. A switch immediately above the door (inside the IC), energizes a light fixture above the door. Power is supplied to the switch and light through a surface-mounted conduit on the upper left corner of the IC interior.

The container interior is outfitted with two sets of five shelves that are removable. Each shelf provides a storage surface measuring 72 3/4 x 21 in. (185 x 53 cm) and can hold up to 300 lb (136 Kg). The shelves can be quickly adjusted and/or disassembled and removed from the container to accommodate bulk materials or facilitate cleaning of the interior.

Bulk cargos (cargos not stored on shelves) can be secured by lashing them to the tie-down rings located on the container floor. Fourteen tie-down rings are distributed around the perimeter of the container interior. These rings are each capable of resisting up to 7,500 lb of tension.

The container floor includes a drain for removing liquids trapped by the doorframe. The drain transports fluids from the interior, through a one-inch diameter tube, to the front of the skid. A plug at the exit end seals the drain. This plug also serves as a pressure release in the event of a sudden decrease of exterior pressure.

Figure 1. Insulated Container.

Refrigeration Unit (RU)

The interior temperature of the IC is maintained by the RU. The RU includes the refrigerator and unit controller.

The refrigerator uses R-404A in a vapor compression cycle to remove heat from the IC interior. The evaporator (cold) section (Figure 2) of the refrigerator protrudes into the container interior. The evaporator fan draws in interior air and blows it through the evaporator coil where heat is transferred from the air to the refrigerant. The cooled air then returns to the container and the warmed refrigerant gas flows back to the compressor (Figure 3).

The refrigerant gas flows to the compressor, which raises the pressure and temperature of the gas. It then moves to the condenser coil (Figure 3), located in the condenser section (Figure 2), where it is cooled and condensed by exchanging heat with the outside air. The liquid refrigerant then flows through an expansion valve (Figure 4) where the pressure is reduced and then returns to the evaporator coil (Figure 4).

Outdoor air is drawn through the condenser coil, which is at the face of the outside enclosure. After passing through the coil, the air is exhausted through the top of the enclosure.

Operation is controlled by the unit controller (Figure 2), which starts the compressor. The refrigeration system is protected by high pressure and low pressure cutout switches (Figure 3).

The unit controller, located in the control panel enclosure, includes a keypad for entering control commands and a display that provides system operating information to the operator.

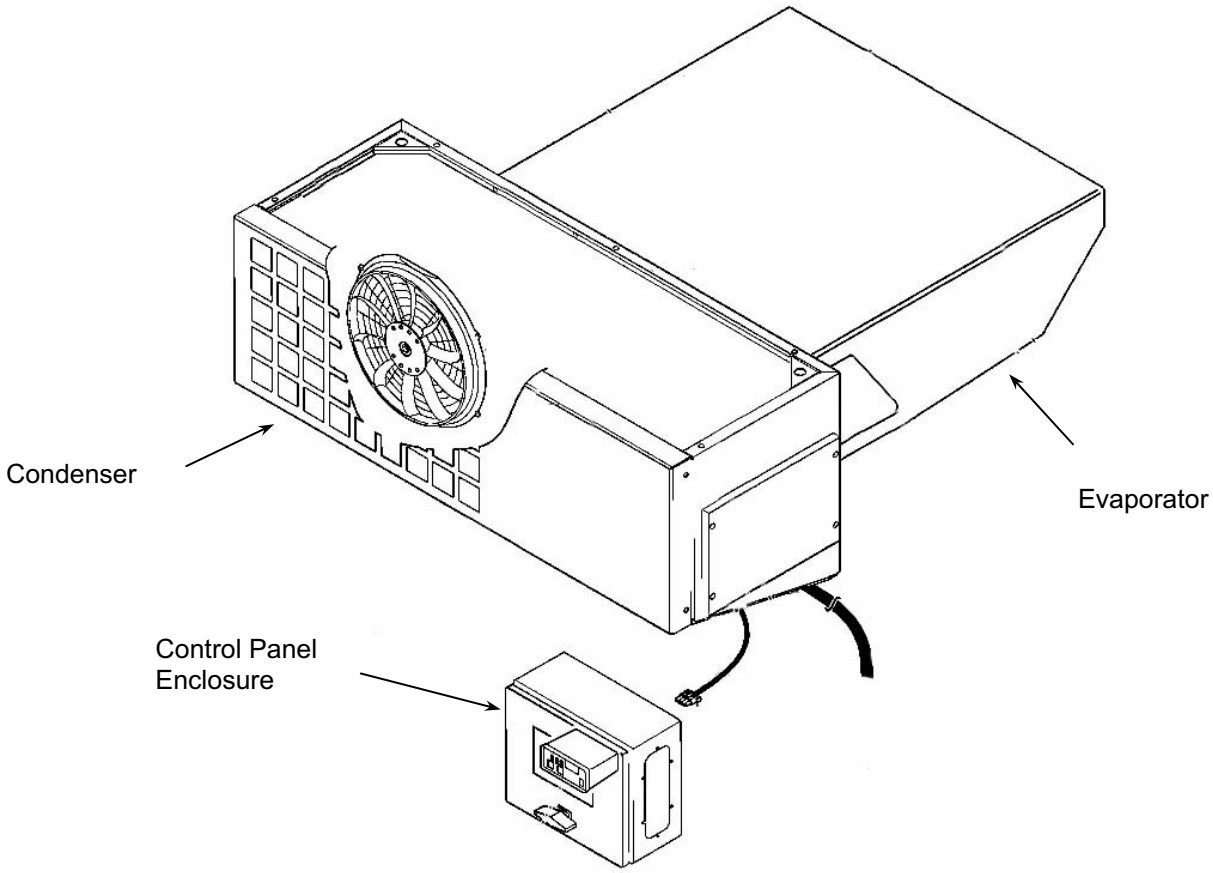


Figure 2. Refrigeration Unit.

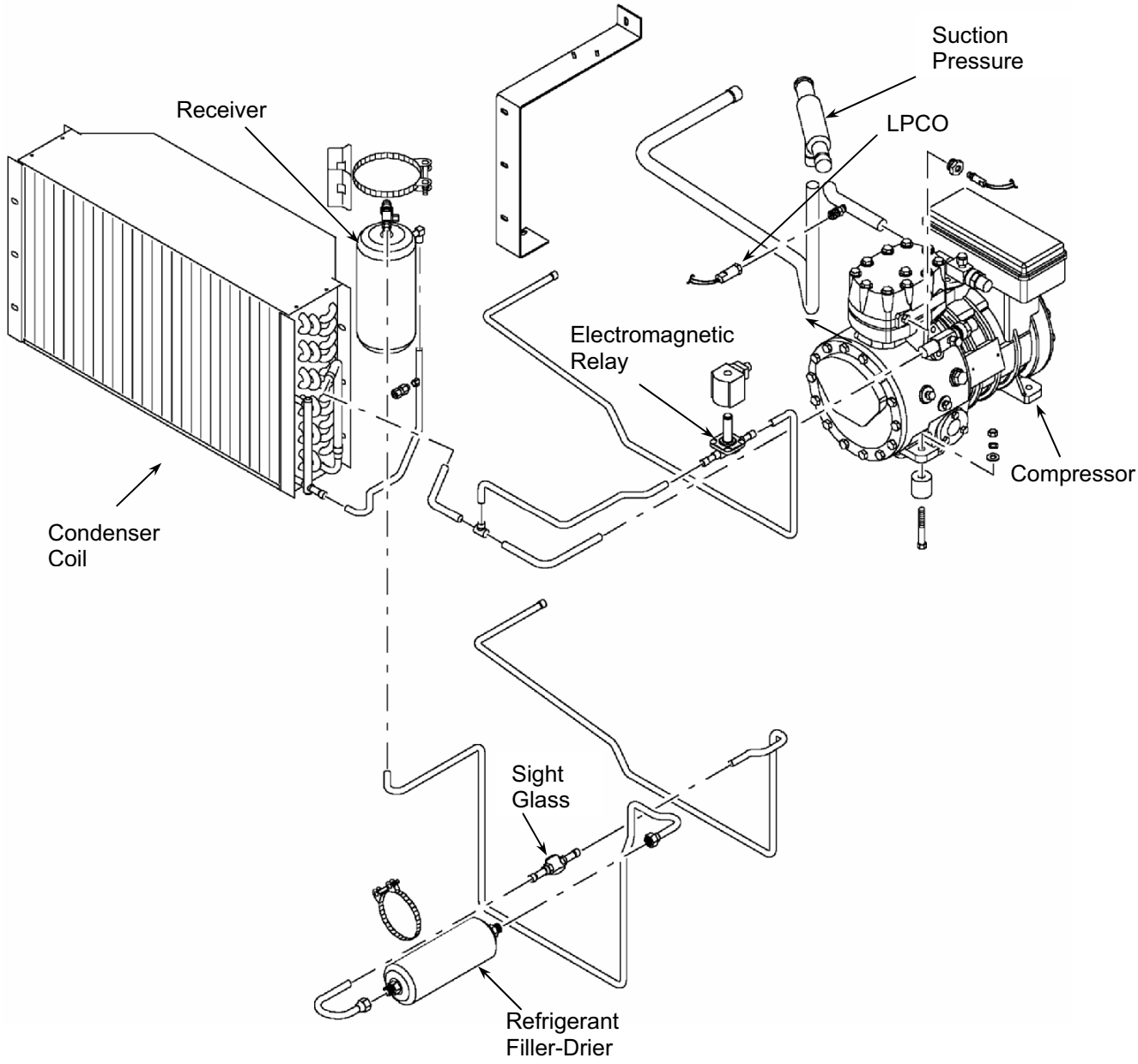


Figure 3. Condenser Section Components.

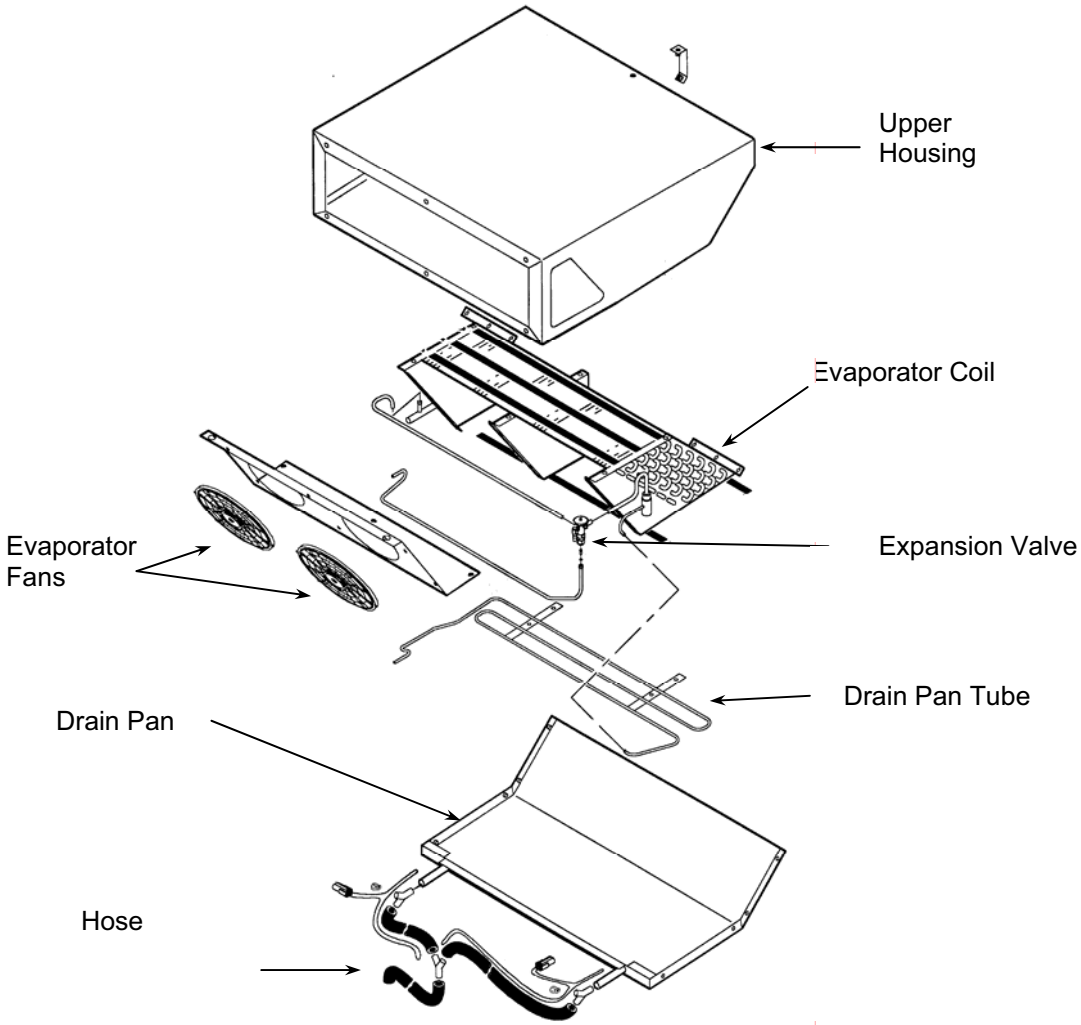


Figure 4. Evaporator Section Components.

Unit Operation

Unit operation is controlled by the unit controller, which includes the on/off switch, manual defrost switch, thermometer, thermostat, thermostat adjustment and the indicator light. The operating modes are cool, null, heat, and defrost. The unit automatically shifts from cool, null, and heat to maintain the setpoint temperature.

The thermostat controls the operation of the heating cycle by energizing and de-energizing the heater contactor (CMC Heat). The compressor operation is controlled by the thermostat, and energizing the compressor contactor during cooling operations.

When the power relay is energized, it energizes the evaporator and condenser fans as well as the compressor motor.

COOL Mode

When 230 volt three phase power is applied to the unit power plug, power is available at the CMC COOL contactor and the CMC HEAT contactor. Power also flows through the primary of the transformer. 24 volt AC power is then produced by the transformer secondary that flows to the bridge rectifier. The rectifier converts the AC voltage to DC voltage that is filtered by capacitor C1. 115-volt power is also available from the transformer through fuses 6 and 7 to the lamp connection to power the light inside the container.

The transformer secondary is also connected to diodes D1 and D2. DC voltage from these diodes is filtered by capacitor C2. 24 volt DC power flows through fuse 4 to the controller through the red wire to pin 2 of connector C-9 in the back of the controller.

When the controller is turned on the display will show the temperature inside the container. If the temperature inside the container is above the set point on the controller by more than 3 degrees F, the controller output to pin 6 of connector C-9 will apply power to the blue wire. This will then pass power to wire 7 to the high pressure cutout switch (HPCO) and on through the low pressure cutout switch (LPCO) to the power relay.

With the power relay closed power will flow from the bridge rectifier through 2R to the normally closed contacts of relays CR1 and CR2, fuse 3, the contacts of the power relay (PR), the normally closed contact of the ER relay to the compressor motor contactor (CMC COOL). This contactor coil goes to ground through the motor protector (TH). This will cause the motor contactor to energize allowing power to flow through its contacts to the compressor motor. If the motor overheats for any reason the motor protector will open the grounding circuit of the contactor coil turning off power to the compressor until the compressor cools.

When the compressor contactor energizes power also flows through its auxiliary contacts from circuit 2RC to the K4 relay. This relay will then close a circuit from 2RB to 9A to a transistor on the circuit card assembly that allows the evaporator fan relay (EFR) to close. Power will then flow from relays CR1 and CR2 through the EFR contacts and fuses 1 and 2 to the evaporator fan (Figure 4) motors.
Power will also flow from the power relay through the normally closed contacts of the defrost relay (D) to the condenser fan. In addition power is also supplied to the tube heaters from the power relay. These heaters are used to prevent the condensate tubes (Figure 4) from freezing shut.

NULL Mode

If the temperature inside the container is at or within 4 degrees above the set point, the output of the controller to pin 6 of connector C-9 is turned off. This will shut off the compressor, the drain tube heaters and the condenser and evaporator fans.

HEAT Mode

If the temperature inside the container is 4 degrees F lower than the controller power to the blue wire pin 6 on connector C-9 is removed. Ground is now sent from the controller to pin 10 of connector C-9 (orange wire) to the heat contactor (CM HEAT). This will cause the contacts of this contactor to close allowing power to flow to the electric heating elements. The auxiliary contacts of this contactor also connect circuit 9B which is connected to 2RC to 9D energizing relay K4 which turns on the evaporator motors as described above.

Defrost mode

The unit will go into a DEFROST mode if the evaporator temperature is below freezing and the unit is running in the COOL mode and the manual defrost key on the controller is pressed. This will cause

power to flow from pin 8 of connector C-9 through the gray wire to pin 1 of C-3 on the circuit card to the defrost relay. This relay is grounded through the push (defrost termination) switch in the evaporator when this thermostat is below 36 ºF (± 5 ºF). When the defrost relay is energized power flows from the power relay through the normally open contacts of the defrost relay, through the 26 circuit to the electromagnetic relay (pilot solenoid). This electromagnetic relay (solenoid) allows hot gas from the compressor to flow directly to the evaporator coil where the hot gas will melt frost off the coil. Power to the condenser fan is also interrupted by the normally closed defrost relay contacts so that this fan does not run during defrost. Power also flows from the defrost relay contacts through diode D6 to the defrost coil. This keeps the relay energized after the manual defrost key is release and until the defrost termination switch opens after the evaporator is defrosted and warms up.

There is also a timer built into the relay circuit card that will also initiate a defrost mode if the unit has been running in the cool mode for 3 hours. This time is adjustable by way of a potentiometer and dipswitches located on the circuit card. When this timer times out it applies power to the defrost relay coil and defrost is initiated and continues as described above.

This unit has a few relays that are needed to complete the circuits through their normally closed contacts but are never energized. This is because this circuit card is used on other units that are mounted on trucks where power is supplied by the vehicle battery. These relays are labeled CR1, CR2, and ER.

During defrost the suction pressure regulator limits the load on the compressor. It maintains the suction pressure at 65 psi.

Defrost Timer Settings

The Defrost timer counts plugged-in time and not switch-on time. It is only active when the coil temperature is below 36 ºF and the push (defrost termination) switch is closed.

The timer has two switches and a red, round selector located on the circuit card in the RU electrical enclosure. The timer is set from factory at 4 hours. The setting may be changed to any value between 1 minute and ten hours. To change the setting, refer to WP 0029.

Manual Defrost Switches

NOTE

Manual defrost will only cycle on if unit is indexed to run in the cooling mode.

A Manual Defrost switch is located on unit controller. Pressing this switch initiates the defrost cycle if the push (defrost termination) switch is closed and the unit is in Cool mode.

Push Switch (Defrost Termination) (mechanized)

The push switch is mounted in the evaporator coil and controls the defrost cycle in response to the evaporator coil temperature. The switch is closed when the evaporator coil temperature is below 36 ºF, completing the defrost circuit to ground and preparing the electrical system for the defrost cycle.

When the unit does shift into a defrost cycle, the evaporator and condenser fan stop, and heat from the hot refrigerant gas melts the frost from the evaporator coil. The switch opens and terminates the defrost cycle when the evaporator coil temperature rises above 48 ºF (± 5 ºF).

Defrost Relay

The Defrost relay controls operation of the defrost cycle. When the Defrost Timer or the Manual Defrost switch completes the circuit through the push switch to ground, the defrost relay is energized. This energizes the electromagnetic relay and de-energizes the fan relay.
The defrost relay stays energized until the defrost cycle is terminated by the push switch or the On/Off switch is pressed.

Electromagnetic Relay (Defrost Solenoid Valve)

The electromagnetic relay (Figure 3) is a solenoid (hot gas) valve that is electrically controlled.

When the relay is energized, the hot gas valve is opened and it routes hot refrigerant gas to the evaporator.

END OF WORK PACKAGE

CHAPTER 2
OPERATOR INSTRUCTIONS
FOR
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT
(ADR-300)

OPERATOR'S, UNIT, AND DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS

GENERAL

This work package contains information on the controls and indicators of the ADR-300. Figures 1, 2, 3, and 4 below show the locations of the controls and indicators found on the ADR-300. Figure 5 and Table 1 explain the functions of the identified controls and indicators.

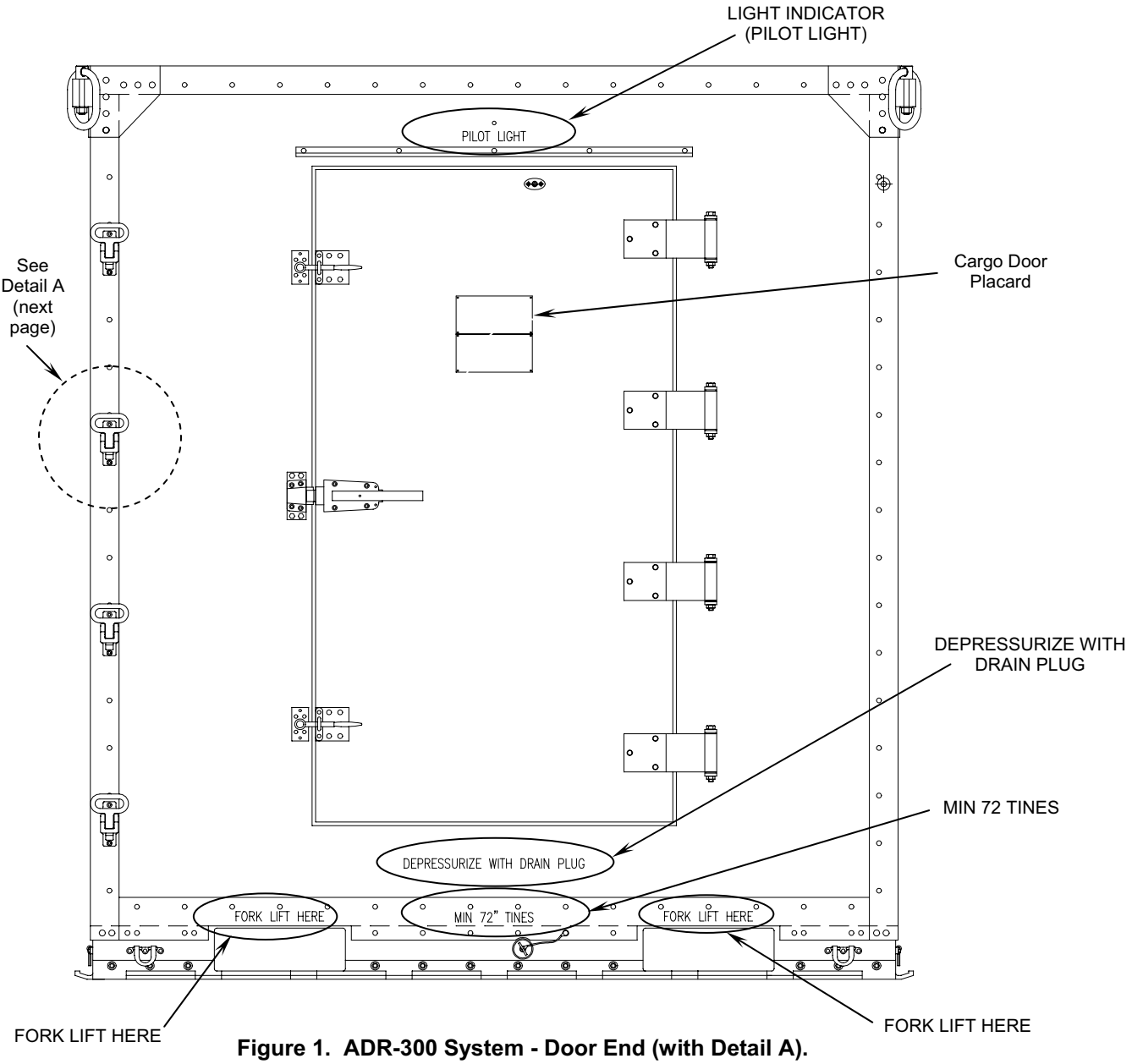
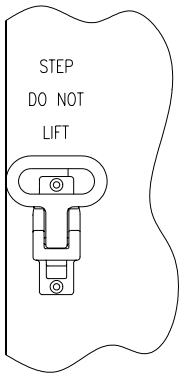


Figure 1. ADR-300 System - Door End (with Detail A).



Detail A

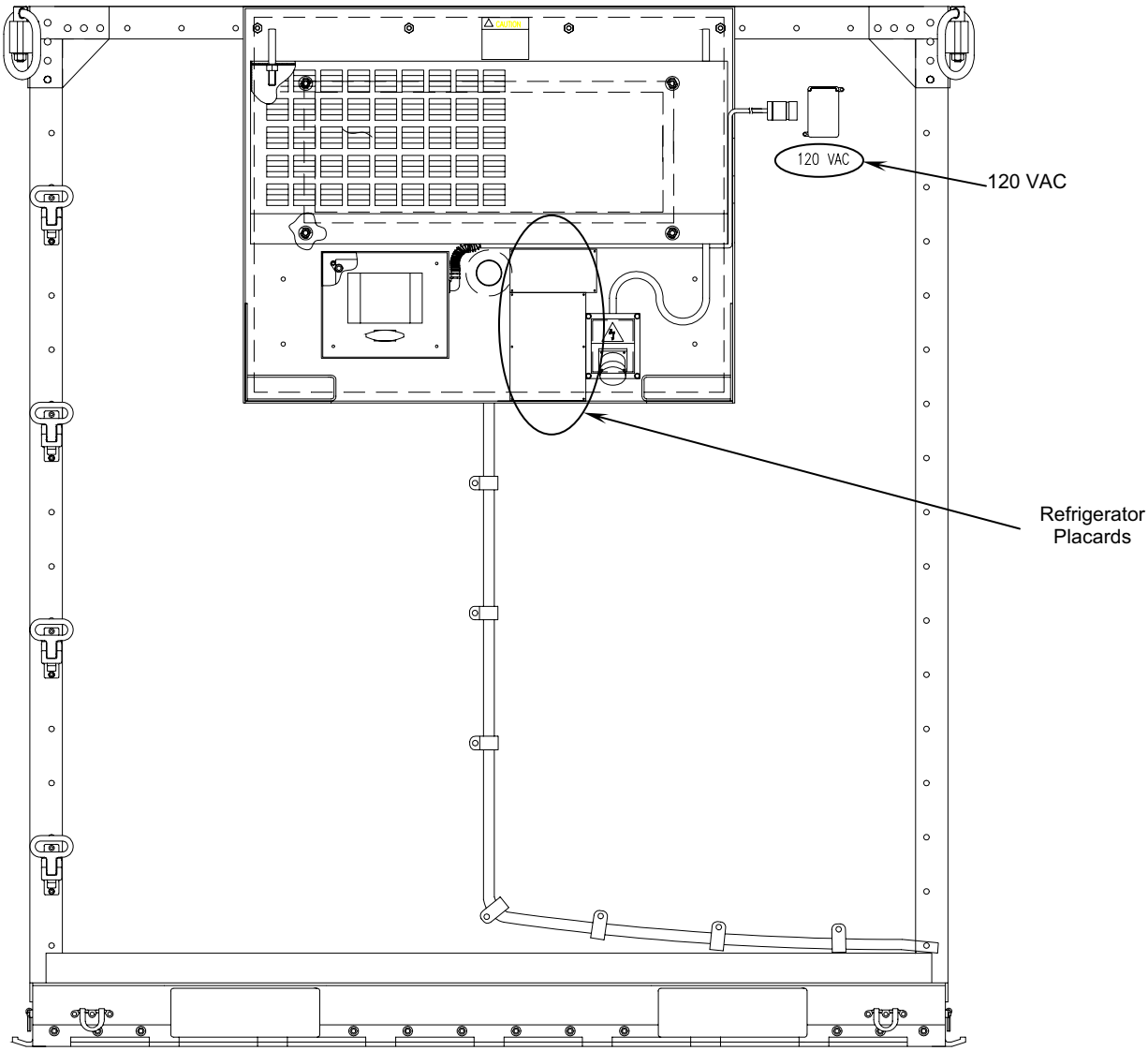


Figure 2. ADR-300 Stencils and Placards - Refrigeration Unit (RU) End.

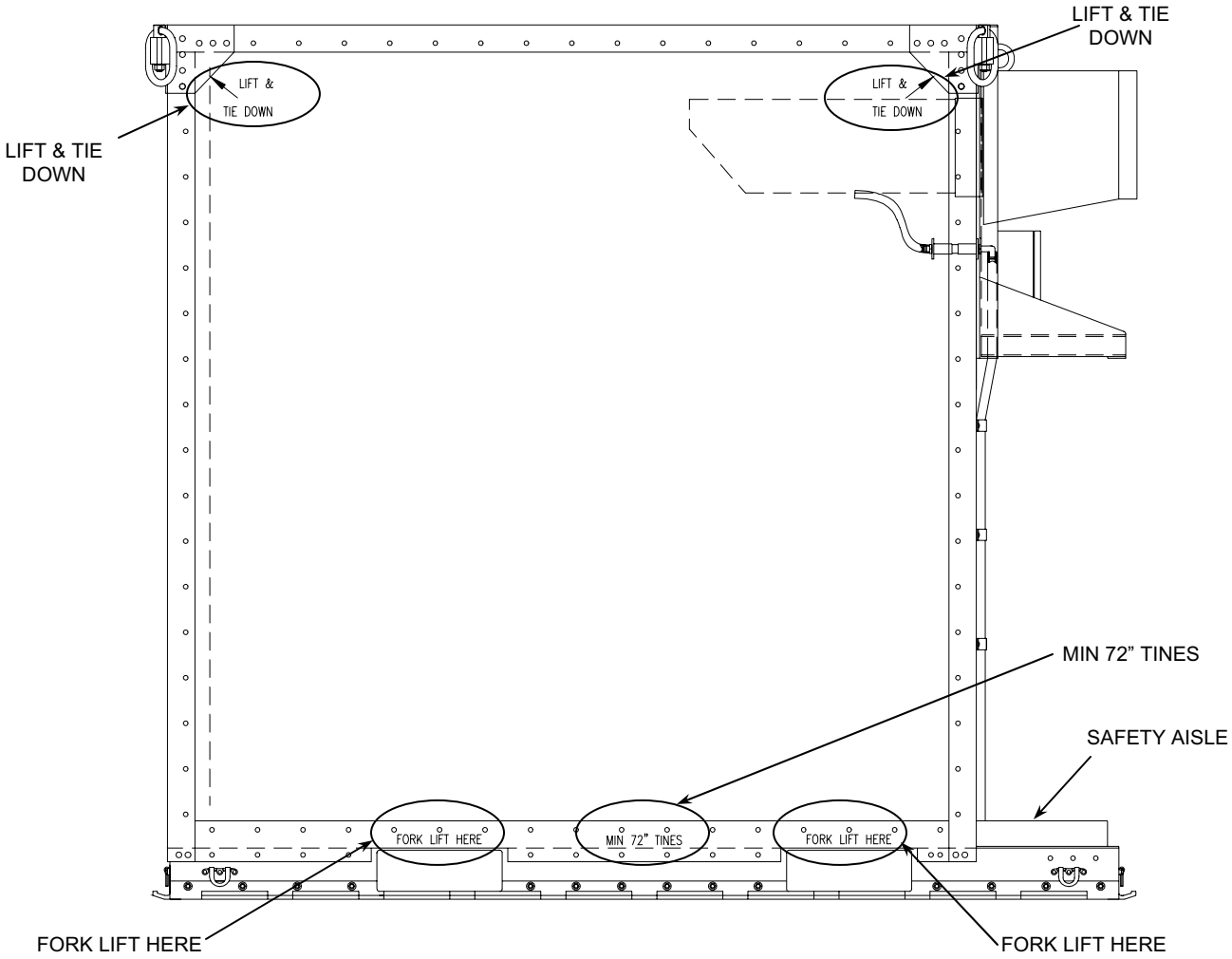


Figure 3. ADR-300 Stencils and Placards - Side View.

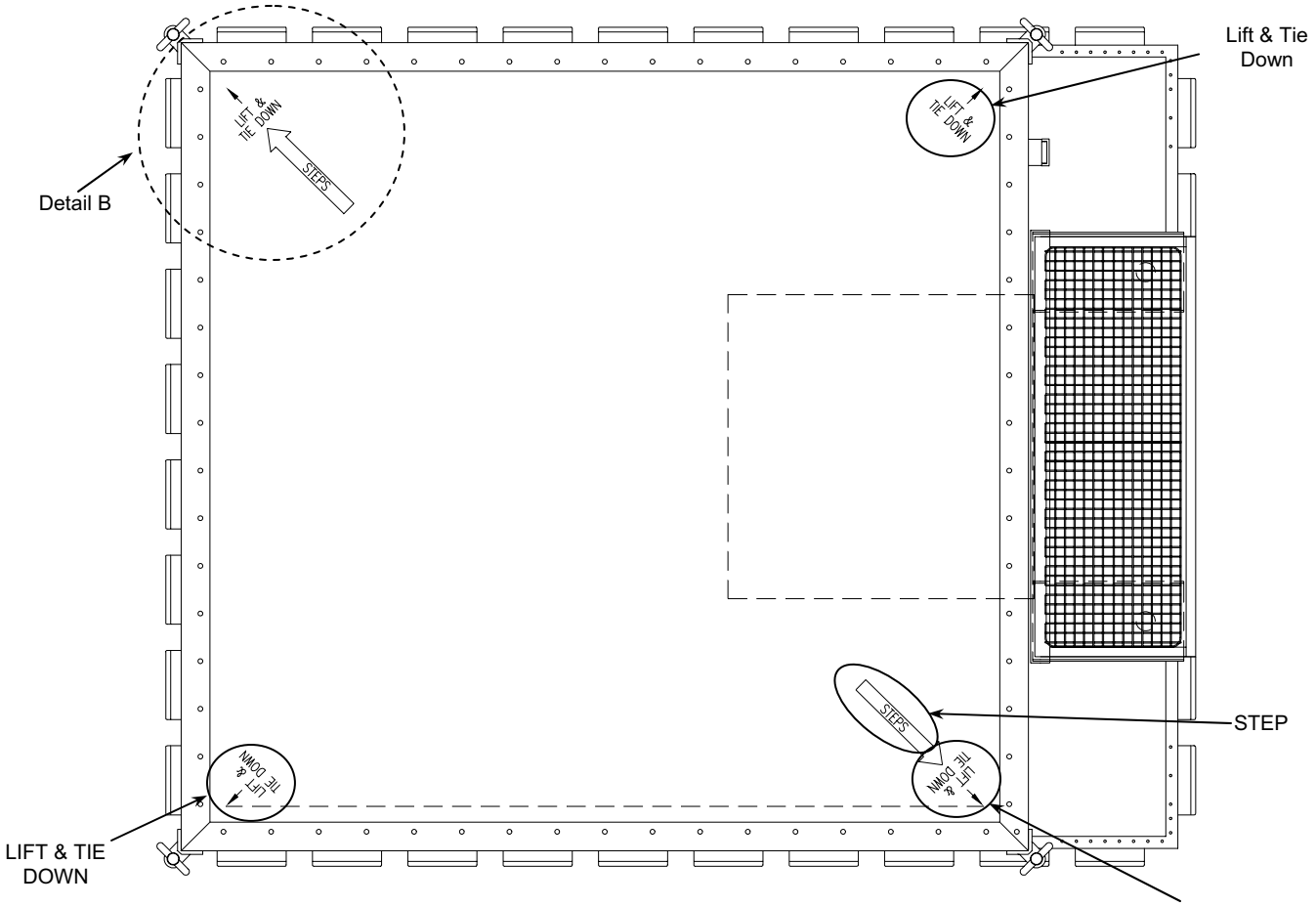
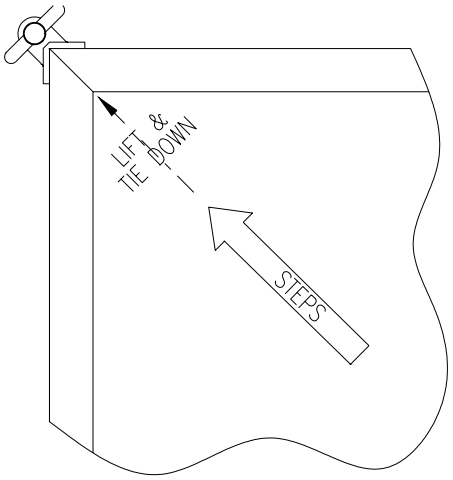


Figure 4. ADR-300 Stencils and Placards - Top View (with Detail B below).



Detail B

ADR-300 Unit Controller Display

The RU controller is mounted inside a NEMA enclosure. The controller display and keys are used to change operating settings and monitor operating status. To locate and identify keys on the controller display, refer to Figure 5 and Table 1, respectively.

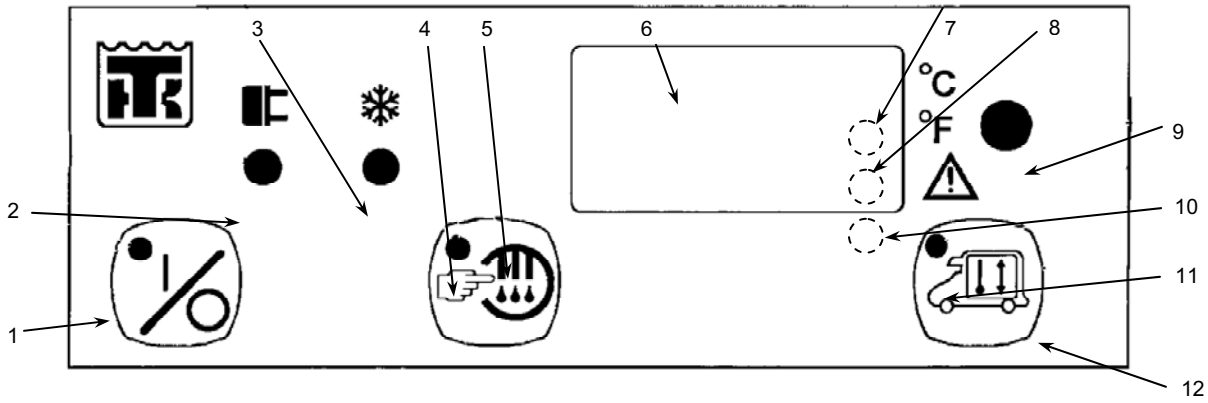


Figure 5. ADR-300 Unit Controller Display and Keypad.

Table 1. ADR-300 Unit Controller Display and Keypad References.

Ref	Function	Ref	Function
1	On/Off Key / ON Indicator Light	7	Celsius Indicator Light
2	Power Cord Indicator Light	8	Fahrenheit Indicator Light
3	Unit Operation / Cooling Mode Indicator Light	9	Thermostat Dial
4	Defrost Indicator Light	10	AC Overload Indicator Light
5	Manual Defrost Key	11	Setpoint Key
6	Digital Display	12	Setpoint Key Indicator Light

Unit Controls. The controller features and functions are described below:

ON/OFF Key / ON Indicator Light (Figure 5, Item 1). Press this key to turn the unit on and off. When the unit has been stopped by the HEAT or COOL overload relay, press this key to restart the unit.

When this light is on, it indicates that the unit is turned ON. When this light is OFF, it indicates that the unit is turned off.

Power Cord Indicator Light (Figure 5, Item 2). When this light is on, it indicates that the unit is connected to an AC power supply.

Unit Operation / Cooling Mode Indicator Light (Figure 5, Item 3). When this light is on, it indicates the unit is operating in either the cooling or heating modes. A green light indicates the unit is in the cooling mode. A red light indicates the unit is in the heating mode. When the unit is stopped by the thermostat, HPCO, or LPCO, the unit operation indicator light will be off and the ON indicator will remain ON.

Defrost Indicator Light (Figure 5, Item 4). When this light is on, it indicates that the unit is in the defrost mode.

Manual Defrost Key (Figure 5, Item 5). Press this key to start the defrost cycle. The unit will not defrost unless the push switch is closed and the evaporator coil temperature is below 36 ºF (2 ºC).

NOTE

The thermostat dial will change the thermostat setpoint without pressing the setpoint key.

Thermostat Dial (Figure 5, Item 9). Turn this dial to adjust the thermostat setpoint.

Setpoint Key (Figure 5, Item 11). Press this key to make the thermostat setpoint appear on the digital display. The thermostat setpoint will remain on the display for 10 to 15 seconds after the key is released. This gives the operator time to adjust the thermostat setpoint.

Setpoint Key Indicator Light (Figure 5, Item 12). When this light is on, the display is indicating the setpoint temperature.

AC Overload Indicator (Figure 5, Item 10). When this light is on, it indicates that the overload relay has opened and the unit has been stopped. The indicator must be reset by pressing the ON/OFF key after allowing the overload relay to cool. Manually reset overload relay IAW WP 0028.

Digital Display (Figure 5, Item 6). This display is active only when the unit is turned on. The thermometer reading (return air sensor temperature) normally appears on the display. Pressing the setpoint key causes the thermostat setpoint to appear on the display for 10 to 15 seconds.

Celsius Indicator Light (Figure 5, Item 7). When this light is on, it indicates that the temperature is being displayed in degrees Celsius (ºC).

Fahrenheit Indicator Light (Figure 5, Item 8). When this light is on, it indicates that the temperature is being displayed in degrees Fahrenheit (ºF).

Display Information. With the unit or the controller OFF, the display screen will be dark – nothing will appear on the display screen. When the unit ON/OFF key is pressed on, the unit operation light will be lit.

The display screen will display the return air temperature or the setpoint temperature, depending on the current operating mode.

When the unit is switched off, the screen is once again blank and the unit operation indicator light goes OFF.

Display Operating Data. During normal operation, the display shows the return air temperature on the screen. To display the setpoint, press the setpoint key. This will display the setpoint temperature on the screen for 10-15 seconds, after which, the display will again show the return air temperature.

Initiate Manual Defrost. You may start a manual defrost cycle anytime the evaporator coil temperature is below 36 ºF (2 ºC).

1. Press the manual defrost key. The defrost indicator light will show that the unit is in the defrost mode. The unit will automatically return to the proper operating mode when the defrost cycle is finished. The unit will return to the cooling mode automatically when the evaporator coil temperature reaches 48 ºF (9 ºC).

2. To end the defrost cycle before automatic termination, press the ON/OFF key to turn the unit off.

END OF TASK

CAUTION

Do not accidentally move the thermostat dial. The thermostat setpoint can be changed by moving the dial without pressing the setpoint key. Failure to comply may result in damage to the equipment or loss of stored commodities.

The setpoint can be set and changed with the following steps:

1. Press the setpoint key and the display will show the thermostat setpoint. The setpoint indicator will illuminate.
2. Watch the controller display and turn the thermostat dial to the desired thermostat setpoint.
3. Release the setpoint key. The return air temperature should appear on the display after 10-15 seconds.

END OF TASK

END OF WORK PACKAGE

OPERATOR'S, UNIT, AND DIRECT SUPPORT MAINTENANCE

ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)

OPERATION UNDER USUAL CONDITIONS

SITING REQUIREMENTS

WARNING

The ADR-300 weighs as much as 10,000 lb (4,536 kg) when fully loaded. Lift and move the container only with material handling equipment of at least 10,000-pound (4,536 kg) capacity. Observe all safety precautions. Never stand under an ADR-300 when it is being lifted.

This section outlines the site requirements for the ADR-300. It also provides procedures for the preparation and operation of the ADR-300 under usual conditions. Refer to WP 0006 for Operation Under Unusual Conditions.

The selected site should be relatively level and free of rocks and other obstructions. It should provide for adequate drainage of ground water. The cleared area should be large enough for the container itself and permit unrestricted movement of cargo handling equipment.

The site should have adequate electric power available. The ADR-300 requires 208/230 VAC, 3-phase, 50-60 Hz power up to 30 A (refer to WP 0002). No other facilities are required for normal operation.

NOTE

The compressor overload should be set at different levels, depending on the supply power frequency. The unit is set at the factory at 15 A for 60 Hz power. When used with 50 Hz power, the overload relay should be set to 12.5 A. Refer to WP 0029 for checking and adjusting the overload relay setting.

ASSEMBLY AND PREPARATION FOR USE

Unloading and moving the ADR-300 requires a forklift or an overhead crane with a lifting capacity of at least 10,000 pounds (4,536 kg). When using a forklift, use the built-in forklift pockets on the container base.

WARNING

When stacking one ADR-300 on top of another, ensure that both units are aligned so that the front and side walls of the top unit are flush with the front and side walls of the lower unit. This will ensure that the lower unit will support the weight of the top unit. Failure to comply may result in serious injury or death to personnel.

CAUTION

Ensure that the sling lines create an angle of MORE THAN 45° with the container roof to prevent structural damage to the ADR-300. Failure to comply may result in damage to the equipment.

For storage, ADR-300 containers may be stacked NO MORE THAN TWO HIGH. Hoisting requires a hoist of 10,000-pound (4,536 kg) capacity and slings connected to the lifting rings (Figure 1) in the upper corners of the container as shown in the following figure.

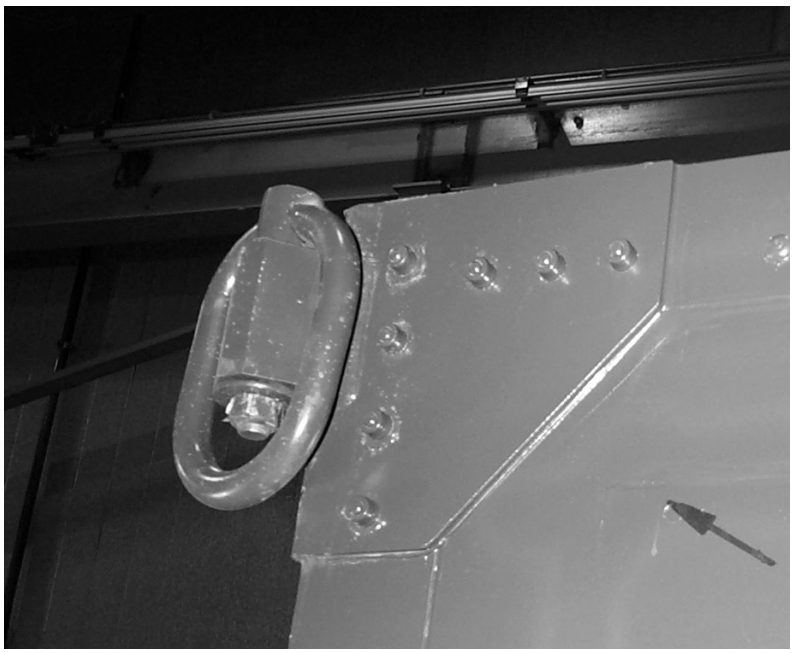


Figure 1. Lifting Ring.

WARNING

Ensure that the forklift capacity exceeds the gross weight of the loaded container. The fully loaded container may have a maximum gross weight of 10,000 pounds (4,536 kg). Use of a forklift of insufficient capacity may result in serious injury or death.

When using a forklift to lift the container, use a spotter to ensure that forklift tines enter the forklift pockets in the container base. Failure to ensure entrance into tubes may result in improper lifting. Improper lifting could result in container sliding off tines causing personal injury or death.

CAUTION

When using a forklift to lift the container, use a spotter to ensure that forklift tines enter the forklift pockets in the container base. Failure to ensure entrance into tubes may result in damage to the container.

Do not open the container door when the folding steps (Figure 2) are deployed. Failure to comply may damage the equipment.

Observe the following general considerations when using the ADR-300:

1. Do not exceed the maximum weight of the container and contents, 10,000 lb (4,536 kg).
2. Secure all equipment and supplies being transported.
3. A forklift or overhead crane (coupled to the lift rings) is the only acceptable means of lifting the container.

NOTE

Folding steps on the container may be lowered to allow personnel to climb on top of the container. This allows easier access to the lift ring assemblies for attachment purposes.

4. Use a spotter to ensure forklift tines enter forklift pockets in container base.

Figure 2. Folding Step (Deployed).

Figure 3. Folding Step (Stowed).

Unpacking the ADR-300

The ADR-300 does not require unpacking or assembly prior to normal use. All components are mounted in their operational positions.

Prior to using the ADR-300, complete a general system inspection to be sure the unit is in good working order. A general system inspection includes all of the “Before” system checks presented in WP 0010.

OPERATING PROCEDURES

Connect the Power Supply

WARNING

The ADR-300 electrical system uses high voltage power. Do not attempt to alter or repair electrical wiring. Make sure power supply circuit breakers are in the OFF position before connecting or disconnecting the power supply. Failure to comply may result in serious injury to personnel or death.

1. Turn all switches to the OFF position. Plug the power supply cable into a 208/230 VAC, 3-phase, 50-60 Hz supply outlet.

2. Plug the other end of the power supply cable into the five-pin cannon plug (Figure 4) on the RU.

Figure 4. Cannon Plug (RU Power Supply).

3. Plug the IC power supply cord into the IC power connector assembly (Figure 5).

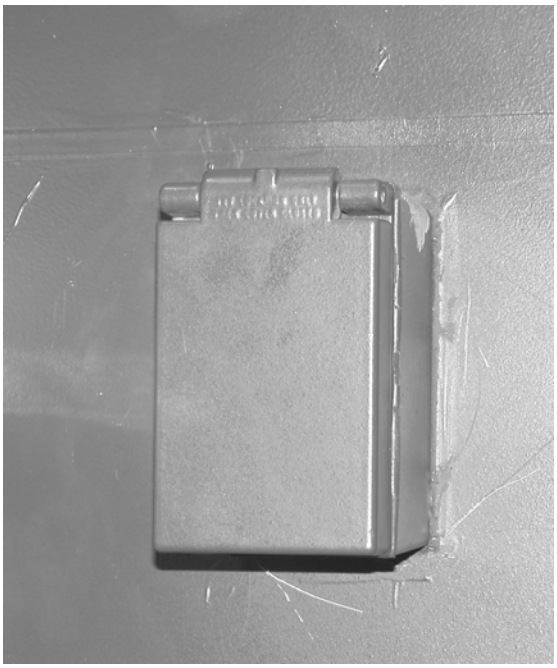


Figure 5. IC Power Entry Connector Receptacle Enclosure.

END OF TASK

Operate the ADR-300

After the external power source is connected, the RU may be operated through the controller. To locate controller keys, refer to WP 0004, Figure 5.

1. Start the RU by pressing the ON/OFF key on the unit controller. The ON/OFF Light will remain steadily lit.

2. To enter the setpoint, press and hold the setpoint key. The setpoint temperature will be displayed in the display window for 10-15 seconds. Adjust the setpoint up or down by rotating the thermostat dial while the setpoint is displayed.

3. Release the setpoint key. The display will return to the inside temperature after approximately 10-15 seconds.

NOTE

Do not move the thermostat dial after adjusting the setpoint. The setpoint may be changed without the setpoint temperature displayed.

4. Verify that the new setpoint was entered by pressing the setpoint key and checking the display.

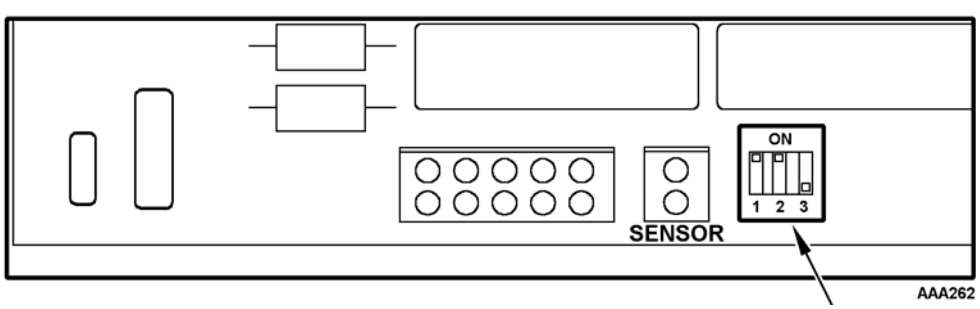
END OF TASK

Unit Controller Box

Selecting the Temperature Scale. The temperature readings can be displayed in either the Celsius scale or the Fahrenheit scale. Dip switch 3, located inside the controller is used to select which scale is displayed. Indicator lights next to the digital display show that the scale has been selected. Place dip switch 3 in the ON position to display temperatures in degrees Celsius.

Place dip switch 3 (Figure 6) in the OFF position to display temperatures in degrees Fahrenheit. To change the temperature scale selection:

1. Remove the cover from the back of the controller.
2. Place dip switch 3 (Figure 6) in the proper position.
3. ON for Celsius
4. OFF for Fahrenheit
5. Replace the cover.



Dip Switch

END OF TASK

Testing the Controller Box. The controller contains the thermometer and the thermostat. The thermometer and the thermostat share the same digital display and use the same sensor. The thermometer displays the sensor temperature. The thermostat compares the sensor temperature with the setpoint to determine the unit's operating mode. The sensor is located in the evaporator return airflow stream.

Setpoint Differential Adjustment. The factory thermostat setpoint differential is 4 ºF (2 ºC). Do not change thermostat setpoint differential unless necessary. See the instructions below if you must change the thermostat setpoint differential.

1. Adjust the thermostat setpoint differential to 4 ºF (2 ºC).
2. Remove the controller from its bracket.
3. Remove the cover from the back of the controller.
4. Turn the adjusting potentiometer (Figure 7) to the 12 o'clock position.
5. Replace the cover and place the controller back in its bracket.

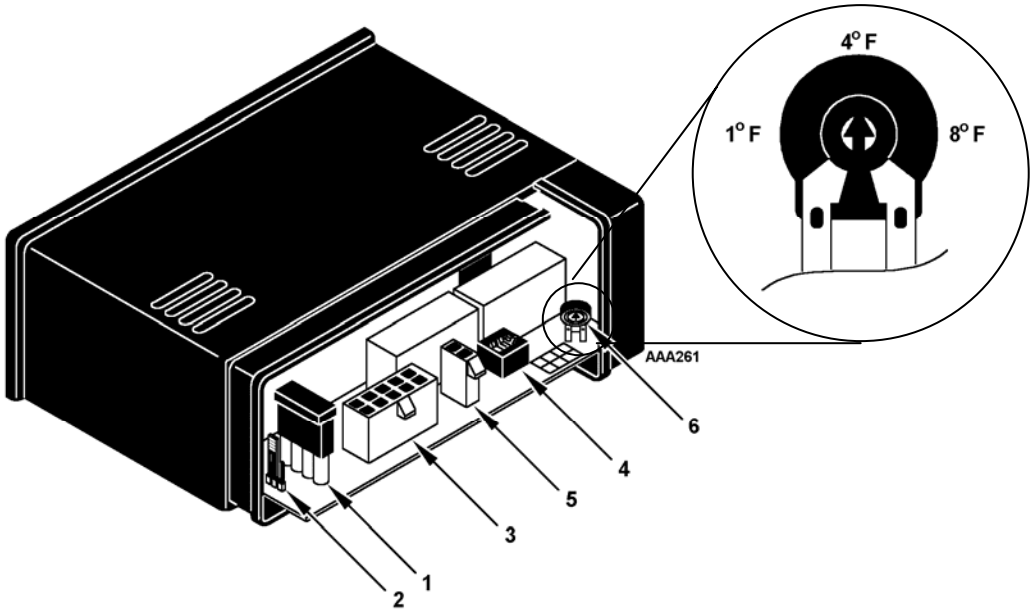


Figure 7. Back of Controller.

Table 1. Back of Controller References

1	1 Amp Fuse
2	12/24 Volt Jumper
3	Main Harness Plug
4	Dip Switches
5	Sensor Plug
6	Setpoint Differential Potentiometer Set to 12 o'clock position

END OF TASK

Initial Digital Display Test.

1. Turn the unit on.

NOTE

The temperature will appear on the digital display.

   a. Normal Display (-40 to 199 °F [-40 to 38 ºC])

   b. Blank Display

   c. Erratic Display

2. Press the setpoint key and note what appears on the digital display. This is the setpoint display.

   a. Normal Display (-26 to 86 °F [-32 to 30 ºC])

   b. Blank Display

   c. Erratic Display

   d. No Change

3. The Display Diagnosis Chart (Table 2) will help determine the next item to check.

Table 2. Display Diagnostics Chart.

		Setpoint Display			
		Normal Display	Blank Display	Erratic Display	No Change
Temperature Display	Normal Display	No Problem	Faulty Controller	Faulty Controller	Faulty Controller
	Blank Display	Check Sensor	Check Power	Check Power	Check Power
	Erratic Display	Check Sensor	Check Power	Check Power	Check Power

END OF TASK

Selecting the Setpoint Range. The setpoint range can be set at either –26 to 86 °F (-32 to 30 ºC) or –8 to 86 °F (-22 to 30 ºC). Dip switches 1 and 2 (Figure 6), located inside the controller are used to select the setpoint range. Place dip switches 1 and 2 in the ON position for a setpoint range of –26 to 86 °F (-32 to 30 ºC). Place dip switches 1 and 2 in the OFF position for a setpoint range of –8 to 86 °F (-22 to 30 ºC). To change the setpoint range selection:

1. Remove the cover from the back of the controller.

2. Place dip switches 1 and 2 (Figure 6) in the proper position.

   a. ON for a setpoint range of –26 to 86 °F (-32 to 30 ºC).

   b. OFF for a setpoint range of –8 to 86 °F (-22 to 30 ºC).

3. Replace the cover.

END OF TASK

Thermostat. The setpoint range for the thermostat is –26 to 86 °F (-32 to 30 ºC) or –8 to 86 °F (-22 to 30 ºC). The thermostat setpoint appears on the digital display when the setpoint key is pressed. Turning the thermostat dial changes the setpoint. The thermostat controls the operation of the unit by controlling the power relay, and the heat relay.

Thermometer. The range for the thermometer is –40 to 99 °F (-40 to 38 ºC). Normally the thermometer reading appears on the digital display. Pressing the Setpoint key causes the thermostat setpoint to appear on the digital display for 10 to 15 seconds.

Initiating a Manual Defrost Cycle. During a defrost cycle, the defrost indicator light (Figure 8) will appear in the display (Figure 8). Before initiating a manual defrost cycle, make sure the unit is not already in a defrost cycle. The evaporator coil temperature must be below 36 °F (2.2 °C) for a manual defrost cycle to start.

1. Press the manual defrost key (Figure 8).

2. The defrost cycle will continue until the evaporator coil temperature reaches 48 ºF (9 ºC).

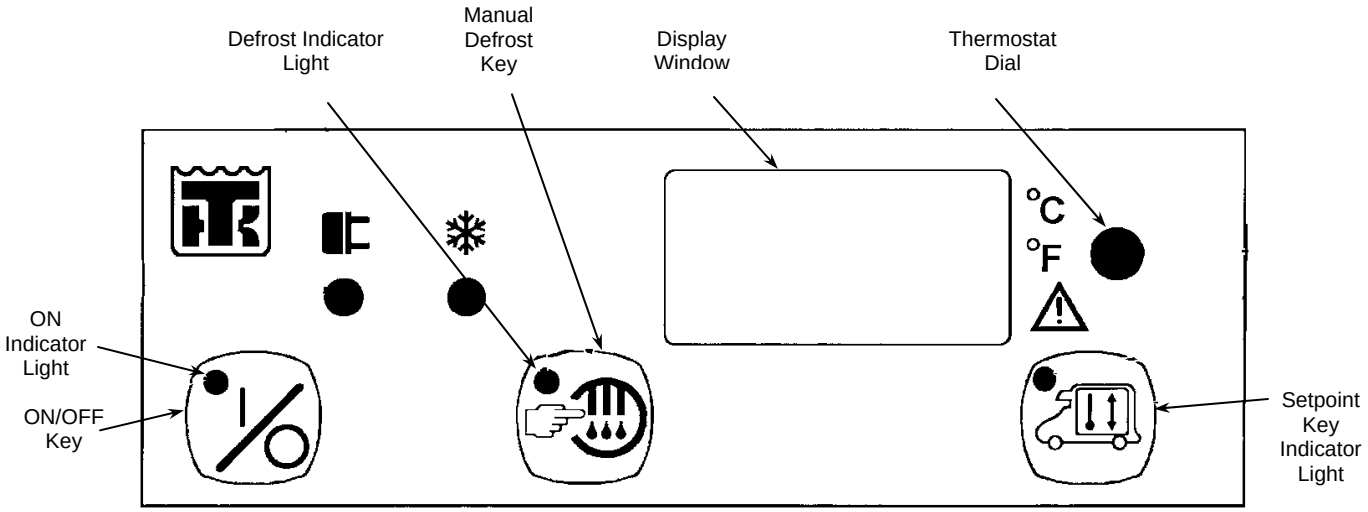


Figure 8. ADR-300 Unit Controller Display and Keypad.

END OF TASK

Terminating a Manual Defrost Cycle. Once initiated, the defrost cycle will continue until the evaporator coil temperature reaches 48 °F (9 °C). If necessary, a manually initiated defrost cycle may be terminated by turning the ADR-300 off and then back on.

Interior Light

The ADR-300 is equipped with an interior light to assist users working inside the container. The light is turned on and off by the light switch on the inside door-wall above the door. A pilot light on the exterior door wall above the door glows when the light is switched on. This alerts the user to the status (on/off) of the interior light without opening the door.

Container Door Lock

The ADR-300 is equipped with a conventional refrigerator door handle (Figure 9) as well as two rotating door handle unit assemblies (Figure 9) that serve as back-up locks. To open the door:

1. Rotate the two door handle unit assemblies (Figure 9) to the vertical position.

2. Pull the door handle (Figure 9) outward.

The door can also be opened from the inside to insure that personnel are not accidentally trapped inside. To release the door from the interior:

1. Rotate the interior door handle unit assemblies to the vertical position

2. Push the plunger toward the outside.

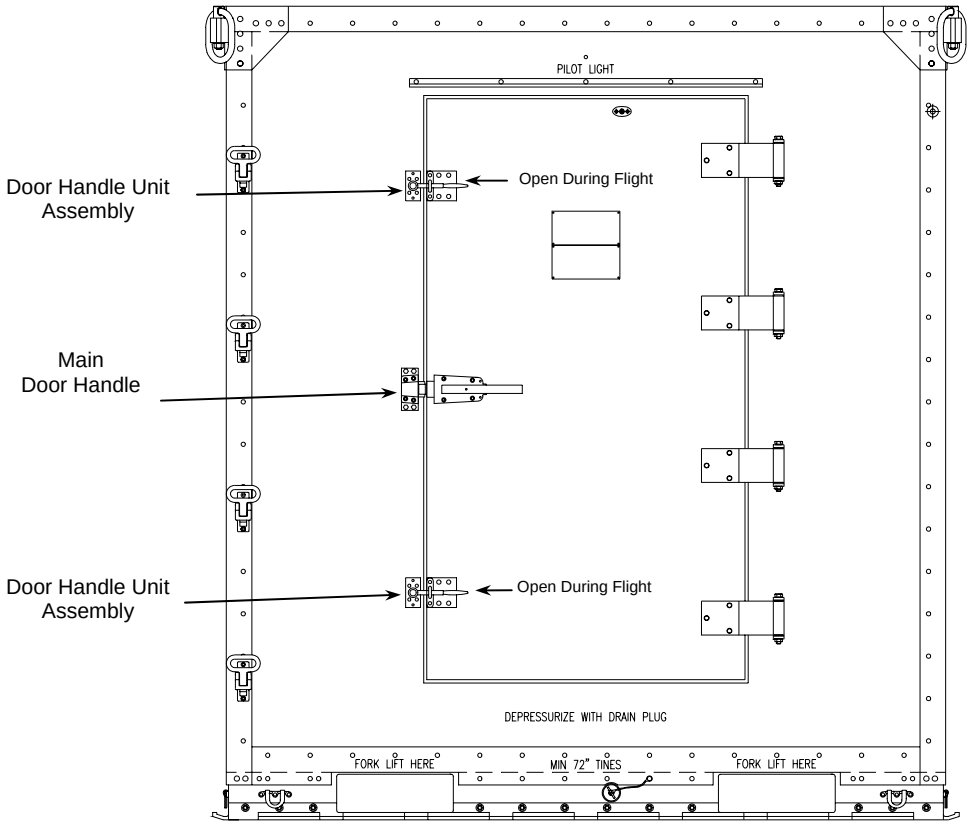


Figure 9. Container Door Locks.

END OF TASK

Loading the ADR-300

WARNING

Do not load or fly the ADR-300 on an aircraft if the container's internal framework on the pallet base is structurally damaged. ADR-300 could shift during flight. Failure to comply may result in serious injury or death to personnel.

CAUTION

Do not exceed the designated weight limit. The container's gross weight should never exceed 10,000 pounds (4,536 kg). Failure to comply may cause damage to the container or cargo handling equipment.

The ADR-300 may be used to transport a wide range of cargoes that require refrigeration. Cargo may be transported on the interior shelves or the shelves may be removed/adjusted to accommodate larger bulk items. To remove or install the shelves, refer to WP 0015 . If cargo is to be shipped on shelves, ensure the cargo restraint rings are not damaged prior to loading.

Make sure the total weight supported by any single shelf does not exceed 300 pounds.

Cargo should not touch the container walls. It should be located more than one inch from any outside wall to permit air circulation on all sides of the load.

Make sure the weight on each shelf is distributed over as much of the shelf area as possible.

If the shelf load is concentrated in one place, place that item as close as possible to one end of the shelf.

Restrain all items with straps, ropes or other appropriate restraints to prevent movement in any direction.

If cargo is to be shipped in bulk:

Make sure the total cargo weight does not exceed 3,600 pounds (1,634 kg) on the floor.

Load the cargo on the container floor so that it does not touch the container outside walls.

Restrain the cargo with straps, ropes or other suitable devices coupled to the tie-down rings at the perimeter of the floor.

END OF TASK

DECALS AND INSTRUCTION PLATES

The following figures are labels and instruction plates are found on the ADR-300.

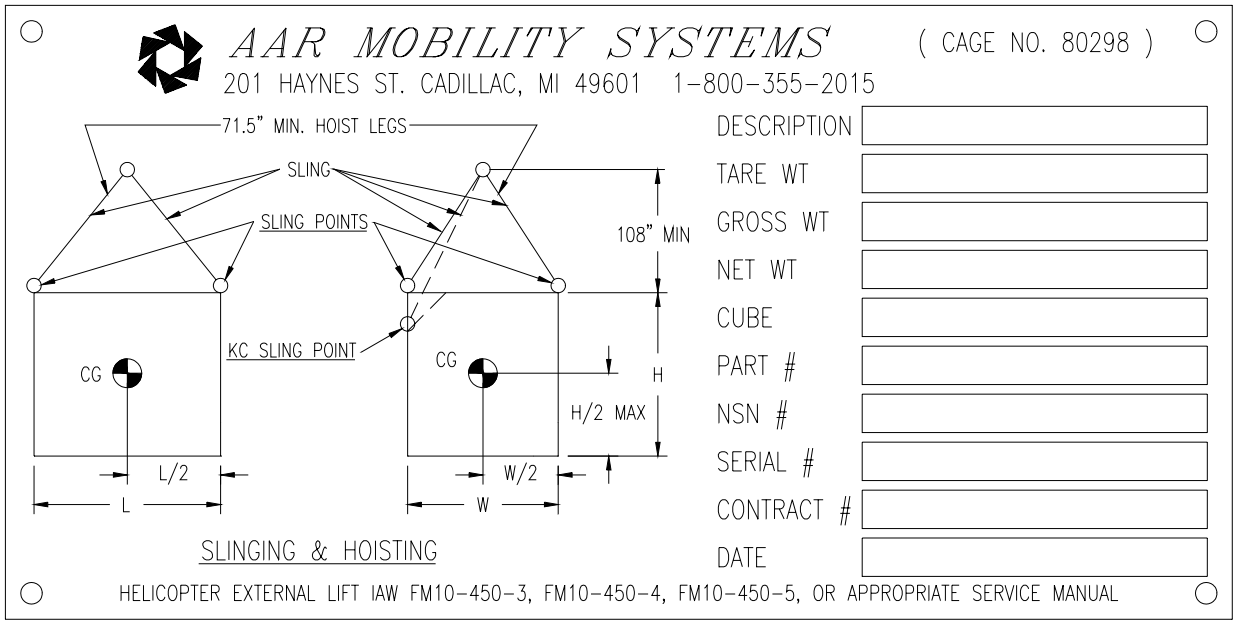


Figure 10. Cargo Door Placard.

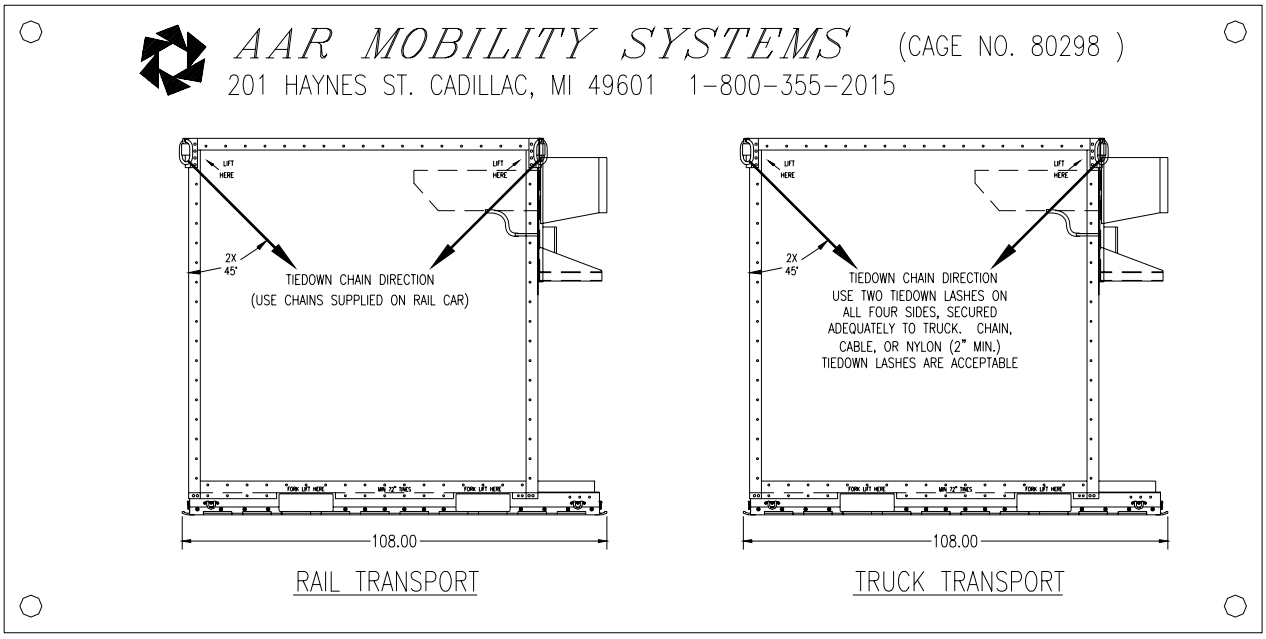


Figure 11. Shipping and Tie-Down Placard.

Figure 12. Photo of the Refrigeration Unit and Unit Controls Placards.

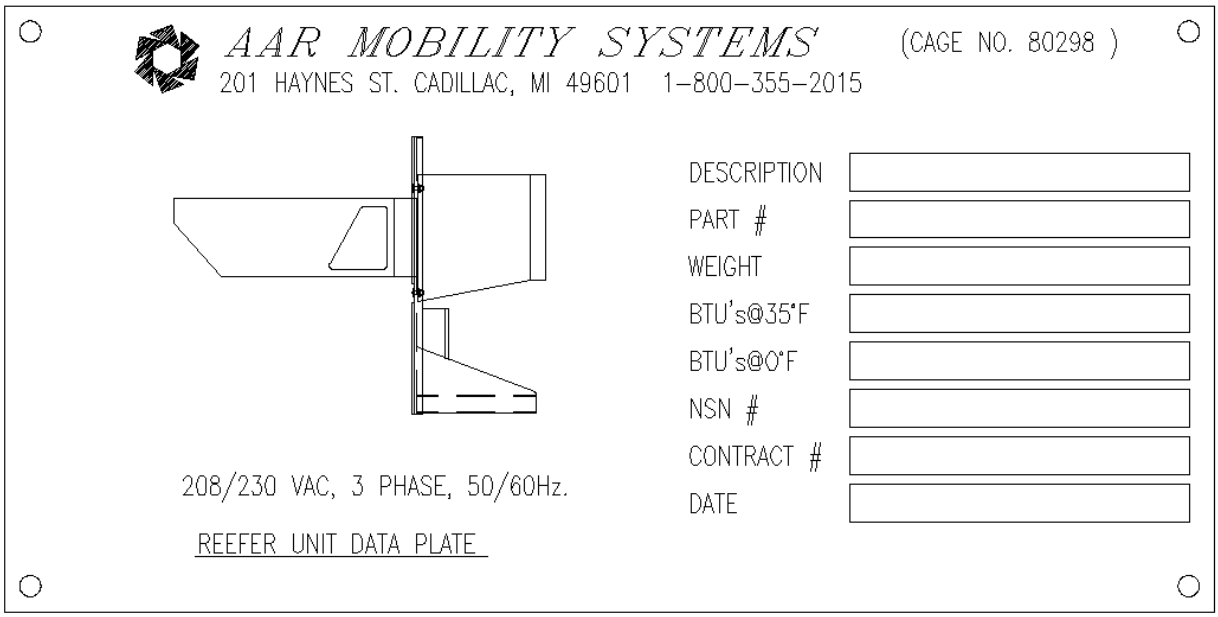
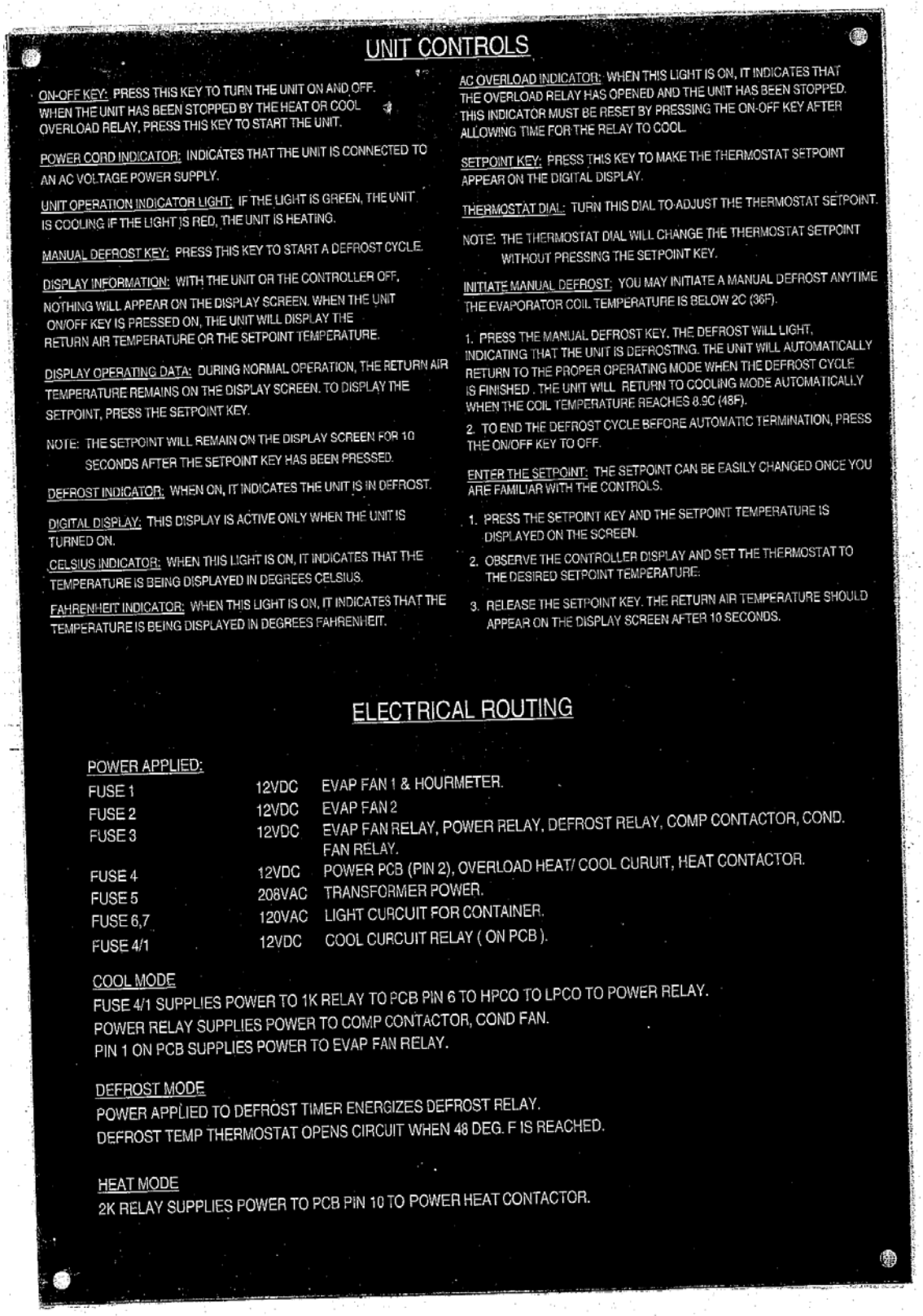


Figure 13. Refrigeration Unit Placard.



UNIT CONTROLS

ON-OFF KEY: PRESS THIS KEY TO TURN THE UNIT ON AND OFF. WHEN THE UNIT HAS BEEN STOPPED BY THE HEAT OR COOL OVERLOAD RELAY, PRESS THIS KEY TO START THE UNIT.

POWER CORD INDICATOR: INDICATES THAT THE UNIT IS CONNECTED TO AN AC VOLTAGE POWER SUPPLY.

UNIT OPERATION INDICATOR LIGHT: IF THE LIGHT IS GREEN, THE UNIT IS COOLING IF THE LIGHT IS RED, THE UNIT IS HEATING.

MANUAL DEFROST KEY: PRESS THIS KEY TO START A DEFROST CYCLE.

DISPLAY INFORMATION: WITH THE UNIT OR THE CONTROLLER OFF, NOTHING WILL APPEAR ON THE DISPLAY SCREEN. WHEN THE UNIT ON/OFF KEY IS PRESSED ON, THE UNIT WILL DISPLAY THE RETURN AIR TEMPERATURE OR THE SETPOINT TEMPERATURE.

DISPLAY OPERATING DATA: DURING NORMAL OPERATION, THE RETURN AIR TEMPERATURE REMAINS ON THE DISPLAY SCREEN. TO DISPLAY THE SETPOINT, PRESS THE SETPOINT KEY.

NOTE: THE SETPOINT WILL REMAIN ON THE DISPLAY SCREEN FOR 10 SECONDS AFTER THE SETPOINT KEY HAS BEEN PRESSED.

DEFROST INDICATOR: WHEN ON, IT INDICATES THE UNIT IS IN DEFROST.

DIGITAL DISPLAY: THIS DISPLAY IS ACTIVE ONLY WHEN THE UNIT IS TURNED ON.

CELSIUS INDICATOR: WHEN THIS LIGHT IS ON, IT INDICATES THAT THE TEMPERATURE IS BEING DISPLAYED IN DEGREES CELSIUS.

FAHRENHEIT INDICATOR: WHEN THIS LIGHT IS ON, IT INDICATES THAT THE TEMPERATURE IS BEING DISPLAYED IN DEGREES FAHRENHEIT.

AC OVERLOAD INDICATOR: WHEN THIS LIGHT IS ON, IT INDICATES THAT THE OVERLOAD RELAY HAS OPENED AND THE UNIT HAS BEEN STOPPED. THIS INDICATOR MUST BE RESET BY PRESSING THE ON-OFF KEY AFTER ALLOWING TIME FOR THE RELAY TO COOL.

SETPOINT KEY: PRESS THIS KEY TO MAKE THE THERMOSTAT SETPOINT APPEAR ON THE DIGITAL DISPLAY.

THERMOSTAT DIAL: TURN THIS DIAL TO ADJUST THE THERMOSTAT SETPOINT.

NOTE: THE THERMOSTAT DIAL WILL CHANGE THE THERMOSTAT SETPOINT WITHOUT PRESSING THE SETPOINT KEY.

INITIATE MANUAL DEFROST: YOU MAY INITIATE A MANUAL DEFROST ANYTIME THE EVAPORATOR COIL TEMPERATURE IS BELOW 2C (36F).

1. PRESS THE MANUAL DEFROST KEY. THE DEFROST WILL LIGHT, INDICATING THAT THE UNIT IS DEFROSTING. THE UNIT WILL AUTOMATICALLY RETURN TO THE PROPER OPERATING MODE WHEN THE DEFROST CYCLE IS FINISHED . THE UNIT WILL RETURN TO COOLING MODE AUTOMATICALLY WHEN THE COIL TEMPERATURE REACHES 8.9C (48F).
2. TO END THE DEFROST CYCLE BEFORE AUTOMATIC TERMINATION, PRESS THE ON/OFF KEY TO OFF.

ENTER THE SETPOINT: THE SETPOINT CAN BE EASILY CHANGED ONCE YOU ARE FAMILIAR WITH THE CONTROLS.

1. PRESS THE SETPOINT KEY AND THE SETPOINT TEMPERATURE IS DISPLAYED ON THE SCREEN.
2. OBSERVE THE CONTROLLER DISPLAY AND SET THE THERMOSTAT TO THE DESIRED SETPOINT TEMPERATURE.
3. RELEASE THE SETPOINT KEY. THE RETURN AIR TEMPERATURE SHOULD APPEAR ON THE DISPLAY SCREEN AFTER 10 SECONDS.

ELECTRICAL ROUTING

POWER APPLIED:

FUSE 1	12VDC	EVAP FAN 1 & HOURMETER.
FUSE 2	12VDC	EVAP FAN 2
FUSE 3	12VDC	EVAP FAN RELAY, POWER RELAY, DEFROST RELAY, COMP CONTACTOR, COND. FAN RELAY.
FUSE 4	12VDC	POWER PCB (PIN 2), OVERLOAD HEAT/ COOL CURUIT, HEAT CONTACTOR.
FUSE 5	208VAC	TRANSFORMER POWER.
FUSE 6,7	120VAC	LIGHT CURCUIT FOR CONTAINER.
FUSE 4/1	12VDC	COOL CURCUIT RELAY (ON PCB).

COOL MODE

FUSE 4/1 SUPPLIES POWER TO 1K RELAY TO PCB PIN 6 TO HPCO TO LPCO TO POWER RELAY.
POWER RELAY SUPPLIES POWER TO COMP CONTACTOR, COND FAN.
PIN 1 ON PCB SUPPLIES POWER TO EVAP FAN RELAY.

DEFROST MODE

POWER APPLIED TO DEFROST TIMER ENERGIZES DEFROST RELAY.
DEFROST TEMP THERMOSTAT OPENS CIRCUIT WHEN 48 DEG. F IS REACHED.

HEAT MODE

2K RELAY SUPPLIES POWER TO PCB PIN 10 TO POWER HEAT CONTACTOR.

Figure 14. Unit Controls Placard.

Table 3. Other ADR-300 Labels.

Label Text	Meaning
LIFT HERE	Identify cargo rings for sling lifting the container
STEP DO NOT LIFT	Identifies folding steps for accessing container roof.
FORKLIFT HERE	Identifies forklift pockets where forklift tines should be inserted to lift the container.
MIN 72 TINES	Forklift tines must be at least 72 inches in length.
120 VAC	IC power connector assembly. Apply 120 VAC, single phase electrical power to energize interior light circuit.
SAFETY AISLE	Keep this area clear during internal airlift to allow crew movement inside the aircraft.

PREPARATION FOR MOVEMENT

WARNING

Personnel should never be left inside the container with the IC door closed and/or locked. Ensure that all personnel are accounted for before locking the IC for shipment. Personnel left inside the IC may suffer serious injury or death due to hypothermia and suffocation.

The ADR-300 may be shipped in either an operational (refrigerated) or non-operational condition. The container is designed to retain cold temperatures inside for several hours without a source of power. If the container will be shipped with refrigerated cargo, follow these steps:

1. Restrain all cargo items as described in loading on page 12 of this work package.

2. Turn off the interior light.

3. If the cargo will not be damaged by freezing and time permits, reduce the setpoint temperature to a low level and allow the cargo to cool to that temperature.

WARNING

For ADR-300 systems that will be airlifted, the door handle unit assemblies should be left unlocked, using only the main door handle to hold the door closed. This will allow pressure relief, if necessary during flight. Failure to comply may cause serious injury or death to personnel. Failure to comply may also cause equipment to implode or explode causing hazard to the aircraft.

4. Lock the cargo door and confirm the seal is satisfactory.

5. Confirm that the drain plug (Figure 15), located under the door on the front face of the IC, is installed.

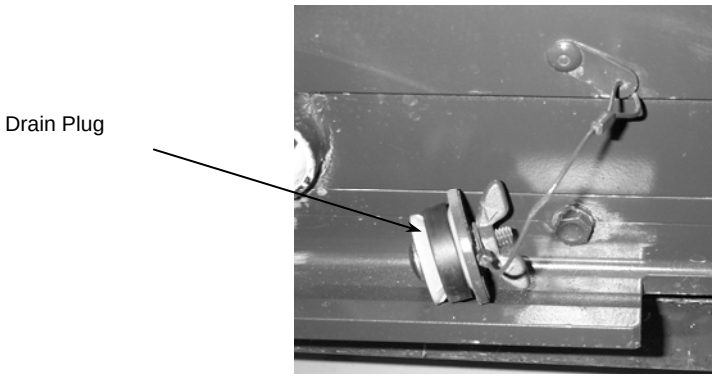


Figure 15. Drain Plug.

6. As near as possible to the departure time, shut down the RU and disconnect the power cord from the source of power.

7. Move the container as described previously in this WP.

If the ADR-300 is to be moved in a non-operational condition:

1. Turn off interior light.

2. Shut down the RU and disconnect the power supply cord from the RU connector.

3. Clean the container interior IAW WP 0014.

4. Restrain all loose items inside the container to the restraint rings on the floor of the IC.

5. Close and lock the cargo door.

6. Move the container as described previously in this work package.

END OF TASK

Vehicle Loading

The ADR-300 may be transported on a variety of flatbed vehicles. Insure that the selected vehicle load capacity exceeds the total gross weight of the loaded container (10,000 lb). Lift the ADR-300 onto the vehicle with either a forklift or overhead crane. Secure the container to the vehicle bed with chains or cargo straps as described below. An instruction plate (Figure 11) for restraining the container on the vehicle is attached to the container exterior.

Truck Transport

The ADR-300 may be transported on a 5-ton or larger truck. A plywood spacer (minimum 5/8 - 1-inch thickness), or similar material, shall be used under the ADR-300 container to protect the under side of the container base during tactical truck movement.

Note that manufacturing tolerances may cause the container base to be slightly wider than the 5-ton truck bed with the side rails in place. In these instances, one of the cargo restraint rails may be removed from the container base to provide side-to-side clearance.

Secure the top of the container (refer to Figure 16). Use chains, cable or nylon straps (minimum 2 in wide) to restrain the container on the truck bed.

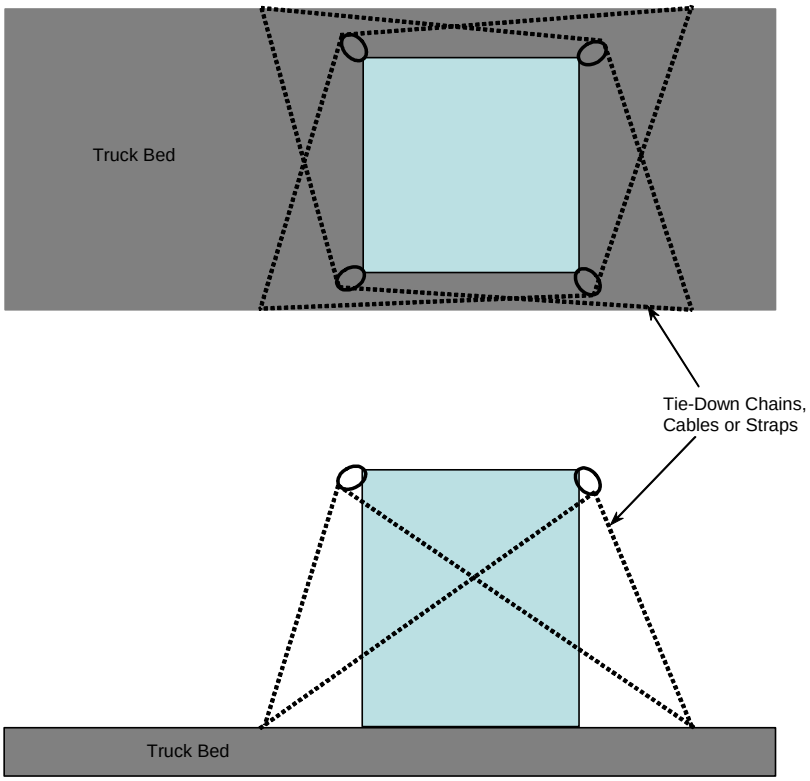


Figure 16. Restraint Layout for Truck Transport.

Rail Transport

The ADR-300 is approved for transport on both OTTX and HTTX in accordance with Military Traffic Management Command Transportation Engineering Command (MTMCTEA) Pamphlet 55-19. The restraint chains should be attached (refer to Figure 17).

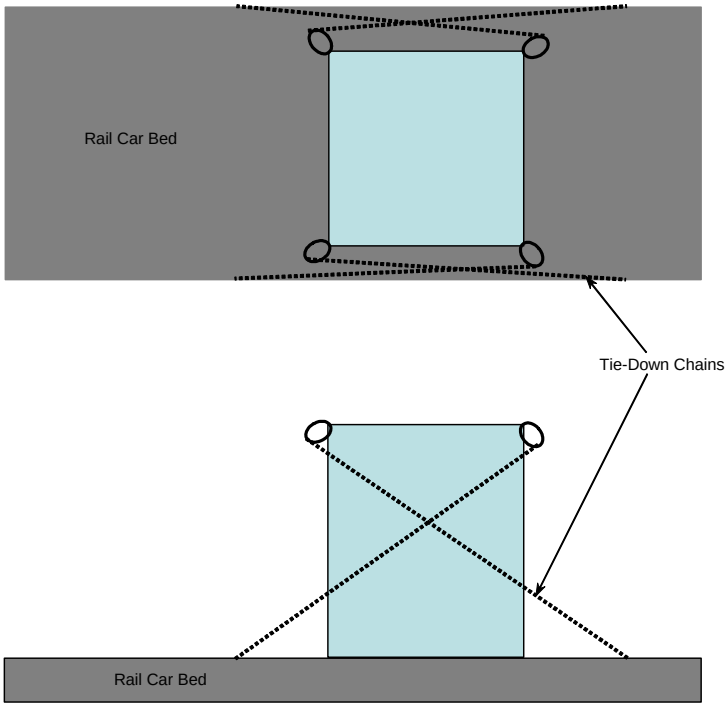


Figure 17. Restraint Layout for Rail Transport.

Airlift

The ADR-300 system is approved for external airlift as described below.

External Airlift

Helicopter sling load (HSL) operations are performed in accordance with (IAW) the MULTISERVICE HELICOPTER SLING LOAD series of manuals. These manuals provide HSL rigging procedures for all services. The Basic Operations and Equipment manual (AFJAM 11-233, VOL I; COMDTINST M13482.2A; NWP 3-04.11; MCRP 4-23E, VOL I; FM 10-450-4) provides all required information for aviation and ground personnel who perform sling load missions ashore or aboard ship.

These manuals are a coordinated effort of the US Army, US Marine Corps, US Navy, US Air Force and US Coast Guard. All services participate in the sling load certification program begun by the Army in 1984. These manuals include standardized rigging procedures and other information from that program.

The ADR-300 must be rigged and flown IAW the procedures published in SINGLE-POINT LOAD RIGGING PROCEDURES, Chapter 11, Certified Single-Point Rigging Procedures for Containers, FM 10-450-4 (See WP 0048).

Internal Airlift

WARNING

Place a tie-down ratchet strap (lightly tensioned) around the container to while in flight. The container door may open during rapid decompression. Failure to comply may result in serious injury or death to personnel.

CAUTION

As an added precaution, add one ratcheting cargo strap (lightly tensioned) around the perimeter of the container, just above the center door latch as an added safety against the door fully opening during a rapid decompression event. Failure to comply may result in damage to the equipment.

The ADR-300 is approved for internally restrained cargo on USAF C-130, C-141, C-5, and C-17 with the following provisions:

1. The maximum gross weight of the loaded container shall not exceed 10,000 lb. Maximum load per shelf is 300 lb. Contents shall be tied down.

2. The container, when presented for airlift, shall be capable of being restrained to withstand minimum loads of 3g forward, 2g up, and 1.5g aft and laterally. The shipper shall also ensure that contents can withstand these forces in addition to a potential 4.5g down load.

3. The end with the refrigeration unit is inset to provide the C-130 an access aisle in the wheel well area of the aircraft.

4. These containers will be loaded to allow, as needed, in-flight inspection and access to the contents.

5. The container will self-ventilate in the event of an in-flight rapid decompression of up to 8.3 psi within ½ second, thus contents should be packaged with this in mind.

NOTE

Do not block drain. Do not lock back-ups.

6. The container base interface with the aircraft cargo systems will be subject to the same reuse inspection criteria as the HCU-6/E pallet. For ground handling and normal aircraft loading, 463L compatible MHE is needed.

7. Any hazardous materials and components carried inside the container must have separate approval for air transport in accordance with AFIM 24-204, Preparing Hazardous Materials for Military Air Shipments (TM 38-250 / NAVSUP PUB 505 / MCO P4030.19I / DLAI 4145.3). This direction is not to be considered approval for shipment of hazardous materials. The servicing aerial port can assist in this regard.

Additionally, the container is approved for any pallet position in a C-130. During internal air transport, the container door handle unit assemblies (upper and lower) should be turned to the vertical (unlocked) position. This allows the door to flex in the event of a rapid decompression, thus relieving pressure inside the container.

END OF TASK

LONG TERM STORAGE

If the ADR-300 will be unused for an indefinite period, take the following steps to preserve the system:

1. Elevate the container. Support the container on at least three 4 x 4-in. beams. These should be evenly spaced across the width of the container. This allows air circulation under the container and prevents moisture accumulation and corrosion.

NOTE

It is recommended that a slight slope be used for drainage.

2. Wash the container interior and exterior IAW WP 0014. Allow the container interior to dry thoroughly before closing it for storage.

END OF TASK

END OF WORK PACKAGE

OPERATOR'S, UNIT, AND DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
OPERATION UNDER UNUSUAL CONDITIONS

UNUSUAL ENVIRONMENT/WEATHER

Refer to Operation Under Usual Conditions (WP 0005) for specific operating instructions and use this work package for further instruction if operating the ADR-300 in unusual conditions. Read all sections that apply to the conditions to which the ADR will be exposed.

Unusual conditions include severe weather, such as

- 90% to 100% relative humidity
- Temperatures at or below 32 °F (0 °C) for a week or more
- Temperatures at or above 100 °F (38 °C) for a week or more
- Blowing sand or dust
- Heavy Rain
- Snow
- Salt/ Salt Fog

High Humidity Conditions

High humidity may increase the rate at which frost accumulates on the evaporator coil. Avoid opening and closing the cargo door more than necessary. This will reduce the amount of humid air entering the container and the resulting accumulation of frost.

Although the RU is designed to defrost automatically, users should monitor the level of frost accumulation on the evaporator (interior) coil. If a significant level of frost is observed, begin a defrost cycle manually IAW WP 0005 or adjust the defrost timer IAW WP 0029.

Low Ambient Temperatures

Low ambient temperatures enhance the performance of the RU; however, those conditions also cause plastic and rubber elements to stiffen and become brittle. Handle plastic and rubber parts gently in cold weather to avoid cracking or breaking them.

The door gasket may freeze to the doorframe. So, when opening the cargo door, pull firmly and steadily to separate the gasket from the frame.

High Ambient Temperatures

High ambient temperatures result in high refrigeration loads while degrading the performance of the RU. Therefore, the user should try to minimize the loads on the system in this environment. Locate the ADR such that it is shaded from the mid-day sun. Avoid opening the container door and do not hold the door open longer than necessary. Avoid, to the extent possible, placing large, warm cargoes in the container all at once.

Blowing Sand and Dust

Sand and dust tend to damage moving parts and accumulate on the refrigeration coils, particularly the condenser (outside) coil. Clean the coil surfaces regularly with water and remove accumulations of sand and dust by blowing compressed air over them. Also, avoid opening and closing the container door more than necessary.

During short periods of high levels of airborne sand or dust, the ADR-300 may be shut down and the RU covered to reduce the amount of sand and dust drawn into the RU. If this is done, shut down the unit before covering the RU and carefully monitor the container interior temperature to be sure it remains at safe levels for the stored cargo.

Heavy Rain

Heavy rain should not adversely affect the operation of the ADR-300. The user should monitor the door seal to insure that no leakage occurs.

Snow

Accumulations of snow or ice around the condenser air inlet or outlet may reduce the air flow through the coil and degrade the RU performance. Keep these openings as clear as possible to promote good air flow.

NOTE

Do not permit more than 12 inches of snow to accumulate on the container roof.

Accumulations of snow elsewhere on or around the unit should not affect the ADR-300 performance. Users are advised to keep controls, displays and gauges clear of snow accumulation to make routine ADR-300 operation and monitoring easier.

Salt / Salt Fog

Salt and marine environments may leave a salt film on the surfaces of the IC and RU. This film can be highly corrosive and should be removed by washing the system regularly. Wash unit as described in WP 0014 whenever a salt film is observed.

EMERGENCY PROCEDURES

General

With two exceptions, the ADR-300 will not normally pose a danger to personnel, resulting in an emergency situation. The exceptions are:

One or more individuals being locked inside the container, either with the RU running or not. Personnel trapped inside the container may suffocate due to lack of fresh air or may suffer hypothermia (low body temperature) if exposed to low interior temperatures.

WARNING

Failure to do so may cause injury to personnel.

A rapid and total loss of refrigerant may result from a broken refrigerant line and may displace air, causing possible suffocation. In the event of a sudden loss of refrigerant, personnel should leave the IC interior immediately; leaving the door open to allow the refrigerant to dissipate.

Other emergency situations may occur that do not represent a hazard to personnel. These situations involve the potential loss or spoilage of cargo due to an inability of the system to maintain the required interior temperature.

Personnel Locked Inside Container

The container door can be opened from the inside at any time, even if the handle is padlocked. To open the door, turn the upper and lower door handle unit assemblies to a vertical position. Push the plunger toward the outside. This will release the door latch and allow the door to swing open.

Failure To Maintain Storage Temperature

If the system is unable to maintain the preset interior temperature, refer to Operator Troubleshooting procedures, WP 0007. Many problems may be solved by checking the following:

- Is the power cord plugged into an appropriate power supply (refer to WP 0005)?
- Is the setpoint correctly programmed into the RU control panel (refer to WP 0005)?
- Are the container door and all other openings in the container closed?

More detailed troubleshooting procedures are outlined in WP 0007. If these steps do not solve the problem,

1. Request assistance from your supervisor or Thermo King Michigan, 955 76th Street, Byron Center, Michigan 49315, (800) 968-9378, http://www.thermokingmichigan.com.

2. Replace the RU IAW WP 0023 with another RU known to be functioning properly.

END OF WORK PACKAGE

CHAPTER 3
TROUBLESHOOTING PROCEDURES
FOR
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT
(ADR-300)

OPERATOR' S, UNIT, AND DIRECT SUPPORT MAINTENANCE

ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)

TROUBLESHOOTING INDEX

TROUBLESHOOTING PROCEDURES

The Malfunction Index lists common malfunctions that may occur during ADR-300 inspection or operation. Find the symptoms in the index that are closest to the problem you are experiencing with the ADR-300 and use the troubleshooting procedure provided to resolve the problem.

The procedures outline steps operators may take to correct problems that may occur with the ADR-300 during normal operation. They address problems that can be corrected by the individual user. The table does not list all malfunctions that may occur, all tests or all inspections needed to find the fault nor all actions needed to correct the fault. If your malfunction is not listed or is not corrected through this procedure, notify your supervisor or unit maintenance.

Do not start any task until:

- You understand the task,
- You understand what you are to do, and
- You understand what is needed to do the work.

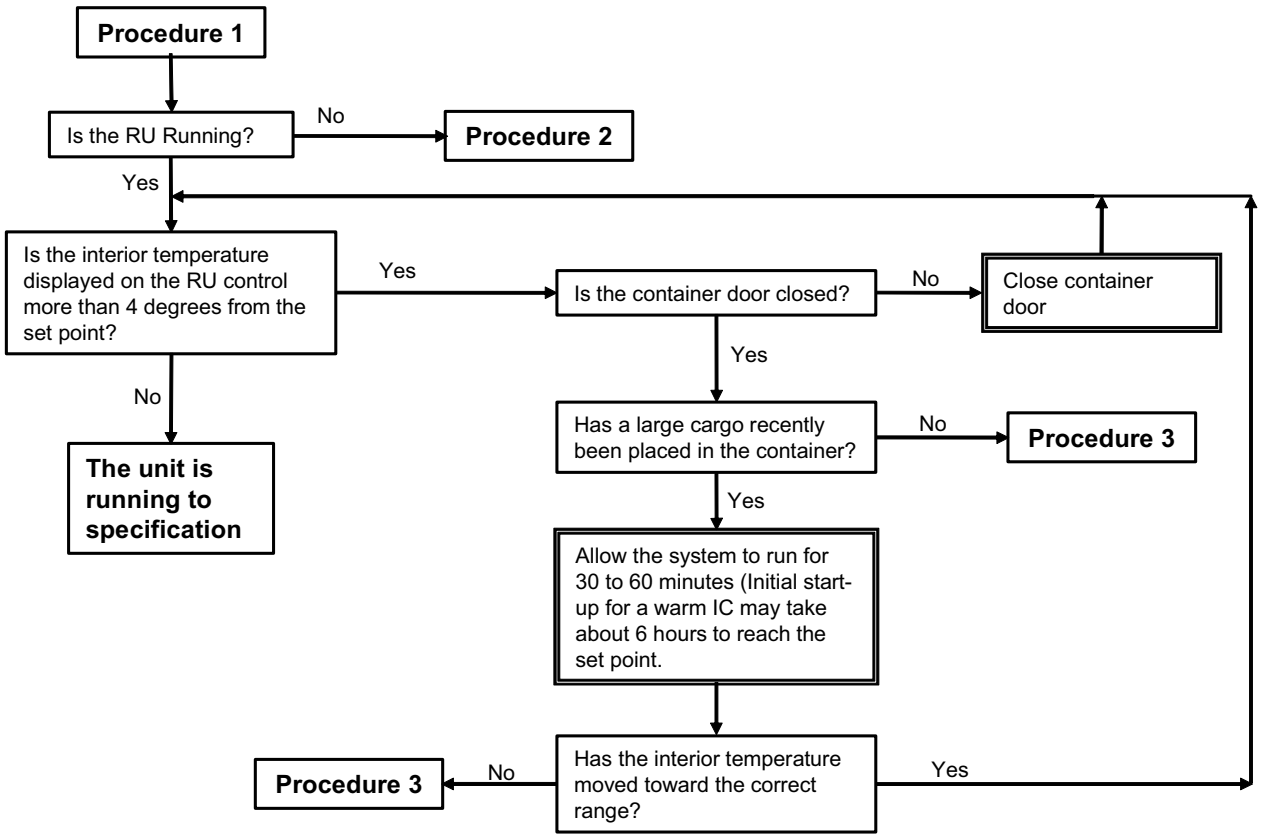
MALFUNCTION/SYMPTOM INDEX

WARNING

The ADR-300 electrical system uses high voltage power. Do not attempt to alter or repair electrical wiring. Operator repairs should be limited to coupling / decoupling existing connectors. Serious injury and death can result from electrical shock.

The ADR-300 refrigeration unit includes fans, motors, and other moving parts. Keep hands, hair and loose clothing clear of moving parts at all times when the unit is running. Contact with moving parts may cause serious bodily injury or damage to the equipment.

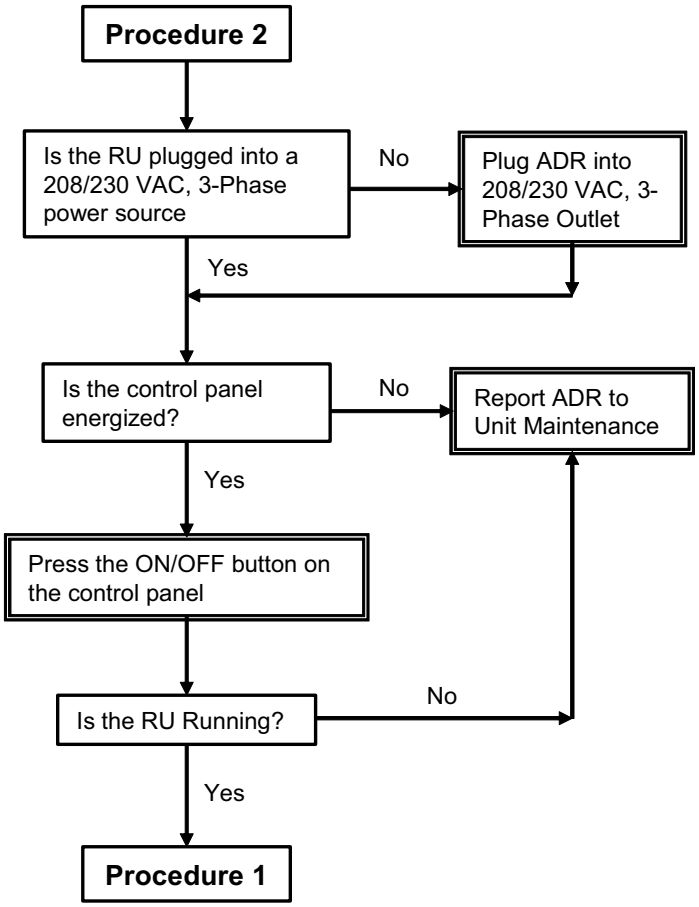
Procedure 1 Covers: **Failure to maintain interior temperature**
Initial Setup: **ADR-300 in operation**
Maintenance Level: **Operator**
Materials / Parts: **None**



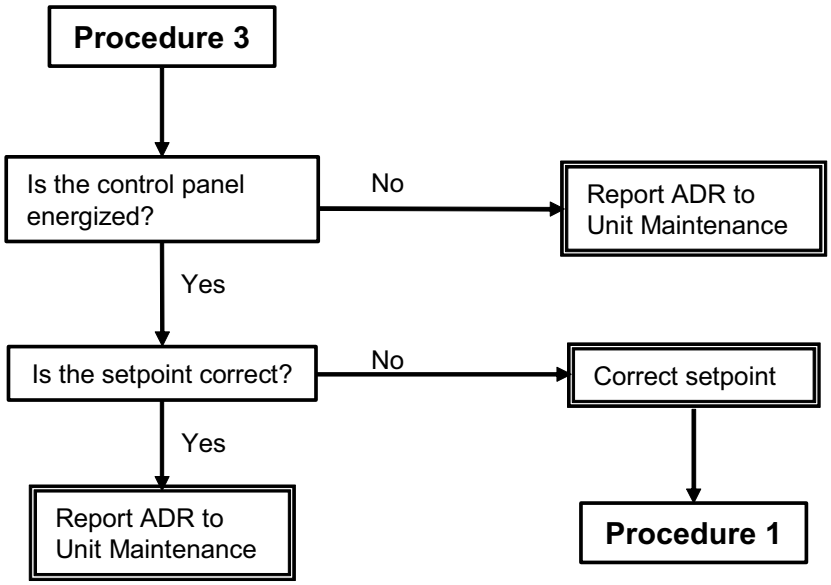
Procedure 2 Covers:	**Refrigeration Unit does not operate**
Initial Setup:	**ADR-300 in operation**
Maintenance Level:	**Operator**
Materials / Parts:	**None**

WARNING

The ADR-300 equipment operates at high voltages. Use extreme caution. Touching a live wire can cause serious injury or death. Only a qualified civilian or military personnel in MOS 51R, 52C, 52D, 52G, or AFSC 3E0X1 or 3E1X1 can connect the power supply to the ADR-300. Failure to comply may cause serious injury or death to personnel.



Procedure 3 Covers:	**Refrigeration Unit operates but fails to maintain interior temperature**
Initial Setup:	**ADR-300 in operation**
Maintenance Level:	**Operator**
Materials / Parts:	**None**



END OF WORK PACKAGE

CHAPTER 4
MAINTENANCE INSTRUCTIONS
FOR
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT
(ADR-300)

OPERATOR' S, UNIT, AND DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
SERVICE UPON RECEIPT

SERVICE UPON RECEIPT

No specific de-processing is required for any of the ADR-300 components before they are used. However, the tasks prescribed in this work package must be performed to insure proper functioning of this equipment.

GENERAL

The ADR-300 is shipped by air, rail, sea, or truck and will arrive with the following components:

- Insulated Container (IC)
- Refrigeration Unit (RU)
- Shelf system (the shelf system is normally installed in the IC but may be removed for some missions)
- Operators, Unit and Direct Support Maintenance Manual

The following tasks must be performed upon receipt of the ADR-300.

Unpacking

The ADR-300 does not include packed components and as such, no unpacking is required. Upon arrival, look over the unit to identify the components listed above. Report any discrepancies in accordance with DA PAM 750-8.

Inspection

Perform the inspections IAW WP 0011 through 0013. Report any damage or discrepancies on SF 364, Report of Discrepancy.

Verification of Equipment Modifications

Check to see if the system components have been obviously modified in any way. Notify your supervisor or unit maintenance personnel if modifications are noted.

Pre-Operation Services

Service any damaged equipment, as necessary, using maintenance procedures presented in this manual. Before operation, perform the "BEFORE" PMCS checks IAW WP 0010.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) INTRODUCTION

INTRODUCTION

Preventive maintenance checks and services (PMCS) are performed to keep the ADR-300 and its associated equipment in good operating condition. The checks are used to find and correct or report problems. Operator personnel complete the PMCS jobs as shown in the PMCS table.

Pay attention to WARNING and CAUTION statements. A WARNING means someone could be hurt. A CAUTION means equipment could be damaged.

The table defines the service interval for completing each service task, the item or component to be checked, the procedure to be followed in performing the check, and the condition that defines the readiness of the item checked. Service intervals are defined as:

- Before you begin using the ADR-300, Complete the **Before** PMCS.
- During the use of the ADR, complete the **During** PMCS.
- After using the ADR, complete the **After** PMCS.
- Once weekly if the ADR has been used, complete the **Weekly** PMCS.
- Once monthly if the ADR has been used, complete the **Monthly** PMCS.

The right hand column of the PMCS table lists conditions that make the ADR-300 not fully mission-ready. If you find something wrong when performing PMCS, fix it using the troubleshooting and/or appropriate maintenance procedure. Write up the problems that can not be repaired on DA Form 2404, Equipment Inspection and Maintenance Worksheet for unit maintenance. For further information on how to use this form, see DA PAM 750-8.

If any PMCS task requires tools that are not listed in the procedures, notify your supervisor.

Inspection

Look for signs of trouble. Senses help here. You can feel, smell, hear or see many problems that can be eliminated before they get worse. Inspect to see if items are in good condition. Are components correctly installed and secure? Is any damage to the frame or components visible? Correct all faults or notify unit maintenance.

Lubrication

The door hinges and latch of the insulated container (IC) should be lubricated as required for smooth operation. Apply light lubricating oil to the door hinges and latch. Open and close the door several times and remove excess lubricant from the hinges and latch with a clean, dry cloth.

Service

Proper cleaning of the ADR-300 is an integral part of maintenance. It will reveal some problems while they are still small and help prevent future problems. Make it a habit to clean the ADR-300 and its components after each use and whenever necessary while it is in use. Procedures for servicing the IC and RU are located in WP 0014.

The exterior of the IC and RU may be washed with a low pressure water spray. Disconnect the system from its primary power supply before washing. Be careful to avoid spraying water up into the RU condenser unit.

The interior of the container should be cleaned only when the refrigerator is turned off and approximately room temperature. Use a low pressure water spray and mild detergent to clean the container surfaces and shelves. Avoid spraying water into the evaporator coil. Do not soak electrical components. Drain all water from the container through the floor drain.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
PMCS, INCLUDING LUBRICATION INSTRUCTIONS

INITIAL SETUP

Tools and Special Tools
None

Materials/Parts
Light Oil Lubricant (WP 0068, Item 11)

Personnel Required
Operator

References
None

Equipment Conditions
ADR-300 set-up and operating procedures (WP 0005)

Table 1. Preventative Maintenance Checks and Services for the ADR-300.

ITEM NO.	INTERVALS	ITEM TO BE CHECKED OR SERVICED	PROCEDURES	EQUIPMENT NOT READY/AVAILABLE IF:
1	Before	Insulated Container (IC)	Inspect the container exterior for major cracks, breaks or dents in the sides, roof, base, ends, door or fork pockets. Inspect the IC interior for cracks, breaks, or dents in any surface. Inspect the sling ring brackets for separation from the IC. Inspect the exterior drain plug and hose to confirm it is properly restrained. Inspect cargo restraint rails for deformation, cracks, breaks or corrosion.	Any hole passes through the inner and outer skins, holes in either skin exceed 1 inch in length, or 1/2 inch in depth, or any crack exceeds 1-inch in length. Deformed, separated, or missing sling ring brackets. Missing drain plug or hose or improperly restrained hose. Missing, damaged or corroded cargo restraint rail.
2	Before	IC Door Panel	Completely open the door. Note any resistance in the door locks or hinges. Inspect the seal. Close the door, locking the main and secondary handles. Note any resistance to swinging, or movement of the door locks. Inspect the perimeter of the door to ensure the seal lays flat against the doorframe everywhere.	Any moving part does not move smoothly or the door does not form a proper seal around its entire perimeter.

Table 1. Preventative Maintenance Checks and Services for the ADR-300 – Continued.

ITEM NO.	INTERVALS	ITEM TO BE CHECKED OR SERVICED	PROCEDURES	EQUIPMENT NOT READY/AVAILABLE IF:
3	Before	IC Shelf Assembly	If shelves are installed, confirm that 10 shelves are installed and shelves are supported at all four corners. Inspect the shelves to ensure that none are damaged or deformed. Verify the shelf assemblies are supporting shelves and rubber spacers rest against the IC interior surfaces. Confirm that bottom shelves are secured to the floor.	Any shelf is damaged or not properly supported. Vertical supports are damaged. Screws or other attachment hardware is missing.
4	Before	Lighting Fixture, Toggle Switch, Light Indicator	Inspect the toggle switch on the container interior. Note any damage to the switch. Confirm that power is connected to the RU and IC. Switch on the light fixture. Confirm that the lighting fixture is illuminated and the light enclosure is intact. Confirm that the light indicator on the container exterior is lit. Switch off the light.	The toggle switch, lighting fixture or light indicator is damaged or any of these are non-operational.
5	Before	Refrigeration Unit (RU) Interior Section	Inspect the inside (evaporator) section of the RU. Note any damage to the housing. Inspect for refrigerant oil residue.	Visible damage to housing. Evidence of refrigerant oil on exterior surface. Notify direct support maintenance.
6	Before During	RU Exterior	(1) Inspect the eight mounting bolts holding the RU on the IC. All bolts should be in place and the RU secured to the container. (2) Inspect the sling rings for breaks, cracks or deformation. (3) Inspect all wires to ensure they are in good condition, properly restrained and securely attached at both ends. (4) Confirm that the RU is plugged into a 208/230 VAC, 50-60 Hz, 3-phase electrical source. (5) Inspect the refrigerator outside section (condenser section) enclosure and ensure that it is not damaged and securely attached.	Missing attachment hardware, loose or unsecured RU, damaged or missing sling rings, damaged, frayed or loose wires, damaged or loose condenser housing, damaged or leaking refrigerant lines, damaged or loose control panel, damaged breaker box.

Table 1. Preventative Maintenance Checks and Services for the ADR-300 – Continued.

ITEM NO.	INTERVALS	ITEM TO BE CHECKED OR SERVICED	PROCEDURES	EQUIPMENT NOT READY/AVAILABLE IF:
			(6) Inspect refrigerant lines for damage or evidence of refrigerant oil residue. (7) Check that the RU control panel enclosure is securely attached to the RU base plate and it is free of cracks or other damage. Confirm that the wire connecting the control panel to the condenser section is in good condition and securely connected at both ends. (8) Inspect the condensation drain to ensure it is not blocked and there is no visible damage. Inspect for refrigerant oil residue. Inspect the cargo restraint rail. Check for corrosion. Inspect external tie-downs.	Evidence of refrigerant oil on exterior surface. Notify direct support maintenance.
7	Before / During	Refrigerator Operation	Start the RU IAW WP 0005. Note the interior temperature. Set the setpoint to 32 ºF (If the interior temperature is lower than 32 ºF, set the setpoint at least 5° below the interior temperature). Confirm that the unit operation indicator light glows green (cooling mode). After the **interior temperature has dropped below 36 °F,** start a manual defrost cycle. Confirm that the defrost indicator light is on. Set the thermostat setpoint to approximately 50 °F. Confirm that the unit operation indicator light glows red (heating mode).	The refrigerator does not enter the heating mode when the setpoint is above the interior temperature or cooling mode when setpoint is below the interior temperature. The defrost mode does not start when the manual defrost is initiated.
8	During	Refrigerator Operation	Check that the interior temperature is holding at the setpoint. Check that the air pathways are not blocked. Check accumulation of frost on inside unit.	Temperature is not maintained, pathways are blocked or there is significant frost accumulation.

Table 1. Preventative Maintenance Checks and Services for the ADR-300 – Continued.

ITEM NO.	INTERVALS	ITEM TO BE CHECKED OR SERVICED	PROCEDURES	EQUIPMENT NOT READY/AVAILABLE IF:
9	During/ After	IC	Check the entire container for damage. Check the door fit and seal. Check door hinges and handles for lubrication (see table). Check for loose or missing hardware.	Damaged container panels, loose missing or damaged components, binding or restricted movement of moving parts.
10	After	IC / Refrigerator	Wash the system as described in WP 0014.	

LUBRICATION REQUIREMENTS

ADR-300 lubrication requirements are summarized below:

Table 2. ADR-300 Lubrications Requirements.

COMPONENT	LUBRICANT	FREQUENCY
Door Hinges	Light Oil lubricant	Weekly (or as required)
Door Lock	Light Oil lubricant	Weekly (or as required)
Roof Access Steps	Light Oil lubricant	Weekly (or as required)

END OF WORK PACKAGE

OPERATOR MAINTENANCE
INSULATED CONTAINER (IC) INCLUDING DOOR
INSPECT

INITIAL SETUP

Tools and Special Tools
None

Materials/Parts
None

Personnel Required
Operator

References
None

Equipment Conditions
ADR-300 set up and connected to a power supply procedures (WP 0005)

GENERAL SYSTEM INSPECTION

Complete an inspection whenever the status of the ADR-300 changes or if there is a reason to suspect that the system has been damaged. Perform an inspection of the insulated container for any of the following reasons:

- A new ADR-300 will be used for the first time.
- An ADR-300 has been removed from storage for use.
- A system has been out of service for an extended period of time.
- Doors do not lock or do not open and close easily.
- Following an incident of excessive rough handling resulting in possible damage or misalignment of the ADR-300, which would impair performance.

Prior to using the ADR-300, complete an inspection as described below.

1. Inspect the container skins for breaks, cracks or dents in the sides, roof, base or door. Look for holes penetrating both inner and outer container skins. Look also for holes or gouges in either skin that are larger than 1½-inch in length or deeper than ½-inch. Notify direct support maintenance.

2. Examine the temperature display on the rear of the container. Note any damage to the display to include loose mounting.

3. Open the door. Note any resistance in the movement of the main door handle or the two rotating hook and handle assemblies. Inspect the seal around the full perimeter and note any wear, deterioration, gaps or tears in the seal material.

4. Activate the inside plunger and the door handle unit assemblies. Note any resistance to movement or malfunction.

5. Open the door to its fullest extent. Note resistance or binding in the door hinges.

6. Inspect the container interior surfaces. Note any breaks, cracks or dents in the sides, roof, base or door. Note missing or damaged tie-down rings.

7. Inspect the interior light fixture, conduit, switch and light indicator. Note missing or damaged components. Confirm that all components are firmly mounted on the container wall.

8. Close the door and engage the locks. Note any misalignment or gaps between the seal and container.

9. Unfold the steps on both the front and rear of the container. Note any loose or damaged steps or any for which movement is impaired. Fold the steps up after inspecting.

10. Examine the cargo restraint rails and note any bent or damaged areas. Visually confirm that all mounting bolts are installed and appear tight.

END OF TASK

END OF WORK PACKAGE

OPERATOR MAINTENANCE
SHELF ASSEMBLY
INSPECT

INITIAL SETUP

Tools and Special Tools
None

Materials/Parts
None

Personnel Required
(1)

References
None

Equipment Conditions
ADR-300 set up and connected to a power supply procedures (WP 0005)

GENERAL

The ADR-300 shelf assembly includes two sets of five shelves (Figure 1). Each set is supported by four vertical supports, two front supports and two rear supports and two shelf assemblies.

Each shelf includes three storage shelves (Figure 1) supported by a shelf weldment (Figure 1), a rectangular frame that spans the distance between the vertical supports. The weldment is attached to the vertical supports with a single bolt in each corner.

The lowest weldment on each set of shelves is bolted to the container floor. At the top, the vertical supports are bolted to a shelf assembly (Figure 1) that spans the aisle between the two shelf racks.

INSPECT

Inspect the shelf system according to the following steps.

1. Inspect all solid shelves (Figure 1) for bends or warping. Also, confirm that the shelves (Figure 1) are not soiled or corroded.
2. Inspect the weldment (Figure 1) for each shelf. Confirm that the weldments are not damaged, warped or bent, the corners are square and the welds are intact.
3. Check the finish on each weldment and confirm that it is not corroded. Confirm that four retaining bolts are installed in each weldment and tight.
4. Examine each vertical support. Ensure that all four legs rest squarely on the container floor. Check the condition of the finish to insure there is no corrosion.
5. Check all bolts to confirm that they are tight.
6. Test the overall stability of the shelf system by pulling or pushing the assembly, first, parallel to the container side wall and then parallel to the end walls. The assembly should be rigid and resist moving or flexing.

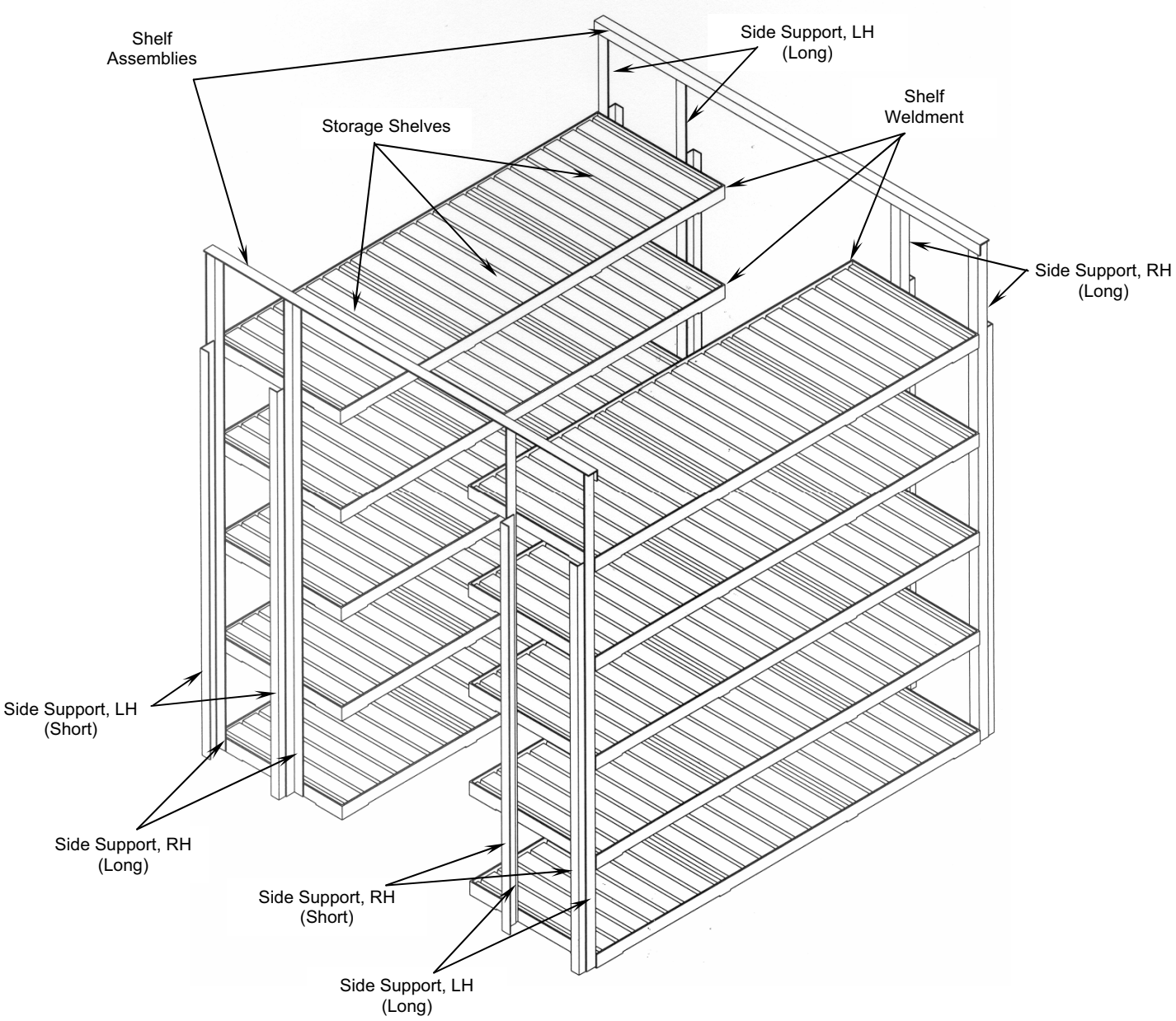


Figure 1. Shelf Assembly.

END OF TASK

END OF WORK PACKAGE

OPERATOR MAINTENANCE
INSULATED CONTAINER (IC) ELECTRICAL SYSTEM
INSPECT

INITIAL SETUP

Tools and Special Tools
None

Materials/Parts
None

Personnel Required
(1)

References
None

Equipment Conditions
ADR-300 set up procedures and IC power supply cord connected (WP 0005)

GENERAL

The electrical system for the insulated container provides power to the interior light and receives power from the refrigeration Unit (RU). The electrical system includes the plug to which the supply power is connected (Figure 1), the interior light fixture (Figure 2), conduit protecting the wires between the light fixture and the switch, the light switch and the light indicator on the container exterior.

INSPECT

1. Inspect the power entry connector (Figure 1) on the rear of the IC and to the right of the RU light circuit. The connector should be undamaged with the prongs straight and free of corrosion.

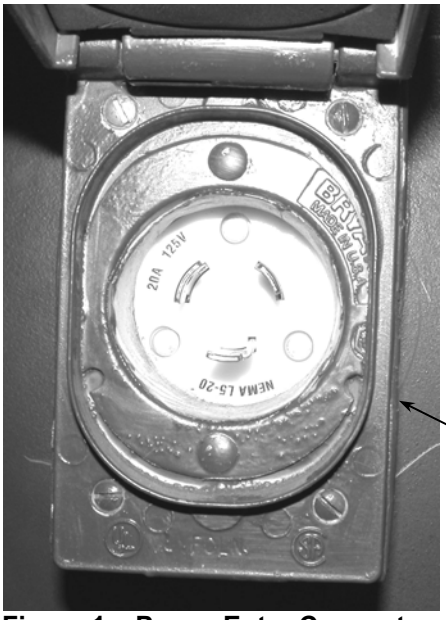


Figure 1. Power Entry Connector.

2. Connect a 120 VAC power source from the RU to the IC.
3. Inspect the light indicator fixture (Figure 2) on the front of the IC, above the door. The fixture should be free of visible damage and clean with the lamp intact.
4. Inspect the toggle switch. The switch enclosure should be free of visible damage. The switch movement should be easy while permitting the user to feel the switch action.
5. Examine the conduit between the switch and the light fixture. The conduit should be securely fastened to the container surfaces and undamaged. The conduit should be firmly attached to the light switch enclosure at one end and the light fixture at the other, with no wires exposed.
6. Examine the light fixture. Look at the cage, globe and lamp to confirm that they are undamaged. Check that the fixture is securely attached to the container wall.
7. Switch on the interior light and confirm that the light and the exterior light indicator both turn on when the switch is on and turn off when the switch is off.

Figure 2. IC Light Fixture.

END OF TASK

END OF WORK PACKAGE

OPERATOR MAINTENANCE
INSULATED CONTAINER AND REFRIGERATION UNIT
SERVICE

INITIAL SETUP

Tools and Special Tools
None

References
None

Materials/Parts
None

Equipment Conditions
ADR-300 disconnected from all power sources.

Personnel Required
Operator

GENERAL

This section outlines procedures for cleaning the ADR-300. In general, all surfaces should be cleaned with non-abrasive cleaners and warm soap and water. Take care not to scratch the exterior paint or interior panel surfaces.

The cleaning procedure generates a large volume of water run-off. Therefore, it is recommended that the container be washed where the run-off will not affect other operations.

SERVICE

1. Remove all cargo from the IC interior and set aside in a protected area.

NOTE

If cargo requires continued refrigeration, place it in another refrigerated container or cold storage facility.

2. Allow the IC interior temperature to rise so that all surfaces are above freezing.
3. Remove the drain plug from the container base and, if not captive, store the plug in a secure location.

NOTE

The shelter base may be raised slightly (1 to 2 inches) to encourage drainage.

4. Using a low-pressure water spray, wash down the container interior from top to bottom. If shelves are installed, wash the shelves as well.
5. Use a non-abrasive sponge or rag and mild detergent on difficult soiled areas. A scrub or mild abrasive brush may be used on the floor only.
6. Rinse all surfaces thoroughly and allow the washing liquids to drain from the shelter interior.

7. Ensure that the door to the RU controller enclosure is closed, the power connector assembly are covered and the electrical enclosure cover is securely in place.
8. Using a low-pressure water spray, wash down the container exterior from top to bottom. Do not use abrasive tools or cleaners on the container or RU exterior.
9. Restrain the container door in the open position and allow all surfaces to dry completely.

END OF TASK

END OF WORK PACKAGE

CHAPTER 5
UNIT MAINTENANCE
FOR
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT
(ADR-300)

UNIT MAINTENANCE
SHELF ASSEMBLY
REMOVE/INSTALL

INITIAL SETUP

Tools and Special Tools
Tool Kit, Organizational Maintenance
(WP 0066, Table 2, Item 4)

Materials/Parts
None

Personnel Required
(2)

References
None

Equipment Conditions
ADR-300 set up procedures (WP 0005)

GENERAL

This section describes procedures for removing and installing the ADR-300 shelf system.

REMOVE

To remove the shelf system, take the following steps.

1. Remove and store in an appropriate location all items supported by the shelves. Do not begin disassembly with anything stored on any of the shelves.

WARNING

Edges of the storage shelves are sharp. Use caution when working with shelves and frames. Failure to do so may result in serious injury to personnel.

2. Remove all (30) storage shelves (Figure 3) from the supporting frames (shelf weldment) (Figure 1) by lifting the shelves straight up. Stack the shelves so that the ribs nest and stow them in an appropriate place.

3. Remove the four bolts (Figure 1) supporting each shelf weldment and the three bolts securing the bottom weldment (Figure 2) to the IC floor. Remove each shelf weldment from the IC and stow the parts with the storage shelves (Figure 3).

4. Remove the four bolts holding each shelf assembly to the long side supports (Figure 1). Remove the shelf assemblies from the container and stow the parts with the storage shelves.

5. Remove the side supports (Figure 1) from the container and stow them with the storage shelves.

INSTALL

To install the shelf system in the ADR-300, follow these steps:

1. If side supports are not pre-assembled, assemble, four right-side support sets, each consisting of one long left-hand side support joined to one short right-hand side support. Leave nuts loose to allow adjustment in the width of the assembly.

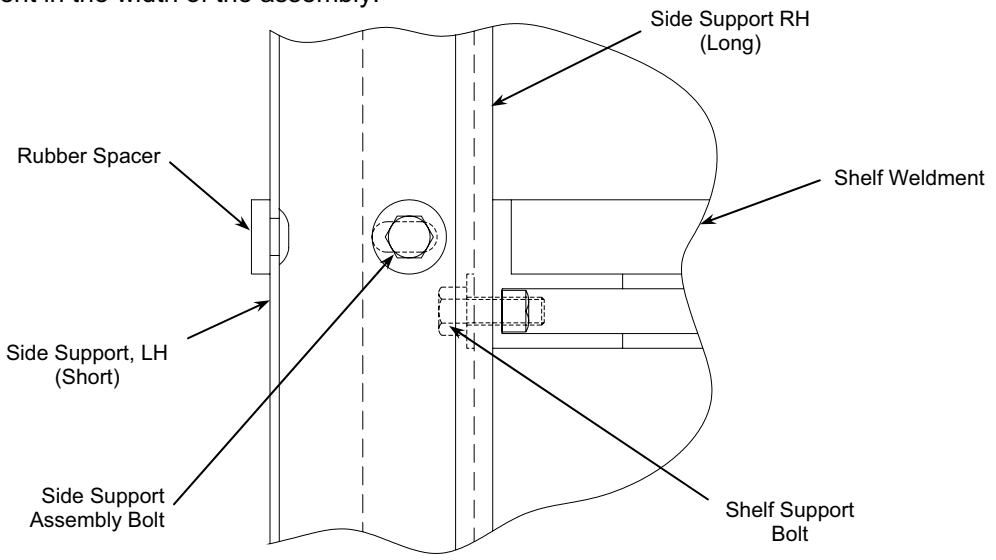


Figure 1. Shelf System--Install.

2. Assemble four left-side support sets (Figure 3), consisting of one long right-hand side support (Figure 1) joined to one short left-hand side support (Figure 1). Leave nuts loose to allow adjustment in the width of the assembly.
3. Confirm that four rubber spacers (Figure 1) are installed in each short side support.
4. Position one shelf weldment (Figure 1) on the container floor and align the bolt holes in the weldment with the three threaded inserts (Figure 2) in the container floor. Thread three bolts through the weldment (Figure 1) into each of the inserts. Do not tighten the bolts.
5. Facing the shelves, position two right-side support sets (Figure 3) at the right end of the weldment (Figure 1). Insert the shelf support bolts (Figure 2) through the supports and the weldment. Thread the nuts onto the shelf support bolts. Do not tighten the nuts.
6. Facing the shelves, position two left-side support sets (Figure 3) at the left end of the weldment (Figure 1). Insert the shelf support bolts (Figure 1) through the supports and the weldment. Thread the nuts onto the shelf support bolts. Do not tighten the nuts.
7. Repeat Steps 4-6 on the opposite side of the container aisle.
8. Confirm that five rubber spacers (Figure 1) are installed on each of the two shelf assemblies. Place one shelf assembly on top of the four long side supports at the RU-end of the container with the vertical surface of the shelf assembly toward the shelf.
9. Match the holes in the side supports and the shelf assembly and install bolts, washers and nuts in each hole. Do not tighten bolts.
10. Repeat Step 8 and 9 for the door-end of the shelf system.

11. With an assistant, locate the second shelf frame at the next set of holes in the supports. Install retaining bolts in each of the four side supports and the frame. Leave these bolts loose. Repeat this step for the remaining three shelves on each side of the container.
12. Slide each short side support (Figure 3) toward the container end wall until the rubber spacer is snug against the wall. Tighten the side support assembly bolts (Figure 1) in each side support assembly.
13. Snug (do not over tighten) all bolts in the shelf assembly including the top of each side support, four bolts on each shelf weldment, and the bolts restraining the bottom weldments (Figure 2) to the floor.
14. Install three storage shelves (Figure 3) (with the ribs facing up) on each weldment.

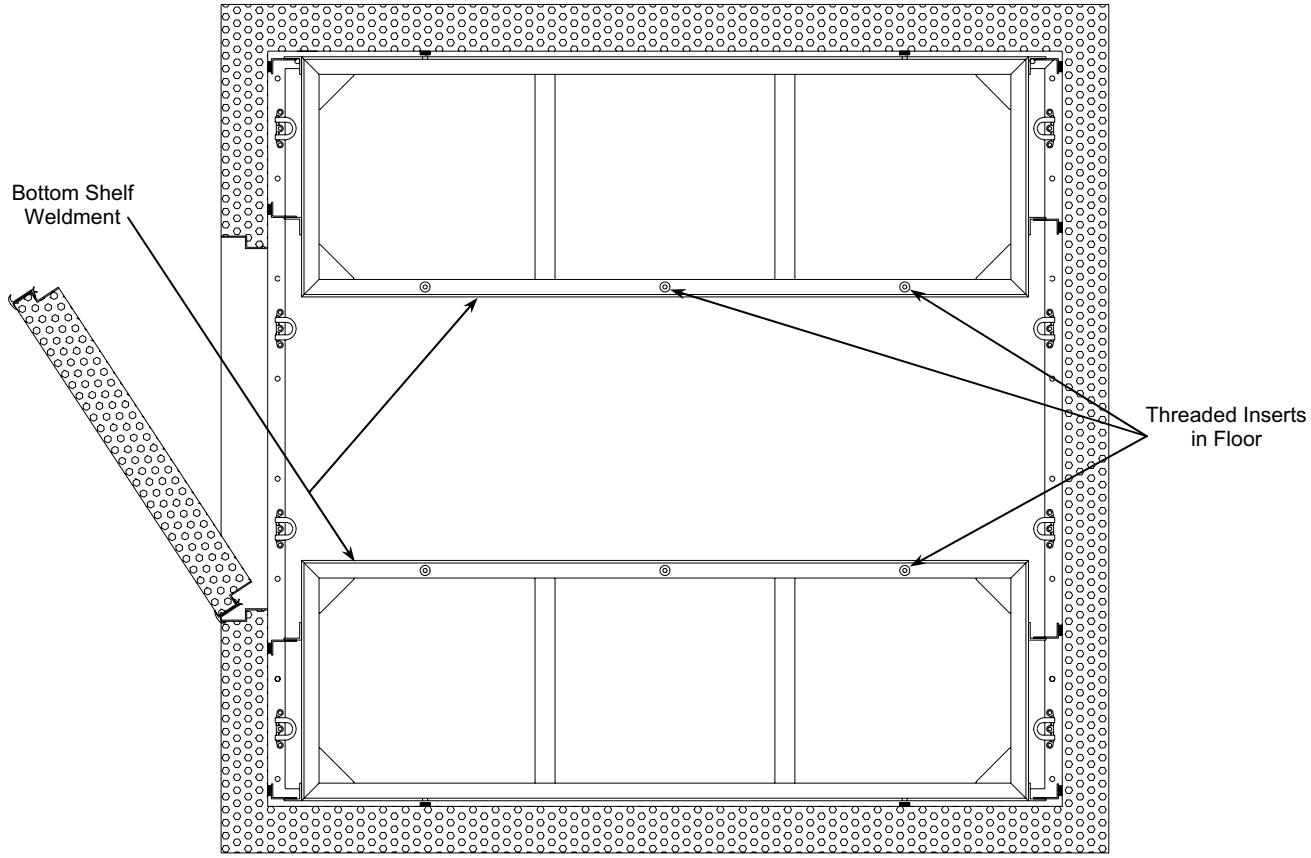


Figure 2. Layout of Shelf Weldments.

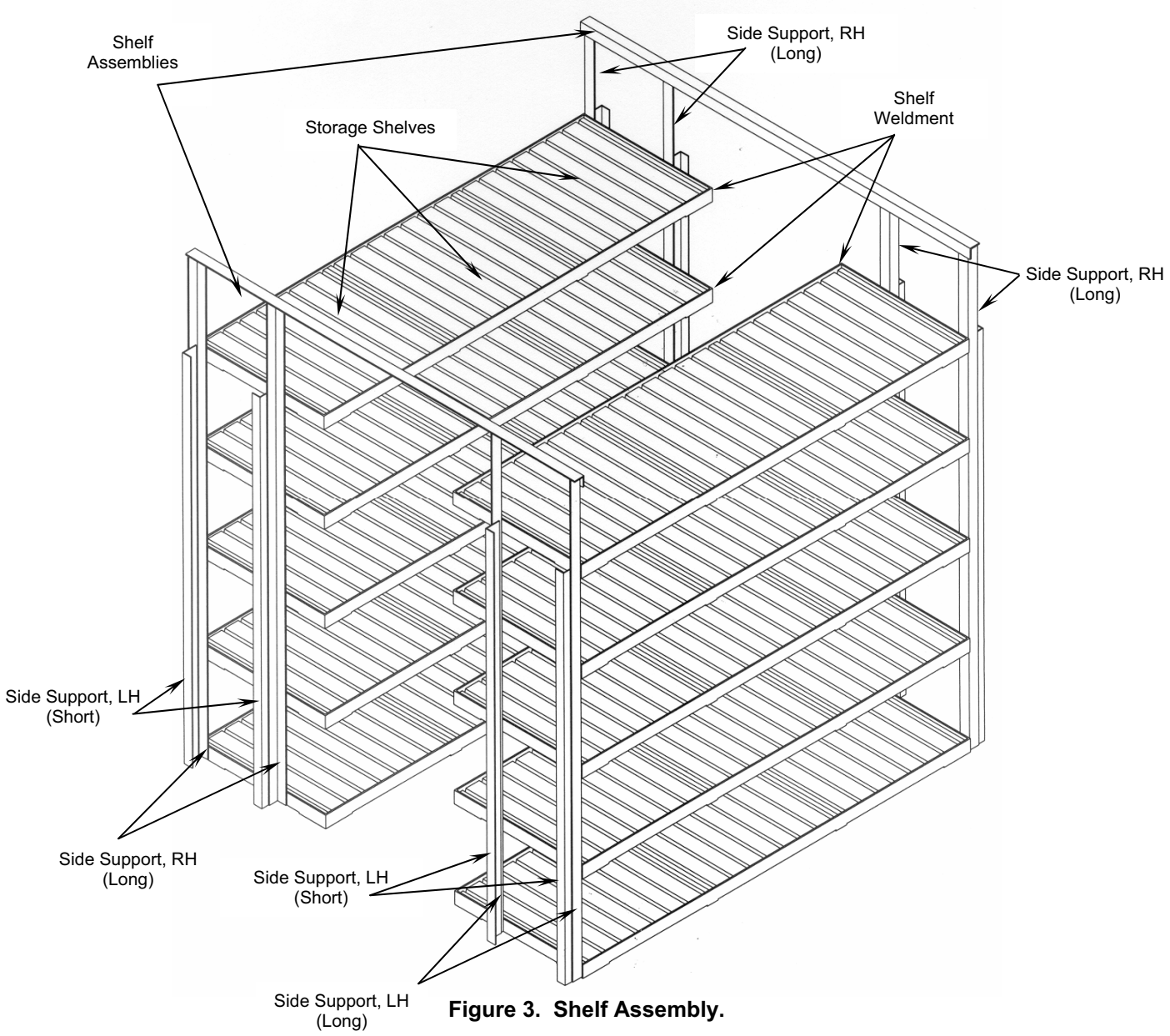


Figure 3. Shelf Assembly.

END OF TASK

END OF WORK PACKAGE

UNIT MAINTENANCE
REFRIGERATION UNIT (RU)
INSPECT

INITIAL SETUP

Tools and Special Tools
Tool Kit, Organizational Maintenance
(WP 0066, Table 2, Item 4)

Materials/Parts
None

Personnel Required
Unit Maintenance

References
Insulated Container, Including Door
(WP 0011)

Equipment Conditions
ADR-300 set up procedures (WP 0005)

GENERAL

The RU is an assembly that includes the refrigerator, unit controller, and electrical distribution. The unit should be inspected as part of a general system inspection before each use or for any of the reasons identified in WP 0011.

INSPECT

NOTE

Personnel may find some RU components too high to be inspected effectively. A stepladder or other means of elevating the inspector may be needed to complete this procedure.

1. Turn off the RU at the control panel located in the controller enclosure (Figure 1).
2. Unplug the power supply cable (Figure 1) from the RU.
3. Check tightness of the eight mounting bolts (Figure 1) holding the RU on the IC. All bolts should be in place, fastened securely and the RU should be securely attached to the IC.
4. Inspect all visible wires to ensure they are in good condition, properly restrained and securely attached at both ends.
5. Inspect the RU outside section (condenser section) enclosure (Figure 1). Ensure that it is undamaged and securely attached.

WARNING

The RU condenser section includes moving parts that may cause serious injury to hands or other body parts. The unit can start at any time. Stay clear of fans when the condenser cover is removed. Failure to comply may result in serious injury to personnel.

6. Remove the condenser section front cover (Figure 1) and exhaust grille (Figure 2) and set aside.

7. Inspect:

   a. All refrigeration components and all refrigerant lines for evidence of leaks or damage. Copper tubes and hoses should be free of dents and kinks. Condenser fins should be free of debris and without damage.

WARNING

The RU electrical system includes high voltage components that, if contacted, may cause serious injury or death. Failure to comply may result in serious injury or death of personnel.

NOTE

Leaks appear as a film of oil or dirt on the surface of the tube.

   b. Electrical connections to ensure they are secure and free of cracks, corrosion, and moisture.

   c. Electrical enclosure

      (1) Remove control box cover (Figure 2).

      (2) Inspect electrical enclosure components for tightness of electrical connection.

      (3) Note damage to components or moisture.

      (4) Replace control box cover.

d. Condenser fan blade to ensure that it is undamaged and turns freely.

e. All other components to confirm they are undamaged and properly restrained.

8. Replace the condenser section cover and exhaust grille and secure all fasteners.

9. Check that the RU controller box is firmly attached to the RU base plate and it is free of cracks or other damage.

10. Inspect the hose (condensate drain tube) (Figure 1) to ensure it is not restricted or damaged.

11. Inspect the RU interior (evaporator) section and drain. Note any damage to the enclosure or missing or loose fasteners.

12. Plug the RU into a 208/230 VAC, 50-60 Hz, three-phase electrical source. Start the RU and note the interior temperature. Set the controller setpoint:

    a. To a temperature above the interior temperature and confirm that the RU controller unit operation indicator light glows red.

    b. To a temperature below the interior temperature and confirm that the unit operation indicator light glows green.

13. After the interior temperature falls below 36 °F, initiate a manual defrost cycle and confirm that the defrost indicator light glows.

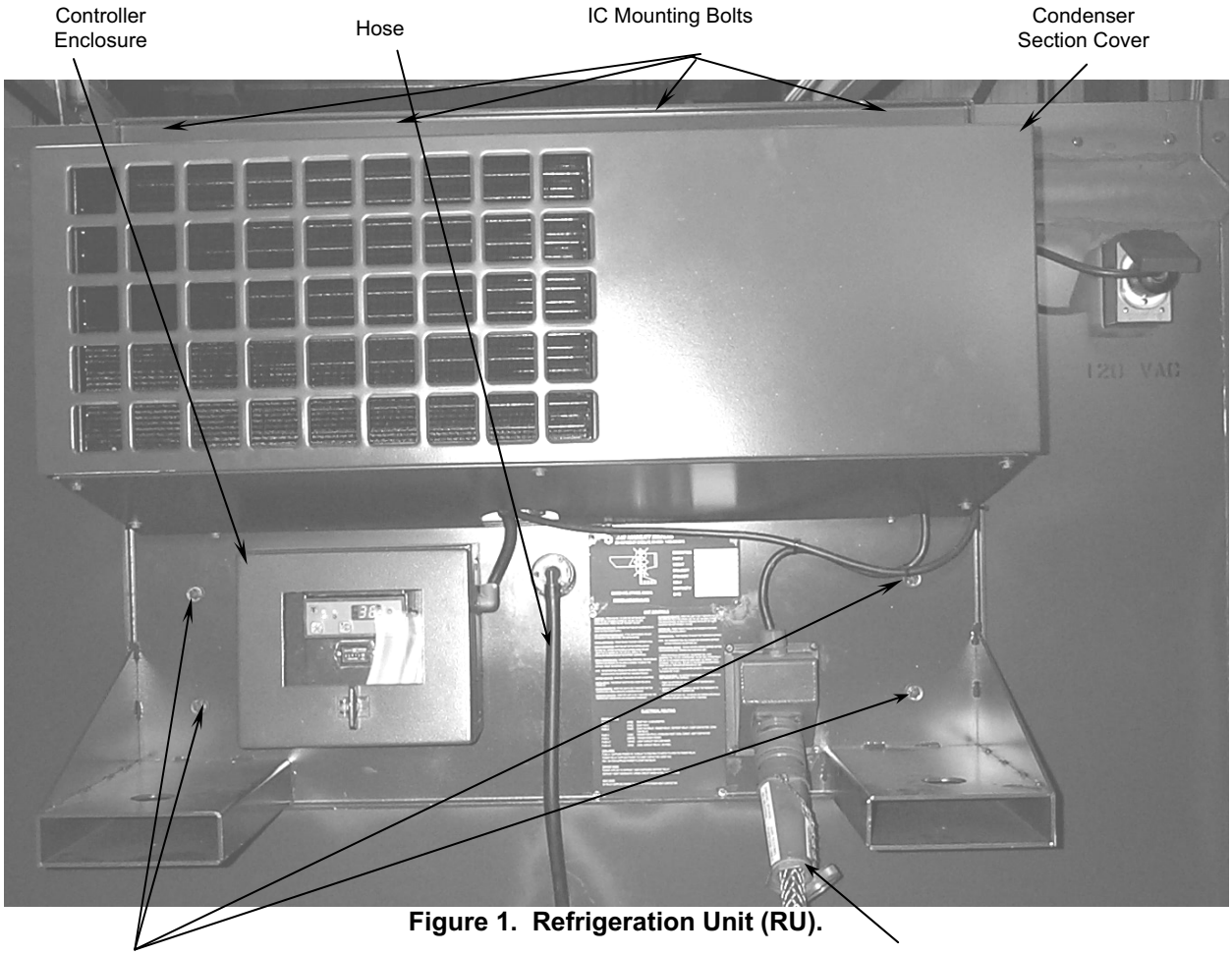


Figure 1. Refrigeration Unit (RU).

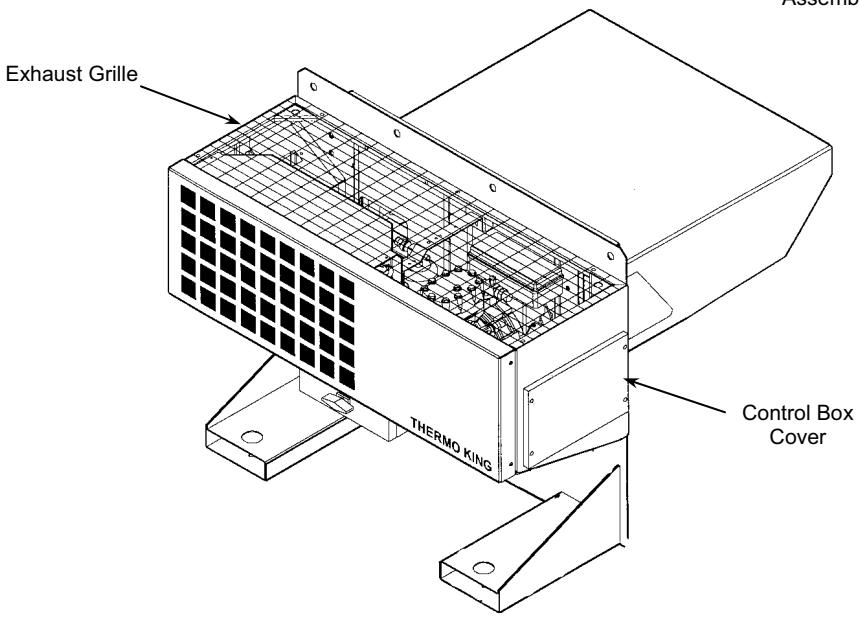


Figure 2. RU Enclosure.

END OF WORK PACKAGE

UNIT MAINTENANCE
LIGHTING FIXTURE
REPLACE

INITIAL SETUP

Tools and Special Tools
Allen wrench set

Materials/Parts
Lamp, Incandescent, 100 W
(WP 0052, Item 2)

Personnel Required
(1)

References
None

Equipment Conditions
ADR-300 set up and connected to a power supply procedures (WP 0005).

GENERAL

The light fixture inside the IC uses a conventional 100-Watt incandescent lamp. This type of lamp periodically fails and requires replacement. To replace the lamp, use the steps below.

REPLACE

Incandescent Lamp

1. Disconnect the IC Power Supply Cable from the connector receptacle.
2. Loosen the setscrew that holds the cage in place.
3. Unscrew the protective cage (Figure 1) from the fixture. Remove the cage and set it aside.
4. Unscrew the glass lens (Figure 1) from the fixture in the same manner as the protective cage. Set the lens aside.
5. Remove the failed lamp from the fixture. Dispose of the failed lamp.
6. Install a new lamp by screwing the new lamp into the empty socket by hand. Do not over tighten.
7. Turn on light switch to confirm lamp works. If not refer to electrical system troubleshooting.
8. Replace the lens. Use only hand force to screw on the lens. Do not over tighten.
9. Replace the protective cage. Use only hand force to screw on the cage. Do not over tighten.
10. Tighten the setscrew to prevent the cage from rotating.
11. Reconnect the IC Power Supply Cable to the receptacle connector.
12. Check the operation of the fixture by switching the light on.

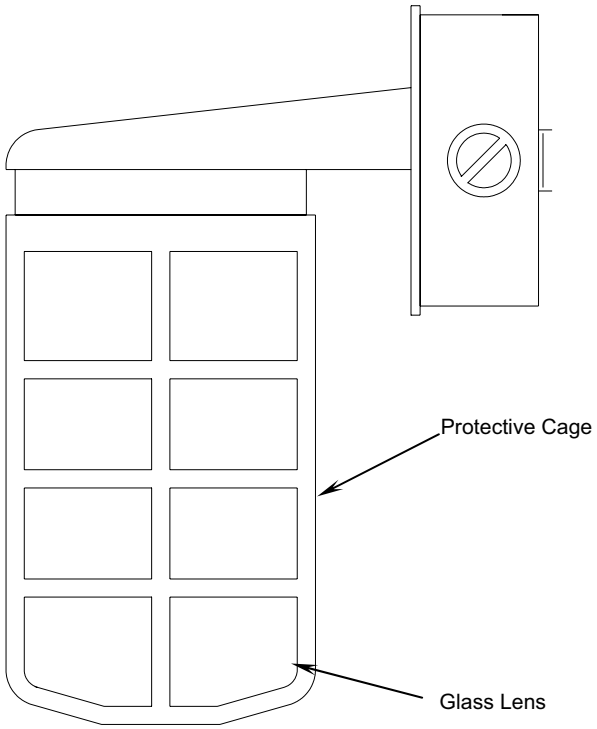


Figure 1. Lighting Fixture.

END OF TASK

END OF WORK PACKAGE

UNIT MAINTENANCE
IC ELECTRICAL SYSTEM
TEST

INITIAL SETUP

Tools and Special Tools
Multimeter (WP 0066, Table 2, Item 2),
Tool Kit, Organizational Maintenance
(WP 0066, Table 2, Item 4)

Materials/Parts
None

Personnel Required
Electrical Technician MOS 51, 52C
or AFSC 3E1X1

References
IC Toggle Switch Repair and
Replacement (WP 0021)
IC Lighting Fixture Replacement
(WP 0019)

Equipment Conditions
ADR-300 set up and connected to a power
source procedures (WP 0005)

GENERAL

This section outlines procedures for isolating electrical problems in the IC.

WARNING

The RU electrical system includes high voltage components that, if contacted, may cause serious injury or death. Failure to comply may result in serious injury or death of personnel.

TEST

1. Unplug the IC power supply cable from the receptacle connector.
2. Using a multimeter, test the voltage applied to the receptacle connector.
3. Confirm that a 110 -120 VAC 50-60 Hz source is present at the plug. If it is not present go to Step 3 on 0018 00-3.
4. Plug the IC power supply cable back into the receptacle connector.
5. Test the overall system function by switching the lighting fixture on. If both the light and the exterior light indicator illuminates, the system is operational.
6. If either of the lights identified in Step 5 do not work, isolate the failed component using the troubleshooting procedure below.

If Both Lights Don't Work

1. Unplug the IC power supply cable from the connector receptacle and verify 110-120 VAC 50-60 Hz is present. If present go to Step 2 on WP 0018-3. If not present go to Step 3 on WP 0018-3.
2. Remove the toggle switch cover.
3. Remove the switch from the box and the pull it to the extent of the wires.
4. Reconnect the power at the connector receptacle.
5. Test the voltage at the black wire (35001) and the white wire (35000).
6. If line voltage is detected, go to Step 8.
7. If line voltage is not detected, isolate the fault between the connector receptacle and the switch.
8. Disconnect the RU main power supply from the ADR-300.
9. To test the switch:
    a. Disconnect the IC power supply cable from the connector receptacle to de-energize the IC electrical system.
    b. Remove the switch cover from the switch, remove the two screws that hold the switch in the box, and remove the switch from the box.
    c. Test the electrical continuity between the switch terminals.

NOTE

The switch is good if there is no continuity with the switch in the OFF position and there is continuity with the switch in the ON position.

    d. If the switch is good, go to the section entitled, If the Light Indicator Works and the Light Does Not, Step 3 on the next page.
10. If the switch is not good, replace the switch IAW WP 0021.

If the Light Works and the Light Indicator Does Not

Replace the light indicator IAW WP 0021.

If the Light Indicator Works and the Light Does Not

1. To check the lamp in the interior light fixture:

   a. Disconnect the IC power supply cable from the connector receptacle to de-energize the IC electrical system.

   b. Loosen the setscrew at the base of the protective cage. Unscrew the cage from the fixture. Remove the cage and set it aside.

   c. Unscrew the lens from the fixture. Set the lens aside.

   d. Remove the lamp from the fixture. Check the lamp for continuity.

   e. If there is continuity in the lamp, go to Step 2 of this section.

   f. If there is no continuity, replace the lamp IAW WP 0017.

   g. Reconnect power to the system and switch the light on to confirm the fault is corrected. Reinstall the lens and protective cage.

CAUTION

Use caution when checking the line circuit. Do not short out meter leads. Failure to comply may cause damage to equipment.

2. If there is continuity in the lamp, check the fixture:

   a. Restore power to the light fixture and measure the voltage between the center terminal (hot) and the threaded side (neutral) of the light socket.

   b. The voltage should be zero with the switch off and full line voltage with the switch on.

   c. If you do not have full line voltage when the switch is on, replace the light fixture IAW WP 0019.

3. If voltage is not present at the connector receptacle confirm that 208/230 VAC, 50-60 Hz is supplied to the RU main power connection. If not, connect power to the RU and check voltage at the connector receptacle. If voltage is present, return the ADR-300 to service.

WARNING

The RU electrical system includes high voltage components that, if contacted, may cause serious injury or death. Failure to comply may result in serious injury or death of personnel.

4. If voltage is not present, open the RU electrical enclosure and check voltage between the load sides of Fuses 6 and 7. If voltage is still not detected, go to Step 3 on WP 0018-1. If 110 – 120 VAC is detected, replace the IC power cord. Reconnect power to the RU and check voltage at the IC power entry connector. If voltage is present, return the ADR-300 to service.

5. Check voltage between the line sides of Fuses 6 and 7. If 110 – 120 VAC is not detected, go to Step 8.

6. Disconnect power from the RU.

7. Inspect Fuses 5, 6 and 7 in the RU electrical enclosure. Replace blown fuses as required. Reconnect power to the RU and check voltage at the connector receptacle. If voltage is present, return the ADR-300 to service.

8. Check voltage between the three line-side terminals of the compressor motor contactor (CMC Cool). Voltage between each pair of terminals (L1-L2, L2-L3, L1-L3) should be 208 VAC. If all three pairs show full voltage, go to Step 14. If not voltage is detected, then go to Step 9.

9. Disconnect power from the RU.

10. Remove the cannon plug from the electrical connector box for the main power connection to the RU.

    a. Remove four mounting bolts from the cannon plug mounting flange.

    b. Pull the plug to the extent of the attached wires.

    c. Inspect all wires for good connections to terminals, damaged insulation or broken/burned conductors.

11. Check continuity for each terminal of the connection. If any terminal does not show continuity, replace the connector.

    a. Tag wire connections to identify their correct terminals in the cannon plug.

NOTE

Two terminals are different length and diameter. Be sure to note that the wires attach to these terminals.

    b. Cut wires as close as possible to the plug terminals.

    c. Strip about ½ in of insulation from the ends of each wire.

d. Insert the appropriate wire ends into the new odd-sized connector terminals and crimp or solder as appropriate. Confirm that the wire-terminal joint is good.

e. Insert the remaining wire ends into the remaining terminals and crimp or solder as appropriate. Confirm that the wire-terminal joint is good.

f. Insert the terminals into the new connector until the terminal is seated in the connector body.

g. Assemble the connector body and housing.

h. Install the new connector in the electrical connector box.

12. If all three terminals tested in Step 11 show continuity, replace the wire from the main power connector to the compressor motor contactor.

13. Reconnect power to the RU and check voltage at the connector receptacle. If voltage is present, return the ADR-300 to service.

14. Disconnect power from the RU.

15. Open the condenser section top grille.

16. Remove the transformer cover to access the transformer terminals.

17. Reconnect power to the RU.

18. Check voltage between transformer primary connections.

a. If voltage between H and H1 is NOT 110 VAC, go to Step 19.

b. If voltage between H and H2 is NOT 220 VAC, go to Step 19.

c. Go to Step 22.

19. Disconnect power from the RU.

20. Replace the transformer.

21. Reconnect power to the RU and check voltage at the connector receptacle. If voltage is present, return the ADR-300 to service.

22. Disconnect power from the RU.

23. Replace the wire harness between the transformer and Fuses 6 and 7.

24. Reconnect power to the RU and check voltage at the connector receptacle. If voltage is present, return the ADR-300 to service.

END OF TASK

END OF WORK PACKAGE

UNIT MAINTENANCE
LIGHTING FIXTURE
REPAIR

INITIAL SETUP

Tools and Special Tools
Multimeter (WP 0066, Table 2, Item 2),
Tool Kit, Organizational Maintenance
(WP 0066, Table 2, Item 4)

Materials/Parts
Fixture, Lighting (WP 0053, Item 1)

Personnel Required
Electrical Technician MOS 51 (AFSC 3E0x1)
HVAC Technician MOS 52C (AFSC 3E1x1)

References
IC Electrical System Test (WP 0018)
PMCS (WP 0010)

Equipment Conditions
ADR-300 set up and connected to a power source procedures (WP 0005)

GENERAL

This section outlines the procedures for removing and reinstalling the IC lighting fixture. Before beginning this procedure, confirm that the lamp is operational (refer to WP 0010). The lighting fixture should only be replaced by an identical assembly or an approved substitute (maximum 100 W).

REPAIR

1. Disconnect the IC power supply cable from the connector receptacle.

2. Remove the cage, lens and lamp from the lighting fixture IAW WP 0017.

3. Remove four screws from the lighting fixture base to separate the fixture from the junction box. Support the fixture and remove the wire nuts. Retain gasket.

4. Twist the loose ends, and secure the connection with a wire nut. Examine the wire connections. Ensure the connections are secure.

5. Restore power to the electrical system and test the fixture.

    a. If the light works, disconnect power and reinstall the fixture, lamp, lens and cage. If the gasket is serviceable, reuse it. If the gasket is not serviceable, replace it with a new gasket.

    b. If the light does not work, disconnect the power supply from the system and replace the light fixture.

6. Remove two wire nuts and separate the fixture wires from the supply wires.

7. Examine the replacement fixture. If the ends are not stripped, strip about ½-in. of insulation from the ends of the fixture wires.

8. Support the replacement fixture and twist the white fixture wire to the exposed white supply wire. Secure the connection with a wire nut.

9. Twist the black fixture wire together with the black wire and install a wire nut.

10. Mount the new fixture on the junction box with the screws removed in Step 2, ensuring the gasket is properly positioned.

11. Install the lamp and test the fixture operation. Replace the lens, setscrew, and cage IAW WP 0017.

END OF TASK

END OF WORK PACKAGE

UNIT MAINTENANCE
CONNECTOR RECEPTACLE
REPAIR AND REPLACE

INITIAL SETUP

Tools and Special Tools
Tool Kit, Organizational Maintenance
(WP 0066, Table 2, Item 4)
Multimeter (WP 0066, Table 2, Item 2)

Materials/Parts
Connector Receptacle
(WP 0066, Item 4)
Sealant (WP 0068, Item 21)
Putty Knife (WP 0068, Item 14)

Personnel Required
HVAC Technician MOS 52C (AFSC 3E1x1)
Electrical Technician MOS 51 (AFSC 3E1x1)

References
IC Electrical System Test (WP 0018)

Equipment Conditions
ADR-300 set up and connected to a power source (WP 0005)

GENERAL

This work package outlines steps for testing, repairing and replacing the connector receptacle on the rear of the IC exterior. Before beginning this procedure, complete the IC electrical system test IAW WP 0018. The connector receptacle should only be replaced by an identical assembly or an approved substitute.

REPAIR

1. Confirm that power is disconnected from the connector receptacle.

2. Remove the four screws (Figure 1) that retain the cover plate for the connector receptacle.

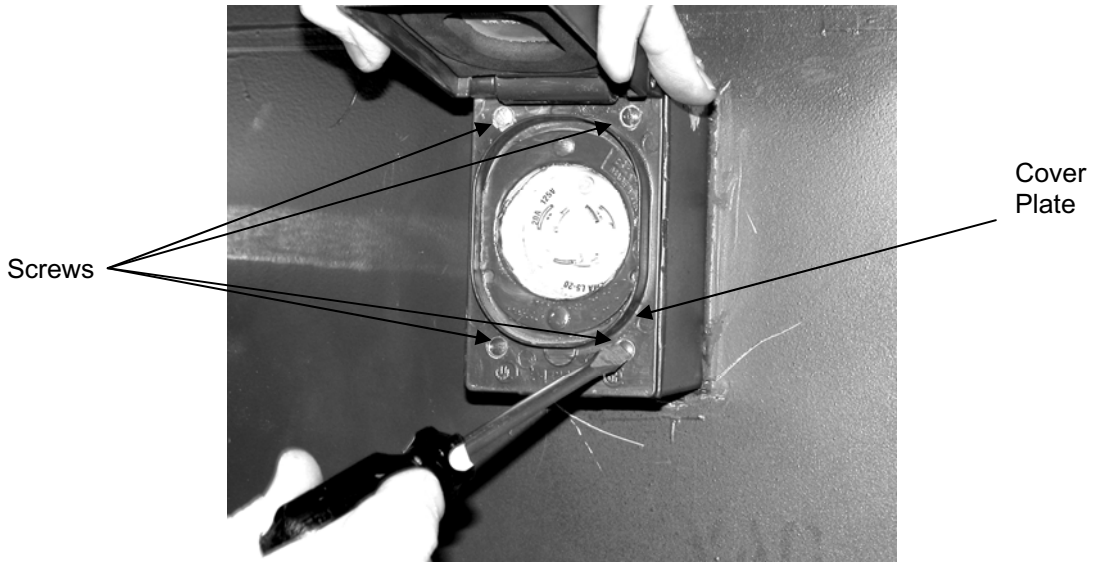


Figure 1. Connector Receptacle.

3. Pull the connector out of the enclosure to the limit of the attached wires (Figure 2).

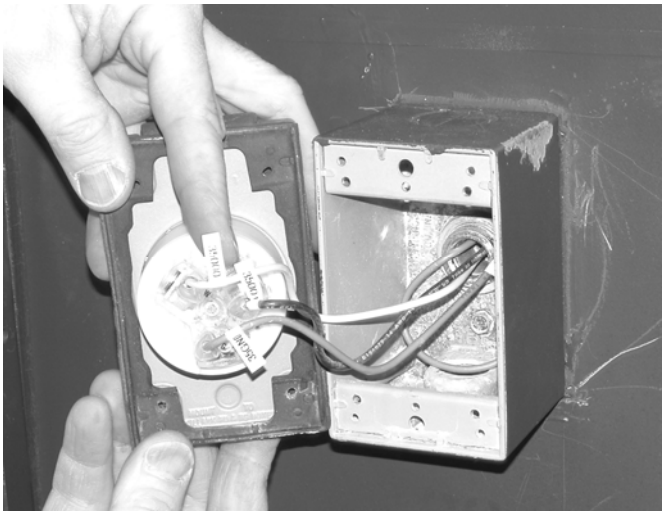


Figure 2. Connector Receptacle Wires.

4. Look for loose, broken or burned wires. Reconnect loose wires to the appropriate screw terminals.

5. For broken or burned wires, strip about ½ of insulation from the wire on the container-side of the break and connect the wire to the connector terminals.

6. If the wires are not long enough to make a reliable connection, pull the new wires from the interior switch box.

7. Inspect the connector. If the connector is damaged, including bent or broken prongs, or cracked or broken housing or other obvious damage, replace the connector.

8. Using the multimeter, check continuity between each connector prong and its respective wire terminal.

    a. If no continuity exists between a post and corresponding terminal or if continuity exists between terminals, go to Step 9.

    b. If continuity exists between a post and corresponding terminal and no continuity exists between terminals, go to Step 11.

9. Tag and disconnect the wires from the terminals.

10. Connect the tagged wire ends to the replacement connector receptacle, ensuring that the terminals to which the wires connect correspond to the same terminals on the connector that was replaced. Make sure the terminal screws are secure.

11. Verify the gasket is serviceable. If not, replace or seal with sealant to ensure a watertight seal.

12. Replace the cover plate and screws removed in Step 2.

13. Connect a 110 VAC 50-60 Hz power supply to the power connector assembly and test the operation of the IC electrical system IAW WP 0018.

REPLACE

Connector Receptacle Box

1. Ensure power is disconnected.
2. Remove receptacle from the receptacle box (Figure 3).
3. Tag wires and remove them from the receptacle.
4. Cut the sealant from around the receptacle box.
5. Remove the two fasteners from the back of the box on the IC.
6. Use a mallet to rotate the receptacle box counter-clockwise. Remove the receptacle box.

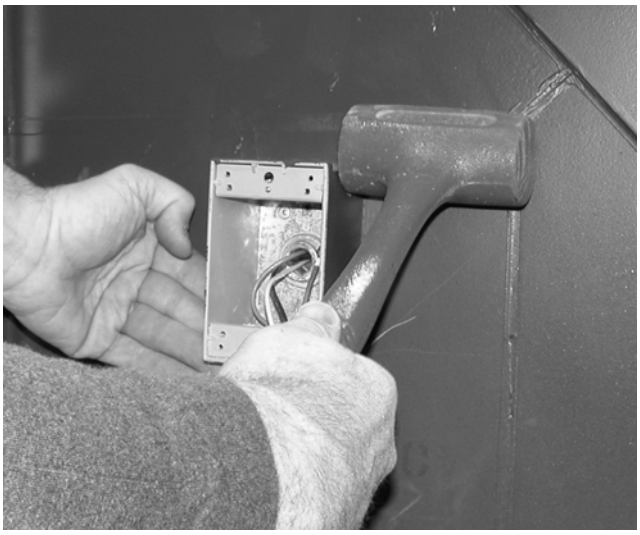


Figure 3. Connector Receptacle Box.

7. Remove the remaining sealant with a putty knife.
8. If necessary, add sealant around the nipple to prevent moisture infiltration.
9. Thread on the new connector receptacle box.
10. Install the two fasteners to the back of the box.
11. Use the sealant to seal the receptacle box to the exterior of the IC.
12. Install the connector receptacle as described in Steps 10 – 13 in the repair procedure above.

END OF TASK

END OF WORK PACKAGE

UNIT MAINTENANCE
IC TOGGLE SWITCH AND LIGHT INDICATOR
REPAIR

INITIAL SETUP

Tools and Special Tools
Tool Kit, Organizational Maintenance
(WP 0066, Table 2, Item 4)
Multimeter (WP 0066, Table 2, Item 2)

Materials/Parts
Switch, Toggle (WP 0053, Item 3)
Light Indicator (WP 0053, Item 5)
Sealant (WP 0068, Item 21)

Personnel Required
Electrical Technician MOS 51 (AFSC 3E0X1)
HVAC Technician MOS 52C (AFSC 3E1x1)

References
IC Electrical System Test (WP 0018)

Equipment Conditions
ADR-300 set-up procedures (WP 0005)

GENERAL

This work package outlines steps for repairing and replacing the toggle switch and/or the light indicator in the Insulated Container (IC). Before beginning this procedure, complete the IC electrical system test outlined in WP 0018. The toggle switch or light indicator should be replaced only by an identical part or an approved substitute.

REPAIR

Toggle Switch

WARNING

The IC electrical system has high voltage components that, if contacted, may cause serious injury or death. Failure to comply may result in serious injury or death of personnel.

1. Confirm that the IC power supply cord is disconnected from the connector receptacle.

2. Remove the four screws (Figure 1) that hold the cover plate for the toggle switch. Remove the cover plate and gasket (if present). Set the cover plate, gasket and screws aside.

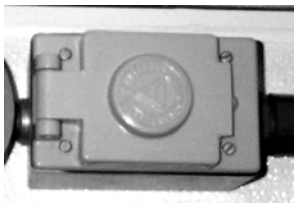


Figure 1. Toggle Switch Cover Plate.

3. Remove two screws that retain the toggle switch (Figure 2) in the enclosure. Pull the toggle switch out of the enclosure to the limit of the attached wires (Figure 2).

4. Look for loose, broken or burned wires. Reconnect loose wires to the appropriate screw terminals as shown.

5. For broken or burned wires, strip about ½ in. of insulation from the wire on the container-side of the break and connect the wire to the switch terminals.

6. If the wire is too short to make a secure connection, use the existing wire to pull a replacement wire through the conduit from the junction box at the light fixture.

7. Inspect the light switch. If the switch is damaged, go to Step 9.

8. Turn the switch on. Using the multimeter, check continuity between the switch input and output terminals. If you do not detect continuity, go to Step 9. If there is continuity, change the wires as described in Step 3.

9. Remove the damaged switch assembly. Loosen the wire terminal screws on the switch, tag and disconnect the wires from the terminals.

10. Connect the wire ends to the replacement toggle switch, ensuring that each tagged wire is connected to the proper terminal. Make sure the terminal screws are secure.

11. Insert the new switch in the enclosure, making sure no wires are pinched. Install the retaining screws removed in Step 3.

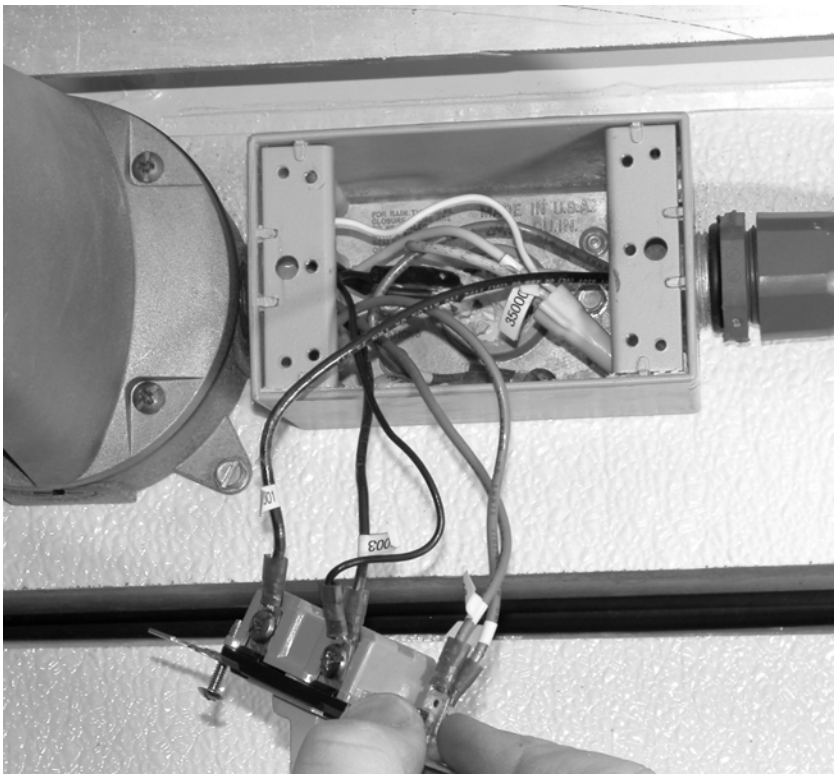


Figure 2. Toggle Switch Wires.

12. Replace the cover plate and screws removed in Step 2. Make sure the gasket is in good condition and properly located.

13. If no gasket is available or if it is not serviceable, caulk the perimeter of the plate with silicone sealant to provide a watertight seal.

14. Connect a 110 VAC 60 Hz power supply to the power connector assembly and test the operation of the IC electrical system IAW WP 0018.

Light Indicator

1. Confirm that the IC power supply cord is disconnected from the connector receptacle.

2. Remove the four screws that hold the cover plate for the toggle switch. Remove the cover plate and gasket (if present). Set the cover plate, gasket and screws aside.

3. Remove two screws that retain the toggle switch in the enclosure. Pull the switch out of the enclosure to the limit of the attached wires.

4. Look for loose, broken or burned wires. Reconnect loose wires to the appropriate screw terminals.

5. For broken or burned wires, strip about ½ inch of insulation from the wire on the container-side of the break and connect the wire to the switch terminals.

6. If the wire is too short to make a secure connection, use the existing wire to pull a replacement wire through the conduit from the junction box at the lighting fixture.

7. Remove the wire nut joining the white IC neutral wire from the first light indicator lead.

8. Remove the second light indicator lead from the switch by loosening the switch terminal screw.

9. Remove the sealant from the perimeter of the light indicator on the IC exterior surface.

10. Using a punch, tap the light indicator from the inside of the container. Pull one wire at a time to the outside of the opening. Dispose of the failed light indicator.

11. Apply a small bead of sealant around the rim of the new light indicator.

12. Insert the wire leads for the replacement light indicator, one at a time, through the outside skin and pull them into the toggle switch junction box.

13. If the light indicator wire leads are not long enough to reconnect, splice additional wire as needed to reconnect.

14. Press the light indicator into the outside skin until the clips on the light indicator engage the IC skin. Strip ½ inch of insulation from both light indicator leads.

15. Twist one of the light indicator leads together with the white wire and secure with a wire nut.

16. Secure the second light indicator lead wire to the light switch terminal.

17. Test the system to confirm the new light indicator works appropriately.

18. Reinstall the toggle switch and replace the cover plate and screws removed in Step 2. Make sure the gasket is in good condition and properly located.

19. If no gasket is available or if it is not serviceable, caulk the perimeter of the plate with silicone sealant to provide a watertight seal.

20. Connect the IC 110 VAC 60 Hz power supply to the power connector assembly and test the operation of the IC electrical system as described in WP 0018.

END OF TASK

END OF WORK PACKAGE

UNIT MAINTENANCE
CARGO RESTRAINT RAIL
REMOVE/INSTALL

INITIAL SETUP

Tools and Special Tools
Tool Kit, Organizational Maintenance (WP 0066, Table 2, Item 4)
Threaded Insert Installation Tool (WP 0066, Table 2, Item 7)
Threaded Insert Anvil (WP 0066, Table 2, Item 6)
3/8 – 24 Mandrel (WP 0066, Table 2, Item 8)

Materials/Parts
Cargo Restraint Rail (Short) (WP 0051, Item 16)
Cargo Restraint Rail (Long) (WP 0051, Item 17)
Anti-seize thread compound (WP 0068, Item 3)
3/8-24 Threaded Insert (WP 0068, Item 23)

Personnel Required
1 Person

References
None

Equipment Conditions
ADR-300 set up and connected to a power source procedures (See WP 0005)

GENERAL

This WP outlines procedures for removing and replacing the cargo restraint rails from the perimeter of the ADR-300. The container includes rails on all four sides and each is individually removable for service or repair.

WARNING

Do not fly cargo on an internal aircraft if the pallet base is structurally damaged. ADR-300 could shift during flight. Failure to comply may result in serious injury or death to personnel.

Be careful to keep toes, hands and other appendages out from under the ADR-300 when it is lifted off the ground. The system may weigh up to 10,000 pounds and may crush hands, feet or other appendages. Failure to comply may result in serious injury to personnel.

NOTE

It may be necessary to lift the container slightly with a forklift or dunnage and pry bar to facilitate removal of the cargo restraint rails.

REMOVE

1. Remove all (12 for short rail, 14 for long rail) bolts and lock washers from the cargo restraint rail (Figure 1) to be removed.

2. Remove the cargo restraint rail from container base.

INSTALL

1. Position the rail next to the container base with the notched edge on the ground and away from the container.

2. Confirm that the bolt holes on the rail match the threaded inserts (Figure 1) on the container base and the cutout regions of the rail correspond to the forklift pockets on the container.

3. Insert 3/8-24 x 1.375 bolts (12 for short rail, 14 for long rail) and lock washers in each of the bolt holes and thread them into the threaded inserts in the container.

4. Tighten bolts securely but do not strip threads. If the threads are stripped, remove the rivnut.

REMOVE

Threaded Insert

WARNING

Do not fly cargo on an internal aircraft if the pallet base is structurally damaged. ADR-300 could shift during flight. Failure to comply may result in serious injury or death to personnel.

1. Remove the flange from the damaged rivnut by drilling the rivnut with a ½-inch (0.490 – 0.500) drill bit.

2. Press the remaining portion of the damaged rivnut into the interior of the container base.

INSTALL

Threaded Insert

1. Assemble the rivnut installation tool, anvil and mandrel.

2. Thread the replacement rivnut onto the mandrel.

3. Insert the free end of the replacement rivnut into the hole from which the damaged rivnut was removed.

4. Set the rivnut as described in the installation tool literature. Remove the tool from the installed rivnut.

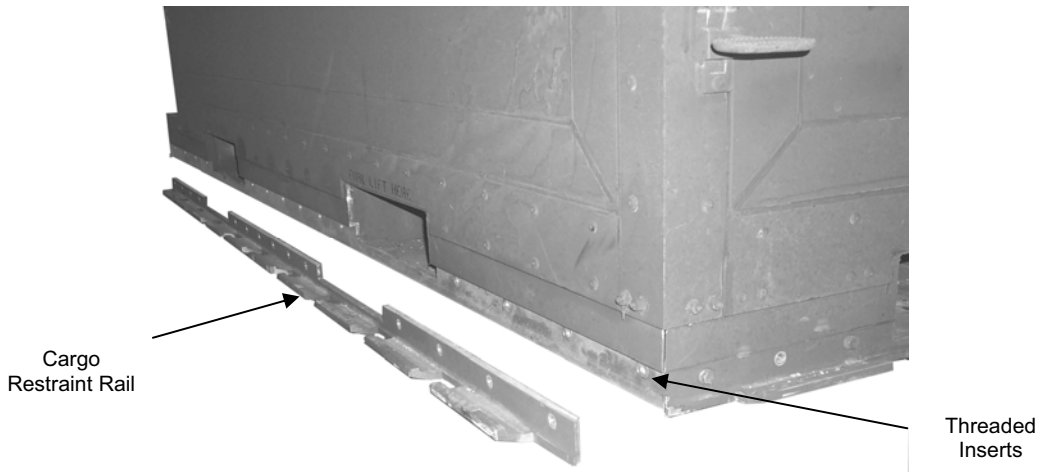


Figure 1. Cargo Restraint Rail.

END OF TASK

END OF WORK PACKAGE

UNIT MAINTENANCE
REFRIGERATION UNIT (RU)
REMOVE/INSTALL

INITIAL SETUP

Tools and Special Tools
Tool Kit, Organizational Maintenance (WP 0066, Table 2, Item 4)
Threaded Insert Installation Tool (WP 0066, Table 2, Item 7)
Threaded Insert Anvil (WP 0066, Table 2, Item 6)
3/8-24 Mandrel (WP 0066, Table 2, Item 8)

Materials/Parts
Adhesive (WP 0068, Item 2)
Outer Seal (WP 0054, Item 4)
Anti-seize thread compound (WP 0068, Item 3)
3/8-24 Threaded Insert (WP 0068, Item 23)

Personnel Required
(2), and forklift driver

References
None

Equipment Conditions
ADR-300 set up and connected to a power source procedures (WP 0005)

GENERAL

This WP outlines procedures for removing the refrigeration unit (RU) from the ADR-300 insulated container (IC). It also presents the steps for installing a new RU in an IC.

WARNING

Personnel should wear head protection while working below the forks of a forklift. RU mounting bolts should not be removed until the RU is supported by a forklift. Always use a safety strap to keep the RU on the forklift tines during removal and installation. The RU is heavy and the unit falling on personnel may cause serious injury or death.

REMOVE

1. Shut down the RU.

2. Disconnect the IC power supply cord from the connector receptacle (Figure 1) and secure the cord.

3. Disconnect the main RU power supply cord from the connector (Figure 1) on the RU back plate and secure the cord.

4. Disconnect the external hose (Figure 1) and remove the drain tube fitting from the RU base plate.

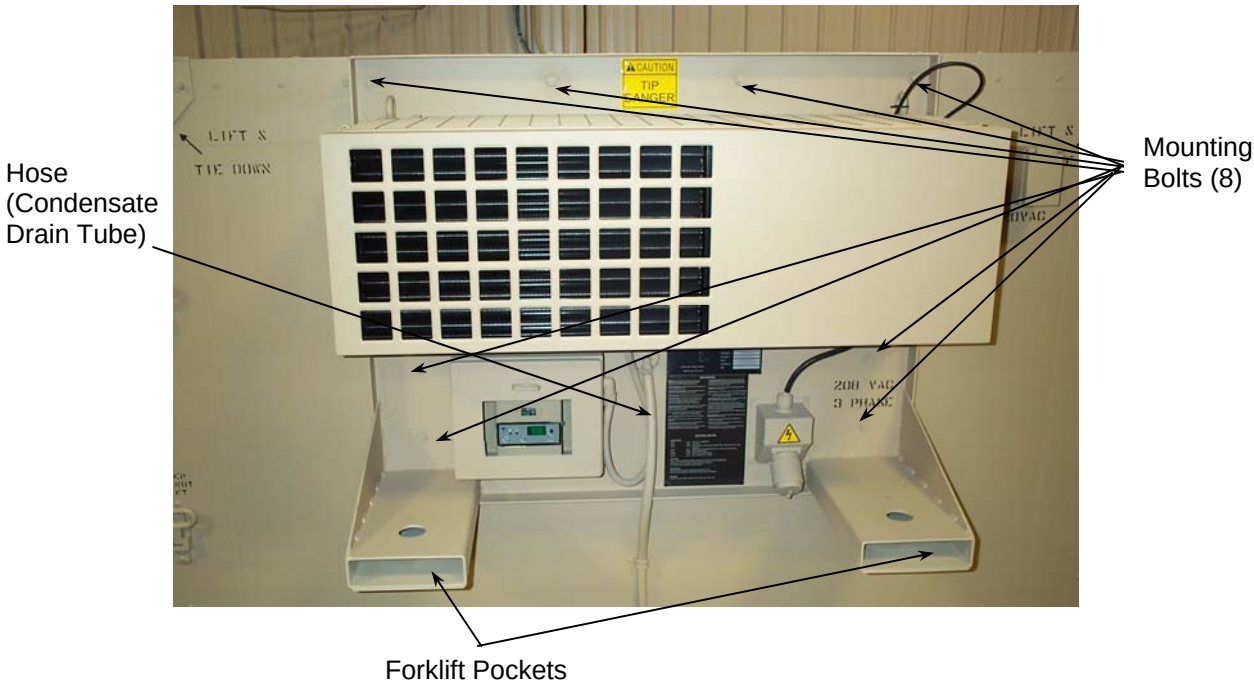


Figure 1. Refrigeration Unit (outside ADR-300).

CAUTION

Be careful to avoid damaging the evaporator section. Failure to comply may result in damage to equipment.

5. From inside the IC (Figure 2), disconnect the two drain tubes from the nipples on the drain pan and tuck the drain tube heaters into the evaporator housing to ensure that they clear the opening in the IC wall.

Figure 2. RU (inside ADR-300).

6. If a forklift will be used to support the RU during removal, proceed to Step 7.

NOTE

If a crane or hoist will be used, ensure that the lifting device load capacity is greater than 1500 lb (680 kg).

7. Attach the lifting cables to the lifting rings at the top of the RU and raise the crane until the lifting cables support the RU weight. Go to Step 9.

8. Insert forklift tines into the fork pockets (Figure 1) on the RU. Raise the forks just enough to support the RU without lifting the IC.

9. Attach a safety strap between the RU and the forklift to prevent the forks from coming out of the fork pockets.

10. Remove 8 mounting bolts (Figure 1) from the RU back plate (The top four bolts are shorter than the lower mounting bolts).

WARNING

Keep fingers away from forklift tines while removing the RU. Fingers could get pinched between the RU and the forklift tines. Keep fingers away from the evaporator sections as the RU is being removed. Failure to do so may result in serious injury to personnel.

11. Using a spotter inside and outside of the IC, direct the forklisft driver to slowly remove the evaporator section from the opening. The inside spotter shall guide the evaporator section through the opening in the container.

WARNING

The RU tends to tip toward the evaporator section when the unit is standing on the back plate. Always support the evaporator section on blocks or other supporting device to prevent tipping. Failure to comply may result in serious injury to personnel.

12. Slowly and gently, pull the RU straight back from the IC until the evaporator section is clear of the container.

13. Stand the RU on the bottom edge of the back plate and support the evaporator enclosure on blocks to ensure that the unit is stable.

INSTALL

1. Inspect the hose in the IC rear wall and reseal the opening if necessary.

2. Inspect the seal around the perimeter of the RU back plate and, if it is serviceable, proceed to Step 3. If the seal is not serviceable, replace it with the following procedure:

    a. Remove all traces of the old seal material by cutting scraping or sanding (if necessary) both the RU back plate and the mating surface of the IC. Be careful to avoid gouging scraping or otherwise damaging the IC or the RU surfaces.

    b. Apply a 1-in. band of adhesive around the perimeter of the RU back plate on the IC side.

    c. Remove the adhesive backing and install a replacement seal around the perimeter of the back plate. Be careful to align the edges of the seal with the edge of the back plate.

3. Insert forklift tines into the fork pockets of the RU. Raise the forks just enough to support the RU without lifting it.

WARNING

Personnel should wear head protection while working below the forks of a forklift. RU mounting bolts should not be removed until the RU is supported by a forklift. Always use a safety strap to keep the RU on the forklift tines during removal and installation. The RU is heavy and the unit falling on personnel may cause serious injury or death.

4. Attach a safety strap to the forklift and to the RU to keep the RU from falling off the forklift tines.

5. Raise the RU and move it to the opening of the IC. Align the RU evaporator (inside) section with the opening.

WARNING

Keep fingers away from forklift tines while removing the RU. Fingers could get pinched between the RU and the forklift tines. Keep fingers away from the evaporator section as the RU is being installed Failure to do so may result in serious injury to personnel.

6. Using a spotter inside and outside of the IC, direct the forklift driver to slowly insert the evaporator section into the opening. The inside spotter shall guide the evaporator section through the opening in the container and align the bolt holes in the back plate with the threaded inserts in the IC wall.

7. Align the hose fitting on the IC rear wall with the corresponding hole in the RU back plate.

CAUTION

Do not over-tighten the RU mounting bolts. Over-tightening these bolts may debond the threaded inserts from the IC structure causing container leaks and reducing the security of the RU mounting.

NOTE

The top four bolts are shorter than the lower mounting bolts.

If a threaded insert is stripped replace it using the procedure on the following page.

8. Install eight mounting bolts through the bolt holes snugly, then tighten after all bolts are installed.
9. Reconnect the external hose.
10. Connect the IC power supply cord to the connector receptacle.
11. Reconnect the condensate hoses from the evaporator to the nipples on the drain pan.
12. Connect the RU power supply cord to an appropriate source of power. Turn on the power at the source.
13. Operate the RU IAW WP 0005.

Threaded Insert

1. Remove the flange from the damaged threaded insert by drilling the threaded insert with a ½ inch (0.490—0.500) drill bit.
2. Press the remaining portion of the damaged threaded insert into the interior of the container wall.
3. Assemble the threaded insert installation tool, anvil and mandrel.
4. Thread the replacement threaded insert onto the mandrel.
5. Insert the free end of the replacement threaded insert into the hole from which the damaged threaded insert was removed.
6. Set the threaded insert as described in the installation tool literature. Remove the tool from the installed threaded insert.

END OF TASK

END OF WORK PACKAGE

UNIT MAINTENANCE
FUSE
TEST AND REPLACE

INITIAL SETUP

Tools and Special Tools
Tool Kit, Organizational Maintenance (WP 0066, Table 2, Item 4)
Multimeter (WP 0066, Table 2, Item 2)

Materials/Parts
Fuse (WP 0059, Item 7 and Item 14)

Personnel Required
Electrical Technician MOS 51 (AFSC 3E) (1)
HVAC Technician MOS 52C (AFSC 3E1x1)

References
PMCS (WP 0010)

Equipment Conditions
ADR disconnected from all sources of power.

GENERAL

The ADR-300 RU uses eight fuses (Table 1) to protect various circuits from overload and damage.

Table 1. ADR-300 Fuse Locations.

Fuse	Protected Components	Fuse Location
1	10 amp Evaporator Fan EF1, Drain Hour Meter	Electrical Enclosure Circuit Card Assembly
2	10 amp Evaporator Fan EF2	Electrical Enclosure Circuit Card Assembly
3	15 amp Circulating (Condenser) Fan Motor and Electromagnetic Relay (when energized), Compressor Motor Contactor, Condensate Heaters (1 and 2)	Electrical Enclosure Circuit Card Assembly
4	3 amp Control Panel Display, Heat Contactor	Electrical Enclosure Circuit Card Assembly
4/1	3 amp Control Panel Display	Rear of Display Enclosure
5	5 amp Transformer	Electrical Enclosure Upper Left Corner
6	1 amp Lighting Fixture	Electrical Enclosure Upper left Corner
7	1 amp Lighting Fixture	Electrical Enclosure Upper Left Corner

REMOVE

Fuses 1, 2, 3, 4 (Figure 2)

1. Open the RU electrical enclosure (Figure 1) by removing the retaining screws in each of the four corners of the cover.

Figure 1. RU Electrical Enclosure.

2. Locate the fuse on the printed circuit board. Using needle-nose pliers, gently pull the fuse straight out of the socket.

Fuse 4/1

1. Open the control box enclosure by turning the handle ¼ turn. Lower the cover and support it in the open position.

2. Loosen the two setscrews, securing the controller to its mounting bracket.

3. Gently remove the controller to the limits of its attached wires.

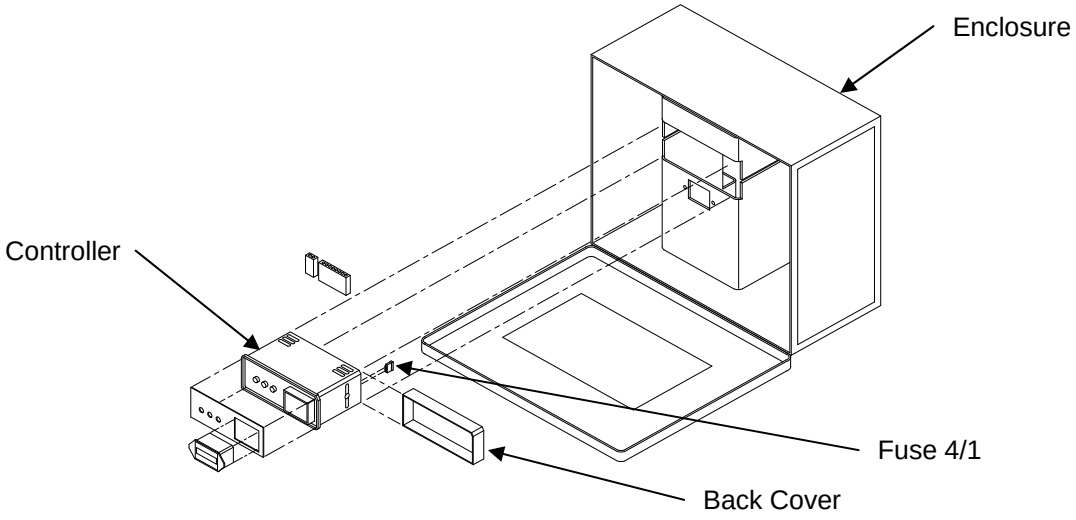


Figure 1A. Accessing Control Box Fuse

4. Remove the back cover to access the fuse.
5. Remove the fuse.
6. Install new fuse.
7. Re-install back cover.
8. Re-install controller into enclosure and check for proper operation.

Fuses 5, 6, and 7 (Figure 3)

NOTE

Observe the size of the fuses as you remove them. The fuses look identical but have different amperage ratings.

1. Open the RU electrical enclosure by removing the retaining screws in each of the four corners of the cover.
2. Unscrew the fuse holder and remove the fuse from the socket.

TEST

Fuse 1

3. Remove Fuse 1 (Figure 2). Check for continuity on fuse.
4. If there is no continuity, replace with an identical fuse.
5. If there is continuity, reinstall the fuse.
6. Connect all power sources.
7. Verify Proper operation.

Fuse 2

1. Remove Fuse 2 (Figure 2). Check for continuity on fuse.
2. If there is no continuity, replace with an identical fuse.
3. If there is continuity, reinstall the fuse.
4. Connect all power sources.
5. Verify Proper operation.

Fuse 3

1. Remove Fuse 3 (Figure 2). Check for continuity on fuse.
2. If there is no continuity, replace with an identical fuse.
3. If there is continuity, reinstall the fuse.
4. Connect all power sources.
5. Verify Proper operation.

Fuse 4

1. Remove Fuse 4 (Figure 2). Check for continuity on fuse.
2. If there is no continuity, replace with an identical fuse.
3. If there is continuity, reinstall the fuse.
4. Connect all power sources.
5. Verify Proper operation.

Fuse 4/1

1. Remove Fuse 4/1. Check for continuity on fuse.
2. If there is no continuity, replace with an identical fuse.
3. If there is continuity, reinstall the fuse.
4. Connect all power sources.
5. Verify Proper operation.

Fuse 5

1. Unscrew the fuse holder.
2. Remove the fuse (Figure 3) from the fuse holder. Check for continuity on the fuse.
3. If there is no continuity, replace with an identical fuse.
4. If there is continuity, reinstall the fuse in the fuse holder.
5. Reinstall the fuse holder.
6. Connect all power sources.
7. Verify Proper operation.

Fuse 6

1. Unscrew the fuse holder.

2. Remove the fuse (Figure 3) from the fuse holder. Check for continuity on the fuse.
3. If there is no continuity, replace with an identical fuse.
4. If there is continuity, reinstall the fuse in the fuse holder.
5. Reinstall the fuse holder.
6. Connect all power sources.
7. Verify Proper operation.

Fuse 7

1. Unscrew the fuse holder.
2. Remove the fuse (Figure 3) from the fuse holder. Check for continuity on the fuse.
3. If there is no continuity, replace with an identical fuse.
4. If there is continuity, reinstall the fuse in the fuse holder.
5. Reinstall the fuse holder.
6. Connect all power sources.
7. Verify Proper operation.

INSTALL

Fuses 1, 2, 3, 4 (Figure 2)

1. Hold the fuse with needle-nose pliers and align the fuse terminals with the socket on the circuit card assembly.
2. Push the fuse into the socket until the fuse body is seated.

Fuse 4/1

1. Insert the replacement fuse in the controller socket. Reinstall the back cover.
2. Install the controller into the mounting bracket.
3. Tighten the setscrews.
4. Close the cover and secure the cover by turning the handle ¼ turn.

Fuse 5, 6, and 7 (Figure 3)

Insert the new fuse in the fuse holder and screw the fuse holder into the socket.

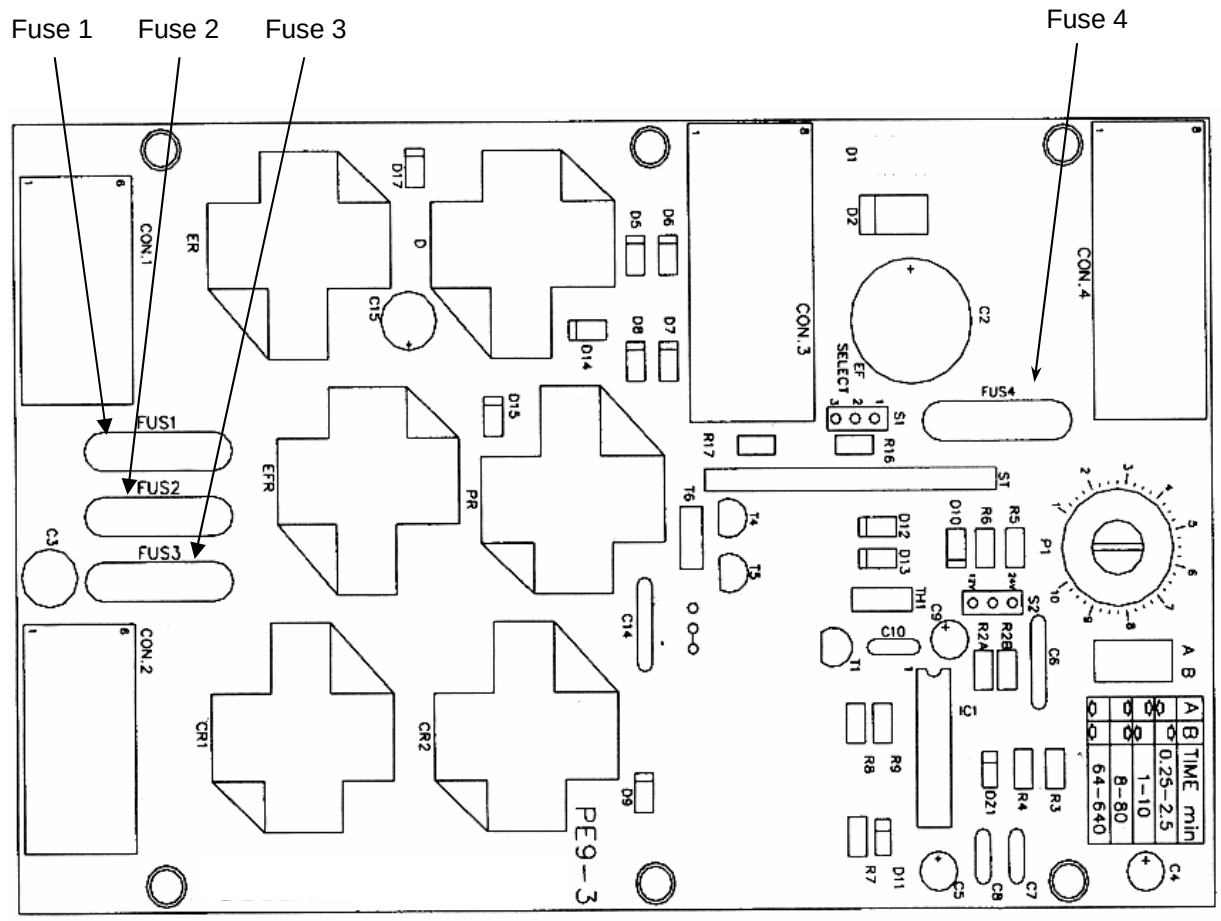


Figure 2. Location of Fuses 1 - 4.

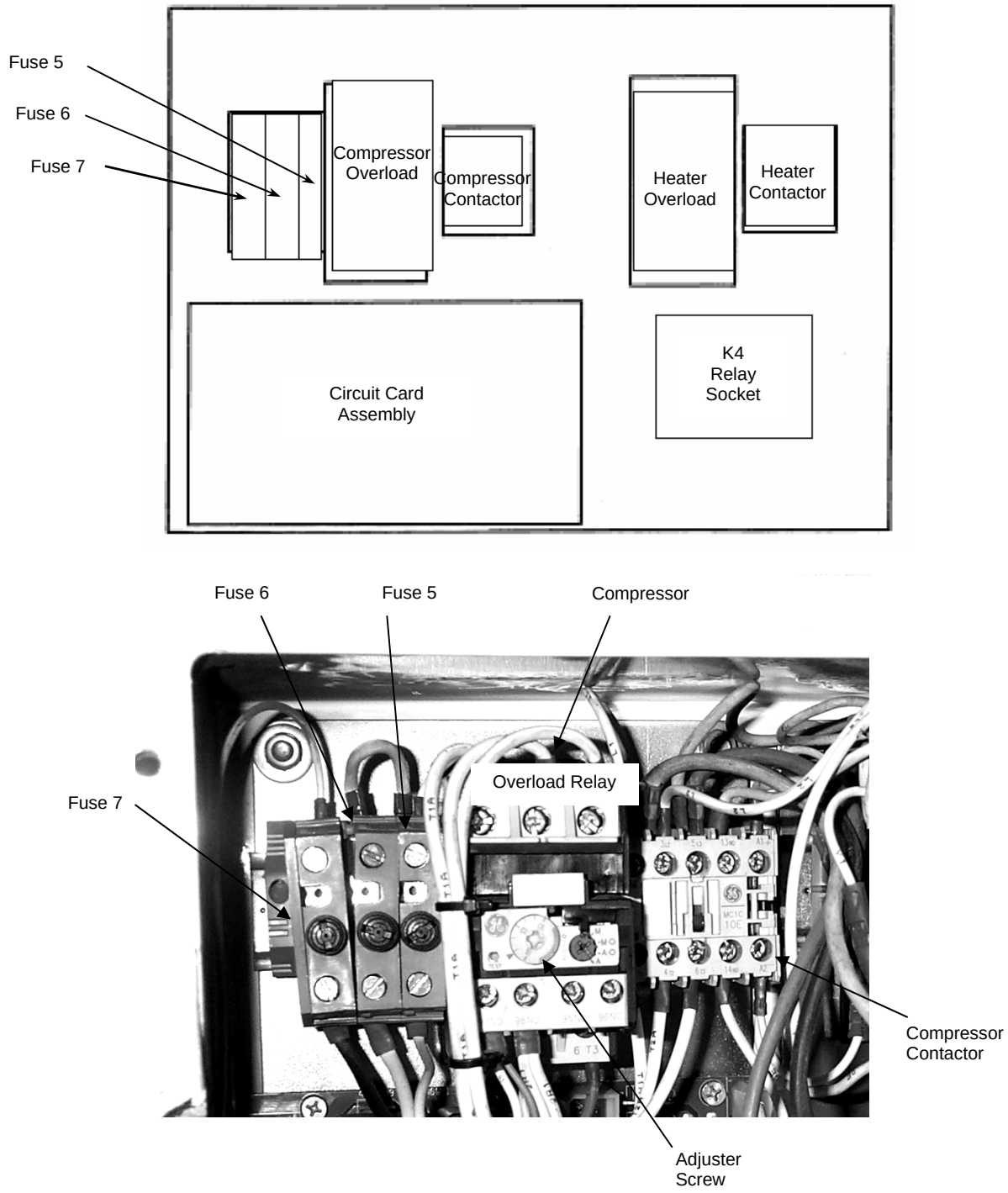


Figure 3. Location of Fuses 5 - 7.

END OF TASK

END OF WORK PACKAGE

CHAPTER 6
DIRECT SUPPORT
FOR
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT
(ADR-300)

DIRECT SUPPORT MAINTENANCE
INSULATED CONTAINER
REPAIR

INITIAL SETUP

Tools and Special Tools
Tool Kit, Organizational Maintenance (WP 0066, Table 2, Item 4)
Disk Sander (WP 0066, Table 2, Item 1)

Materials/Parts
Isopropyl alcohol (WP 0068, Item 9)
Body Filler (WP 0068, Item 4)
Sand Paper (WP 0068, Items 18, 19, or 20)
Mixing containers (non plastic) (WP 0068, Item 12)
Putty Knife (WP 0068, Item 14)

Personnel Required
Direct Support Maintenance

References
None

Equipment Conditions
ADR-300 set is disconnected from power source procedures (WP 0005)

GENERAL

The side and roof panels of the ADR-300 include an aluminum outer skin (Figure 1), a foam core (Figure 1) and a fiberglass inner skin (Figure 1). The entire perimeter (outside edge) of each panel is framed by fiberglass frames that also provide reinforcement at regular intervals across the width of the panels. This work package describes procedures for repairing damage to the skin and foam core of the panels.

Damage to the internal reinforcing elements or damage areas larger than those described in this work package should not be attempted in the field. Damage of this magnitude should be repaired only by factory trained technicians at a manufacturer-approved facility.

EXCLUDED REPAIR OPERATIONS

WARNING

Failure to comply with instructions regarding lifting ring assemblies could result in catastrophic failure of the shelter during operation. This could result in serious injury or death.

The following repair operations are not authorized for field implementation. These repairs may only be completed by manufacturer-authorized personnel at approved facilities:

- Folding step replacement
- Lift ring replacement
- Hinge Butt Replacement
- Replacement of any component riveted to the main assembly
- Skin punctures greater than ½ inch deep
- Skin fractures and tears greater than 1½ inch length, and
- Bottom skin repair

REPAIR

Dents or Depressions – Aluminum Bonded Material

The shelter floor and side panels are constructed of aluminum-bonded material. If the panel skin (face sheet) is not punctured, the following procedure should be used to repair dents or depression:

1. Sand the damaged area (Figure 1) with fine sandpaper to remove all traces of paint.

WARNING

Isopropyl alcohol is toxic and flammable. Do not consume internally and avoid inhaling vapors. Good, general ventilation is normally adequate. Avoid all sources of ignition. Failure to comply may result in serious injury to personnel or death.

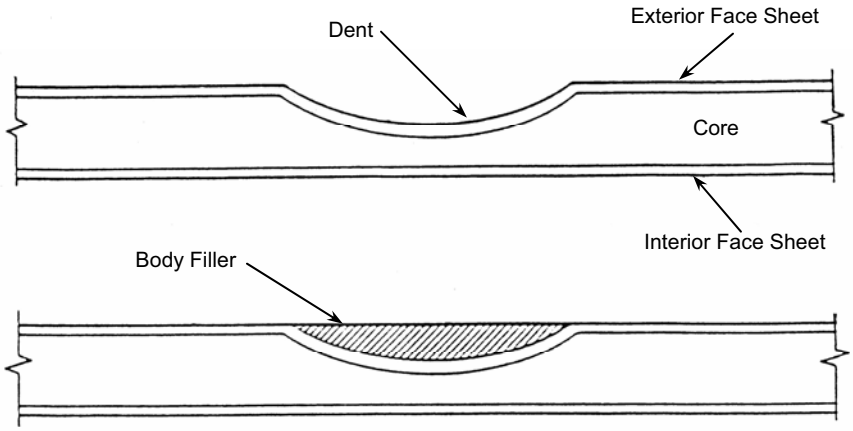


Figure 1. IC Skin Dents or Depressions--Repair.

2. Wipe the surface with a cloth dampened with isopropyl alcohol and immediately wipe the solvent from the surface with a clean, dry cloth.

3. Fill in the damaged area with body filler (Figure 1) using a spatula or putty knife.

4. Allow the body filler to cure for one hour at room temperature. Sand the surface of the cured dent filler to conform to the surrounding area.

5. Touch up the repair with paint corresponding to the color of the surrounding surface.

END OF TASK

Fractures Less Than 1½ X 3-in. (3.8 X 7.6 cm) – Aluminum Bonded Material

The following procedure should be used to repair skin fractures with an area of less than 1½ x 3 in. (3.8 x 7.6 cm):

1. Brush the damaged area with a stiff wire brush to rid it of foreign material, grease, and dirt.

NOTE

If the punctured or gouged area in the panel is surrounded by extended cracks, drill the ends of all cracks using 1/8-in. drill (see figure) to stop the crack from growing.

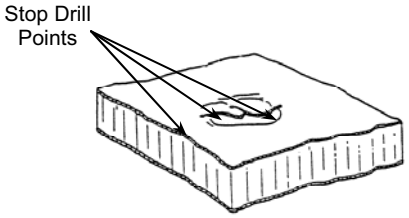
2. Drill a hole at the ends of all tears or cracks (“stop-drill”) (Figure 2) in the face skin with a 1/8-in. drill bit.

WARNING

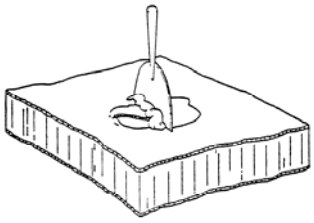
Isopropyl alcohol is toxic and flammable. Do not consume internally and avoid inhaling vapors. Good, general ventilation is normally adequate. Avoid all sources of ignition. Failure to comply may result in serious injury or death to personnel.

NOTE

Fill damaged areas no larger than 1-1/2 x 3 in wide and no closer than two feet apart. Larger area damage should be referred to an intermediate maintenance area for repair.



Typical Minor Damage to Single Surface



Repair of Minor Damage to Single Surface

Figure 2. IC Skin Fractures--Repair.

3. Clean the damaged area by wiping with a soft cloth dampened with isopropyl alcohol.

4. Fill the damaged area. With a 1½ in. (3.8 cm) wide spatula (Figure 2), fill the damaged area with body filler (Figure 2). Smooth the body filler to the level of the panel face.

5. Allow the body filler to cure for one hour at room temperature.

6. Sand (or grind as necessary) the hardened body filler. Paint the repair with paint corresponding to the color of the surrounding surface.

END OF TASK

Face/Skin Damage - Fiberglass Reinforced Plastic (FRP) Material

WARNING

FRP materials contain minute particles of glass and plastic resin. Wear appropriate eye and respiratory protection during cutting, grinding, and sanding operations as dust particles may cause eye and respiratory irritation. Failure to comply may result in serious injury to personnel.

Avoid unnecessary contact with skin. Chemicals in the resins and catalysts may cause discomfort if contact is made with the skin. Read all instructions carefully and observe good safety practices. Smoking is prohibited while working with resins and solvents.

CAUTION

Repairs should be made only to clean, dry surfaces. Repairs should be made at temperatures above 50 °F (10 °C). Lower temperatures prevent effective curing. Failure to comply may result in damage to the equipment.

NOTE

For repair of minor interior damage, filler-paste may be used.

Determine Extent of Repair

FRP material is used in the door assembly and the interior surfaces of the walls and roof. Before beginning a repair, identify the type of damage so that appropriate procedures may be used. Following are the three levels of damage:

Structural Damage (Figure 3). This is the most extensive level of damage consisting of damage to both surfaces (inner and outer) of the panel. This level of damage should not be repaired by untrained personnel. Contact the manufacturer to arrange for repair of this type of damage.

Surface Damage (Figure 3). This level of damage includes minor gouges in the panel core. Follow repair procedure Steps 1-4.

Cosmetic Repair (Figure 3). Minor surface scratches. Follow repair procedure steps 1-4.

Figure 3. Levels of Damage.

WARNING

Do not use a plastic container for mixing body filler and hardener. Heat generated by mixed materials may melt the container and cause burns. Mix the body filler and hardener in a well-ventilated area. The vapor produced is toxic. Avoid breathing vapors and avoid skin contact with the mixture. If the mixture contacts the skin, flush area with warm water and soap. Failure to comply may cause serious injury or death to personnel.

Isopropyl alcohol is toxic and flammable. Do not consume internally and avoid inhaling vapors. Good, general ventilation is normally adequate. Avoid all sources of ignition. Failure to comply may result in serious injury to personnel or death.

CAUTION

Do not pour repair chemicals or pastes into sinks, toilets, or garbage containers. Material could set and clog drains or cause fire in containers having flammable contents, oily rags, etc. Failure to comply may cause damage to equipment.

1. Roughen the damaged panel surface with a disc sander to a radius of approximately four inches (10 cm) around the damaged area.

2. Fill all gouges and other depressions in the panel with body filler to the level of the panel surface. Allow the body filler to harden at room temperature and sand it smooth. If the filler shrinks when setting, repeat the application to raise the level of the filled area to the level of the panel surface.

3. Paint the repair with paint corresponding to the color of the surrounding surface.

4. Clean all tools, brushes, etc., with isopropyl alcohol. Also, clean up work area and dispose of any resin containing curing agent after it has set-up or hardened (see warning concerning isopropyl alcohol).

END OF TASK

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
DOOR PANEL
REMOVE AND INSTALL

INITIAL SETUP

Tools and Special Tools
Tool Kit, Organizational Maintenance
(WP 0066, Table 2, Item 4)

Materials/Parts
Seal, Nonmetallic (WP 0051, Item 16)
Door Panel (WP 0051, Item 22)
Adhesive (WP 0068, Item 2)
Sealant (WP 0068, Item 21)

Personnel Required
2 persons

References
Insulated Container Panel Repairs
(WP 0025)

Equipment Conditions
None

GENERAL

Repairs to the IC door may include:

- Panel repairs like those described in container side and roof panels
- Door Seal replacement
- Door hardware replacement

Panel repairs should follow the same procedures outlined for other IC panel repairs in WP 0025. This WP outlines procedures for replacing the seal and door lock hardware.

EXCLUDED PROCEDURES

The following repair procedures are not authorized for field implementation:

- Hinge replacement
- Replacement of any component riveted to the door or IC assembly.

These procedures should be completed only by factory-trained personnel in an approved facility.

REMOVE

Door Seal

1. Remove the old seal (Figure 1) by peeling it from the door inside and outside surfaces.

NOTE

The seal is glued only to the inside and outside surfaces and not to the edges of the door.

2. To assist in separating the seal from the door surface, insert a knife or other flat tool between the seal and the door (Figure 1). Take care to avoid scratching or otherwise damaging the door surface.

3. Remove all remnants of the old seal and adhesive by scraping or sanding the door surfaces. Take care not to gouge or otherwise damage the painted surface or the inside door skin.

4. Wipe down the door edge to remove all particles and dust.

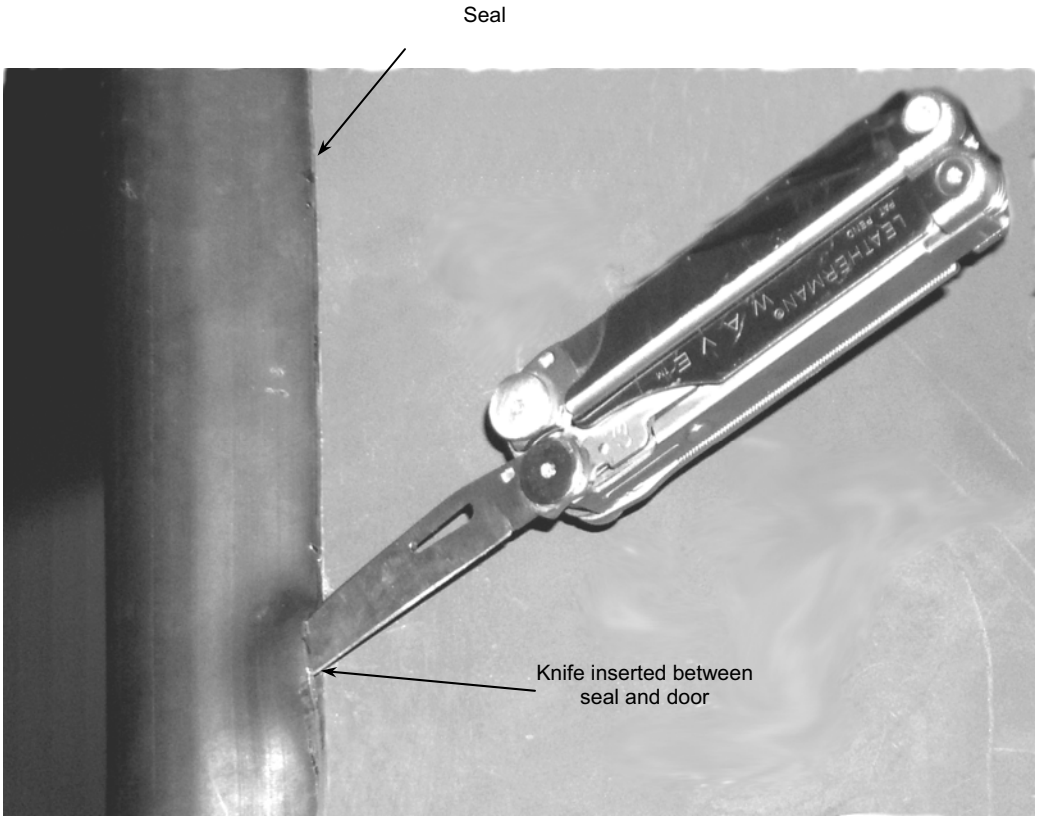


Figure 1. Removal of Door Seal.

INSTALL

Door Seal

1. Fit the new seal to the door perimeter and adjust its position so that the sides lie flat on the inner and outer door surfaces.

2. Carefully separate the seal side from the inside surface of the door and insert the application end of the adhesive tube.

3. Apply a bead of adhesive around the perimeter of the inside surface of the door so that the adhesive will stick to the seal and the door surface.

4. Press the seal against the door and adjust it so that it lies flat on the door surface.

5. Wipe off any excess adhesive that shows outside the seal.

6. Close the door and ensure the latch is fully seated. Allow the glue joint to set for about 30 minutes.

7. Carefully separate the seal side from the outside surface of the door and insert the application end of the adhesive tube.

8. Apply a bead of adhesive around the perimeter of the outside surface of the door so that the adhesive will stick to the seal and the door surface.

9. Press the seal against the door and adjust it so that it lies flat on the door surface.

10. Allow the adhesive to set for 24 hours.

END OF TASK

REMOVE

Door Handle

1. Open the door to disengage the main door handle (Figure 2) from the door handle unit (Figure 2).

2. Remove three screws from the plunger mounting plate (Figure 2) on the inside surface of the door. Remove the plunger (Figure 2) and plate from the door and set aside.

3. Score around the perimeter of the main door handle to loosen the old sealant.

4. Remove the two screws furthest from the edge of the door on the main door handle assembly. Remove the ring spacer (metal ring) (Figure 2) from the inside surface and set aside.

5. Remove the remaining two screws from the main door handle assembly while supporting that assembly. Remove the main door handle assembly and set it aside.

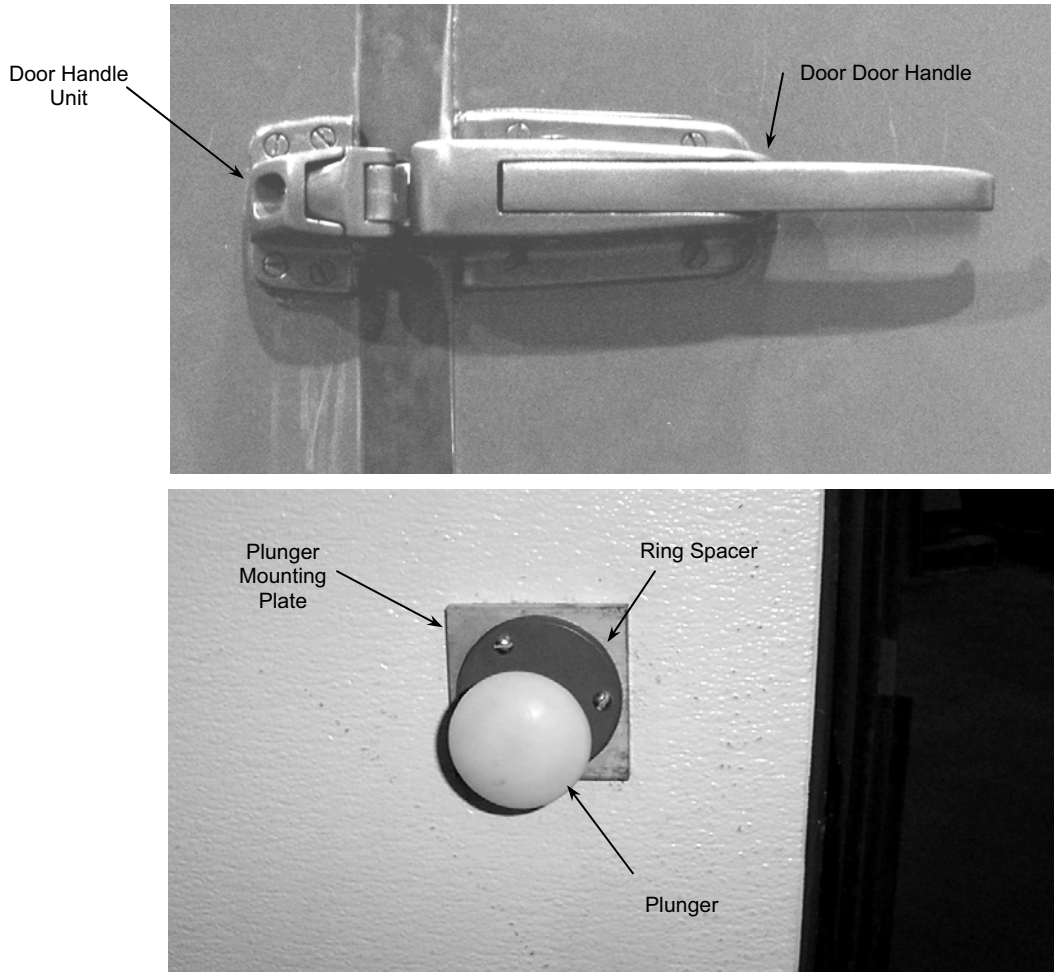


Figure 2. Main Door Handle Assembly.

INSTALL

Door Handle

1. Remove all remnants of sealant and adhesive by scraping or sanding the door surfaces.

2. Support the exterior main door handle assembly (Figure 2) such that the screw holes align with the four mounting holes in the door.

3. Thread the two short screws into the two holes closest to the door edge. Leave screws loose.

4. Support the ring spacer (Figure 2) on the inside surface of the door and align the screw holes in the door with the threaded holes in the ring.

5. Insert the longer screws into the remaining two holes in the main door handle assembly (Figure 2). Thread the screws into the threaded holes in the ring spacer (Figure 2).

6. Insert the plunger handle into the hole on the inside surface of the door and support the inside (plunger) assembly in position on the inside door surface.

7. Align the three holes in the plunger mounting plate (Figure 2) with the small threaded holes in the ring spacer (Figure 2). Thread the three screws from the inside assembly into the holes in the ring spacer.

8. Tighten all screws until they are snug. Do not over tighten.

8. Verify proper operation of door handle.

END OF TASK

REMOVE

Door Handle Unit Assembly

1. Drive out the outside door handle unit assembly handle retaining roll pin.

2. Remove the setscrew on the inside assembly handle.

3. Remove the retaining nut and washer from the door handle unit assembly, and slide the interior lock handle off the shaft at the same time and set aside.

4. Remove the four mounting screws from the exterior lock mounting plate. Slide the exterior lock assembly out of the IC wall and set aside.

INSTALL

Door Handle Unit Assembly

1. Hold the exterior door handle unit assembly against the IC outer skin such that the lock axle passes through the IC wall and the four screw holes on the door handle unit assembly mounting plate.

2. Align with the holes in the container skin.

3. Thread the four mounting screws through the mounting plate into the IC skin.

4. Thread the retaining nut onto the door handle unit assembly axle and slide the interior lock handle to tighten until the handle rotates with a little resistance.

5. Align the holes and drive the roll pin in.

6. Install the setscrew.

7. Verify the proper operation of the door handle unit assembly.

END OF TASK

REMOVE

Door Panel

WARNING

Door Panel is heavy. Use appropriate lifting techniques. Failure to use proper lifting techniques may result in serious injury to personnel.

CAUTION

Failure to use proper lifting techniques may result in damage to the door panel.

1. Remove the nuts from each hinge pin and retain.
2. Partially open and support the door.
3. Remove the hinge pins.
4. Remove door panel and retain washers in each hinge. Note washer location in the hinge.

INSTALL

Door Panel

1. Slide door panel in place.
2. Install washers.
3. Install hinge pins.
4. Install hinge pin nuts, do not over tighten. If you over tighten the door will not move freely.

END OF TASK

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
DOOR HANDLE UNIT
REMOVE/INSTALL

INITIAL SETUP

Tools and Special Tools
Tool Kit, Organizational Maintenance (WP 0066, Table 2, Item 4)

Materials/Parts
Handle Unit, Door (WP 0051, Item 7)

Personnel Required
1 person

References
None

Equipment Conditions
No required condition

REMOVE

1. With a knife, scribe around the perimeter of the door handle unit (Figure 1) to cut the sealant. Be careful to avoid cutting or gouging the container skin.
2. Remove the four mounting screws (Figure 1) from the door handle unit exterior (Figure 1).

NOTE

If needed, gently tap the keeper to loosen it from the container surface.

3. Remove the door handle unit assembly from the IC.

INSTALL

1. Remove any residual sealant from the container surface with a knife.

CAUTION

Take care to avoid damaging the paint or IC skin. Failure to comply may result in damage to equipment.

2. Hold the door handle unit in position on the container surface and align the four holes in the door handle unit with the threaded inserts in the IC.
3. Thread the four screws through the door handle unit and into the threaded inserts. Tighten the screws securely.
4. Close the container door. If the door is loose, move the latch closer to the container surface.
5. Loosen the two screws on the latch (one toward the door and one on the other side of the door handle unit) (Figure 1).
6. Slide the latch to the desired position and tighten the mounting screws (Figure 1).

7. Repeat Steps 4-6 to readjust the latch as necessary (Figure 1).

8. Caulk the perimeter of the latch with sealant and tighten the screws securely.

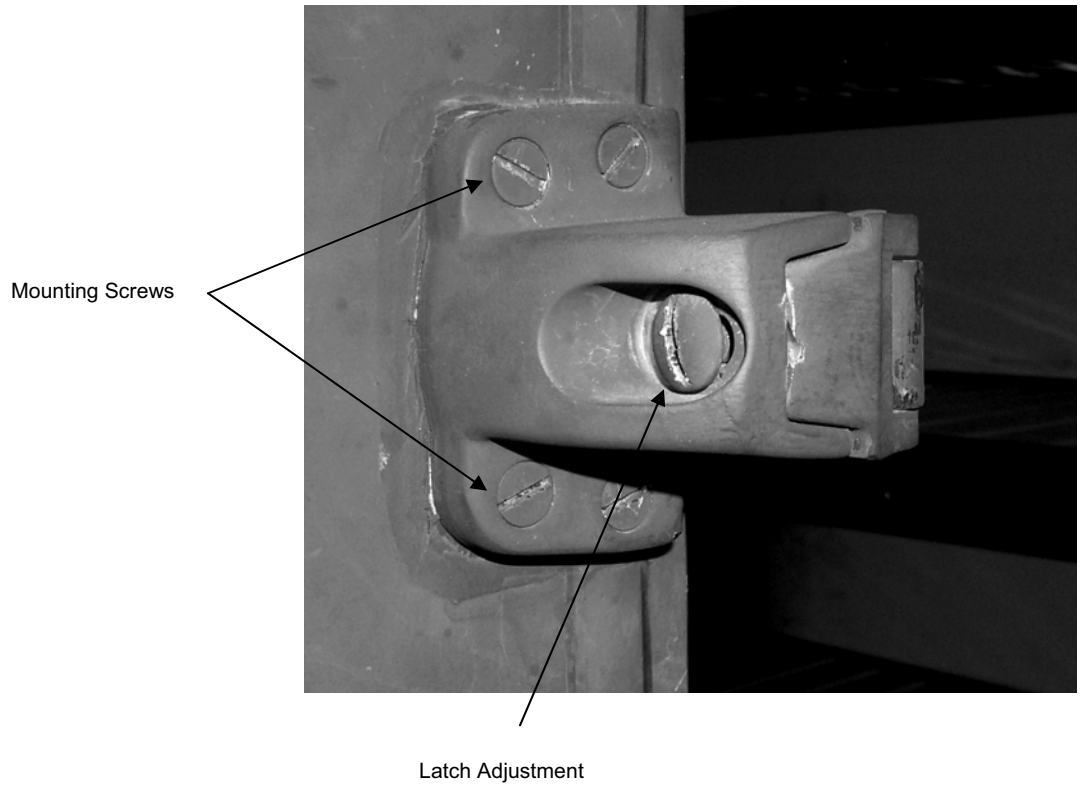


Figure 1. Door Handle Unit.

END OF TASK

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
REFRIGERATION UNIT
TEST

INITIAL SETUP

Tools and Special Tools
Tool Kit, Refrigeration Service
(WP 0066, Table 2, Item 5)
Multimeter (WP 0066, Table 2, Item 2)

Materials/Parts
None

Personnel Required
HVAC Technician (MOS 52C, AFSC 3E1x1) (1)

References
None

Equipment Conditions
ADR-300 set up and connected to a power source procedures (WP 0005)

POTENTIAL OPERATING PROBLEMS

Use the following information to troubleshoot your unit. If the desired container temperature cannot be obtained, any of the following may be indicated:

Excessive Heat Load

An excessive heat load on the system will be caused by too many, or excessively long door openings. Excessive heat loads will also be caused by a loose door, damaged body panels, warm loads, and poor insulation.

Dirt On Coils

Dirt on the condenser or evaporator coils acts as an insulator, reducing the capacity of the unit.

Shortage of Refrigerant

Shortage of refrigerant reduces the capacity of the unit. Find and remedy the cause of the shortage and recharge the system. DO NOT operate the unit if there is an indication of low charge. DO NOT operate below 30 ºF (-1 °C) box temperature if the refrigerant level is low as indicated in the liquid line sight glass.

Faulty Expansion Valve

High superheat settings will starve the evaporator causing low suction pressure. Low superheat settings will flood the coil causing high suction pressure. The superheat setting should be adjusted **ONLY** by a trained refrigeration service technician. The superheat setting is 6 °F (4.4 °C) at 0 °F (-18 °C) box temperature.

Excessive Oil

Too much compressor oil in the system may result in lower than normal suction pressure as well as lowered capacity.

Moisture in the System

Symptom: Expansion valve freeze-up will not allow refrigerant circulation. Usually this can be checked by warming the expansion valve with either a hand or hot towels to see if the valve opens. Evacuate the system. Install a new refrigerant filler-drier.

Expansion Valve Loses its Charge

If the expansion valve loses its charge, the valve will close causing the system to go into a vacuum. Replace the valve.

Air in the System

Air is not condensable. Its presence in the system increases head pressure. When the compressor is stopped, air will gather at the high point of the high side. Evacuate the system.

Temperature of the Liquid Line

During normal operation, the liquid line will be slightly warmer than the surrounding air. An extremely hot line indicates either a shortage of refrigerant or a plugged condenser coil. A cold line indicates a restriction, and some flashing may take place in the liquid line sight glass.

Restricted or Wet Refrigerant Filler-Drier (Dehydrator)

If the outlet line of the refrigerant filler-drier is colder than the inlet line; the refrigerant filler-drier is either saturated with moisture or is dirty and must be replaced.

Dirt in the Expansion Valve Screen

This is indicated by abnormally low suction pressure. Perform a low side pump down. Remove the screen and clean the system, replace the refrigerant filler-drier, pressurize and check for leaks, and evacuate the low side. Return the unit to normal operation.

Ice on the Evaporator Coil

Run the unit through a manual defrost cycle to remove the ice.

Air Flow

Do not load product directly in front of the evaporator air return or discharge. Ensure that the condenser air inlet and discharge areas are clear of obstruction. Ensure that the fans (evaporator and condenser) are correctly positioned in their respective openings and operating to achieve maximum airflow.

Compressor Life

The following conditions will shorten the life of a compressor:

- Operating a contaminated system
- Clogged expansion valve screen
- Defective high pressure or low pressure switches
- Insufficient oil charge
- Wrong oil or mixed oil
- Insufficient refrigerant charge
- Non-condensables in the system
- Dirty coils

REFRIGERATION SYSTEM OPERATING PROBLEMS

Operating problems may result from a faulty refrigeration system component or a problem in the control system. Use Table 1 to diagnose and repair problems in the refrigeration system. Troubleshooting procedures for the ADR-300 control system are presented in the next section.

Table 1. Refrigeration System Operating Problems.

Condition	Possible Cause	Remedy
Compressor does not run	Improperly wired	Check wiring against diagram.
	Low line voltage	Check line voltage-determine location of voltage drop
	Defective control circuit	Check and replace relay if defective. If not, check control circuit
	Open circuit in motor winding	Check motor and continuity between windings and check for grounded windings. If open, replace compressor
	Compressor piston stuck	Replace compressor.
	Shortage of refrigerant	Check for leaks, repair as required, recharge
	Overload relay open	Reset and check current (A) draw
Unit short-cycles	Shortage of refrigerant (low pressure cutout)	Repair leak and recharge
	Evaporator fan rotating in wrong direction	Change DC motor polarity
	Restricted expansion valve (low pressure cutout)	Clean or replace expansion valve
	Refrigerant overcharge (high pressure cutout)	Recover excess refrigerant
	Cycling on high pressure cutout	Check air flow and fan, clean coil, and check switches
	Clogged condenser coil	Clean coil
Unit operates long or continuously	Shortage of refrigerant	Repair leak and recharge
	Discharge compressor valve leaking	Replace compressor
	Dirty condenser	Clean condenser
	Air in system	Recover refrigerant, locate and repair leak, test for leaks, and recharge
	Poor compressor performance	Replace compressor
	Plugged expansion valve	Clean or replace
	Iced or plugged coil	Defrost or clean. Check coil for frost and cleanliness. Check expansion valve. Check for proper charge
	Defective or damaged container insulation	Repair container
	Door open	Keep door closed
	Load too warm	Precool hot product
	Door seals leaking	Repair/replace

Table 2. Refrigeration System Operating Problems.

Condition	Possible Cause	Remedy
IC temperature too high	Refrigerant shortage	Recover refrigerant, locate and repair leak, test for leaks, recharge
	Setpoint set too high	Change set point
	Expansion valve or strainer plugged	Clean or replace
	Restricted lines	Replace line
	Hot load	Precool hot product
	Iced evaporation	Initiate manual defrost and check air flow
Head pressure too high	Refrigerant overcharge	Recover excess refrigerant
	Air in system	Recover refrigerant, locate and repair leak, test for leaks, recharge
	Dirty condenser	Clean condenser
	Restricted condenser	Clean condenser
	Condenser fan not running	Check fan motor. Check fan control circuit.
	Condenser fan rotating backwards	Change fan motor polarity
Head pressure too low	Refrigerant shortage	Recover refrigerant, locate and repair leak, test for leaks, recharge
	Bad compressor suction or discharge valves (internal)	Replace compressor
Noisy compressor	Insufficient compressor oil	Add oil to proper level
	Mounting bolts loose	Tighten
	Refrigerant flooding back	Adjust refrigerant charge. Check expansion valve for proper superheat
Frosted suction line	Frosted evaporator coil	Initiate manual defrost
	Evaporator airflow restricted	Clean evaporator coil and inspect evaporator fan.
Frosted liquid line	Restricted refrigerant filler-drier or receiver tank	Replace restricted part
Condenser coils cool when unit is cooling	Refrigerant undercharge	Check refrigerant charge. If low, recover refrigerant, locate and repair leak, test for leaks, recharge
	Compressor inefficient	Replace compressor
Unit in vacuum. Frost on expansion valve only	Ice plugging expansion valve orifice	Apply hot wet cloth to expansion valve. Moisture indicated by increase in suction pressure. Replace refrigerant filler-drier.
	Plugged expansion valve strainer	Clean strainer or replace expansion valve
	Sensor bulb lost charge	Replace expansion valve
Low refrigerant	System is undercharged	Adjust charge.
	Leak in system	Repair leak.

DIAGNOSING REFRIGERATION SYSTEM PROBLEMS

Test Procedure

1. Operate the unit in cooling mode.
2. Maintain discharge pressure at 290 to 310 psig. Control condenser air flow to maintain discharge pressure.
3. Maintain box temperature near 0 °F (-18 °C).
4. Record suction pressure. Normal reading is 12 - 20 psig.
5. Check the suction line at the accumulator.

NOTE

A cool, moist line is normal. A frosted or abnormally dry line and out-of-range pressures indicate refrigeration problems.

Select Appropriate Suction Line Condition and Suction Pressure Category Below

1. LOW SUCTION PRESSURE-FROSTED SUCTION LINE

   Basic Problem: Insufficient Evaporator Air Flow

   a. Evaporator coil iced.
   b. Evaporator airflow restricted (dirty coil, plugged air inlets, etc.).
   c. Evaporator fan motor failure, or rotating backwards.

2. LOW SUCTION PRESSURE-UNFROSTED SUCTION LINE

   Basic Problem: Insufficient Refrigerant Flow

   a. Low refrigerant charge,
   b. Expansion valve screen restricted (if equipped).
   c. Restricted drier.
   d. Leaking expansion valve bulb/tube.
   e. Restricted suction pressure regulator.
   f. Frozen expansion valve.

3. HIGH SUCTION PRESSURE-FROSTED SUCTION LINE

   Basic Problem: Flooded evaporator

   a. Poor expansion valve bulb contact with suction line.

4. HIGH SUCTION PRESSURE-UNFROSTED SUCTION LINE

   Basic Problem: High Pressure Internal Vapor Leak to Low Side

   a. Compressor valve plates leak.

   b. Compressor piston or cylinder wear.

   c. Hot gas defrost valve leaks to low side.

Conditions That Can Cause High Discharge Pressure

- High ambient temperature.
- Air or non-condensables in system.
- Restricted airflow across condenser. Dirty or bent condenser fins etc.
- A restriction in the high-pressure line between the compressor and the receiver tank.
- Overcharge of refrigerant.
- Incorrect refrigerant.
- Condenser fan failure.

Conditions That Can Cause Low Discharge Pressure

- Low box temperature.
- Cold ambient temperature.
- Low refrigerant charge.
- Low-side restriction.
- Worn compressor.
- Incorrect refrigerant.

Diagnosing Using the Liquid Line

The liquid line should be slightly warmer than the surrounding air. A low refrigerant charge may cause the liquid line to be warmer than normal. A liquid line restriction will cause the line to become cold after the point of restriction.

CONTROLLER DIAGNOSTICS

Before starting troubleshooting, verify that the control box 12/24 V selector is placed in the 24V position and check the ground circuit through Pin 9 (Wire W).

NOTE

This procedure covers only control box circuit card assembly functions and does not address all possible electrical contingencies.

Circuit Card Assembly (PC board) Diagnostic Hints

The balance of this WP is devoted to diagnostic routines designed to help the technician quickly identify the cause of a problem and repair it using the correct tools, information and procedures. It is important that the required procedures be followed exactly. Failure to do so may result in an incomplete repair.

Important Diagnostic Consideration

When performing diagnostics, consider if the refrigeration system rather than the controls may cause the problem. Diagnostic procedures for refrigeration system problems were outlined previously in this WP. Please refer to Figure 1 and Table 2 for controller diagnostics.

NOTE

Ensure Pin 9 (W) is properly grounded.

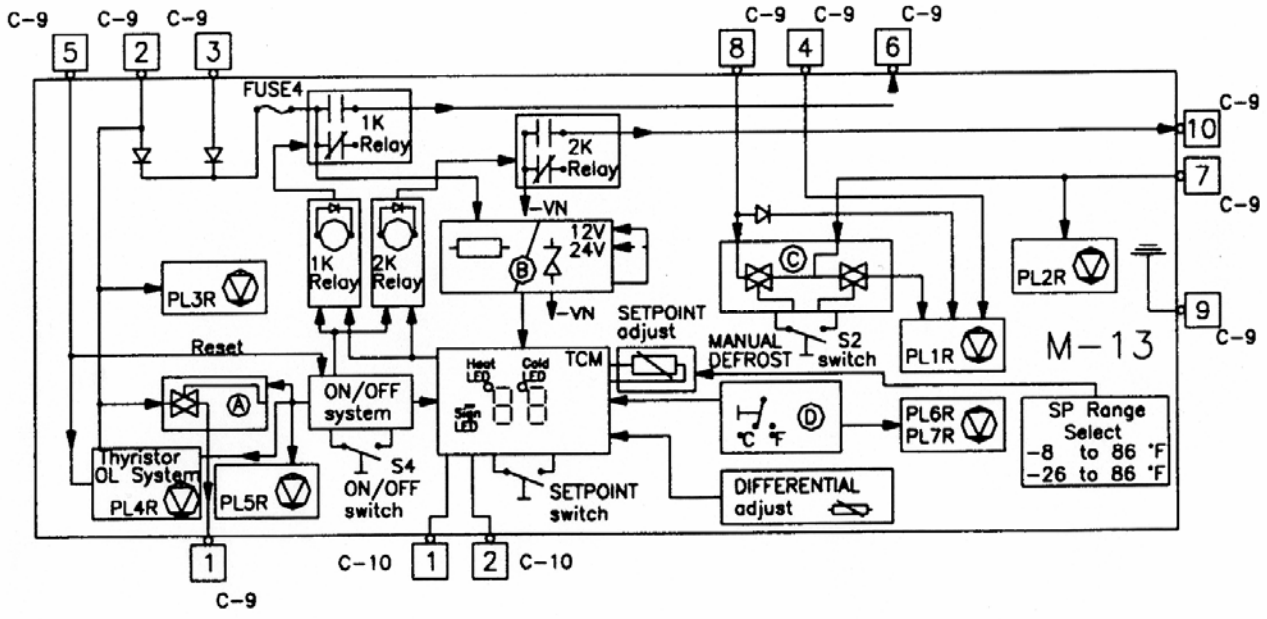


Figure 1. Circuit Card Assembly.

Table 3. Controller Diagnostics.

Symptom	Corrective Action
Blank display when the ON/OFF switch is pressed	Check for 24 VDC between Pin 2 (positive) and Pin 9 (ground)
	Check Fuses 4 and 4/1
	Replace unit controller
Unit is not cooling when the IC interior temperature is higher than the setpoint temperature.	Check for 24 VDC between Pin 6 and Pin 9 (W)
	Check continuity on Fuse 4/1
	If no voltage, replace unit controller.
Unit operation LED is off when the unit is cooling	Check for 24 VDC on Pin 7
	Note the malfunctioning LED and continue to operate the unit
Defrost cycle is not initiated when the manual defrost switch is pressed	The unit must be indexed to cool (compressor on)
	Evaporator coil temperature must be lower than 36 ºF at the push switch, and the push switch must be closed.
	Press the manual defrost switch and check for 24 VDC on Pin 8.
	Replace unit controller
Defrost LED is off when the unit is in the defrost mode	Check for 24 VDC between Pin 4 and Pin 2.
	Note the malfunctioning LED and continue to operate unit.
Temperature displayed is out of range	Check that the unit controller 12/24 V selector is in the 24 V position
	Check the thermostat sensor
Unit is not working	Run an ice bath test on the sensor. See sensor calibration data in WP 0002.
	Check overload protector LED. If on, check overload protector.
	Check fuses 4 and 4/1
	Check for 24 VDC between Pin 2 and Pin 9
	Replace unit controller
Unit is stopped by the AC overload relay, but the AC overload LED is off	Check for 24 VDC between Pin 5 and Pin 9
	Note the malfunctioning LED and continue to operate unit.
Compressor does not run	Check for 24 VDC between Pin 6 and Pin 9
	Replace controller if no power.
Unit is indexed to heat but does not run	Check for 24VDC on Pin 10 and Pin 2
	If no power, replace controller.

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE

REFRIGERATOR COMPONENT (INCLUDING ELECTRICAL)

TEST AND ADJUST

INITIAL SETUP

Tools and Special Tools
Tool Kit, Refrigeration Service
(WP 0066, Table 2, Item 5)
Multimeter (WP 0066, Table 2, Item 2)

Materials/Parts
Refrigerant, R404A (WP 0068, Item 16)

Personnel Required
HVAC Technician (MOS 52C, AFSC 3E1x1) (1)

References
Equipment Description and Data (WP 0002)
Refrigeration Unit Service (WP 0031)
Compressor Remove/Install (WP 0034)
Electrical Enclosure Contactors
Remove/ Install (WP 0036)
Push Switch Removal and
Replacement (WP 0044)

Equipment Conditions
ADR-300 set up and connected to a power source supply (WP 0005)

TEST

NOTE

The following procedures involve servicing the refrigeration system. Some of these service procedures are regulated by Federal, and in some cases, by State and Local laws. All regulated refrigeration service procedures must be performed by an EPA certified technician, using approved equipment and complying with all Federal, State, and Local laws.

Checking the Refrigerant Charge

If the unit has an insufficient charge of refrigerant, the evaporator will be “starved” and the box temperature will rise even though the unit is operating. Also, an insufficient charge does not circulate enough oil to properly lubricate the compressor. Determine the charge by inspecting the liquid line sight glass with one of the following conditions established:

NOTE

The following conditions must be established each time the refrigerant level is checked or if refrigerant needs to be added for any reason.

Testing the Refrigerant Charge with an Empty IC

1. Install a manifold gauge assembly set.
2. Run the unit in cool until the thermometer reads 32 °F (0 °C).
3. The discharge or head pressure gauge should be at least 270 psi (1862 kPa).
4. If the pressure is below this, it can be raised by covering a portion of the condenser air inlet with a piece of cardboard.

5. Under these conditions, the sight glass must indicate a full charge.
6. If refrigerant is low, evacuate the system and charge the unit by weight.

END OF TASK

Compressor Functionality

This procedure will test the compressor piston reed condition, piston to cylinder clearance, piston and cylinder condition, and compressor performance capability.

Preparations Before the Test

1. Ambient temperature must be above 60 °F (15 °C).
2. Install a calibrated manifold gauge assembly.
3. Check the refrigerant charge (correct if needed).
4. Check for low side restrictions - pressures must be normal or high on the suction side.
5. Perform low side pump down IAW WP 0031. If the system does not pass the low side pump down procedure, repair before continuing.

Compressor Functionality

1. If the IC temperature is below 36°F, initiate manual defrost cycle until defrost is terminated.
   a. Press the manual defrost key.
   b. The defrost cycle will continue until the evaporator coil temperature reaches 48 ºF (9 ºC).
2. After manual defrost cycle is completed, go to Step 4.
3. If the temperature is above 36 °F, go to Step 4.
4. Operate the unit in cool and cover the condenser to build discharge pressure to 300 to 350 psig.
5. Close the compressor suction valve (keep condenser covered).
6. When low side pumps down to a 10-inch vacuum, read discharge pressure. It should read 200 psig or more.
7. If pressure is below 200 psig, replace the compressor.
8. Open the compressor suction valve.
9. Uncover the condenser.

Compressor Oil Condition

1. Check the compressor oil condition by observing its color during each major service or system repair.

2. Test a sample of compressor oil for acid contamination. If acid is present, the system must be flushed and replenished with clean oil.

NOTE

The acid test kit must be compatible with Polyol Ester (POE) compressor oil and R-404A.

- Clear Oil—Appearance of good oil.
- Black Oil—Carbonization from operating a unit with air and moisture in the system.
- Brown Oil—Results from moisture in the system causing an acid condition and subsequent copper plating.
- Gray/Metallic—Caused by wear metal from pistons, bearings, cylinders, etc.

END OF TASK

ADJUST

Expansion Valve Test / Superheat Adjustment

NOTE

Before beginning this procedure, perform the compressor functionality test and check the refrigerant charge level. Correct any deficiencies observed.

1. Install an accurate compound gauge at the compressor suction access valve.

2. Install an accurate thermometer sensor beside the expansion valve feeler bulb. Secure and insulate the thermal resistor.

3. Defrost the evaporator and stabilize the thermal resistor (installed beside the TEV bulb) temperature near 35 °F (2 ºC).

4. Cover the condenser inlet as needed to maintain a discharge pressure of 320 – 340 psi.

5. Read the suction pressure and box temperature simultaneously. Record your readings every two minutes for at least ten minutes (five or more readings). Calculate the average value of each reading. Convert the suction line pressure to temperature using the chart presented in WP 0002.

6. Calculate the superheat value according to the formula:

   - Superheat = Suction Line Temperature – Suction Temperature**.**

   - Superheat should be between 10 °F and 12 °F at a box temperature of 35 °F.

Suction Pressure Regulator

1. Install the manifold gauge assembly.
2. Run unit until the IC temperature is 36 °F or lower.
3. Initiate manual defrost cycle.
4. Monitor suction pressures.
5. If suction pressure rises above 65 psig, while in defrost, adjust the suction pressure regulator until the suction pressure is maintained at 65 psig during defrost.
6. Remove the manifold gauge assembly.
7. Perform system operation check in WP 0010.

HPCO

The HPCO is located on the discharge line near the compressor. If the discharge pressure rises above 450±10 psi (3103 kPa), the switch opens, de-energizing the power relay coil and the RU will shut down.

To test:

1. To determine if the HPCO contacts are closed, disconnect each HPCO weather tight connector. Check for continuity through the HPCO switch.
2. To determine if the HPCO is functioning properly, do the following:
   a. Connect a manifold gauge assembly to suction and discharge service valves.
   b. Set the thermostat well below the IC temperature so that the unit will be in cool.

NOTE

Unit will restart when the discharge pressure drops below 450 psi ± 10 psi.

   c. Raise the discharge pressure of the compressor by first blocking the condenser coil airflow. When the discharge pressure reaches 450 psi (3,103 kpa), the HPCO switch opens, de-energizing the power relay coil and the RU will shut down.
3. If HPCO does not function as rated, replace HPCO.

LPCO

The low pressure cutout switch is located on the suction line in the condenser section behind the receiver tank. If the suction pressure drops between 5 to 11 inHg of vacuum (-17 to -37 kpa), it opens the contactor to stop the compressor. To check the low pressure cutout:

1. Install a manifold gauge assembly.

2. Close the receiver tank outlet valve and run the unit in cool.

3. When the suction pressure drops between 5 to 11 in. Hg of vacuum (-17 to -37 kpa), the LPCO will open and the RU will stop.

4. If not, replace the LPCO.

Refrigerant Filler-Drier (Dehydrator)

Indications that the refrigerant filler-drier may need to be replaced are:

1. Moisture indicated in the sight glass – The sight glass indicates the presence of moisture. If moisture is present, replace the refrigerant filler-drier and sight glass.

NOTE

Once the sight glass has indicated moisture it must be replaced. Just replacing the dehydrator will not change the indications of moisture.

2. Condensation or frost on the refrigeration lines downstream from the refrigerant filler-drier – Frost, condensation, or a temperature differential across the refrigerant filler-drier indicates a restriction.

3. When the system has been open for an extended period of time during service.

4. During system cleanup.

NOTE

Refrigerant must be recovered or a low side pump down must first be performed before the dehydrator can be replaced.

Receiver

Indications that the receiver needs to be replaced are:

1. Condensation or frost on the refrigeration lines downstream from the receiver – A partially plugged (obstructed) receiver will act as an expansion device and cause an accumulation of frost or condensation downstream from the obstruction.

2. The compressor pumps down the low side to vacuum – If the refrigeration system gauges indicate that the low side is in vacuum, confirm that the receiver tank outlet valve is back seated. Install a high pressure manifold gauge assembly on the receiver tank outlet valve, gauge the receiver tank outlet valve, and confirm that the gauge is reading within 10 lbs of the compressor discharge pressure, if not the obstruction may be in the receiver. Recover the refrigerant and remove the receiver as outlined in WP 0031. Blow nitrogen through the receiver to confirm that the obstruction is in that component. If the obstruction is confirmed, replace the receiver.

Main Power Supply

1. Check input power cable voltage (Table 1).

2. Check phase-to-phase voltage for 208/230 VAC, phase-to-ground and phase-to-neutral for 120 VAC.

3. Check voltage phase-to-phase on the line side of the compressor contactor.

Table 1. Input Power Cable Voltage.

L1 to L2	208/230 VAC
L1 to L3	208/230 VAC
L2 to L3	208/230 VAC
L1 to ground and phase to neutral	120 VAC
L2 to ground and phase to neutral	120 VAC
L3 to ground and phase to neutral	120 VAC

WARNING

Disconnect all input power. High voltage is present and electric shock may occur. Failure to comply may result in serious injury or death to personnel.

4. If no voltage or incorrect voltage is present at terminals L1, L2 or L3, conduct a resistance check from the connector body to the individual terminal L1, L2, L3 and connector body pins.

5. Replace defective conductor and/or connector body if required.

Heater Circuit

1. Adjust the set point to 10 ºF above box temperature to initiate the heat cycle.

2. If heater elements in evaporator are not hot, check heater overload. If tripped, reset. If it trips again, check for shorted heater or circuit.

3. If overload is not tripped, check for voltage on load side of overload.

4. If no voltage, check heater contactor control circuit.

NOTE

Controller grounds contactor coil through OR circuit.

5. If heater contactor coil has no power, check fuse 4.
6. If contactor has power but no ground, check “OR” circuit and controller.
7. If contactor has power and ground, replace contactor.
8. If load side of overload has power, disconnect power to RU.
9. Disconnect wires to heater elements and ohm elements separately. Replace as necessary.
10. If heater elements are correct, replace conductor from the overload to the heater elements.

Defrost Drain Heater

1. With RU running, check for 24 VDC at the drain heater weather tight connectors.
2. If voltage is present, replace heater resistive wires.
3. If voltage is not present, check fuse 3.
4. If fuse 3 is faulty, replace the fuse.
5. If fuse 3 is good, check connector C3 terminal 4 to ground for 24 VDC.
6. If power is present, replace conductor to heater connector.
7. If power is not present, replace the Power Relay.

Contactors

1. Index the unit to run in either the heat or a cool mode depending on the contactors being checked.
2. Verify the coil voltage (24 VDC).
3. Using a multimeter, determine if 208/230 VAC is present on the line side of contactors between L1,
4. L2, L3 (heat contactors will be L2 and L3).
5. If proper voltage is not present in Step 3, then troubleshoot loss of incoming power.
6. Check for 208/230 VAC is present on the load side of contactors between terminals 2, 4, and 6 (heat contactors 2 and 4).
7. If proper voltage is not present, then replace contactors.

Evaporator Fan Cycling (non-cycling EF selector)

The evaporator fan selector is located in the RU circuit card assembly. Jumper 1 and 2 indexes the evaporator fan to cycle with the compressor. Jumpers 2 and 3 index the evaporator fan to run continuously. The RU is factory set with jumper 1 and 2 connected.

Transformer

1. 700VA, 110/220 VAC primary and 24 VAC secondary transformer.
2. Secondary 24 VAC is obtained by adjoining two 12 VAC secondary windings in series.
3. 24 VAC secondary is wired directly to the full bridge rectifier circuitry and is converted to 24 VDC to power all 24 VDC components.
4. Primary power is fed with 208/230 VAC from L1 and L3.
5. 110 VAC is supplied to the light fixture from terminals H and H1 on the primary side of the transformer.

Troubleshooting the Power Supply at the Transformer

1. 208/230 VAC
   a. Using a multimeter, check for 208/230 VAC between H and H2.
   b. If no voltage is present, check fuse 5 located in the RU control box.
   c. If the fuse is good, check interconnecting wires.
2. 24 VAC
   a. Using a multimeter, ensure primary voltage is present at the transformer (208/230 VAC).
   b. Check for 24 VAC across terminals X1 and X4.
   c. If 24 VAC is not present and the jumper wire is properly connected between terminals X2 and X3, then replace the transformer.
3. Troubleshooting 24 VDC Circuitry
   a. Using a multimeter, check for 24 VDC on plug C2 located in the RU control box at terminals 2 or 5 (positive) to unit ground.
   b. If no voltage is present, then locate the full bridge rectifier in the transformer/rectifier assembly box and check for 24 VDC between terminals 2R and CH.
   c. If 24 VDC is present, then troubleshoot wire between rectifier and C2 terminal.
   d. If 24 VDC is not present, replace the full bridge rectifier (refer to WP 0060).

Heatsink (Radiator)

The heat sink is located on top of the transformer cover. Use heat sink compound between heat sink and the bridge rectifier whenever installing/reinstalling a heat sink (refer to WP 0060).

Relays

Power relay

24 VDC supplies control voltage to the compressor contactor, circulating (condenser) fan motor, evaporator fan relay coil, electromagnetic relay (defrost solenoid) and condensate heaters.

Compressor Overload – Adjust

The compressor overload relay should be set at different levels for operation on 50 and 60 Hz power. The settings are:

Supply Power Frequency (Hz)	Overload Setting (A)
50	12.5
60	15

To adjust the setting:

1. Disconnect power form the ADR-300.
2. Remove the control box cover.
3. Using a screw driver, adjust the overload relay (Figure 1) setting by rotating the adjuster screw (Figure 1) until the appropriate overload level lines up with the arrow on the relay face.
4. Replace the control box cover.
5. Reconnect power to the unit.

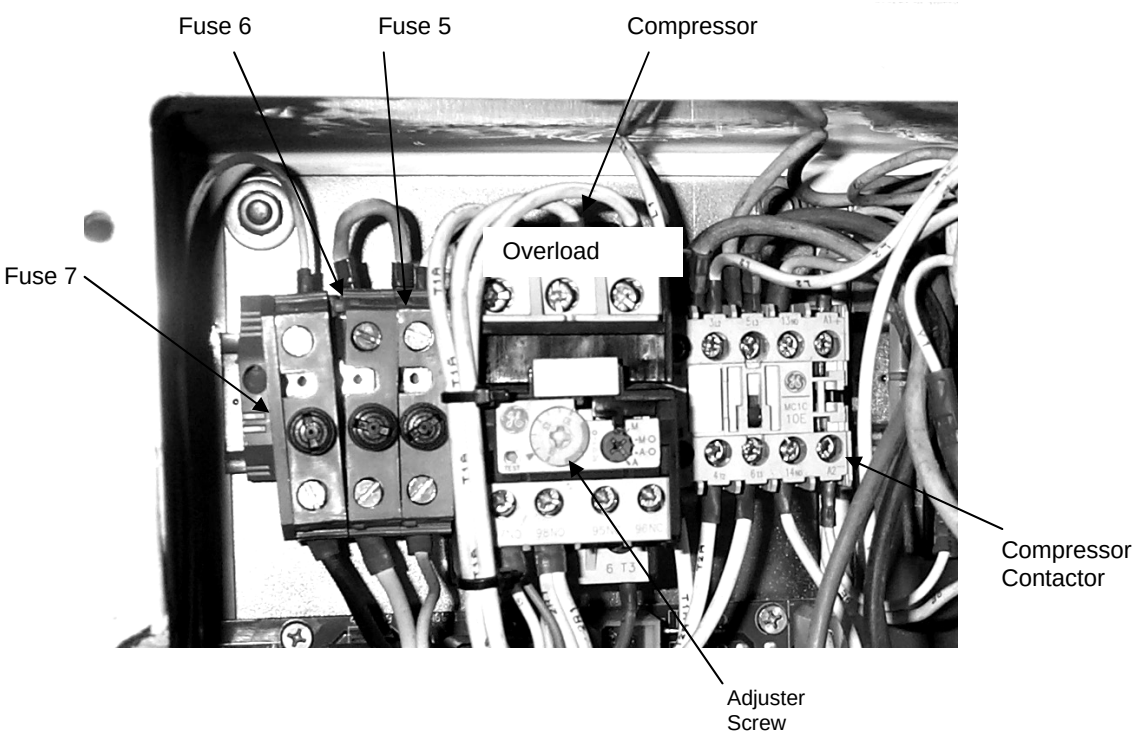


Figure 1. Compressor Overload--Adjust.

Defrost relay

1. 24 VDC control voltage is supplied by the defrost timer during normal operation or by the RU controller when manual defrost has been initiated.

2. The ground for the defrost relay coil is provided through the push switch.

Evaporator Fan Relay

1. 24 VDC is continuously supplied to the relay coil by terminals 85 and 30 (both positive).

2. The negative side of the coil is switched by the electronic circuitry on the RU control board.

3. This circuitry is energized/de-energized by the compressor and defrost run circuitry.

Defrost Maintenance

The Defrost timer has two DIP switches (Figure 2) and a red, round selector (Figure 2). The timer is set from factory at 4 hours. To change the setting of the Defrost timer, proceed as follows:

1. Choose a range from the timing table by setting the A and B selectors to the desired position. For example, setting the A and B selectors to the positions A: □ and B: □ selects a range of time between 64 and 640 minutes (1 to 10 hours).

2. Set the red selector to multiply the minimum value of the chosen range by the value at which it is pointing. If the selector points to position 2: 2 · 64 = 128 minutes (approximately 2 hours). If the selector points to position 4: 4 · 64 = 256 minutes (approximately 4 hours).

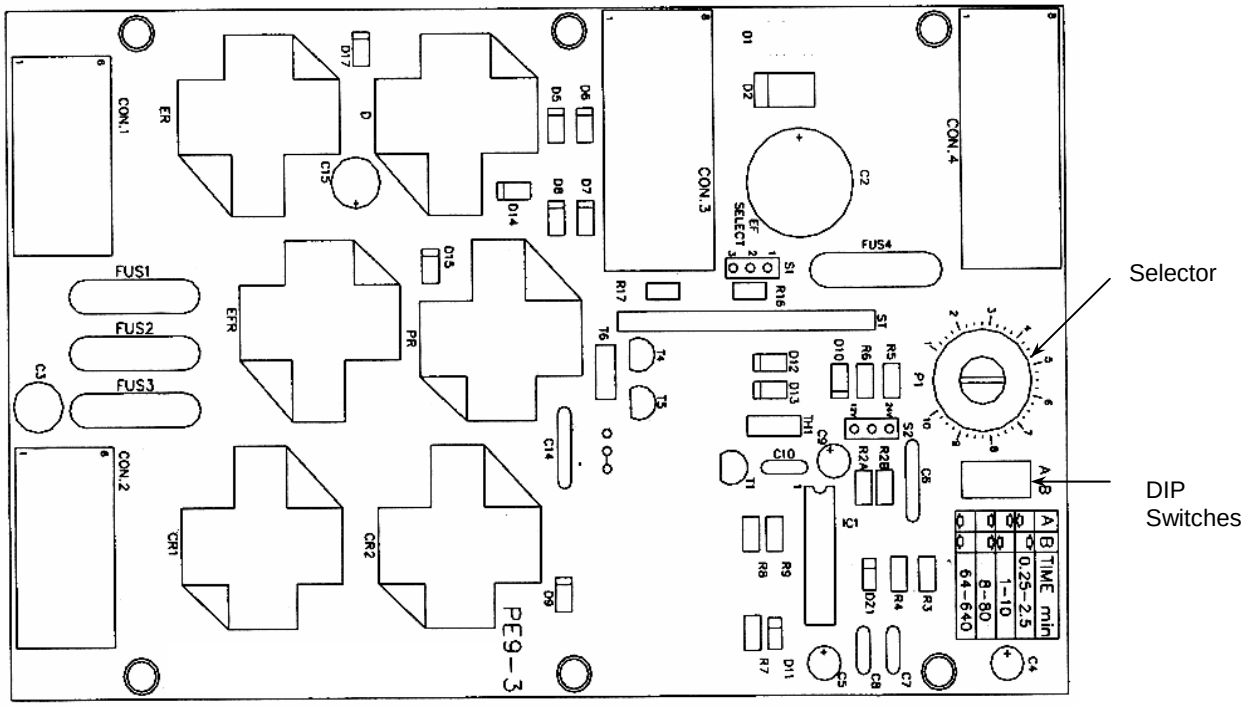


Figure 2. Change of Defrost Timer.

The following table can be found on the printed circuit board:

Timing Table	A	B	Scale
0.25 – 2.5	□	□	0.25 to 2.5 minutes
1 – 10	□	□	1 to 10 minutes
8 – 80	□	□	8 to 80 minutes
64 – 640	□	□	1 to 10 hours

Testing the Defrost System

To test the defrost system, run the unit on Cool until the evaporator coil temperature is below 36 ± 5.4 ºF and press the manual defrost switch. If the unit doesn't switch to defrost cycle, proceed to step 2 (below).

1. Check the Evaporator Temperature.

NOTE

The evaporator coil temperature must be below 36 ± 5.4 ºF or the unit will not defrost. Use a test thermometer to check the evaporator temperature at push switch.

2. Check the push switch.
    a. Place a jumper wire between both switch terminals.
    b. Press the Manual Defrost switch.
    c. If the unit shifts to Defrost, the push switch is defective.
3. If the unit does not switch to Defrost, check for an open circuit in the 12 wire. If the 12 wire is not opened, proceed to step 4.
4. Check voltage on PCB terminal of GR (grey) wire. If voltage is present, proceed to step 5.
5. Check for open circuit on wire GR that goes to the am-13 controller (Pin 8 C-9). If the wire GR is not open, proceed to step 6.
6. Keeping the Manual Defrost switch pressed, check voltage on Pin 8 C-9. If voltage is present on Pin 8 C-9, and the rest of the above mentioned points are correct, replace the Circuit Card Assembly.

Defrost Timer Test

The defrost timer initiates the defrost cycle.

1. Verify that the evaporator coil temperature is lower than 36 ± 5.4 ºF, otherwise jump push switch.
2. Set the Defrost Timer to approximately 1 minute: A: □, B: □, red round selector position 4.
3. After approximately 1 minute, the defrost must be initiated: Defrost LED, Defrost Relay, and Electromagnetic Relay (Solenoid Valve) must be activated.

Push Switch

If the ADR-300 does not switch to the defrost cycle, the problem may be defective push switch or a fault on the circuit card assembly. Test the push switch as follows:

NOTE

The push switch closes at 36 ºF± 5.4 and opens at 48 ºF±5.4.

1. Confirm that the evaporator coil temperature is below 36±5.4 ºF.
2. Unplug push switch terminal connector located near the TEV sensing bulb.
3. Place a jumper wire between the two terminals of the push switch harness.
4. Press the manual defrost button. If the ADR-300 shifts to defrost, the push switch is defective.
5. If the ADR-300 does not shift to defrost, proceed to the next section to isolate other defrost problems.

Other Defrost Problems

If the ADR-300 does not switch to the defrost cycle, first test the push switch as outlined above. If the ADR-300 does not shift to defrost:

NOTE

Terminal 1 is positive and Terminal 2 is negative.

1. Open the RU electrical enclosure and check 24 VDC between connector C3 (Terminal 1) and connector C3 (Terminal 2).
2. If 24 VDC is detected, then replace the defrost relay (D).
3. If no voltage is detected, skip to step 5.
4. Initiate a manual defrost if the RU still fails to defrost then replace the circuit card assembly in the RU control box.
5. If 24 VDC is not detected in step 2, check for voltage between C3 (Terminal 1) and the main unit ground.
6. If 24 VDC is detected, check for continuity between C3 (terminal 2) to the main unit to ground.
7. If no continuity is detected, locate and repair the wire coming/going from the RU control box to the push switch contactor.
8. If no continuity is detected then remove the jumper wire installed in step 3 of the Push Switch section above and check between C3 (terminal 2) and wire 12 located in the push switch harness.
9. If continuity is not found, then replace the wire.

10. If continuity is found, check for continuity between wire CHB located in the push switch harness and ground.

11. If no continuity is found, replace the wire.

12. Check for 24 VDC at pin 8 (grey wire) located at the RU controller and pin 9 (white wire – ground).13. If 24 VDC is detected between pin 8 and pin 9, disconnect the main power from the RU, remove the 10-pin connector to isolate the circuit and check continuity between pin 8 and C3 pin 1 on the RU control board.

13. If no continuity is detected, then make sure the pin connector is firmly seated in both harness connectors.

14. If continuity is still not detected, replace wire harness (refer to WP 0059).

Unit Controller

1. Remove the controller from the unit controller enclosure.

2. Ensure that all wires are firmly seated in the terminal connector.

3. Recheck controller operation. If unit controller is not functioning:

   a. Disconnect the 10-pin wire harness pin connector from the back of the unit controller.

   b. Verify 24 VDC is present between terminals 2 (positive) and 9 (ground).

   c. If proper power is not present, troubleshoot 24 VDC power supply.

   d. With an ohmmeter, check continuity between terminal 9 (w) and unit ground.

   e. Pull the controller fuse 4/1 out and check continuity across the fuse.

   f. If no continuity, replace the fuse. If continuity, replace the unit controller.

END OF TASK

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
SUCTION PRESSURE REGULATOR VALVE
REMOVE/INSTALL

INITIAL SETUP

Tools and Special Tools
Tool Kit, Refrigeration Service
(WP 0066, Table 2, Item 5)

Materials/Parts
Rags (WP 0068, Item 15)
Solder

Personnel Required
HVAC Technician (MOS 52C, AFSC 3E1x1) (1)

References
PMCS (WP 0010)
Refrigerator Component Test and Adjust
(WP 0029)

Equipment Conditions
ADR-300 set up and connected to a power source procedures (WP 0005).

REMOVE

1. Install the manifold gauge assembly.
2. Perform the low-side pump down until suction pressure gauge reads 0 psi.
    a. Jump out the low pressure cut out (LPCO) located on the suction line behind the receiver tank with a jumper wire.
    b. Run the unit in the cooling mode for 10 or more minutes.
    c. Front seat the receiver tank outlet valve.
    d. Pump down until the suction pressure gauge reads 0 psi.
3. Remove the condenser support bracket (Figure 1).
4. Remove the suction line insulation.
5. Remove the LPCO switch and the schrader valve core.
6. Unsolder the suction pressure regulator (Figure 1).

INSTALL

CAUTION

Do not contaminate the system when preparing refrigeration tubing for soldering. Contamination may cause restrictions in the refrigeration system. Failure to comply may result in damage to the equipment.

1. Prepare refrigerant lines for soldering.
2. Prepare the suction pressure regulator by wrapping it with a wet cloth.
3. Solder the joints and allow them to cool.
4. Reinstall the schrader valve core and the LPCO switch.
5. Leak check, evacuate, and return the system to normal operation.
   a. Evacuate the low side to a vacuum of 15 inHg.
   b. Stop the unit and observe the low side pressure for at least two minutes. The pressure should remain below 10-in. Hg of vacuum. If the pressure rises:
      (1) To zero and stops, this indicates a low side refrigerant leak to the atmosphere.
      (2) To above zero, either refrigerant is boiling out of the oil or there is an internal high side to low side refrigerant leak.
   c. Remove the jumper wire from the LPCO.
   d. Reconnect the weather-tight connector.
   e. Back-seat (open) the receiver tank outlet valve.

NOTE

Suction pressure regulator is not preset.

6. Adjust the regulator IAW WP 0029.
7. Remove the manifold gauge assembly.
8. Perform system operation check IAW WP 0010, Table 1, Item No. 7.
9. Re-insulate the suction line.
10. Reinstall the condenser support bracket.

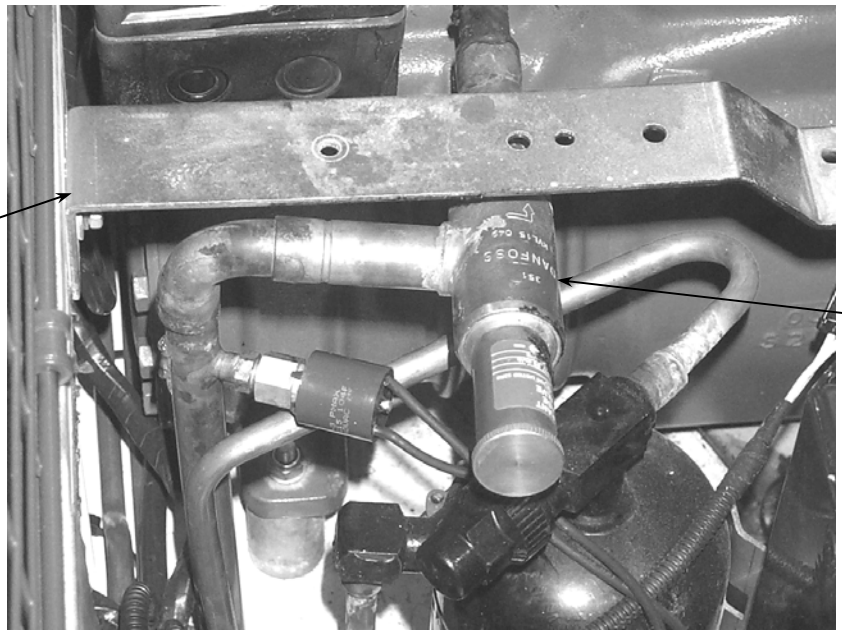


Figure 1. Suction Pressure Regulator Valve.

END OF TASK

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
REFRIGERATION UNIT
SERVICE

INITIAL SETUP

Tools and Special Tools
Tool Kit, Refrigeration Service
(WP 0066 00, Table 2, Item 5)

Materials/Parts
Refrigerant, R404A (WP 0068, Item 16)

Personnel Required
HVAC Technician (MOS 52C, AFSC 3E1x1) (2)

References
None

Equipment Conditions
ADR-300 set up and connected to a power source procedures (WP 0005)

NOTE

The following procedures involve servicing the refrigeration system. Some of these service procedures are regulated by Federal, and in some cases, by State and Local laws. All regulated refrigeration service procedures must be performed by an EPA certified technician, using approved equipment and complying with all Federal, State and Local laws.

Recovering the Refrigerant

The liquid line sight glass allows the operator to determine the amount of charge under the established operating conditions. The most satisfactory method of recovering the refrigerant is:

1. Connect a manifold gauge assembly to the compressor.
2. Connect the center hose of the manifold gauge assembly to the recovery machine.
3. Recover the refrigerant.

END OF TASK

Evacuating the Refrigeration System

1. Connect the manifold gauge assembly.
2. Start the vacuum pump and evacuate the system to 500 microns.

NOTE

If the system will not come down to 500 microns, there may be a leak or moisture in the system or in the evacuation and charging equipment hoses. Find and repair the leak.

3. Close the valve at the vacuum pump, stop the vacuum pump, and observe the reading on the vacuum gauge for 5 minutes. The pressure should not exceed 2000 microns.

4. If pressure does exceed 2000 microns, repeat Step 2. This time, if the pressure exceeds 2000 microns within 5 minutes, look for a leak in the system or in the evacuation and changing equipment hoses. Find and repair the leak.

5. Open the vacuum valve at the vacuum pump, start the vacuum pup, and evacuate the system to 500 microns.

6. Whe the system reaches 500 microns, close the manifold gauges and turn off the vacuum pump. The system is now ready to charge.

END OF TASK

Charging An Evacuated Unit By Weight

1. Install a manifold gauge assembly. Keep the unit turned off.

2. If the system is not evacuated, recover the refrigerant and evacuate the system as described above.

3. Place the refrigerant bottle on a scale and attach the manifold's service line.

4. Record total refrigerant and container weight.

NOTE

The ADR-300 will require 4.62 lb of refrigerant.

5. Purge air from the service line as required. Open the bottle to withdraw liquid.

6. Gauge the compressor discharge service valve.

7. Open the high side hand valve all the way on the manifold gauge assembly and begin charging the unit.

8. Watch the scale and close the high side valve at the refrigerant bottle when 4.62 lb have been added. If refrigerant flow stops before charging is complete, add liquid to complete charging as described below.

END OF TASK

Add Liquid in the Low Side to Complete Charging

1. Back seat the discharge service valve (DSV) and open it to the service port. Gauge the suction service valve (SSV).

2. Set the bottle to withdraw liquid. Close the manifold high pressure hand valve.

3. Run the unit in cool and read the suction pressure.

4. Open the manifold low pressure hand valve to allow liquid to enter and suction pressure to increase approximately 25 psi.

5. When the correct weight has been added, close the hand valve at the refrigerant bottle.

6. Remove the manifold gauge assembly.

7. Use good caps and seals and secure the service port caps and valve stem covers before returning the unit to service.

END OF TASK

Low-Side Pump Down

Use the low-side pump down procedure to test for internal high- to low-side leaks and to perform low-side service with refrigerant loss. This procedure should be used in conjunction with the following service procedures:

- Add or remove refrigerant oil,
- Clean expansion valve screen,
- Change expansion valve, or
- Replace the dryer.

1. Install a manifold gauge assembly.

2. Jump out the low pressure weather tight cut out (LPCO) connector located on the suction line behind the receiver tank with a jumper wire.

3. Run the unit in the cooling mode for 10 or more minutes.

4. Front seat the receiver tank outlet valve.

5. Pump down the low side to a vacuum of 15 inches.

6. Stop the unit and observe the low side pressure for at least two minutes. The pressure should remain below 10 in Hg of vacuum. If the pressure rises:

    a. To zero and stops, this indicates a low side refrigerant leak to the atmosphere.

    b. To above zero, either refrigerant is boiling out of the oil or there is an internal high side to low side refrigerant leak.

7. Remove the jumper wire.
8. Reconnect the weather-tight connector.
9. Back-seat (open) the receiver tank outlet valve.
10. Replace the condenser cover and perform PMCS procedures IAW WP 0010, Table 1, Item No. 7 and Item No. 8.

END OF TASK

System Compressor and Oil

Use these tests to check compressor oil level, oil condition, and oil pressure.

Check and Adjust Oil Level

1. If the temperature is below 36 °F, initiate manual defrost cycle until defrost is terminated.
   a. Press the manual defrost key.
   b. The defrost cycle will continue until the evaporator coil temperature reaches 48 ºF (9 ºC).
   c. After manual defrost cycle is completed, go to Step 3.
2. Compressor sight glass should be 1/4 to 3/4 full. If compressor sight glass is below 1/4 go to Step 13.
3. Remove excess oil by performing a pump down procedure.
4. Install a manifold gauge assembly.
5. Run the unit in cooling mode for 10 or more minutes.
6. Front seat the receiver tank outlet valve.
7. Pump down to 0 psig.
8. Isolate the compressor by closing the suction and discharge service valves.

WARNING

Be careful oil is hot and may be under pressure. Wear appropriate safety clothing. Failure to comply may result in serious injury or death to personnel.

9. Gently remove the compressor oil drain plug (Figure 1) until the remaining oil is ½ full.

Figure 1. Oil Drain Plug.

10. Reinstall the compressor oil drain plug.

NOTE

If all of the oil is removed or replaced, then evacuate the compressor before opening the service valves.

11. Open compressor suction and discharge service valves, and the receiver tank outlet valve.

12. Place unit in operation and in check oil level.

13. To add compressor oil, perform a compressor pump down. Adjust crankcase pressure slightly positive and remove the oil fill plug above the oil sight glass.

END OF TASK

Major Loss of Refrigerant

In case of a major loss of refrigerant, it must be assumed that some system oil is lost also. The oil level should be verified by the "Checking the Oil Level" method in this manual.

Oil contamination

- Color changed to a varnish color
- Presence of contaminants in the oil.

NOTE

Replace oil with new fresh oil taken from a sealed container only.

NOTE

Change the refrigerant filler-drier if the oil is contaminated.

When a System Becomes Contaminated

A severely contaminated system may be indicated by black oil in the compressor. If severe contamination occurs, it will be necessary to flush the complete system. If flushing is required, use industry approved materials.

In all cases when this occurs you must determine the extent of contamination. Do this by removing the refrigerant filler-drier and determine if the darker colored oil is present at that point of the system. If it is, flushing the system is recommended.

If the oil appears clean at the refrigerant filler-drier, install a new refrigerant filler-drier and replace the compressor with clean new oil. Refer to checking and draining the compressor oil section for details.

System Cleanup

1. Recover the refrigerant.
2. Remove the suction pressure regulator and install a temporary suction line cleanup filter in its place.
3. Change the compressor oil as described in this WP.
4. Change the expansion nozzle.
5. Change the refrigerant filler-drier IAW WP 0038.
6. Leak check, evacuate, and charge the system.
7. Run the unit for at least six hours.
8. Acid test the oil.
9. If the acid test fails, change the refrigerant filler-drier, and begin process starting from Step 3.
10. If the acid test passes, perform low-side pump down (as described previously in this WP).
11. Remove the suction line cleanup filter.

12. Reinstall the suction pressure regulator.

13. Leak check, evacuate, and open all valves.

14. Perform a system check.

END OF TASK

Evaporator Coil

WARNING

Disconnect main power source before beginning cleaning. Physical shock may occur. Failure to comply may result in serious injury to personnel.

CAUTION

Excessive pressure may damage fins. Do not use a pressure washer. Failure to comply may result in damage to equipment.

Clean the evaporator coil during scheduled maintenance inspection. Inspect the coil and fins for damage and repair if necessary.

For light dirt, use the following procedures:

1. Remove the evaporator grille.
2. Remove the two evaporator motors.
3. Blow out coil with compressed air in the direction opposite to normal air flow.
4. Replace both fan motors.
5. Reinstall the evaporator grille.

For heavier dirt, use the following procedures:

1. Remove the RU from the IC IAW WP 0023.
2. Remove the evaporator grille.
3. Remove the drain pan IAW WP 0045.
4. Remove the fan assembly.

5. Thoroughly wash with water (Do not use excessive pressure)
6. Reinstall fan assembly.
7. Reinstall drain pan IAW WP 0045.
8. Reinstall the evaporator grille.
9. Reinstall the RU on the IC IAW WP 0023.

END OF TASK

Condenser Coil

Clean the condenser coil during scheduled maintenance inspections. Inspect the coil and fins for damage and repair if necessary.

WARNING

Disconnect main power source before beginning cleaning. Physical shock may occur. Failure to comply may result in serious injury to personnel.

1. Remove the condenser top grille.
2. Remove the front condenser cover.
3. Remove the fan motor from the fan assembly IAW WP 0032.
4. Blow out the coil with compressed air in the direction opposite to normal air flow.
5. Reinstall the fan motor.
6. Reinstall the front condenser grille.
7. Reinstall the condenser top grille.

END OF TASK

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
CONDENSER FAN
REMOVE/INSTALL

INITIAL SETUP

Tools and Special Tools
Tool Kit, Refrigeration Service
(WP 0066, Table 2, Item 5)

Materials/Parts
None

Personnel Required
HVAC Technician (MOS 52C, AFSC 3E1x1) (1)

References
None

Equipment Conditions
ADR-300 or RU disconnected from all power supplies.

REMOVE

1. Remove the condenser top grille.
2. Disconnect the electrical power supply (Figure 1) to the fan at the weather tight connector. Cut the wire ties as necessary.
3. Remove the four bolts (Figure 1) that hold the condenser fan assembly (Figure 1) in the condenser enclosure. Retain the bolts.
4. Remove the fan from the condenser section.

INSTALL

1. Position the condenser fan assembly in the fan enclosure and align the mounting holes.
2. Reinstall the fan mounting bolts. Don't over tighten.
3. Reconnect the electrical power supply to the fan at the weather tight connector. Install the new wire ties.
4. Reconnect power to the RU and start the unit. Confirm that the direction of air flow through the evaporator is from outside, through the coil and then through the fan.
5. If this flow is reversed, stop the unit, disconnect power from the ADR-300 and reverse polarity on the fan power supply wires.

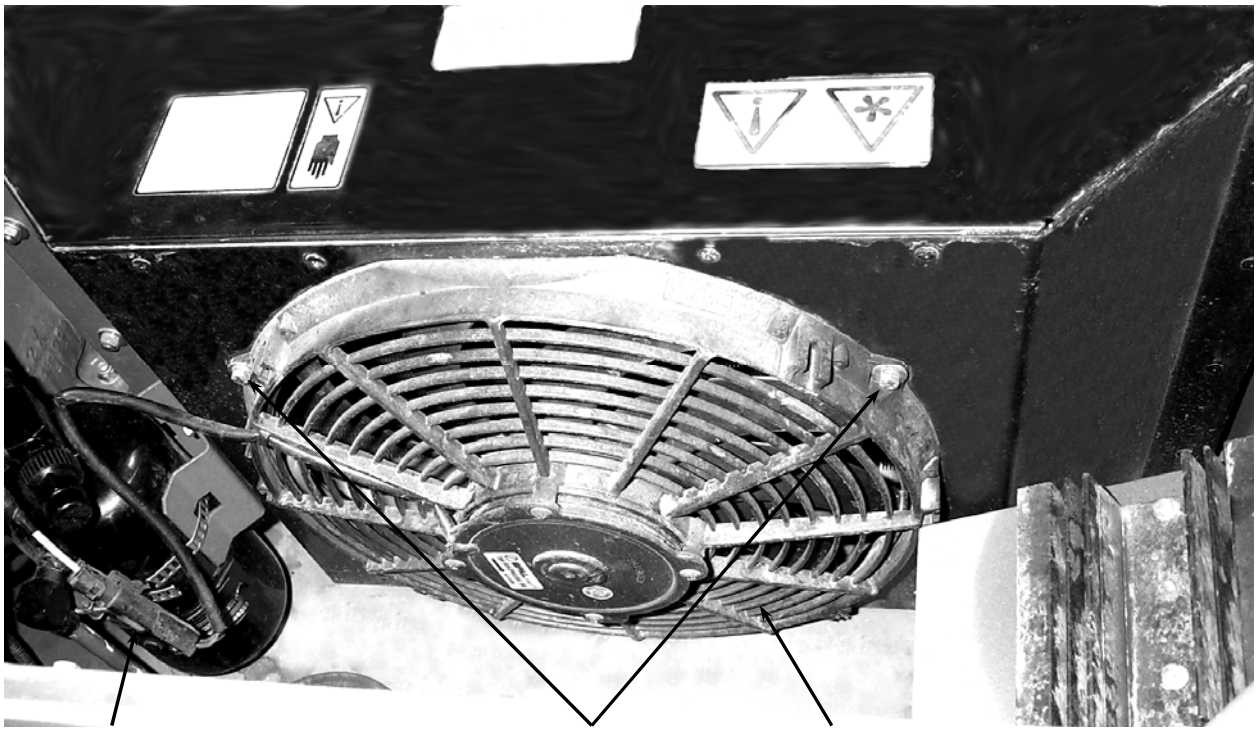


Figure 1. Condenser Fan.

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
TRANSFORMER
REMOVE/INSTALL

INITIAL SETUP

Tools and Special Tools
Tool Kit, Refrigeration Service
(WP 0066, Table 2, Item 5)

Materials/Parts
None

Personnel Required
HVAC Technician (MOS 52C, AFSC 3E1x1) (1)

References
None

Equipment Conditions
ADR-300 or RU disconnected from all power supplies.

REMOVE

1. Remove condenser top grill.

2. Remove the 2 bolts from the transformer cover (Figure 1).

Figure 1. Transformer Cover.

CAUTION

Polarity is critical. Ensure the correct identification of terminals before removal of the wires.

3. Tag and remove all wires (Figure 2) necessary to allow the removal of the transformer cover and transformer.

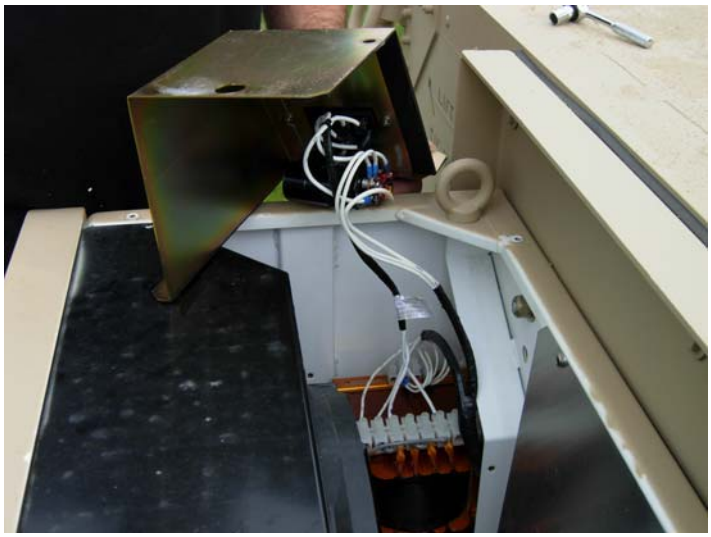


Figure 2. Transformer Cover Removed.

4. Remove the bottom panel cover.

5. Remove four nuts and washers (Figure 3) holding the transformer in place.

Figure 3. Below Transformer.

6. Observe the transformer orientation and carefully remove the transformer.
7. Remove and retain the transformer spacers (Figure 4).

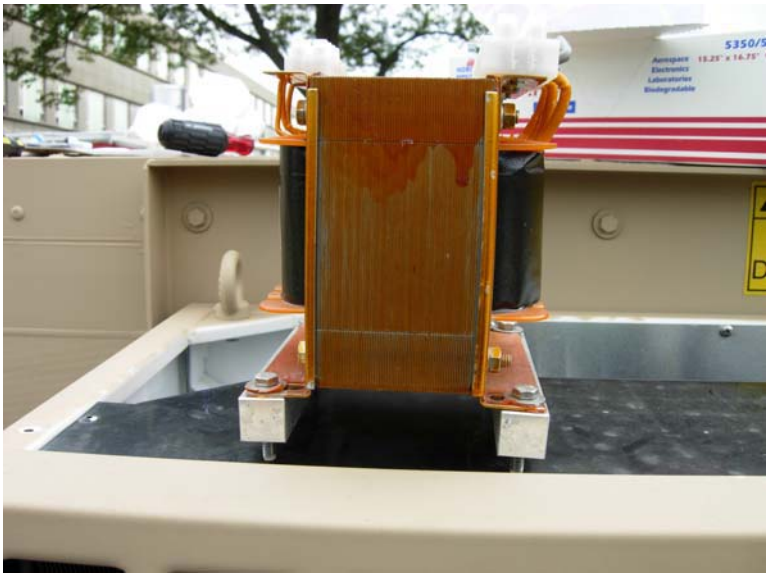


Figure 4. Transformer Spacers.

INSTALL

1. Install transformer spacers (Figure 4).
2. Carefully place transformer as originally positioned in RU enclosure.
3. Reinstall the 4 transformer nuts and washers (Figure 3).
4. Reconnect all wires (Figure 2) removed from the transformer and cover.
5. Reinstall transformer cover (Figure 1).
6. Perform operation check IAW WP 0005.
7. If fully functional, reinstall top grill and bottom panel cover.
8. If not fully functional refer to WP 0029-8.

END OF TASK

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
REFRIGERATION UNIT COMPRESSOR
REMOVE/INSTALL

INITIAL SETUP

Tools and Special Tools
Tool Kit, Refrigeration Service
(WP 0066, Table 2, Item 5)

Materials/Parts
Rags (WP 0068, Item 15)

Personnel Required
HVAC Technician (MOS 52C, AFSC 3E1x1) (2)

References
None

Equipment Conditions
ADR-300 shut down and disconnected from all power sources.

WARNING

Allow tubing to cool. Tubing is hot and can burn skin. Failure to do so may result in serious injury to personnel.

NOTE

The following procedures involve servicing the refrigeration system. Some of these service procedures are regulated by Federal, and in some cases, by State and Local laws. All regulated refrigeration service procedures must be performed by an EPA certified technician, using approved equipment and complying with all Federal, State, and Local laws.

It is generally good practice to replace the filter dehydrator whenever the high side is opened or when the low side is opened for an extended period of time.

Keep the compressor ports and open refrigerant lines covered to prevent contaminating the system components.

REMOVE

1. Remove the condenser top and front grilles and the bottom panel from the refrigeration unit.

2. Recover the refrigerant charge from the system.

3. Disconnect the discharge and suction hoses.

4. To remove the electrical box (Figure 1) on top of the compressor (Figure 1). Tag and disconnect all wires to the compressor and remove them from the box.

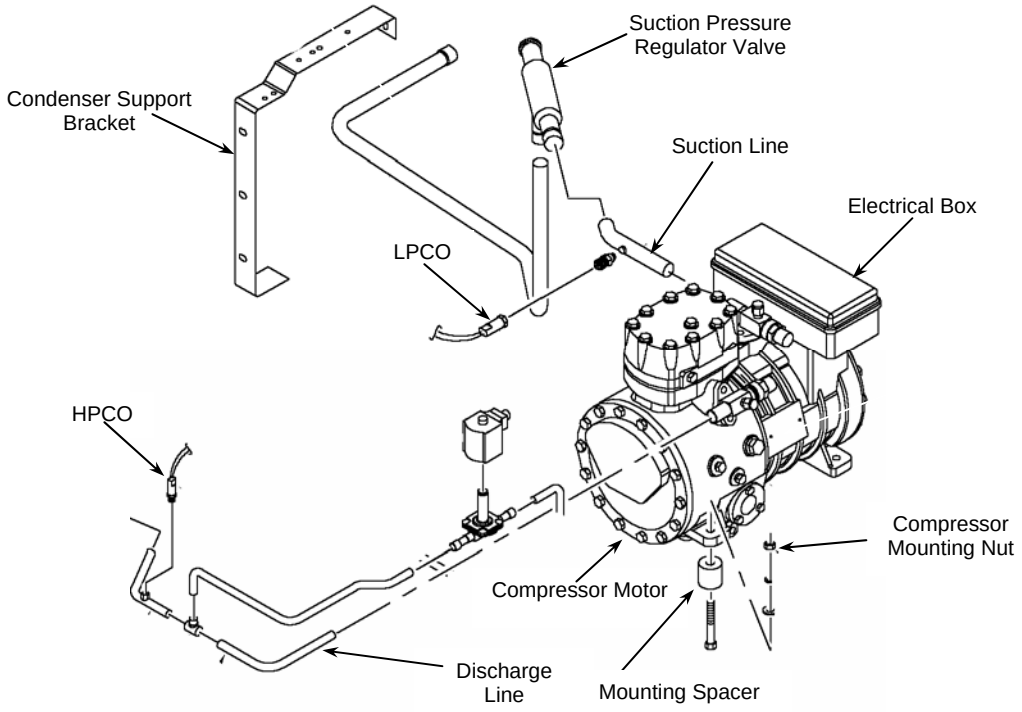


Figure 1. Condenser Section Components.

5. Remove the condenser support bracket (Figure 1).

6. Remove the suction line insulation (Figure 1).

7. Remove the LPCO switch (Figure 1).

   a. Locate the low pressure cut-out switch near the receiver on the suction line. Cut any wire ties restraining the switch wires.

   b. Disconnect the weather-tight connector on the LPCO.

CAUTION

Use a backup wrench on the low pressure switch and the schrader valve. Lines could break causing a leak. Failure to comply may result in damage to equipment.

c. Unscrew the switch and remove it from the schrader valve.

8. Remove the schrader core.

9. Wrap the suction pressure regulator (Figure 2) and suction service valve with a wet cloth.

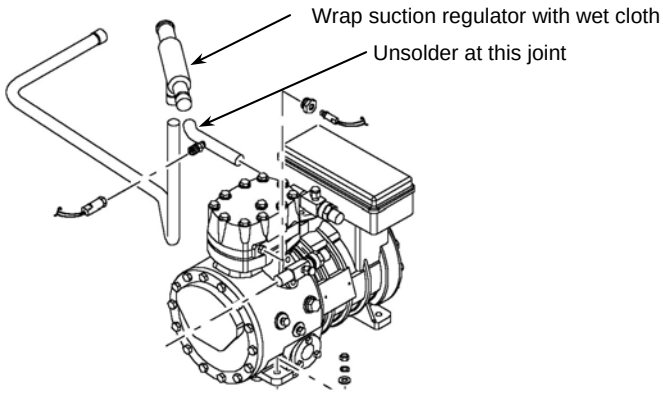


Figure 2. Suction Pressure Regulator--Unsoldering.

10. Unsolder the suction pressure regulator just to the left of the schrader valve (Figure 2).

11. Unbolt the suction line from the compressor.

12. Remove the HPCO switch (Figure 1).

13. Unbolt the discharge service valve.

14. Unsolder the high pressure line just prior to the condenser.

15. Gently bend the discharge lines (Figure 1) to clear the compressor.

16. Remove the four compressor mounting nuts (Figure 1) and mounting spacers (Figure 1).

17. Remove the compressor by lifting the unit straight up.

NOTE

Note the level of oil in the compressor. This amount of oil will be added to the replacement compressor.

18. Perform an acid test on the oil.

INSTALL

NOTE

Any compressor installed in this system must contain the proper amount of compressor oil (see the Specifications section). When installing a new compressor, add Polyol Ester (POE) oil to the compressor to equal the amount of oil in the compressor removed. Follow the system cleanup procedures to remove old oil from the system.

1. Place the compressor in position and install the four mounting nuts (Figure 1).
2. Wrap the suction pressure regulator and suction service valve with a wet cloth (Figure 2).

WARNING

Allow tubing to cool. Tubing is hot and can burn skin. Failure to comply may result in serious injury to personnel.

CAUTION

Do not install the components until the tubing has cooled. Failure to comply may result in damage to equipment.

3. Connect and solder the suction and discharge lines (Figure 2).
4. Remove the service valve gaskets. Clean the surfaces.
5. Install the new service valve gasket.
6. Reinstall the LPCO (Figure 1) schrader valve core.
7. Reinstall the LPCO (Figure 1) and HPCO (Figure 1).
8. Insulate the suction line (Figure 1).
9. Install the condenser support bracket (Figure 1).
10. Replace the refrigerant filler-drier IAW WP 0037.
11. Pressurize the system and check for leaks.

12. Insert the wires disconnected from the old compressor into the new compressor electrical box and connect them to the appropriate terminals. Reinstall the cover.

13. Evacuate the system and recharge.

14. Perform system operation check IAW WP 0010.

15. Reinstall condenser front and top grilles and bottom panels.

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
REFRIGERATION UNIT CONDENSER COIL, EVAPORATOR COIL AND COPPER TUBE REMOVE/INSTALL

INITIAL SETUP

Tools and Special Tools
Tool Kit, Refrigeration Service
(WP 0051, Table 2, Item 6)

Materials/Parts
Refrigerant, R404A (WP 0068, Item 16)
Compressor Oil (WP 0068, Item 6)
Copper tubing (WP 0058 and WP 0058)
as required

Personnel Required
HVAC Technician (MOS 52C, AFSC 3E1x1) (1)

References

Equipment Conditions
ADR or RU shut down and disconnected from power supply.

NOTE

The following procedures involve servicing the refrigeration system. Some of these service procedures are regulated by Federal, and in some cases, by State and Local laws. All regulated refrigeration service procedures must be performed by an EPA certified technician, using approved equipment and complying with all Federal, State, and Local laws.

It is good practice to replace the refrigerant filler-drier whenever the high side is opened or when the low side is opened for an extended period of time.

GENERAL

This procedure is limited to removal and replacement of tube sections identified in WP 0055 and WP 0056, as well as exposed tube sections at the ends of the evaporator and condenser coils.

WARNING

Evaporator and condenser coil fins are sharp and can severely cut hands and other exposed body parts on contact. Take care to avoid contacting coil fins. Failure to comply may result in serious injury to personnel.

CAUTION

Be careful to avoid bending or damaging evaporator and condenser coil fins. Damaged fins will reduce ADR-300 performance. Protect fins with a rigid cover while working on or near either coil. Failure to comply may result in damage to equipment.

REMOVE

1. Recover the refrigerant charge.
2. Remove the condenser or evaporator cover as appropriate.

CAUTION

Take care to protect surrounding components from heat during soldering and unsoldering.

3. Locate the tubing section to be replaced and the closest solder joints in both directions along the tube.
4. Unsolder both joints and remove the tube section.

INSTALL

CAUTION

Do not contaminate the system when preparing refrigeration tubing for soldering. Contamination may cause restrictions in the refrigeration system. Failure to comply may result in damage to the equipment.

1. Clean the mating surfaces of the tubes for soldering.
2. Assemble the tube components in the location in which they will be soldered.

3. Solder the connections taking care to protect nearby components from heat.
4. Perform a system cleanup IAW WP 0031.
5. Replace the refrigerant filler-drier (Figure 1).
6. Pressurize the system with dry nitrogen and test for leaks.
7. Evacuate the system and recharge IAW WP 0031.
8. Reinstall the cover.

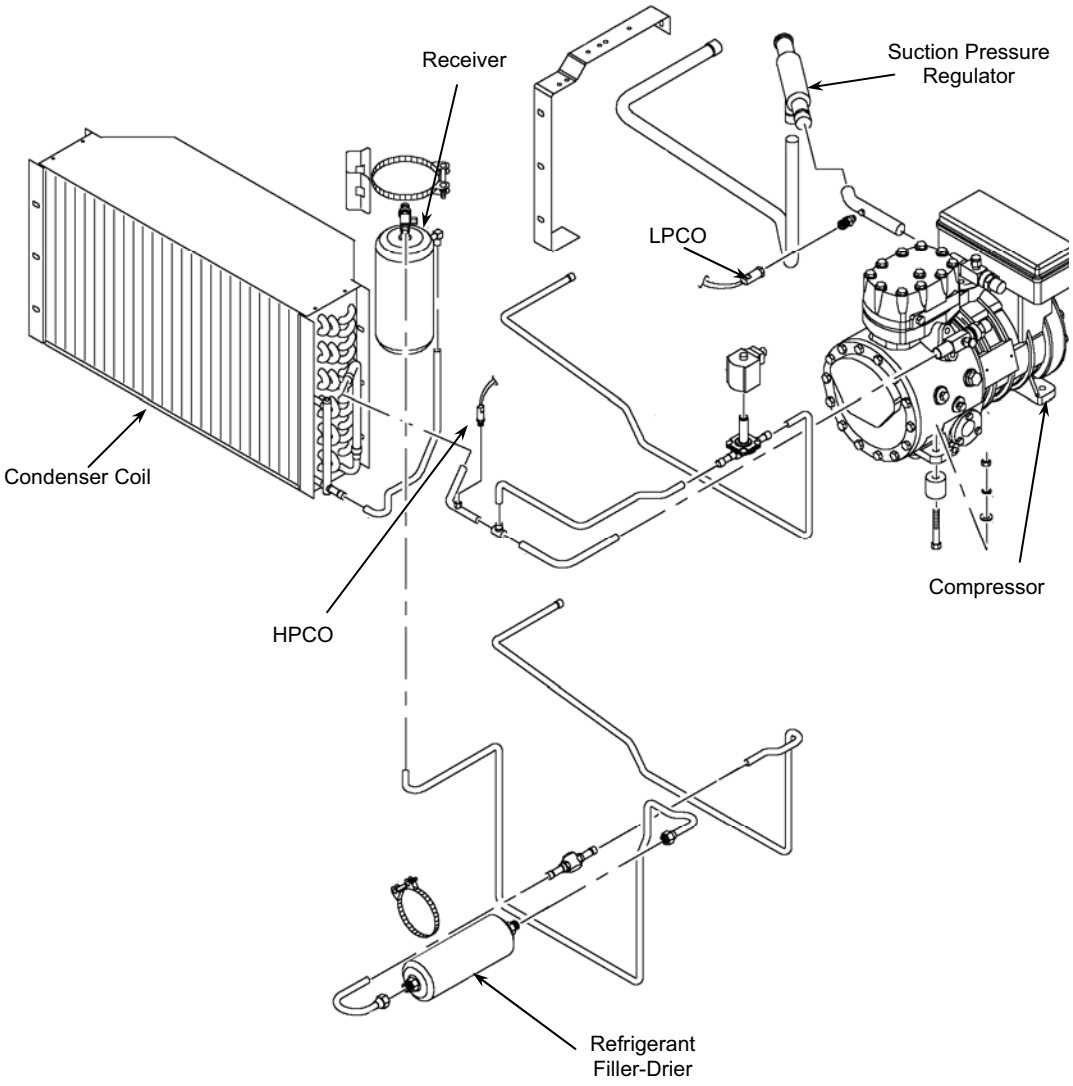


Figure 1. Condenser Section Components.

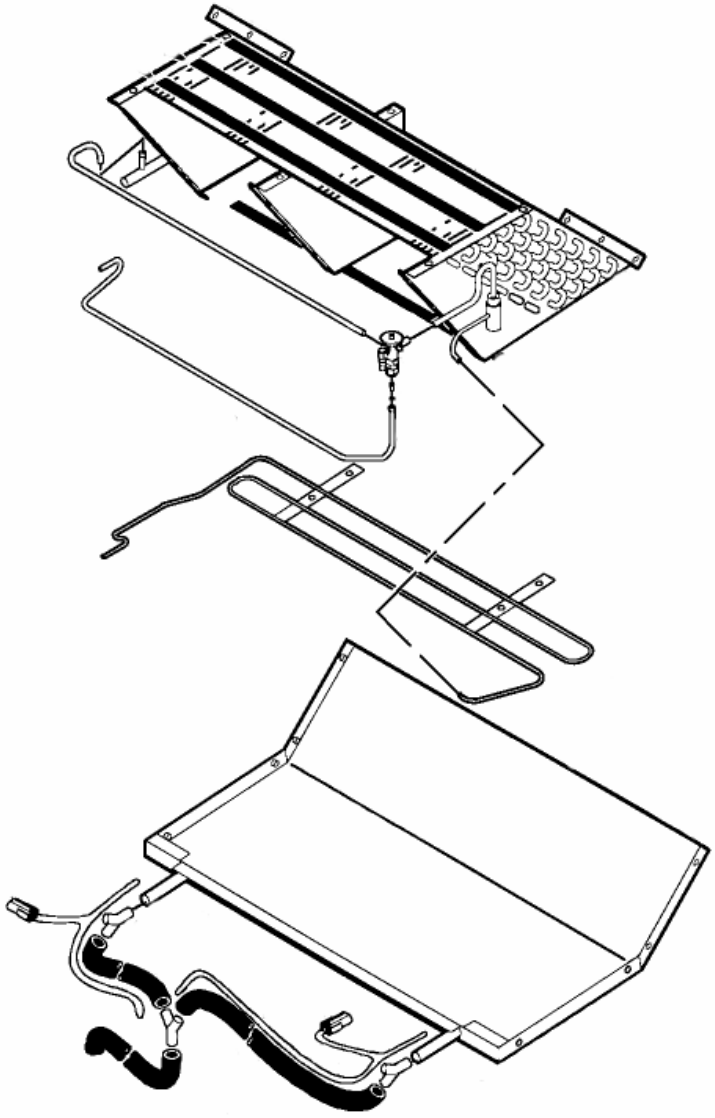


Figure 2. Evaporator Section Components.

END OF TASK

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ELECTRICAL ENCLOSURE CONTACTORS
REMOVE/INSTALL

INITIAL SETUP

Tools and Special Tools
Tool Kit, Organizational Maintenance
(WP 0066, Table 2, Item 4)

Materials/Parts
Relay, Electromagnetic (WP 0059, Item 18)

Personnel Required
HVAC Technician (MOS 52C, AFSC 3E1x1) (1)

References
PMCS (WP 0010)

Equipment Conditions
ADR-300 disconnected from all sources of power.

REMOVE

Contactor/ Relay

1. Remove the electrical enclosure cover by removing the four retaining screws.
2. Using a flathead screwdriver, retract the spring-activated locking tab on the contactor (Figure 1) lower edge. With the tab retracted, pull the bottom of the contactor away from the mounting rail.
3. Lift the contactor off the top rail and remove it from the electrical box.
4. Move wires one at a time from the old contactor to the new contactor (or label wires) to ensure that they are moved to the correct terminals.

INSTALL

Contactor / Relay

1. Ensure that wires are connected to the correct terminals (see Step 4 above).
2. Place contactor-mounting bracket on the bottom rail of the mounting rail. Make sure wires are clear from behind the contactor.
3. Lock the contactor in place by pushing the top of the contactor toward the rail until the locking tab clicks.
4. Check the security of the contactor mount.
5. Close the electrical enclosure and install the four retaining screws.
6. Connect the RU to an appropriate power supply and perform the refrigerator operation check IAW WP 0010, Table 1, Item No. 7.

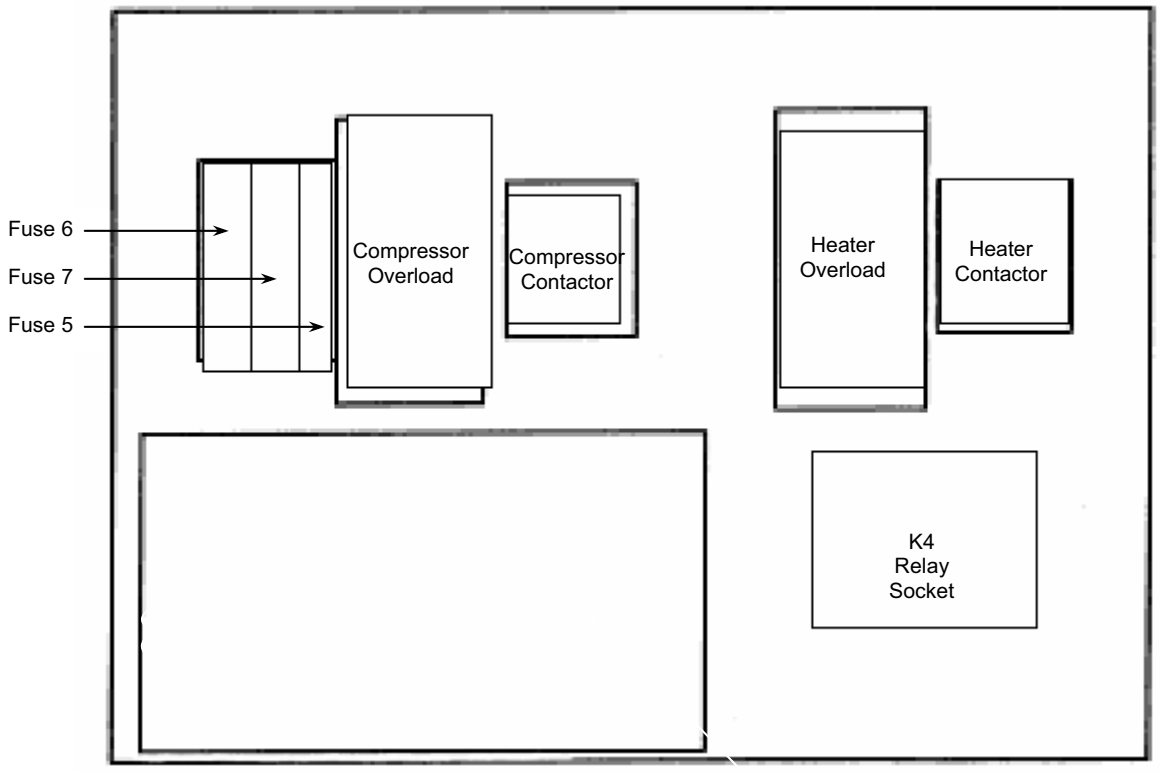


Figure 1. Electrical Enclosure Contactors.

END OF TASK

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
UNIT CONTROLLER
REMOVE/INSTALL

INITIAL SETUP

Tools and Special Tools
Tool Kit, Organizational Maintenance
(WP 0066, Table 2, Item 4)

Materials/Parts
Controller M13 (WP 0057, Item 9)

Personnel Required
HVAC Technician (MOS 52C, AFSC 3E1x1) (1)

References
PMCS (WP 0010)

Equipment Conditions
ADR-300 disconnected from all sources of power.

REMOVE

1. Open the controller enclosure by turning the handle ¼-turn.
2. Loosen one set screw (Figure 1) on each side of the controller (Figure 1).
3. Gently remove the controller from the enclosure to the extent of the connected wires.
4. Slide the terminal cover plate off the controller by pinching the grip points.
5. Remove two terminal plug connectors from the back of the controller.
6. Remove the controller.

INSTALL

CAUTION

Be careful not to pinch the wires. Failure to comply may result in damage to equipment.

Ensure terminal leads are firmly seated in the terminal connector. Leads can pop out of the connector and continuity will be lost. Failure to comply may result in damage to equipment.

1. Install the two terminal plug connectors in the back of the controller.
2. Slide the terminal cover plate on the controller by pinching the grip points.
3. Gently slide the controller into the enclosure.
4. Tighten one set screw on each side of the controller.

5. Close the controller handle by turning the handle ¼ turn.

6. Perform a refrigeration operation check IAW WP 0010, Table 1, Items No. 7 and No. 8.

Figure 1. Unit Controller.

END OF TASK

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
REFRIGERATION UNIT REFRIGERANT FILLER-DRIER
REMOVE/INSTALL

INITIAL SETUP

Tools and Special Tools
Tool Kit, Refrigeration Service
(WP 0066, Table 2, Item 5)

Materials/Parts
Refrigerant R404A (WP 0068, Item 16)
Compressor Oil (WP 0068, Item 5)

Personnel Required
HVAC Technician (MOS 52C, AFSC 3E1x1) (1)

References
Refrigeration System Service (WP 0031)

Equipment Conditions
ADR-300 disconnected from all power sources.

NOTE

The following procedures involve servicing the refrigeration system. Some of these service procedures are regulated by Federal, and in some cases, by State and Local laws. All regulated refrigeration service procedures must be performed by an EPA certified technician, using approved equipment and complying with all Federal, State, and Local laws.

Replace the refrigerant filler-drier whenever the high side is opened or when the low side is opened for an extended period of time.

REMOVE

1. Remove the condenser section top grille.
2. Complete the low-side pump down procedure IAW WP 0031.
3. Remove the clamp (Figure 1) around the refrigerant filler-drier (Figure 1).

NOTE

Observe direction of refrigerant flow.

4. Disconnect the nuts (Figure 1) at each end of the refrigerant filler-drier, using a back-up wrench, and remove the refrigerant filler-drier from the RU.

INSTALL

1. Place new lubricated o-rings in the fittings on the ends of the refrigerant filler-drier (use compressor oil).
2. Install the new refrigerant filler-drier ensuring the proper direction of refrigerant flow.
3. Thread the inlet and outlet nuts onto the refrigerant filler-drier.

4. Tighten both nuts while using a wrench as a back up.

5. Install the clamp around the refrigerant filler-drier and mounting bracket.

6. Check for leaks, evacuate, and return to proper operation IAW WP 0031.

7. Replace the condenser section top grille. Connect the RU to an appropriate power supply and operate the system while monitoring the refrigerant charge.

8. Adjust the refrigerant charge as necessary IAW WP 0031.

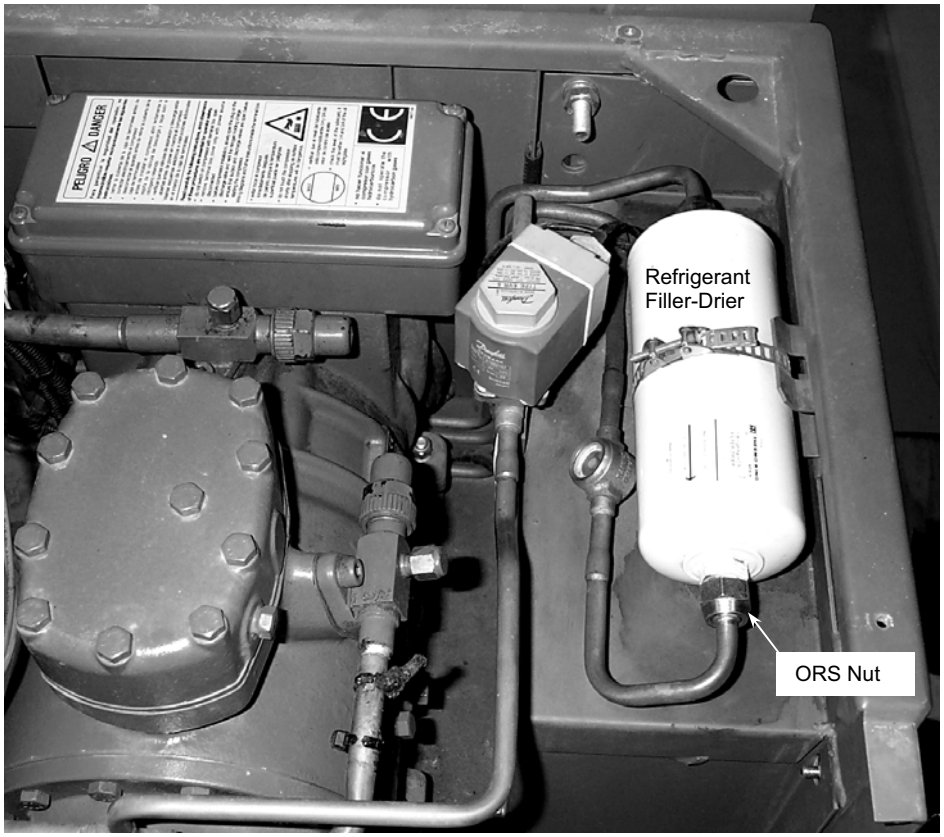


Figure 1. Refrigerant Filler-Drier.

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
REFRIGERATION UNIT RECEIVER TANK
REMOVE/INSTALL

INITIAL SETUP

Tools and Special Tools
Tool Kit, Refrigeration Service
(WP 0066, Table 2, Item 5)

Materials/Parts
Refrigerant, R404A (WP 0068, Item 16)
Compressor Oil (WP 0068, Item 5)
Tank Receiver (WP 0056, Item 11)

Personnel Required
HVAC Technician (MOS 52C, AFSC 3E1x1) (1)

References
Refrigeration System Service (WP 0031)
Refrigerant Filler-Drier Removal and Replacement (WP 0038)

Equipment Conditions
ADR-300 disconnected from all power Supplies.

NOTE

The following procedures involve servicing the refrigeration system. Some of these service procedures are regulated by Federal, and in some cases, by State and Local laws. All regulated refrigeration service procedures must be performed by an EPA certified technician, using approved equipment and complying with all Federal, State, and Local laws.

Replace the dehydrator (see WP 0038) whenever the high side is opened or when the low side is opened for an extended period of time.

REMOVE

1. Remove the condenser section top grille.
2. Recover the refrigerant charge.

CAUTION

Take care to avoid damaging nearby electrical and refrigeration components when soldering and unsoldering. Protect nearby components with a heat sink or other appropriate measure. Failure to comply may result in damage to equipment.

3. Unsolder the refrigerant lines and remove them from the receiver tank (Figure 1).
4. Remove the mounting clamp (Figure 1).
5. Remove the receiver tank (Figure 1).

INSTALL

CAUTION

Ensure that no excess sealant enters into the refrigeration system. Sealant may cause a restriction to the refrigeration system. Failure to comply may result in damage to the equipment.

NOTE

Copper-to-steel soldering connections require silver solder and flux.

1. Prepare all refrigerant lines for soldering.
2. Position the receiver tank (Figure 1) in the unit and install the mounting clamp (Figure 1).
3. Solder the refrigerant line to the receiver tank.
4. Install a new refrigerant filler-drier IAW WP 0038.
5. Leak check and evacuate IAW 0031.
6. If no leaks are found, recharge and check system operation IAW WP 0031.

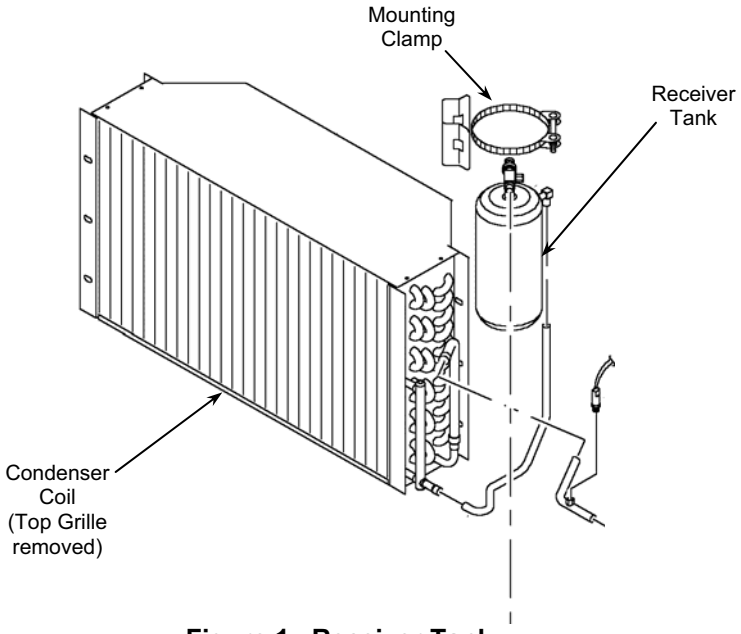


Figure 1. Receiver Tank.

END OF TASK

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
REFRIGERATION UNIT HIGH PRESSURE CUTOUT SWITCH (HPCO)
REPLACE

INITIAL SETUP

Tools and Special Tools
Tool Kit, Refrigeration Service
(WP 0066, Table 2, Item 5)

Materials/Parts
Refrigerant R404A (WP 0068, Item 16)
Compressor Oil (WP 0068, Item 5)
High Pressure Cut-out Switch
(WP 0056, Item 27)
Thread Sealer, Refrigerant
(WP 0068, Item 22)

Personnel Required
HVAC Technician (MOS 52C, AFSC 3E1x1) (1)

References
Refrigeration System Service (WP 0031)
PMCS (WP 0010)

Equipment Conditions
No specified condition

NOTE

The following procedures involve servicing the refrigeration system. Some of these service procedures are regulated by Federal, and in some cases, by State and Local laws. All regulated refrigeration service procedures must be performed by an EPA certified technician, using approved equipment and complying with all Federal, State and Local laws. Failure to comply may cause damage to equipment

Replace the refrigerant filler-drier whenever the high side is opened or when the low side is opened for an extended period of time.

REPLACE

1. Remove the condenser section front and top grilles.
2. Recover the refrigerant charge IAW WP 0031.
3. Disconnect the wires. Remove the defective high pressure cutout switch (HPCO) (Figure 1) using a backup wrench.

INSTALL

CAUTION

Ensure that no excess sealant enters into the refrigeration system. Sealant may cause a restriction to the refrigeration system. Failure to comply may result in damage to the equipment.

1. Apply a refrigerant-compatible thread sealer to the threads of the new HPCO.
2. Install and tighten the HPCO using a backup wrench. Reconnect the wires.
3. Pressurize the refrigeration system and test for leaks IAW WP 0031.
4. If no leaks are found, evacuate and charge the system IAW WP 0031.
5. Perform the refrigerator operation check IAW WP 0010, Table 1, Item No. 7.

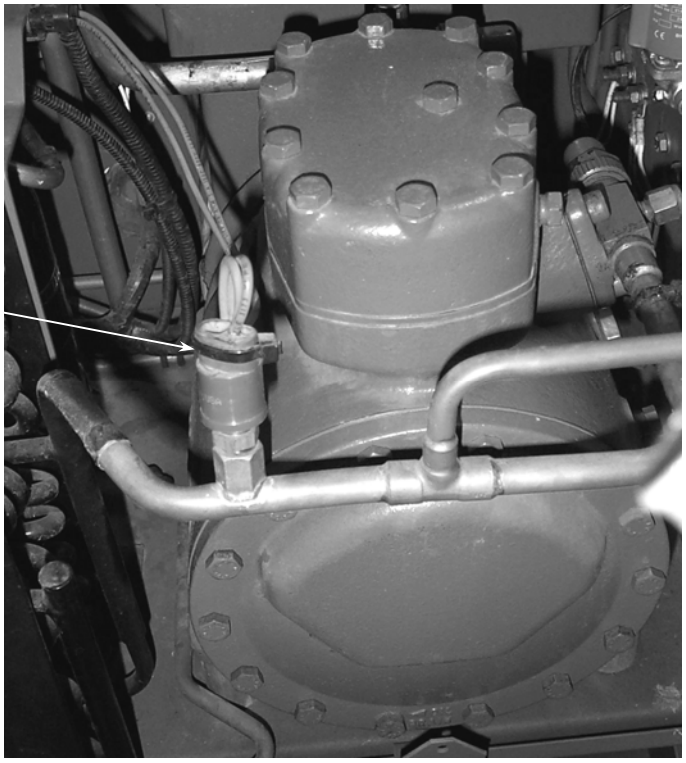


Figure 1. High Pressure Cutout Switch (HPCO).

END OF TASK

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
REFRIGERATION UNIT ELECTROMAGNETIC RELAY
REMOVE/INSTALL

INITIAL SETUP

Tools and Special Tools
Tool Kit, Refrigeration Service
(WP 0066, Table 2, Item 5)

Materials/Parts
Refrigerant R404A (WP 0068, Item 16)
Compressor Oil (WP 0068, Item 5)
Relay, Electromagnetic (WP 0056, Item 15)

Personnel Required
HVAC Technician (MOS 52C, AFSC 3E1x1) (1)

References
Refrigeration Unit Service (WP 0031)
PMCS (WP 0010)

Equipment Conditions
ADR-300 or RU disconnected from all power supplies.

NOTE

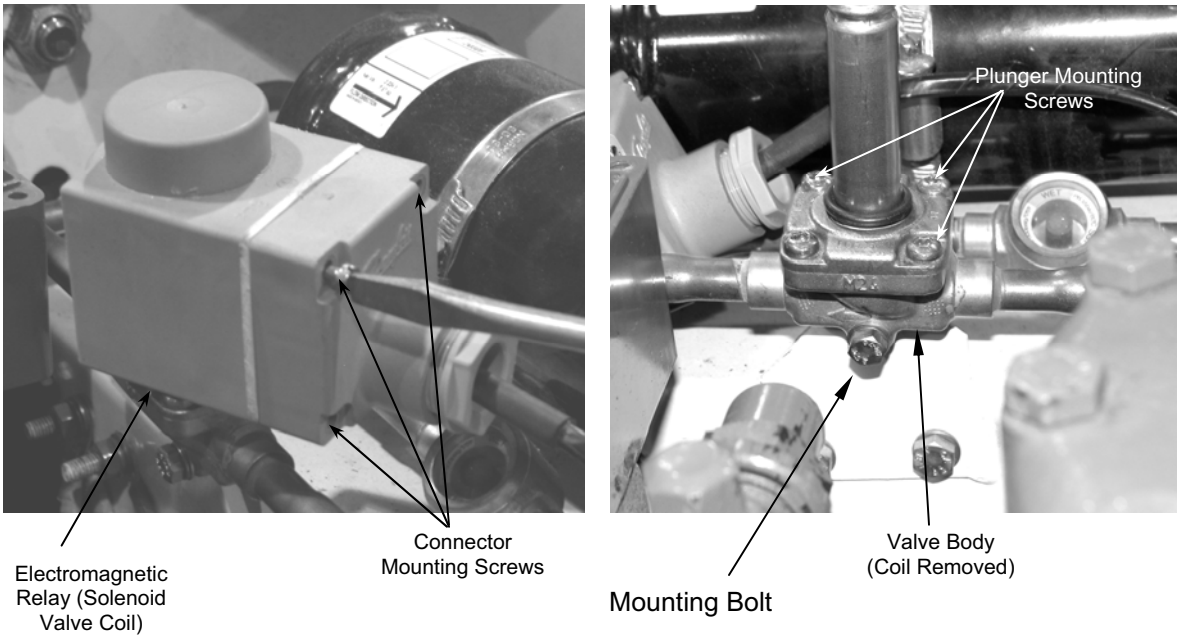
The following procedures involve servicing the refrigeration system. Some of these service procedures are regulated by Federal, and in some cases, by State and Local laws. All regulated refrigeration service procedures must be performed by an EPA certified technician, using approved equipment and complying with all Federal, State and Local laws.

Replace the refrigerant filler-drier whenever the high side is opened or when the low side is opened for an extended period of time.

REMOVE

Electromagnetic Relay (Solenoid Valve Coil)

1. Remove the four screws (Figure 1) from the electromagnetic relay (Figure 1).
2. Separate the two halves of the relay (Figure 1).
3. Gently pry the relay from the valve stem.
4. Refer to the install procedure to install the relay.



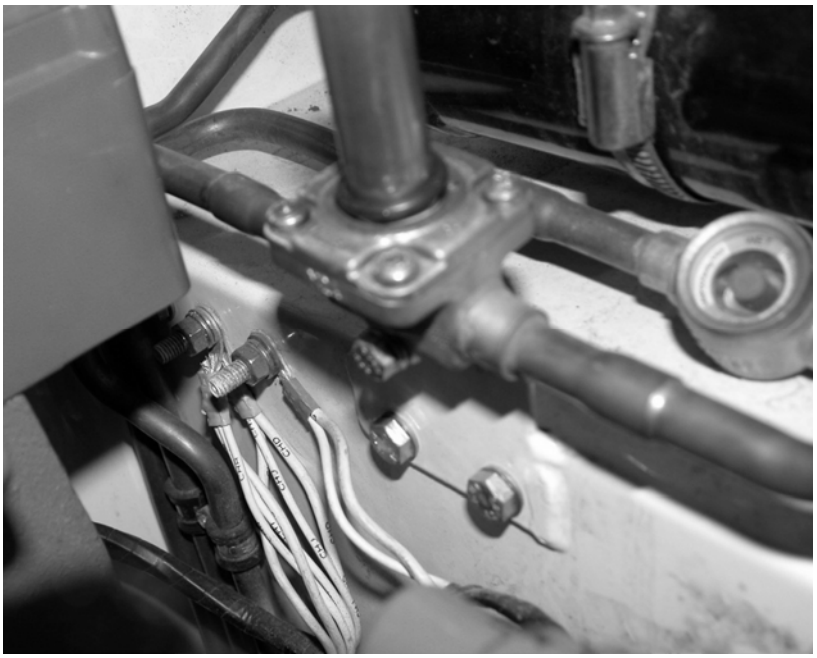


Figure 1. Electromagnetic Relay--Remove/Install.

Electromagnetic Relay (Solenoid Valve Body)

NOTE

Valves that have nylon seats must be disassembled before soldering.

1. Recover the refrigerant from the system.
2. Remove the four screws (Figure 1) securing the valve plunger to the valve body (Figure 1).
3. Remove the plunger assembly and valve diaphragm. Note which face of the diaphragm is oriented toward the plunger.
4. Remove the mounting bolt (Figure 1) under the valve body attached to the bracket.

CAUTION

Protect the wires and nearby components from the torch during de-soldering and re-soldering. Failure to comply may result in damage to equipment.

5. Remove the wires from the protruding stud on the back of the control panel.
6. If valve body is damaged, unsolder the hot gas lines from the valve body and remove the valve from the unit.

NOTE

Observe refrigerant flow by using arrow on valve body as a reference.

INSTALL

Electromagnetic Relay (Solenoid Valve Body)

CAUTION

Do not contaminate the system when preparing refrigeration tubing for soldering. Contamination may cause restrictions in the refrigeration system. Failure to comply may result in damage to the equipment.

1. Clean the refrigeration tubes for soldering.
2. Remove the coil, plunger and diaphragm from the replacement valve. Place the valve body in position and ensure proper refrigerant flow.
3. Install the mounting bolt to the bracket.

CAUTION

Protect the wires and nearby components from the torch during de-soldering and re-soldering. Failure to comply may result in damage to equipment.

4. Solder the inlet and outlet connections. After the valve body cools, assemble the diaphragm and valve plunger.
5. Pressurize the system with dry nitrogen and check for leaks IAW WP 0031.
6. If no leaks are found, reinstall the electromagnetic relay:
   a. Gently push the coil onto the stem until it snaps into place.
   b. Reinstall the electrical plug with the four screws.
7. Evacuate the low side and perform the low side pump up procedure IAW WP 0031.
8. Complete the refrigerator operation check IAW WP 0010, Table 1, Item No. 7.

Electromagnetic Relay (Solenoid Coil)

1. Gently push the coil onto the stem until it snaps into place.
2. Reinstall the electrical plug with the four screws.
3. Leak check, evacuate, and charge the system IAW WP 0031.
4. Complete the refrigerator operation check IAW WP 0010, Table 1, Item No. 7.

END OF TASK

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
EVAPORATOR FAN
REPLACE

INITIAL SETUP

Tools and Special Tools
Tool Kit, Organizational Maintenance
(WP 0066, Table 2, Item 4)

Materials/Parts
Fan, Motor, Evaporator (WP 0057, Item 2)

Personnel Required
(1)

References
None

Equipment Conditions
ADR-300 disconnected from all sources of power.

REPLACE

WARNING

The components on the evaporator coil have sharp edges and will cut hands and other exposed skin surfaces. Take care to avoid contact with the components. Place a folded piece of cardboard or other device over the fins to protect the worker while working near the coil. Failure to comply may result in serious personal injury.

CAUTION

The evaporator coil fins are fragile and easily bent or otherwise deformed. Deformed fins reduce the performance of the refrigeration system. Place a folded piece of cardboard or other device over the fins to protect the fins while working near the coil. Failure to comply may result in damage to the equipment.

1. Disconnect the evaporator fan motor wires at the weather tight connector nearest the motor and cut the wire tie that restrains the wire.
2. Remove the four bolts (Figure 1) that hold the fan assembly (Figure 1). Remove the fan assembly.
3. Position the replacement fan assembly in the opening. Install the four bolts and torque to 10 ft-lbs.
4. Connect the fan electrical leads at the weather tight connector. Secure the loose wires as appropriate.

5. Connect the ADR-300 to an appropriate power supply and turn the unit on.

6. Verify that the air flow is blowing across the evaporator coil. If not, change polarity.

Figure 1. Evaporator Fan.

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
LOW PRESSURE CUTOUT SWITCH (LPCO)
REPLACE

INITIAL SETUP

Tools and Special Tools
Tool Kit, Organizational Maintenance
(WP 0066, Table 2, Item 4)

Materials/Parts
Switch – Low Pressure Cutout
(WP 0056, Item 28)

Personnel Required
HVAC Technician (MOS 52C, AFSC 3E1x1) (1)

References
PMCS (WP 0010)
Refrigeration Unit Service (WP 0031)

Equipment Conditions
Disconnect ADR-300 from the main power source.

WARNING

Sharp object. Edges are very sharp to the touch. Be careful not to cut your hands or limbs. Failure to comply may cause serious injury to personnel.

REMOVE AND REPLACE

LPCO

1. Remove the condenser section front grille and top grille.
2. Locate the low pressure cutout switch (LPCO) (Figure 1) near the receiver on the suction line (refer to figure on WP 0043-2). Cut any wire ties restraining the wires.
3. Disconnect the weather-tight connector.

CAUTION

Use a backup wrench on the low pressure switch and the schrader valve. Lines could break causing a leak. Failure to comply may result in damage to equipment.

4. Unscrew the LPCO and remove it from the schrader valve.
5. Thread the LPCO over the schrader valve. Tighten the LPCO securely.

6. Reconnect the weather tight connector.

7. Secure the wires and connector with wire ties.

8. Check for leaks IAW WP 0031.

9. Reconnect the RU to an appropriate power supply and perform the refrigerator operation check IAW WP 0010, Table 1, Item No. 7.

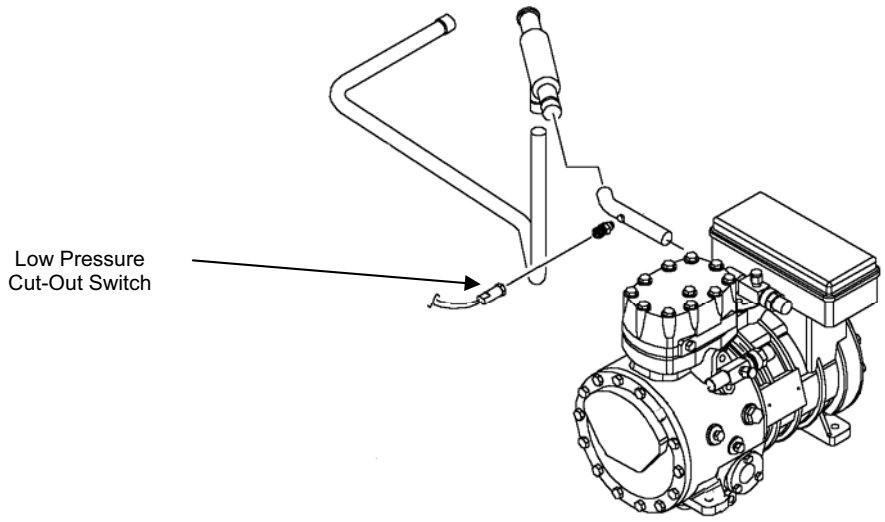


Figure 1. Low Pressure Cutout Swich (LPCO).

END OF TASK

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
DEFROST TERMINATION SWITCH (DK)
REMOVE/INSTALL

INITIAL SETUP

Tools and Special Tools
Tool Kit, Organizational Maintenance
(WP 0050, Table 2, Item 4)

Materials/Parts
Switch, Defrost Termination
(WP 0060, Item 1)

Personnel Required
HVAC Technician (MOS 52C, AFSC 3E1x1) (1)

References
PMCS Instruction (WP 0010)

Equipment Conditions
ADR-300 disconnected from power supply.

REMOVE

Drain Pan

WARNING

The components on the evaporator coil have sharp edges and will cut hands and other exposed skin surfaces. Take care to avoid contact with the components. Place a folded piece of cardboard or other device over the fins to protect the worker while working near the coil. Failure to comply may result in serious personal injury.

1. Remove the four screws from the bottom of the evaporator drip pan and retain gaskets.

CAUTION

The evaporator coil fins are fragile and easily bent or otherwise deformed. Deformed fins reduce the performance of the refrigeration system. Place a folded piece of cardboard or other device over the fins to protect the fins while working near the coil.

Take care to avoid bending, kinking or otherwise damaging the hot gas heating coil. Failure to comply may result in damage to equipment.

2. Remove the four screws from each side of the drain pan and one screw from the middle of the evaporator opening. Lower the drain pan.
3. Remove the two lower evaporator grille bolts (8 millimeters).
4. Remove the four bolts from the rear of the drain pan.

CAUTION

Drain pan heater is attached to the pan. Not removing the clamp may damage the refrigerant line. Failure to comply may result in damage to equipment.

5. Gently lower the pan to access the hot gas drain pan heater clamp on the right side.
6. Remove the 8-millimeter bolt from the clamp.
7. Remove the drain pan.

Defrost Termination Switch (DK)

1. Remove the two screws holding the DK (Figure 1) on the side of the evaporator coil.

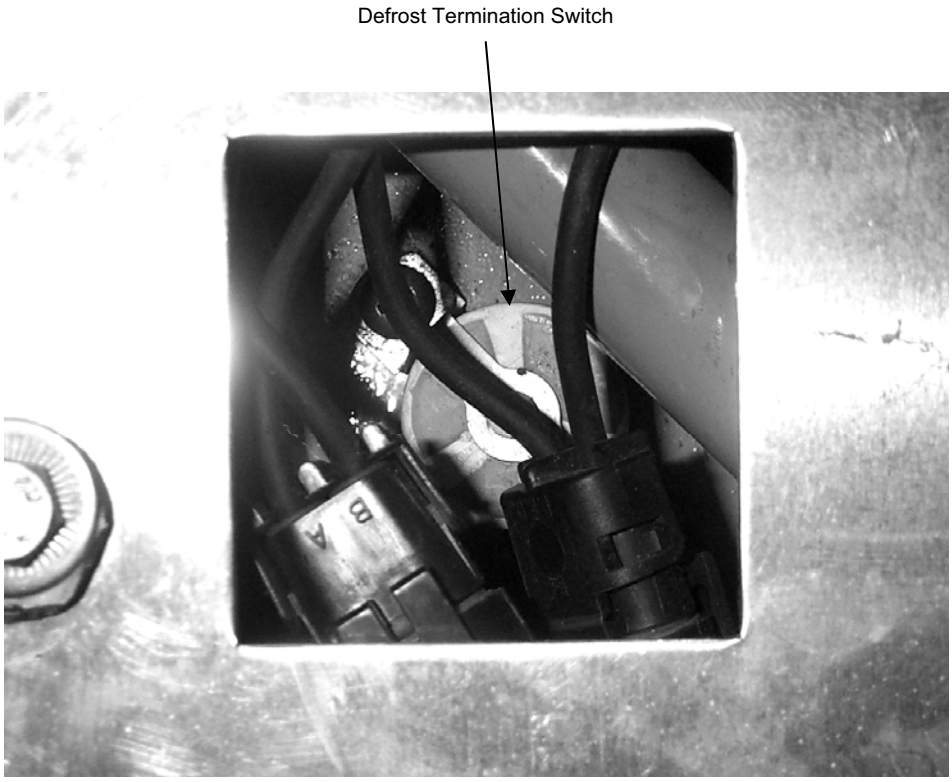


Figure 1. Defrost Termination Switch.

2. Cut the wire ties.
3. Disconnect the DK wire from the refrigerator wiring harness at the weather tight connector.
4. Remove the DK.

INSTALL

Defrost Termination Switch (DK)

1. Position the DK so that the screw holes align with the mounting holes in the evaporator coil.
2. Insert the mounting screws and tighten.
3. Connect the DK wire from the refrigerator wiring harness at the connector.
4. Restrain loose wires with wire ties.
5. Install the two screws holding the switch on the side of the evaporator coil.

Drain Pan

1. Support the drain pan in position.

NOTE

If necessary, remove shelving panels to install the drain pan.

2. Install the clamp on the hot gas drain pan heater. Do not tighten the bolt.
3. Start threading the four bolts to the bottom of the drain pan. Use the washers with gaskets.
4. Tighten the bolt on the clamp used on the hot gas drain pan heater.
5. Tighten the four bolts that you threaded in Step 9.
6. Position the drain pan and align the bolt holes.
7. Install all the bolts, but do not tighten at this time.
8. Tighten the bolts after installing all the bolts.
9. Use wire tires to secure wires.

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ELECTRIC HEATING ELEMENT
REMOVE/INSTALL

INITIAL SETUP

Tools and Special Tools
Tool Kit, Organizational Maintenance
(WP 0066, Table 2, Item 4)

Materials/Parts
Electric Heating Element (WP 0057, Item 14)

Personnel Required
2 persons

References
None

Equipment Conditions
ADR-300 disconnected from all sources of power.

REMOVE

Drain Pan

WARNING

The components on the evaporator coil have sharp edges and will cut hands and other exposed skin surfaces. Take care to avoid contact with the components. Place a folded piece of cardboard or other device over the fins to protect the worker while working near the coil. Failure to comply may result in serious personal injury.

CAUTION

The evaporator coil fins are fragile and easily bent or otherwise deformed. Deformed fins reduce the performance of the refrigeration system. Place a folded piece of cardboard or other device over the fins to protect the fins while working near the coil.

Take care to avoid bending, kinking or otherwise damaging the hot gas heating coil.

1. Remove the four screws from the bottom of the evaporator drain pan and retain gasket.

2. Remove the four screws from each side of the drain pan and one screw from the middle of the evaporator opening. Lower the drain pan.

3. Remove the two lower evaporator grille bolts (8 millimeters).

4. Remove the four bolts from the rear of the drain pan.

CAUTION

Drain pan heater is attached to the pan. Not removing the clamp may damage the refrigerant line. Failure to comply may result in damage to equipment.

5. Gently lower the pan to access the hot gas drain pan heater clamp on the right side.

6. Remove the 8 millimeter bolt from the clamp.

7. Remove the drain pan.

Heating Element

1. Trace the heater wires to the connector near the push switch and disconnect.

2. Pull the wires to the front of the evaporator coil.

3. Remove the rubber grommet.

4. Remove the rubber grommet from the wires.

5. Remove the heating elements from the retaining clips (Figure 1) on the coil by gently rotating the clips away from the evaporator coil. Take care to avoid bending or damaging coil fins.

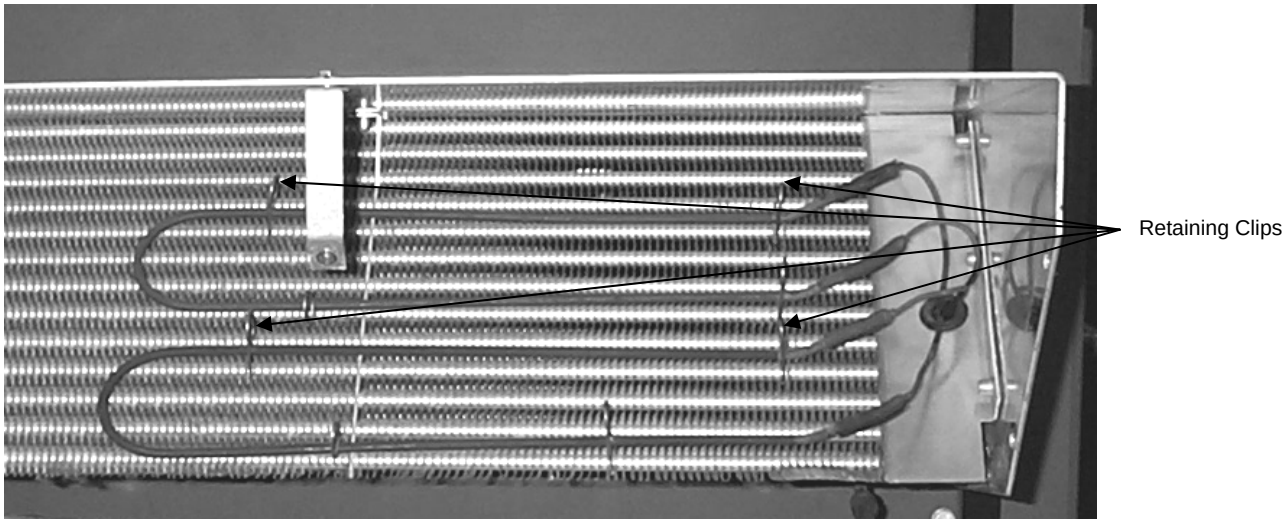


Figure 1. Electric Heating Element.

INSTALL

Heating Element

1. Install the heating elements in the retaining clips on the evaporator coil by gently rotating the clips away from the coil face.
2. Gently insert the heating element into the opened clip. Take care to avoid bending or damaging the coil fins.
3. Insert both of the heating coil wires through the protective rubber grommet.
4. Insert the heater wire connectors through the hole on the evaporator coil face.
5. Install the protective rubber grommet in the hole in the evaporation coil face.
6. Reconnect the heater wire connectors to the evaporator wire harness.

Drain Pan

1. Support the drain pan in position.

NOTE

If necessary, storage shelves to install the drain pan.

2. Install the clamp on the hot gas drain pan heater. Do not tighten the bolt.
3. Start threading the four bolts to the bottom of the drain pan. Use the washers with gaskets.
4. Tighten the bolt on the clamp used on the hot gas drain pan heater.
5. Tighten the four bolts that you threaded in Step 9.
6. Position the drain pan and align the bolt holes.
7. Install all the bolts, but do not tighten at this time.
8. Tighten the bolts after installing all the bolts.
9. Use wire tires to secure wires.

END OF TASK

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
CONDENSATE HEATER
REMOVE/INSTALL

INITIAL SETUP

Tools and Special Tools
Tool Kit, Organizational Maintenance
(WP 0066, Table 2, Item 4)

Materials/Parts
Heater, Condensate (WP 0052, Item 13)

Personnel Required
(1)

References
None

Equipment Conditions
ADR-300 disconnected from all sources of power.

REMOVE

WARNING

The components on the evaporator have sharp edges and will cut hands and other exposed skin surfaces. Take care to avoid contact with the components. Failure to comply may result in serious injury to personnel.

1. From inside the IC, trace the drain tube heater wires (Figure 1) from the drain tubes to their respective electrical weather tight connectors. Disconnect the heater wires.

2. Remove the heater wires from the condensate drain tubes through the “Y” fitting (Figure 1) at the rear of the condensate drain pan.

INSTALL

1. Insert the looped end of one drain heater wire (Figure 1) into each of the two condensate drain hoses.

2. Insert the wire into the “Y” fitting (Figure 1) at the rear of the condensate drain pan.

3. Slide the wire into the tube until only enough wire is exposed to reach from the drain pan connection to the electrical weather tight connectors for the heater wires.

4. Insert the opposite end of the wire into the hose and past the tee to the drain at the back of the unit. Repeat for the other side.

5. Connect the heater wires to their respective electrical connectors (Figure 1).

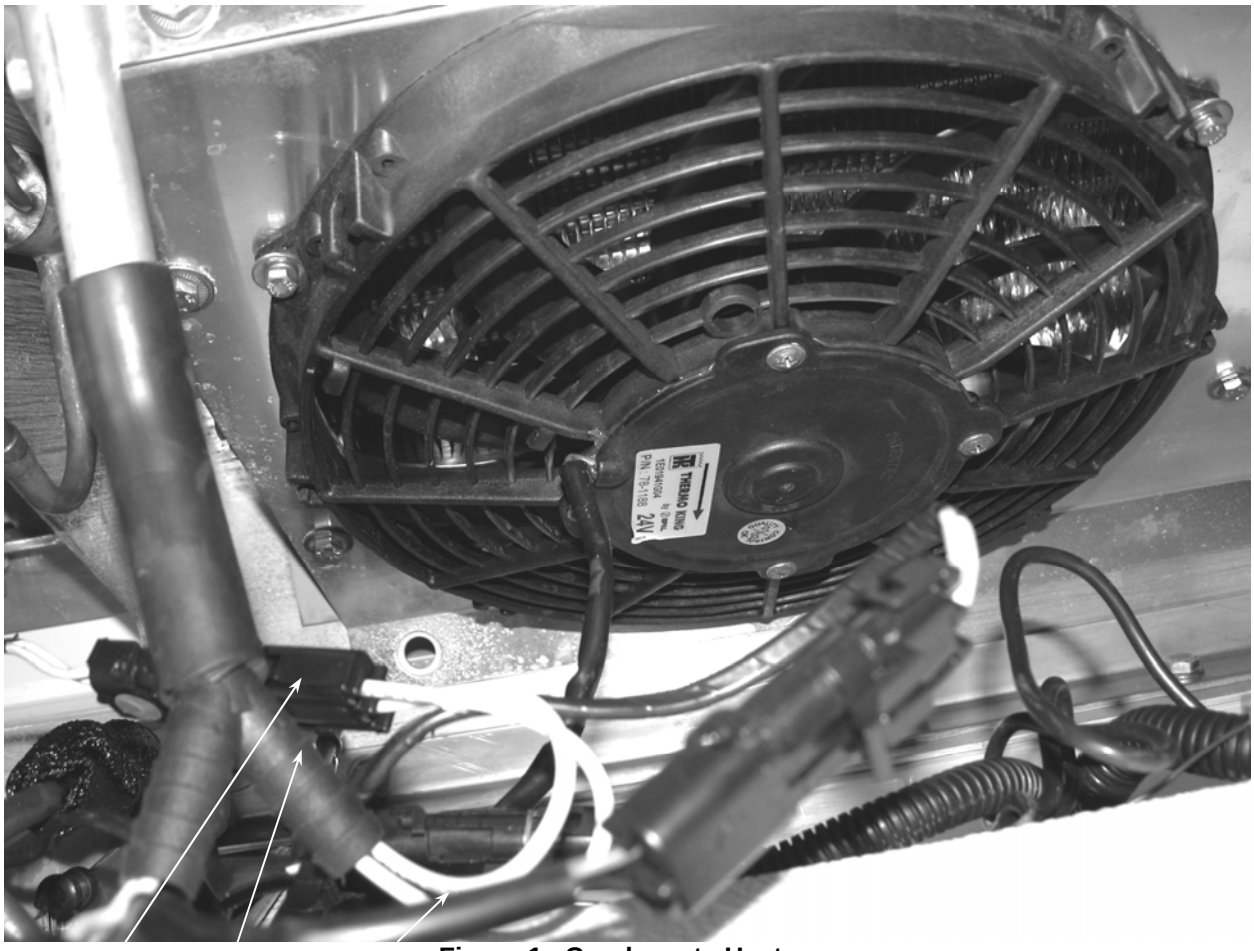


Figure 1. Condensate Heater.

END OF TASK

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE

REFRIGERATION UNIT EXPANSION VALVE ASSEMBLY

REMOVE/INSTALL

INITIAL SETUP

Tools and Special Tools
Tool Kit, Refrigeration Service
(WP 0066, Table 2, Item 5)

Materials/Parts
Refrigerant R404A (WP 0068, Item 16)
Compressor Oil (WP 0068, Item 5)
Valve - Expansion (WP 0055, Item 2)
Cloth

Personnel Required
HVAC Technician (MOS 52C, AFSC 3E1x1) (1)

References
Refrigeration Unit Service (WP 0031)
Push Switch Removal
(WP 0044)
Operation Under Usual Conditions
(WP 0005)
PMCS (WP 0010)

Equipment Conditions
ADR-300 set up and connected to a power supply

NOTE

The following procedures involve servicing the refrigeration system. Some of these service procedures are regulated by Federal, and in some cases, by State and Local laws. All regulated refrigeration service procedures must be performed by an EPA certified technician, using approved equipment and complying with all Federal, State, and Local laws.

It is good practice to replace the filter refrigerant filler-drier whenever the system is opened or for an extended period of time.

REMOVE

1. Pump down the refrigerator low side.

   a. Install a manifold gauge assembly.

   b. Jump out the low pressure cut out (LPCO) located on the suction line behind the receiver tank with a jumper wire.

   c. Run the unit in the cooling mode for 10 or more minutes.

   d. Front seat the receiver tank outlet valve.

   e. Pump down until suction pressure gauge reads a vacuum of 15-in. Hg.

   f. Stop the unit and observe the low side pressure for at least two minutes. The pressure should remain below 10-in. Hg of vacuum.

2. Remove the insulation material from the suction line in the evaporator section and remove the thermostatic expansion valve (TEV) sensing bulb (Figure 1) from the suction line.

Figure 1. Sensing Bulb.

3. Using a backup wrench, remove the liquid line (Figure 2) from the bottom of the TEV.

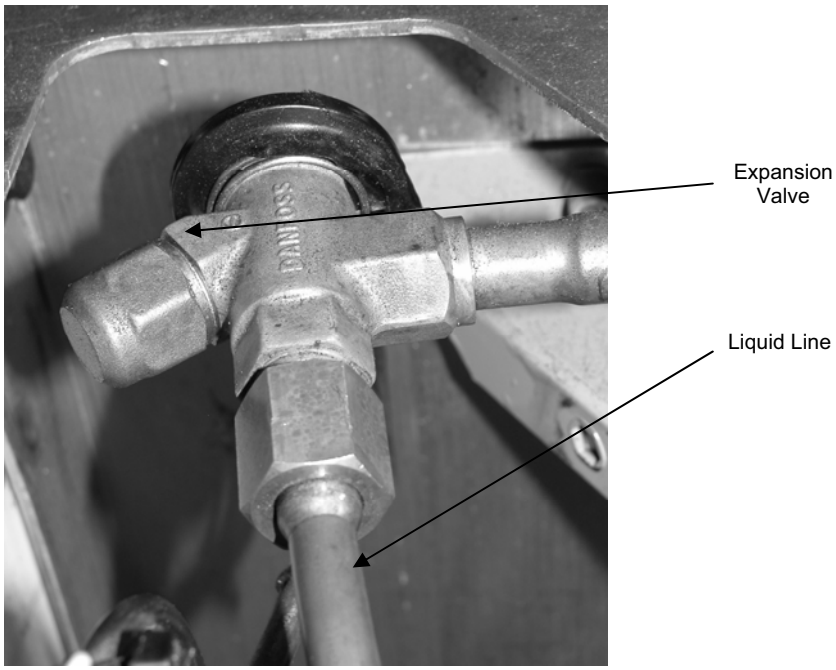


Figure 2. Expansion Valve.

4. Gently bend the liquid line (Figure 2) away from the valve.

5. Unsolder the two remaining lines from the TEV.

6. Remove the expansion valve (Figure 2) from the unit.

INSTALL

1. Prepare all fittings and tube ends to be soldered.

CAUTION

Do not contaminate the system when preparing refrigeration tubing for soldering. Contamination may cause restrictions in the refrigeration system. Failure to comply may result in damage to the equipment.

Wrap new TEV with wet rag before soldering to protect it from heat. Failure to do so may cause damage to equipment.

2. Solder the equalizer line and the evaporator line in the new expansion valve.
3. Connect the liquid line (Figure 2) to the expansion valve (Figure 2).
4. Clean the suction line where the TEV sensing bulb (Figure 1) was removed.
5. Install the TEV sensing bulb on the suction line.
6. Replace insulation around the TEV sensing bulb. Evacuate the low side and test for leaks.
   a. Connect the manifold gauge assembly.
   b. Start the vacuum pump and evacuate the system to 500 microns.

NOTE

If the system will not come down to 500 microns, there may be a leak or moisture in the system or in the evacuation and charging equipment hoses. Find and repair the leak.

   c. Close the valve at the manifold gauge assembly, stop the vacuum pump, and observe the reading on the vacuum gauge for 5 minutes. The pressure should not exceed 2000 microns.
   d. If pressure does exceed 2000 microns, repeat step b. This time, if the pressure exceeds 2000 microns within 5 minutes, look for a leak in the system or in the evacuation and charging equipment hoses. Find and repair the leak.
   e. Remove the jumper wire from the LPCO.
   f. Reconnect the weather-tight connector.
   g. Back-seat (open) the receiver tank outlet valve.
7. Perform the refrigerator operation check IAW WP 0010, Table 1, Item No. 7.

END OF TASK

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
TORQUE LIMITS

SCOPE

This WP specifies torque limits for bolts and screws used in the ADR-300.

TORQUE LIMITS

Table 1. Torque Limits.

WP No	Fastener	Min. Torque (ft-lb)	Max Torque (ft-lb)
0042	All bolts		10
0034	All bolts (unless otherwise specified)	Compressor	20

END OF WORK PACKAGE

CHAPTER 7
PARTS INFORMATION
FOR
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FEET
(ADR-300)

OPERATOR'S, UNIT, AND DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

INTRODUCTION

SCOPE

This RPSTL lists and authorizes spares and repair parts; special tools; special test, measurement; and diagnostic equipment (TMDE); and other special support equipment required for performance of unit and direct support maintenance of the ADR-300. It authorizes the requisitioning, issue, and disposition of spares, repair parts, and special tools as indicated by the source, maintenance, and recoverability (SMR) codes.

GENERAL

In addition to the Introduction work package, this RPSTL is divided into the following work packages:

1. Repair Parts List Work Packages. Work packages containing lists of spares and repair parts authorized by this RPSTL for use in the performance of maintenance. Work packages also include parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups in ascending alphanumeric sequence, with the parts in each group listed in ascending figure and item number sequence. Sending units, brackets, filters, and bolts are listed with the component they mount on. Bulk materials are listed by item name in FIG. BULK at the end of the work packages. Repair parts kits are listed separately in their own functional group and work package. Repair parts for reparable special tools are also listed in a separate work package. Items listed are shown on the associated illustrations.

2. Special Tools List Work Packages**.** Work packages containing lists of special tools, special TMDE, and special support equipment authorized by this RPSTL (as indicated by Basis of Issue (BOI) information in the DESCRIPTION AND USABLE ON CODE (UOC) column). Tools that are components of common tool sets and/or Class VII are not listed.

3. Cross-Reference Indexes Work Packages. There are two cross-reference indexes work packages in this RPSTL: the National Stock Number (NSN) Index work package, and the Part Number (P/N) Index work package. The National Stock Number Index work package refers you to the figure and item number. The Part Number Index work package refers you to the figure and item number.

EXPLANATION OF COLUMNS IN THE REPAIR PARTS AND SPECIAL TOOLS LIST

ITEM NO. (Column (1)). Indicates the number used to identify items called out in the illustration.

SMR CODE (Column (2)). The SMR code containing supply/requisitioning information, maintenance level authorization criteria; and disposition instruction, as shown in the following breakout:

TABLE 1. SMR Code Explanation.

Source Code XX		Maintenance Code XX		Recoverability Code X
1st two positions: How you get an item.	3rd position Who can install, replace; or use the item.	4th position Who can do complete repair* on the item.		5th position: Who determines disposition action on unserviceable items.

*Complete Repair: Maintenance capacity, capability, and authority to perform all corrective maintenance tasks of the 'Repair" function in a use/user environment in order to restore serviceability to a failed item.

Source Code. The source code tells you how you get an item needed for maintenance, repair, or overhaul of an end item/equipment. Explanations of source codes follow:

Source Code	Application/Explanation
PA PB PC PD PE PF PG PH PR PZ	**NOTE** Items coded PC are subject to deterioration. Stock items; use the applicable NSN to requisition/request items with these source codes. They are authorized to the level indicated by the code entered in the 3rd position of the SMR code.
KD KF KB	Items with these codes are not to be requested/requisitioned individually. They are part of a kit which is authorized to the maintenance level indicated in the 3rd position of the SMR code. The complete kit must be requisitioned and applied.
MO - Made at unit/AVUM level MF - Made at DS/AVIM level MH - Made at GS level ML - Made at SRA MD - Made at depot MG - Navy only	Items with these codes are not to be requisitioned/requested individually. They must be made from bulk material which is identified by the part number in the DESCRIPTION AND USABLE ON CODE (UOC) column and listed in the bulk material group work package of the RPSTL. If the item is authorized to you by the 3rd position code of the SMR code, but the source code indicates it is made at a higher level, order the item from the higher level of maintenance.
AO - Assembled by unit/AVUM level AF - Assembled by DS/AVIM level AH - Assembled by GS level AL - Assembled by SRA AD - Assembled by depot AG - Navy only	Items with these codes are not to be requested/requisitioned individually. The parts that make up the assembled item must be requisitioned or fabricated and assembled at the level of maintenance indicated by the source code. If the 3rd position of the SMR code authorizes you to replace the item, but the source code indicates the item is assembled at a higher level, order the item from the higher level of maintenance.
XA	Do not requisition an "XA" coded item. Order the next higher assembly. (Refer to the NOTE below.)
XB	If an item is not available from salvage, order it using the CAGEC and Part Number.
XC	Installation drawings, diagrams, instruction sheets, field service drawings; identified by manufacturer's part number.
XD	Item is not stocked. Order an XD-coded item through normal supply channels using the CAGEC and part number given, if no NSN is available.

NOTE

Cannibalization or controlled exchange, when authorized, may be used as a source of supply for items with the above source codes except for those source coded "XA" or those aircraft support items restricted by requirements of AR 750-1.Maintenance Code.

Maintenance Code. Maintenance codes tell you the level(s) of maintenance authorized to use and repair support items. The maintenance codes are entered in the third and fourth positions of the SMR Code as follows:

Third Position. The maintenance code entered in the third position tells you the lowest maintenance level authorized to remove, replace, and use an item. The maintenance code entered in the third position will indicate authorization to the following levels of maintenance:

Maintenance Code	Application/Explanation
O*-	Unit level/AVUM maintenance can remove, replace, and use the item.
F-	Direct support/AVIM maintenance can remove, replace, and use the item.
H-	General support maintenance can remove, replace, and use the item.
L-	Specialized repair activity can remove, replace, and use the item.
G-	Afloat and ashore intermediate maintenance can remove, replace, and use the item (Navy only)
K-	Contractor facility can remove, replace, and use the item
Z-	Item is not authorized to be removed, replaced, or used at any maintenance level
D-	Depot level can remove, replace, and use the item.

*NOTE - Army may use C in the third position. However, for joint service publications, Army will use O.

Fourth Position. The maintenance code entered in the fourth position tells whether or not the item is to be repaired and identifies the lowest maintenance level with the capability to do complete repair (perform all authorized repair functions).

NOTE

Some limited repair may be done on the item at a lower level of maintenance, if authorized by the Maintenance Allocation Chart (MAC) and SMR codes.

Maintenance Code	Application/Explanation
O-	Unit/AVUM is the lowest level that can do complete repair of the item.
F-	Direct support/AVIM is the lowest level that can do complete repair of the item.
H-	General support is the lowest level that can do complete repair of the item.

L-	Specialized repair activity (enter specialized repair activity designator) is the lowest level that can do complete repair of the item.
D-	Depot is the lowest level that can do complete repair of the item.
G-	Both afloat and ashore intermediate levels are capable of complete repair of item. (Navy only)
K-	Complete repair is done at contractor facility.
Z-	Nonreparable. No repair is authorized.
B-	No repair is authorized. No parts or special tools are authorized for the maintenance of a "B" coded item. However, the item may be reconditioned by adjusting, lubricating, etc., at the user level.

Recoverability Code. Recoverability codes are assigned to items to indicate the disposition action on unserviceable items. The recoverability code is shown in the fifth position of the SMR Code as follows:

Recoverability Code	Application/Explanation
Z-	Nonreparable item. When unserviceable, condemn and dispose of the item at the level of maintenance shown in the third position of the SMR Code.
O-	Reparable item. When uneconomically reparable, condemn and dispose of the item at the unit level.
F-	Reparable item. When uneconomically reparable, condemn and dispose of the item at the direct support level.
H-	Reparable item. When uneconomically reparable, condemn and dispose of the item at the general support level.
D-	Reparable item. When beyond lower level repair capability, return to depot. Condemnation and disposal of item not authorized below depot level.
L-	Reparable item. Condemnation and disposal not authorized below Specialized Repair Activity (SRA).
A-	Item requires special handling or condemnation procedures because of specific reasons (such as precious metal content, high dollar value, critical material, or hazardous material). Refer to appropriate manuals/directives for specific instructions.
G-	Filed level reparable item. Condemn and dispose at either afloat or ashore intermediate levels. (Navy only)
K-	Reparable item. Condemnation and disposal to be performed at contractor facility.

NSN (Column (3)). The NSN for the item is listed in this column.

CAGEC (Column (4)). The Commercial and Government Entity Code (CAGEC) is a five-digit code which is used to identify the manufacturer, distributor, or Government agency/activity that supplies the item.

PART NUMBER (Column (5)). Indicates the primary number used by the manufacturer, (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items.

NOTE

When you use an NSN to requisition an item, the item you receive may have a different part number from the number listed.

DESCRIPTION AND USABLE ON CODE (UOC) (Column (6)). This column includes the following information:

1. The federal item name, and when required, a minimum description to identify the item.

2. Part numbers of bulk materials are referenced in this column in the line entry to be manufactured or fabricated.

3. Hardness Critical Item (HCI). A support item that provides the equipment with special protection from electromagnetic pulse (EMP) damage during a nuclear attack.

4. The statement END OF FIGURE appears just below the last item description in column (6) for a given figure in both the repair parts list and special tools list work packages.

QTY (Column (7). The QTY (quantity per figure) column indicates the quantity of the item used in the breakout shown on the illustration/figure, which is prepared for a functional group, subfunctional group, or an assembly. A "V" appearing in this column instead of a quantity indicates that the quantity is variable and quantity may change from application to application.

EXPLANATION OF CROSS REFERENCE INDEXES WORK PACKAGES FORMAT AND COLUMNS

1. National Stock Number (NSN) Index Work Package. NSNs in this index are listed in National Item Identification Number (NIIN) sequence.

STOCK NUMBER Column. This column lists the NSN in NIIN sequence. The NIIN consists of the last nine digits of the NSN.

NSN
5305-01-574-1467
NIIN

When using this column to locate an item, ignore the first four digits of the NSN. However, the complete NSN should be used when ordering items by stock number.

FIG. Column. This column lists the number of the figure where the item is identified/located. The figures are in numerical order in the repair parts list and special tools list work packages.

ITEM Column. The item number identifies the item associated with the figure listed in the adjacent FIG. column. This item is also identified by the NSN listed on the same line.

2. Part Number (P/N) Index Work Package. Part numbers in this index are listed in ascending alphanumeric sequence (vertical arrangement of letter and number combinations which places the first letter or digit of each group in order A through Z, followed by the numbers 0 through 9 and each following letter or digit in like order).

PART NUMBER Column. Indicates the part number assigned to the item.

FIG. Column. This column lists the number of the figure where the item is identified/located in the repair parts list and special tools list work packages.

ITEM Column. The item number is that number assigned to the item as it appears in the figure referenced in adjacent figure number column.

SPECIAL INFORMATION

UOC. The UOC appears in the lower left corner of the Description Column heading. Usable on codes are shown as “UOC,” in the Description Column (justified left) on the first line under the applicable item nomenclature. Uncoded items are applicable to all models. Identification of the UOCs used in the RPSTL are:

Code	Used On
FSF	ADR-300 (Green)
UOC	ADR-300 (Tan)

Fabrication Instructions. Bulk materials required to manufacture items are listed in the bulk material functional group of this RPSTL. Part numbers for bulk materials are also referenced in the Description Column of the line entry for the item to be manufactured/fabricated.

Index Numbers. Items that have the word BULK in the figure column will have an index number shown in the item number column. This index number is a cross-reference between the NSN/Part Number (P/N) Index work packages and the bulk material list in the repair parts list work package.

ASSOCIATED PUBLICATIONS

There are no associated publications applicable to the ADR-300.

HOW TO LOCATE REPAIR PARTS

1. When NSNs or Part Numbers Are Not Known.

   First. Using the table of contents, determine the assembly group to which the item belongs. This is necessary since figures are prepared for assembly groups and subassembly groups, and lists are divided into the same groups.

   Second. Find the figure covering the functional group or subfunctional group to which the item belongs.

   Third. Identify the item on the figure and note the number(s).

   Fourth. Look in the repair parts list work packages for the figure and item numbers. The NSNs and part numbers are on the same line as the associated item numbers.

2. When NSN Is Known.

   First. If you have the NSN, look in the STOCK NUMBER column of the NSN index work package. The NSN is arranged in NIIN sequence. Note the figure and item number next to the NSN.

   Second. Turn to the figure and locate the item number. Verify that the item is the one you are looking for.

3. When Part Number Is Known.

   First. If you have the part number and not the NSN, look in the PART NUMBER column of the part number index work package. Identify the figure and item number.

   Second. Look up the item on the figure in the applicable repair parts list work package.

END OF WORK PACKAGE

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
GROUP 00 ADR-300

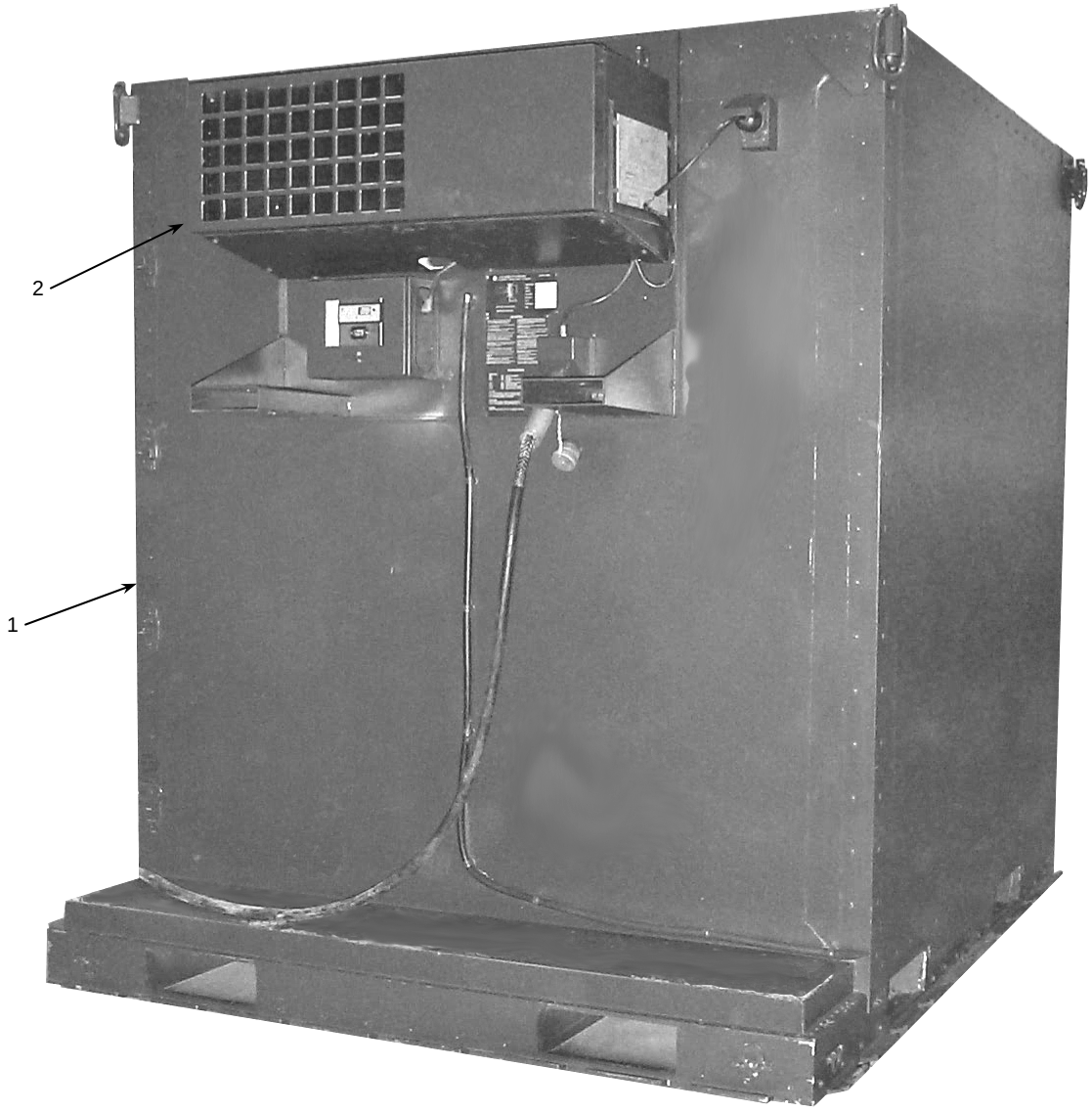


Figure 1. ADR-300.

(1) ITEM NO.	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USEABLE ON CODE (UOC)	(7) QTY
					Group 00 ADR-300 FIG. 1 ADR-300	
1	PDFFF	4110-01-500-3621	80298	50149-120	Insulated Container Assembly, ADR UOC: FSF	1
	PDFFF	4110-01-500-3622	80298	50149-121	Insulated Container Assembly, ADR UOC: FTZ	1
2	PDFFF	4110-01-500-3614	80298	50148-121	Refrigeration Unit, ADR-300, UOC: FSF	1
	PDFFF	4110-01-500-3618	80298	50148-123	Refrigeration Unit, ADR-300, UOC: FTZ	

END OF FIGURE

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
GROUP 01 INSULATED CONTAINER (IC)

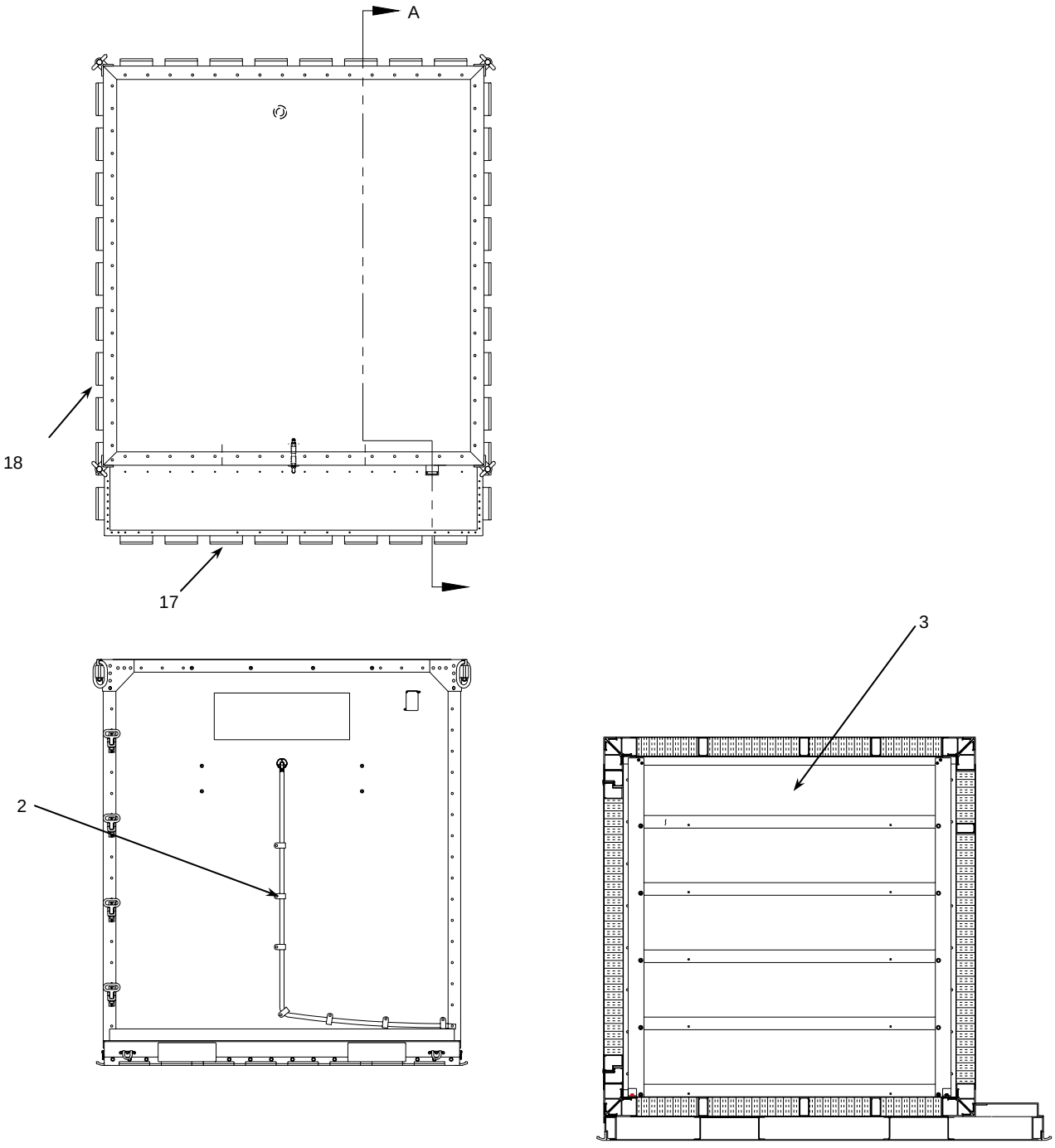


Figure 2. Insulated Container (IC) (Sheet 1 of 3).

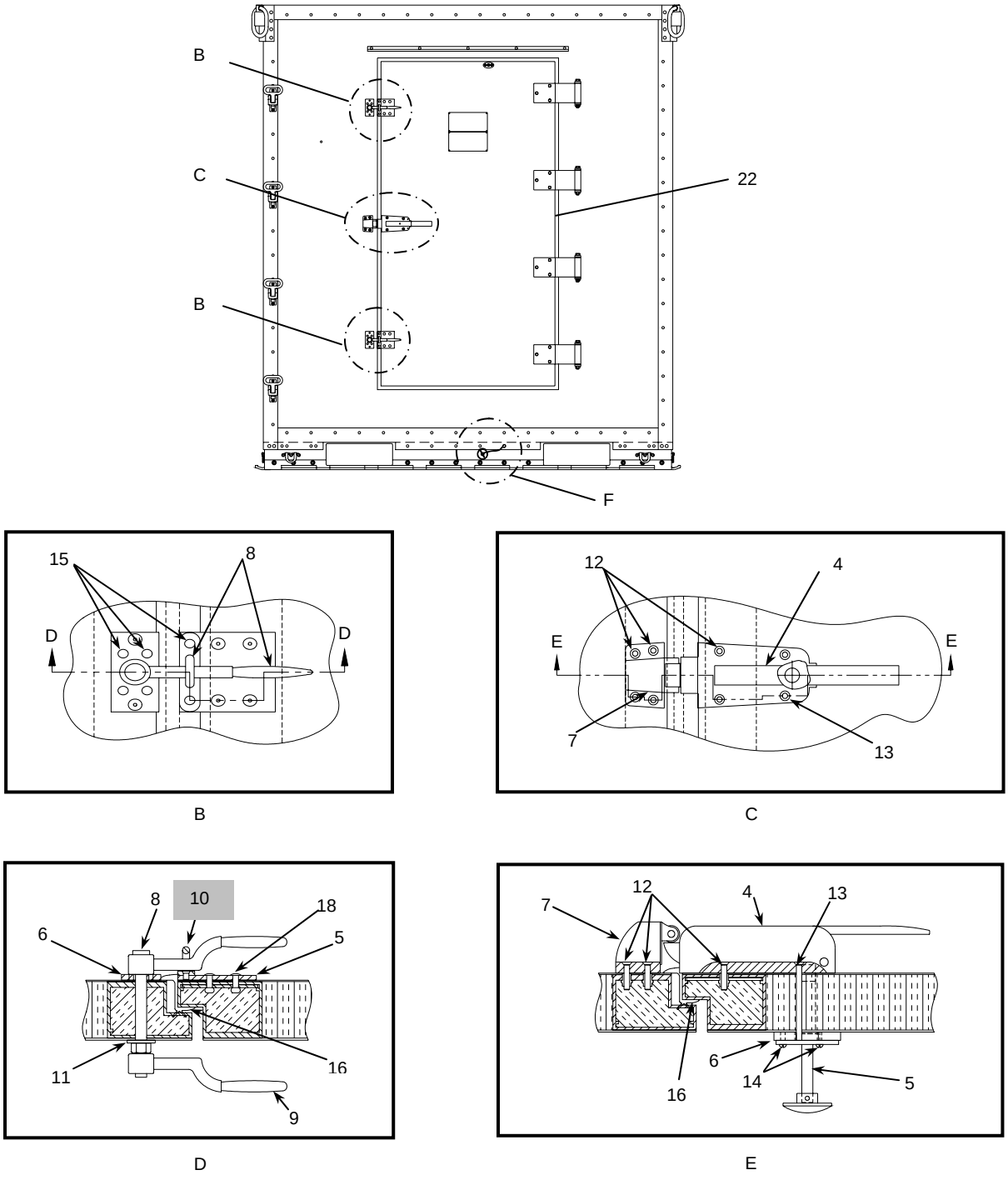


Figure 2. Insulated Container (IC) (Sheet 2 of 3).

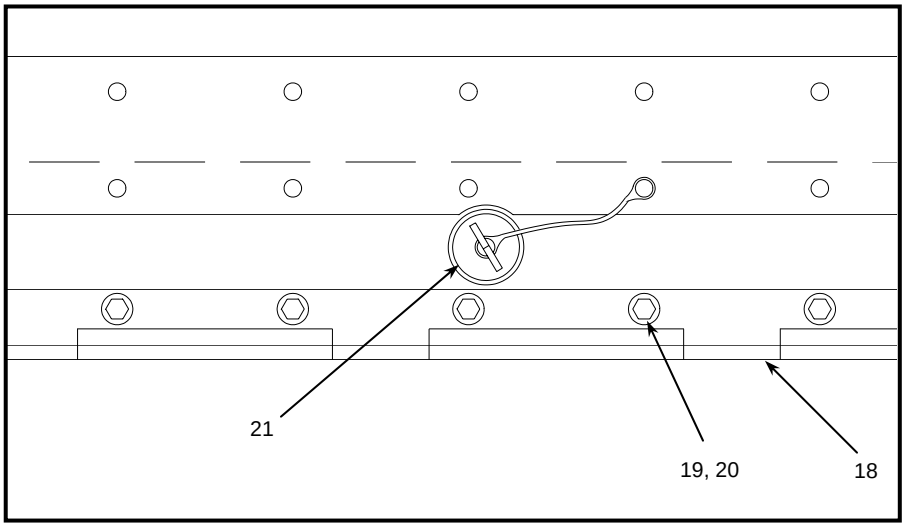


Figure 2. Insulated Container (IC) (Sheet 3 of 3).

(1) ITEM NO.	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USEABLE ON CODE (UOC)	(7) QTY
					Group 01 Insulated Container (IC) FIG. 2 Insulated Container (IC)	
1	PDFFF	4110-01-500-3621	80298	50149-120	Insulated Container Assembly, ADR Green	1
	PDFFF	4110-01-500-3622	80298	50149-121	Insulated Container Assembly, ADR Tan	1
2	PAOZZ	4720-01-519-3110	80298	119223	Condensate Drain Tube	1
3	XBOZZ		80298	860363-002	Shelf Assembly	1
4	PAOZZ	5930-01-519-3107	80298	86025-018	Handle, Main Door	1
5	PAOZZ	5340-01-519-3591	80298	86025-019	Plunger, Quick-Release	1
6	PAOZZ	5365-01-519-3183	80298	50148-201	Spacer, Ring	1
7	XDOZZ		80298	86025-017	Handle Unit, Door	1
8	PAOZZ	5340-01-519-3346	80298	86025-021	Handle Unit, Door Assembly	2
9	PBOZZ	5340-01-519-3351	80298	86025-020	Handle, Inside Release	2
10	PBOZZ	5340-01-519-3347	80298	86025-020	Handle, Inside Release	?
11	PAOZZ	5310-01-518-7443	80298	83010-004	Washer, Sealing 1/2" Dia	2
12	XBOZZ		80298	81096-004	Screw, Countersunk, 1/4-20 x 1.25	6
13	XBOZZ		80298	81096-006	Screw, Countersunk, 1/4-20 x 3.25	2
14	XBOZZ		80298	81037-002	Screw, Round, 10-24 x 0.5	3
15	XBOZZ		80298	81099-001	Screw, Flat-Head, 10-24 x 3/8	12
16	PBFZZ	5330-01-518-8504	80298	60402-002	Seal, Nonmetallic	1
17	XDOZZ	1670-01-518-8200	80298	58400-763	Cargo Restraint Rail, Short	2
18	XDOZZ	1670-01-518-8587	80298	58400-764	Cargo Restraint Rail, Long	2
19	XBOZZ		80298	81083-002	Bolt 3/8"-24 x 1.328 (length)	52
20	XBOZZ		80298	83001-004	Washer, Lock 3/8"	52
21	PAOZZ	5340-01-519-3353	80298	86035-021	Plug, Drain, Expandable (Plug Expansion)	1
22	XBFFF		80298	35183-301	Door Panel	1

END OF FIGURE

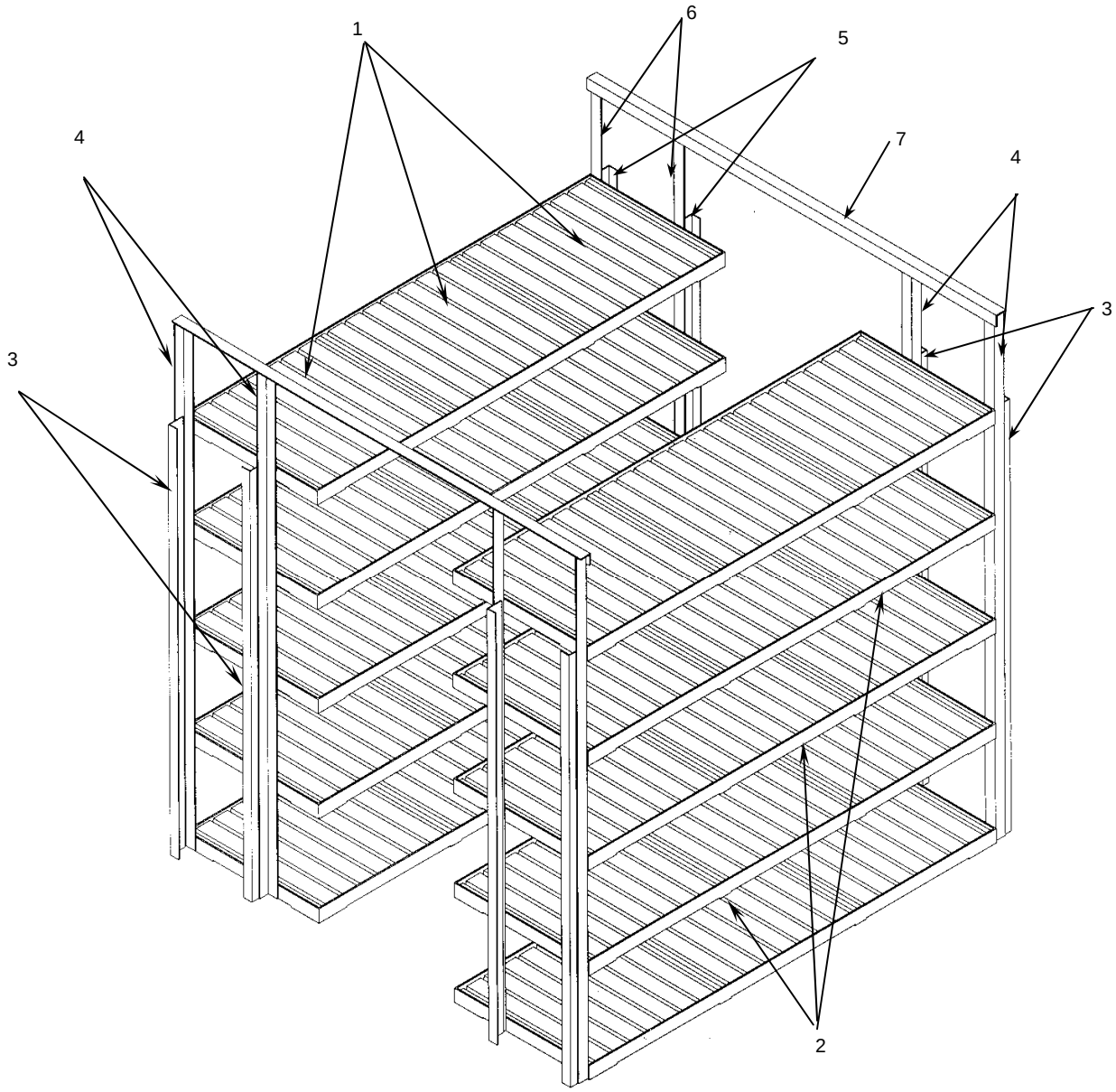


Figure 3. ADR-300 Shelf Assembly (Sheet 1 of 2).

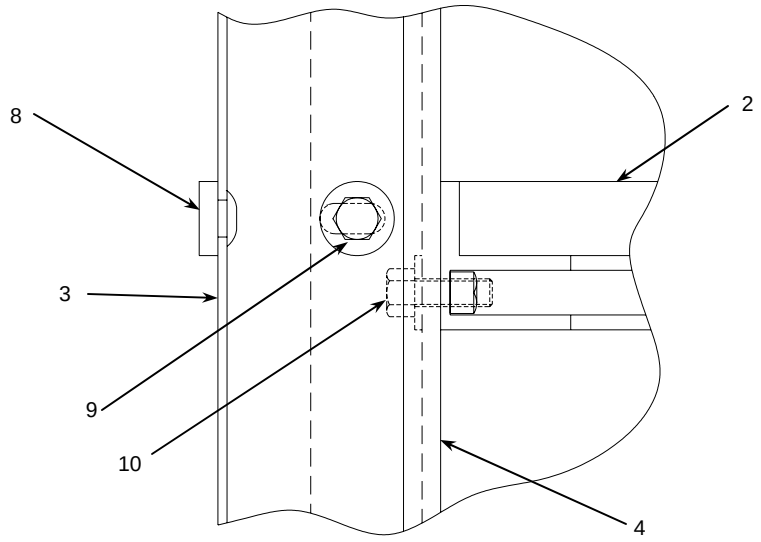


Figure 3. ADR-300 Shelf Assembly (Sheet 2 of 2).

(1) ITEM NO.	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USEABLE ON CODE (UOC)	(7) QTY
			80298	60363-002	Group 0101 ADR-300 Shelf Assembly	
					FIG. 3. ADR-300 Shelf Assembly	2
1	PAOZZ	7110-01-519-3841	80298	60363-602	Shelf, Storage	30
2	XBOZZ		80298	60363-204	Shelf Weldment	10
3	XBOZZ		80298	60363-719	Side Support, LH (Short)	4
4	XBOZZ		80298	60363-720	Side Support, RH (Long)	4
5	XBOZZ		80298	60363-718	Side Support, RH (Short)	4
6	XBOZZ		80298	60363-721	Side Support, LH (Long)	4
7	XBOZZ		80298	60363-717	Shelf Assembly	2
8	XBOZZ		80298	86425-002	Rubber Bumper	62
9	XBOZZ		80298	81002-051	Side Assembly Bolt (3/8-16 x 1-1/2)	32
10	XBOZZ		80298	81002-051	Shelf Support Bolt (3/8-16 x 1-1/2)	40

END OF FIGURE

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
GROUP 02 IC ELECTRICAL SYSTEM

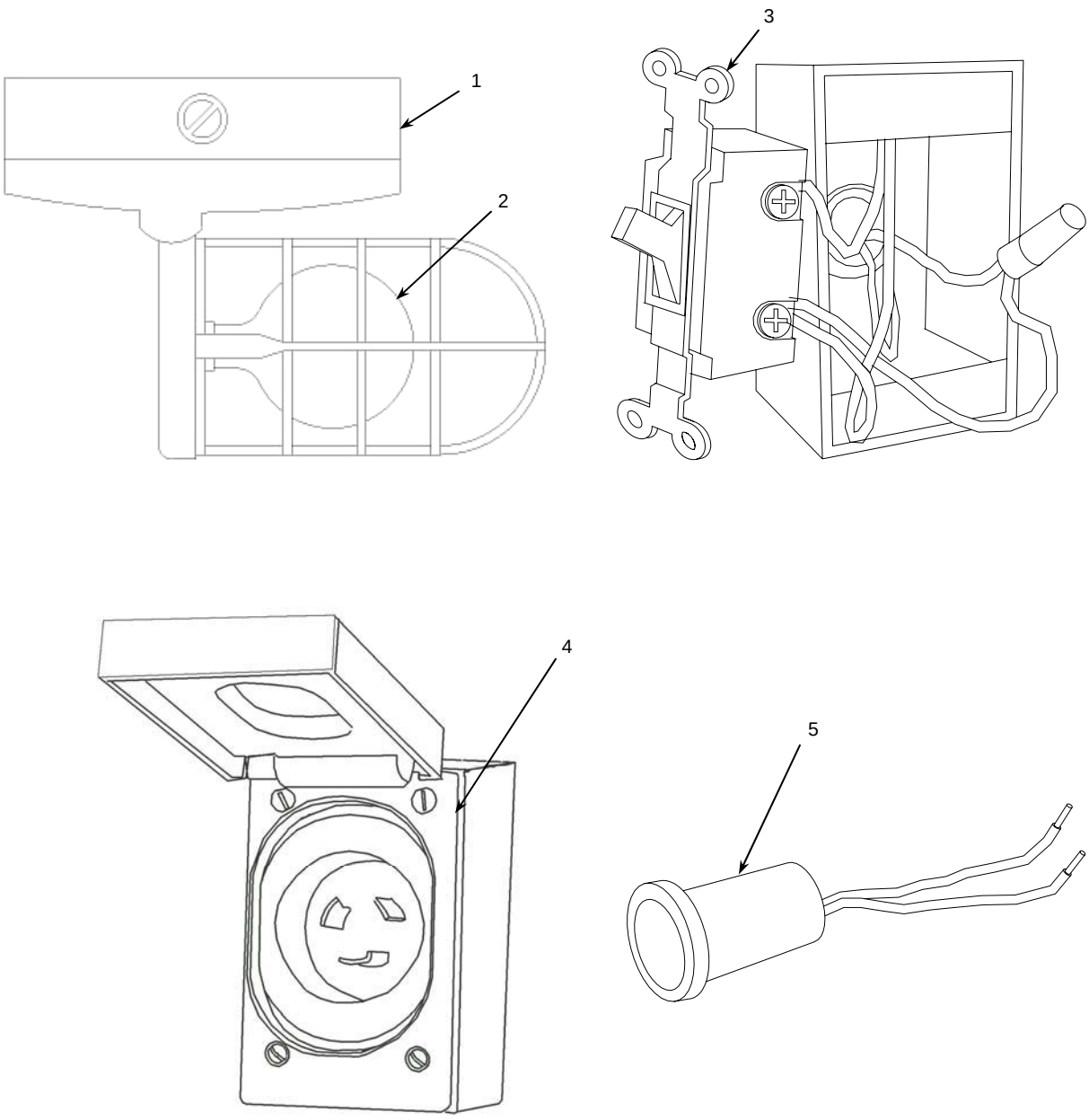


Figure 4. IC Electrical System.

(1) ITEM NO.	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USEABLE ON CODE (UOC)	(7) QTY
					Group 02 IC Electrical System FIG. 4. IC Electrical System	
1	PAOZZ	6210-01-519-3354	80298	86032-001	Fixture, Lighting	1
2	XAOZZ		62607	100-100P25-29-120V	(100 W) Lamp, Incandescent	1
3	PAOZZ	5930-01-230-5340	81091	PS15ACI	Switch, Toggle	1
4	PAOZZ	5930-01-519-3128	80298	86032-002	Connector Receptacle	1
5	XBOZZ		80298	36098-002	Light Indicator	1

END OF FIGURE

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
GROUP 03 REFRIGERATION UNIT (RU)

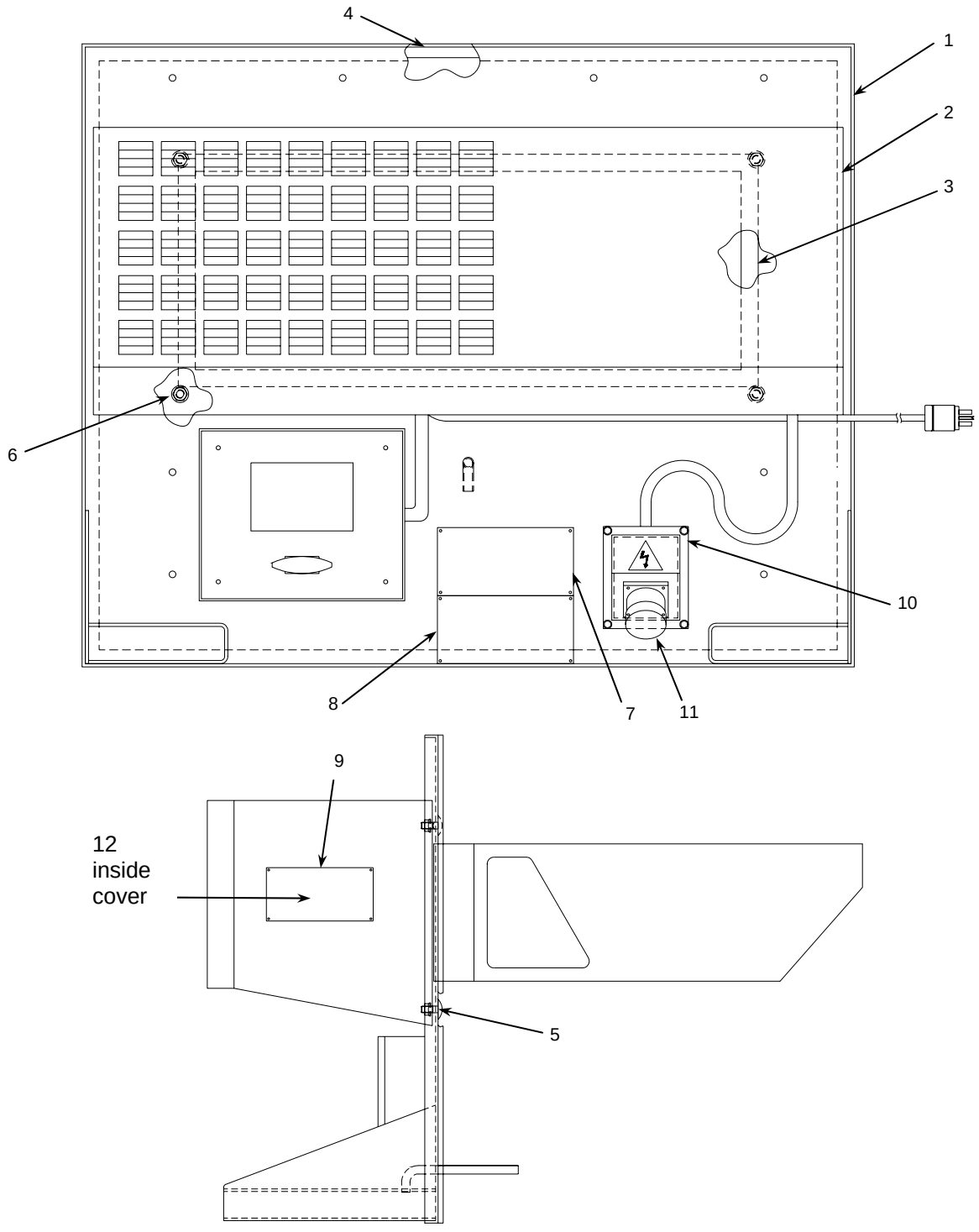


Figure 5. Refrigeration Unit (RU).

(1) ITEM NO.	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USEABLE ON CODE (UOC)	(7) QTY
					Group 03 Refrigeration Unit (RU)	
					FIG. 5. Refrigeration Unit (RU)	
1	XBFZZA		80298	50148-718	RU Base Plate	1
2	PDOFF	4110-01-519-3147	80298	86055-025	Refrigerator Unit	1
3	XBOZZ		80298	50148-213	Inner Seal	1
4	XBOZZ		80298	50148-214	Outer Seal	1
5	XB0ZZ		80298	81098-003	Carriage Bolt	4
6	PA0ZZ	5310-01-518-7445	80298	82004-004	Locknut	4
7	XB0ZZ		80298	88000-077	Reefer Unit Assembly Placard	1
8	XB0ZZ		80298	88000-075	Instruction Placard	1
9	XB0ZZ		80298	88000-078	Electrical Schematic Placard	1
10	XBOZZ		80298	50148-717	Box, Electrical Connector	1
11	XCOZZ	9535-01-519-3157	80298	87011-019	Connector Assembly	1
12	XB0ZZ		80298	88000-079	Plate	1

END OF FIGURE

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
GROUP 0301 EVAPORATOR SECTION COMPONENTS

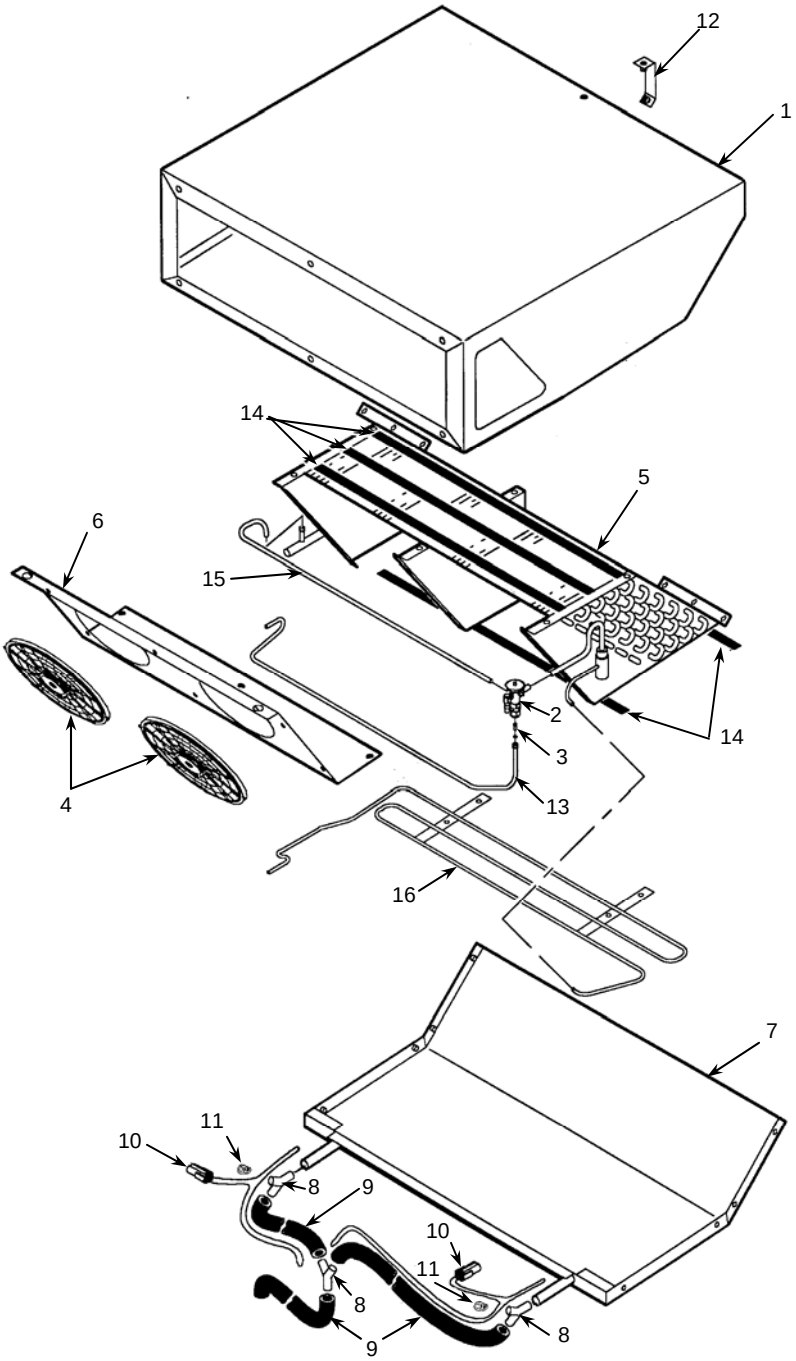


Figure 6. Evaporator Section Components.

(1) ITEM NO.	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USEABLE ON CODE (UOC)	(7) QTY
					Group 0301 Evaporator Section Components FIG 6. Evaporator Section Components	
1	XBOZZ		61510	98-5649	Housing - Evaporator	1
2	PAFZZ	4820-01-518-8574	61510	66-9314	Valve, Expansion	1
3	PAFZZ	5110-01-519-3565	61510	61-1120	Nozzle, Expansion	1
4	PAFZZ	4140-01-518-8169	61510	78-1378	Fan, Motor, Evaporator	2
5	XBFZZ		61510	67-1620	Coil - Evaporator	1
6	XBFZZ		61510	98-5650	Plenum - Evaporator	1
7	XBFZZ		61510	98-5651	Pan - Drain	1
8	XBOZZ		29780	2825	Tee, Hose	3
9	XBOZZ		61510	11-9223	Hose - Drain	1
10	PAOZZ	5999-01-518-8753	61510	41-3156	Condensate Drain Heater	2
11	XBOZZ		61510	33-2801	Grommet - Drain Hose	2
12	XBFZZ		61510	91-9988	Brace - Reinforcement Assembly	1
13	XBFZZ		61510	66-9964	Tube - Liquid	1
14	XBOZZ		61510	91-9989	Strip - Foam Tape	5
15	XBFZZ		61510	66-9965	Tube - Equalizer	1
16	XBFZZ		61510	66-9963	Tube - Drain Pan	1

END OF FIGURE

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
GROUP 0302 CONDENSER SECTION COMPONENTS

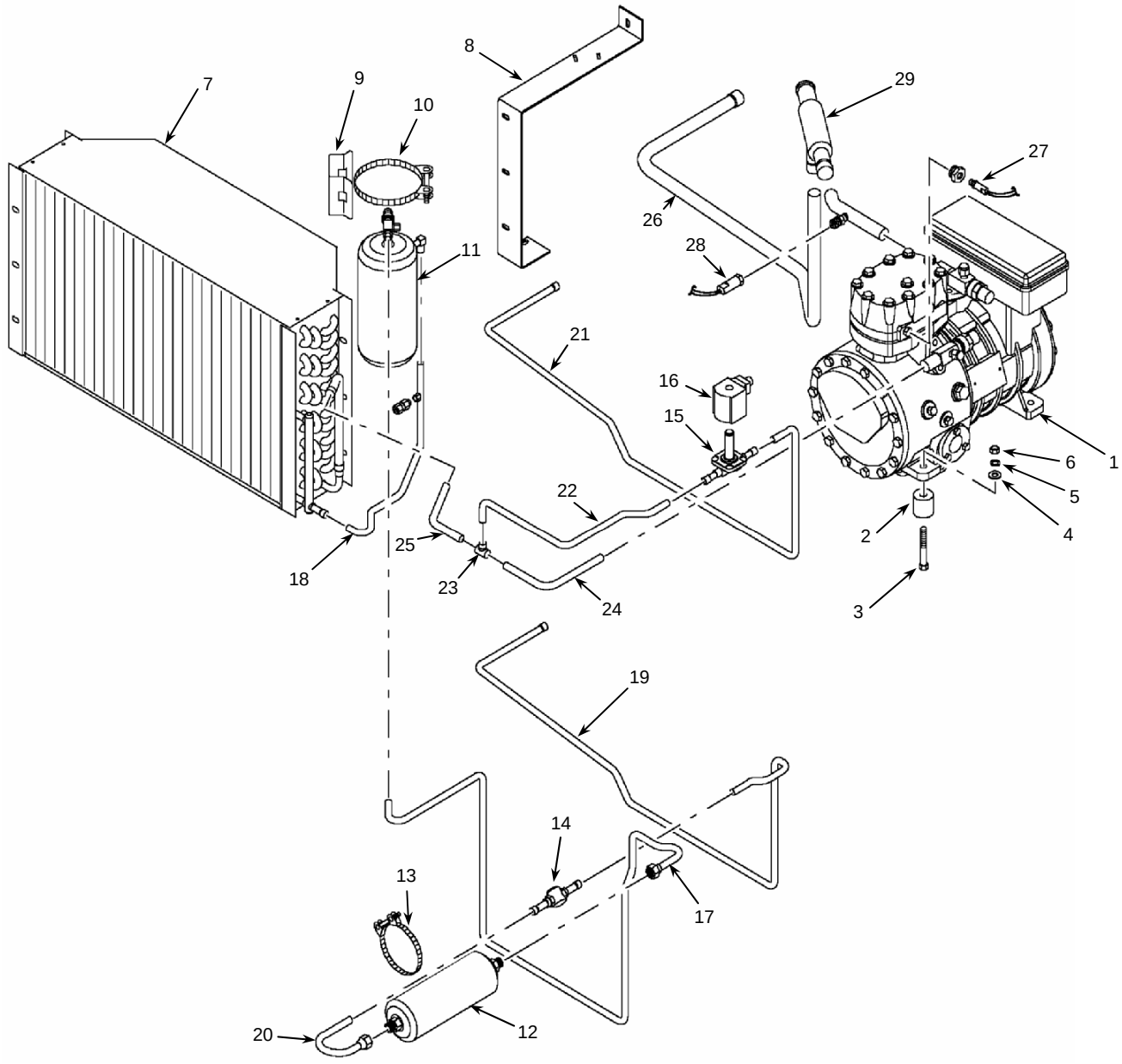


Figure 7. Condenser Section Components.

(1) ITEM NO.	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USEABLE ON CODE (UOC)	(7) QTY
					Group 0302 Condenser Section Components	
					FIG. 7. Condenser Section Components	
1	XDFZZ	4110-01-518-8491	61510	102-0722	Compressor (D2 11)	1
2	XBFZZ		61510	91-6417	Spacer - Compressor Support	4
3	XBFZZ		61510	55-8576	Screw - Compressor	4
4	XBFZZ		61510	55-8249	Flat washer	4
5	XBFZZ		61510	55-8577	Washer - Special	4
6	XBFZZ		61510	55-7006	Nut	4
7	XBFZZ		61510	67-1619	Coil - Condenser	1
8	XBFZZ		61510	91-9985	Bracket - Condenser Coil	1
9	XBFZZ		61510	91-9986	Support - Receiver Tank	1
10	XBFZZ		61510	91-9987	Clamp - Receiver Tank	1
11	XBFZZ	4130-01-518-8505	61510	67-1798	Tank - Receiver	1
12	PBFZZ	4130-01-518-8499	61510	66-8471	Filter-Drier, Refrigerant	1
13	XBFZZ		61510	91-6408	Clamp - Dehydrator	1
14	PAFZZ	6680-01-519-2675	61510	66-7682	Indicator Set	1
15	PAFZZ	5945-01-518-8517	61510	66-7878	Relay, Electromagnetic	1
16	PAFZZ	5945-01-518-8526	61510	41-5051	Relay, Electromagnetic	1
17	XBFZZ		61510	66-9966	Tube - Receiver Tank To Dehydrator	1
18	XBFZZ		61510	66-9967	Tube - Condenser Coil To Receiver	1
19	XBFZZ		61510	66-9968	Tube - Sight Glass To Evaporator	1
20	XBFZZ		61510	66-9969	Tube - Dehydrator To Sight Glass	1
21	XBFZZ		61510	66-9970	Tube - Solenoid To Evaporator	1
22	XBFZZ		61510	66-9971	Tube - Tee To Solenoid	1
23	XBFZZ		61510	55-2181	Tee	1
24	XBFZZ		61510	66-9972	Tube - Compressor To Tee	1
25	XBFZZ		61510	66-9973	Tube - Tee To Condenser Coil	1
26	XBFZZ		61510	66-9974	Tube - Evaporator To Compressor	1
27	PBFZZ	5930-01-518-8463	61510	44-8064	Switch - High Pressure Cutout	1
28	PBFZZ	5930-01-518-7556	61510	44-8030	Switch - Low Pressure Cutout	1
29	PBFZZ	4820-01-518-8554	61510	22-1073	Valve, Regulator, System Pressure	1

END OF FIGURE

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
GROUP 0303 ADR-300 ELECTRICAL COMPONENTS

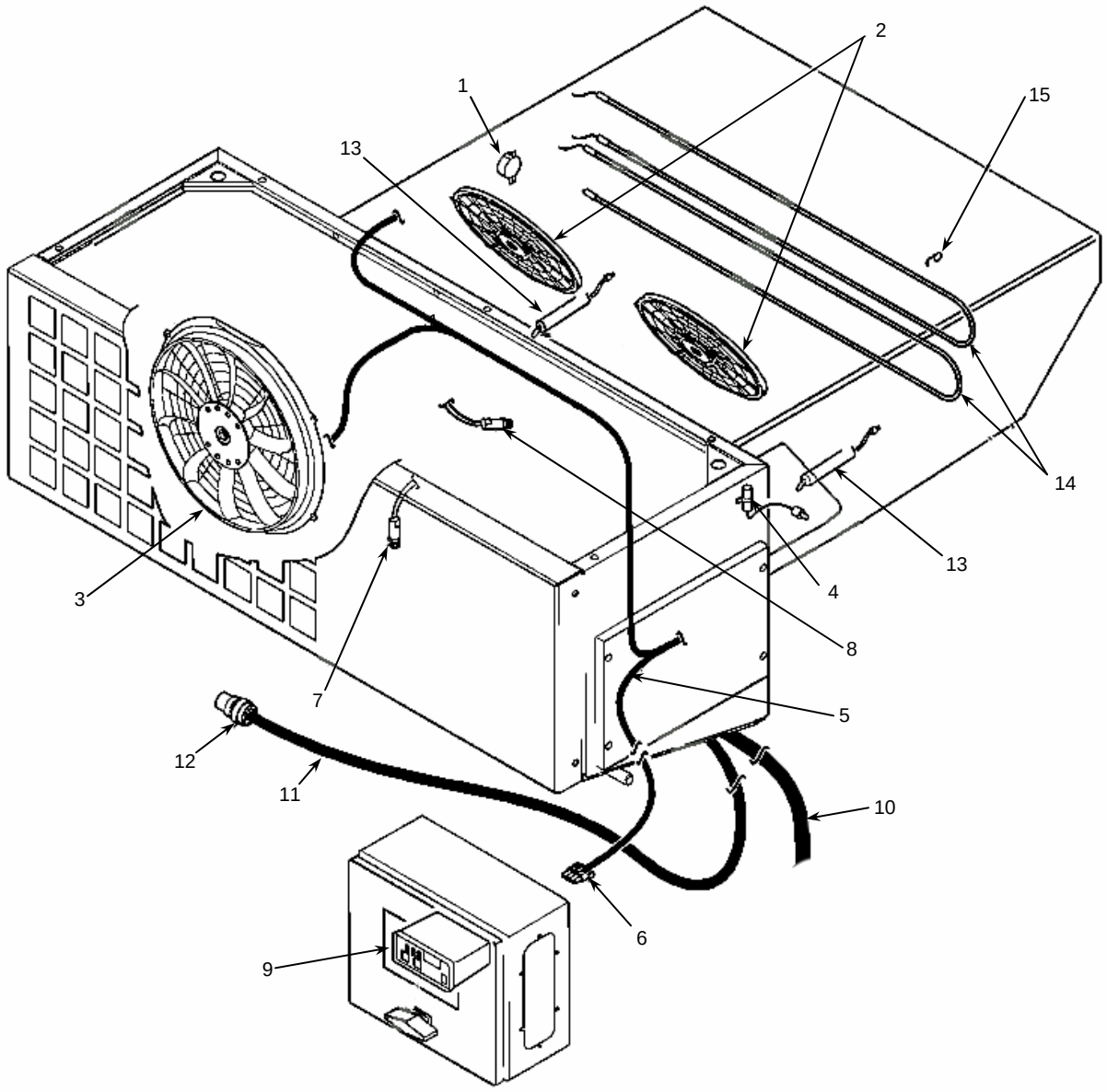


Figure 8. ADR-300 Electrical Components.

(1) ITEM NO.	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USEABLE ON CODE (UOC)	(7) QTY
					Group 0303 ADR-300 Electrical Components	
					FIG. 8. ADR-300 Electrical Components	
1	PBFZZ	5930-01-518-7554	61510	41-3136	Switch, Push	1
2	PBFZZ	4140-01-518-8169	61510	78-1378	Fan, Motor, Evaporator	2
3	PBFZZ	4140-01-518-8170	61510	78-1370	Fan, Motor, Circulating	1
4	PBFZZ	5905-01-518-7813	61510	55-9364	Resistor, Thermal	1
5	XBFZZ		61510	41-3440	Harness - Main	1
6	XBFZZ		61510	41-3098	Connector (10 Pin)	1
7	PAFZZ	5930-01-518-8463	61510	44-8064	Switch - High Pressure Cutout	1
8	PAFZZ	5930-01-518-7556	61510	44-8030	Switch - Low Pressure Cutout	1
9	XDFZZ	6110-01-518-8113	61510	45-1780	Controller M13	1
10	PAOFF	6150-01-519-5311	61510	41-3441	Cable Assembly, special purpose	1
11	PAOFF	6145-01-519-6921	80298	41-3442	Cable - Power (1 Ph, 60 Hz)	1
12	PAOZZ	5935-01-519-3617	61510	41-3445	Connector Body	1
13	PAFZZ	5999-01-518-8753	61510	41-3156	Heater Condensate Drain	2
14	PBFZZ	4520-01-518-7604	61510	45-1395	Electric Heating Element (750 W, 230 VAC)	2
15	XBFZZ		61510	91-240	Retainer - Heater	8

END OF FIGURE

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
GROUP 030306 ADR-300 CONTROL BOX COMPONENTS

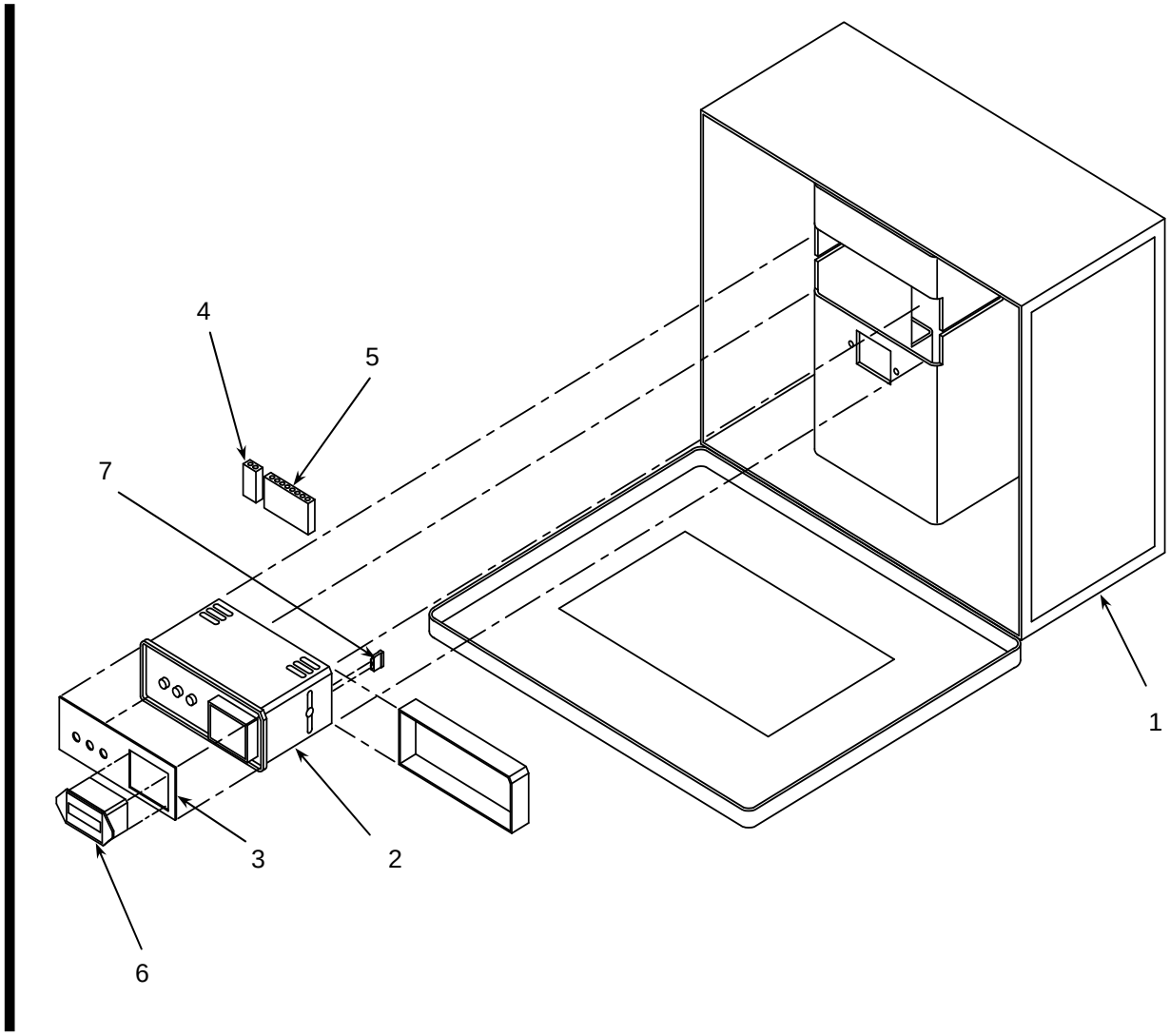


Figure 9. ADR-300 Control Box Components.

(1) ITEM NO.	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USEABLE ON CODE (UOC)	(7) QTY
					Group 030306 ADR-300 Control Box Components	
					FIG. 9. ADR-300 Control Box Components	
1	XBFZZ		61510	98-5656	Box-Hermetic	1
2	PAFZZ	6110-01-518-8113	61510	45-1780	Controller (M13 L07, 12/24 V)	1
3	XBFZZ		61510	91-9613	Face-Controller	1
4	XBFZZ		61510	41-1507	Connector (2, Male)	1
5	XBFZZ		61510	41-3423	Connector (10, Male)	1
6	PAFZZ	6645-01-066-5840	61510	44-5703	Meter, Time	1
7	PAOZZ	5920-01-504-0729	1YHH8	8229249	Fuse 4/1	1

END OF FIGURE

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
GROUP 030308 ADR-300 ELECTRICAL ENCLOSURE COMPONENTS

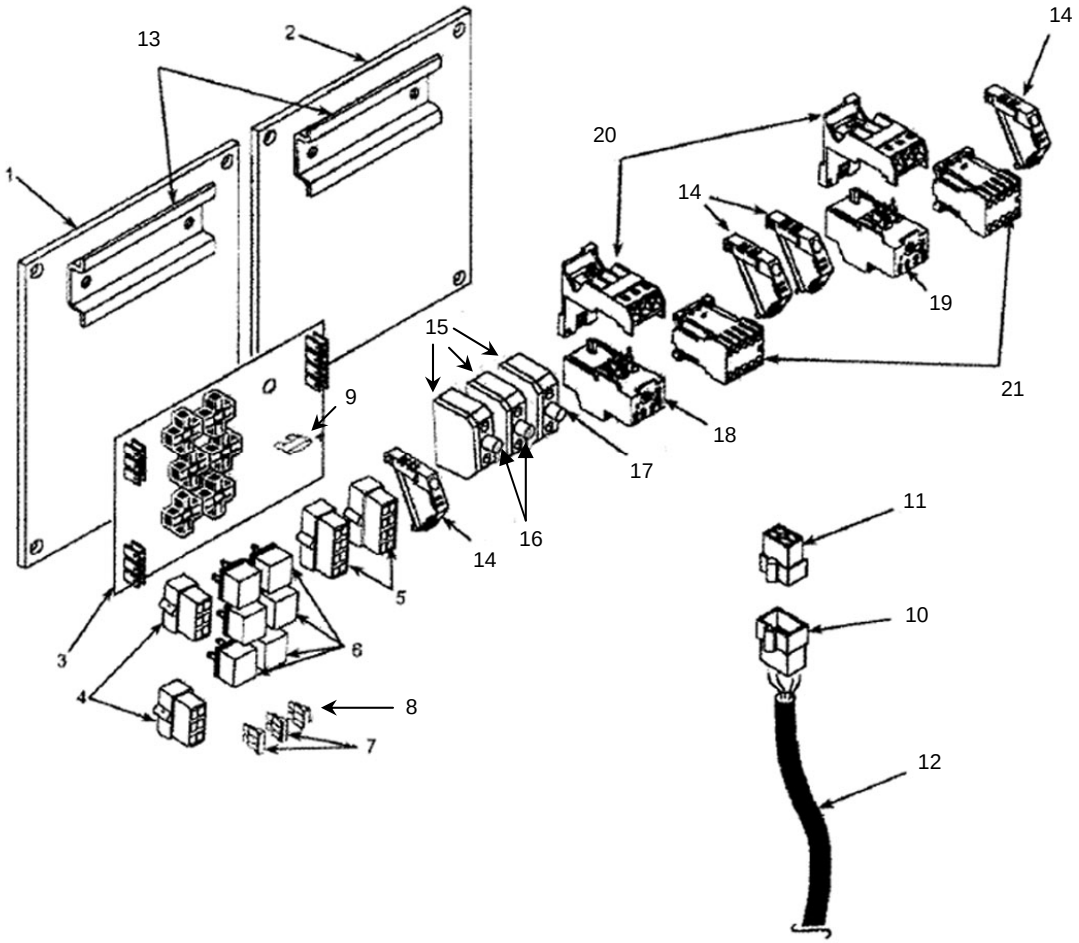


Figure 10. ADR-300 Electrical Enclosure Components.

(1) ITEM NO.	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USEABLE ON CODE (UOC)	(7) QTY
					Group 030308 ADR-300 Electrical Enclosure Components	
					FIG. 10. ADR-300 Electrical Enclosure Components	
1	XBFZZ		61510	91-9602	Bracket - Control Box	1
2	XBFZZ		61510	91-9626	Bracket - Control Box	1
3	PAFZZ	5998-01-518-7389	61510	41-4259	Circuit Card Assembly	1
4	PAFZZ	5935-01-519-2681	61510	41-876	Connector (6 Pin)	2
5	PAFZZ	5935-01-519-2682	61510	41-946	Connector (8 Pin)	2
6	PAFZZ	5945-01-518-7497	61510	41-3707	Relay (24 V)	6
7	PAOZZ	5920-01-519-2684	61510	44-9758	Fuse (10 A)	2
8	PAOZZ	5920-01-519-2688	61510	44-9344	Fuse (15 A)	1
9	PAOZZ	5920-01-464-4348	61510	44-9524	Fuse (3 A)	1
10	PAOZZ	5935-01-519-2736	61510	41-905	Connector - Plug (4 Pin)	2
11	PAOZZ	5935-01-519-2693	61510	41-928	Connector - Socket (4 Pin)	1
12	PAOZZ	6150-01-519-5311	61510	41-3441	Cable Assembly, special purpose	1
13	PAOZZ	9520-01-542-1188	61510	91-9993	Molding, metal	2
14	XBFZZ		61510	41-898	Connector - End	4
15	XBFZZ		61510	41-942	Connector - Fuse 1	3
16	PAOZZ	5920-01-519-2712	61510	41-4180	Fuse (1 A)	2
17	PAOZZ	5920-01-521-0511	61510	41-5863	Fuse (5 A)	1
18	PAOZZ	5925-01-519-2713	61510	41-3097	Breaker - Circuit (4 - 6 A)	1
19	PAOZZ	5925-01-518-7338	61510	41-3091	Breaker - Circuit (10 - 16 A)	1
20	PAFZZ	5925-01-519-2717	61510	41-3099	Socket - Circuit Breaker	1
21	PAFZZ	5945-01-518-7509	61510	41-1005	Relay, Electromagnetic	2

END OF FIGURE

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
GROUP 030310 TRANSFORMER COMPONENTS

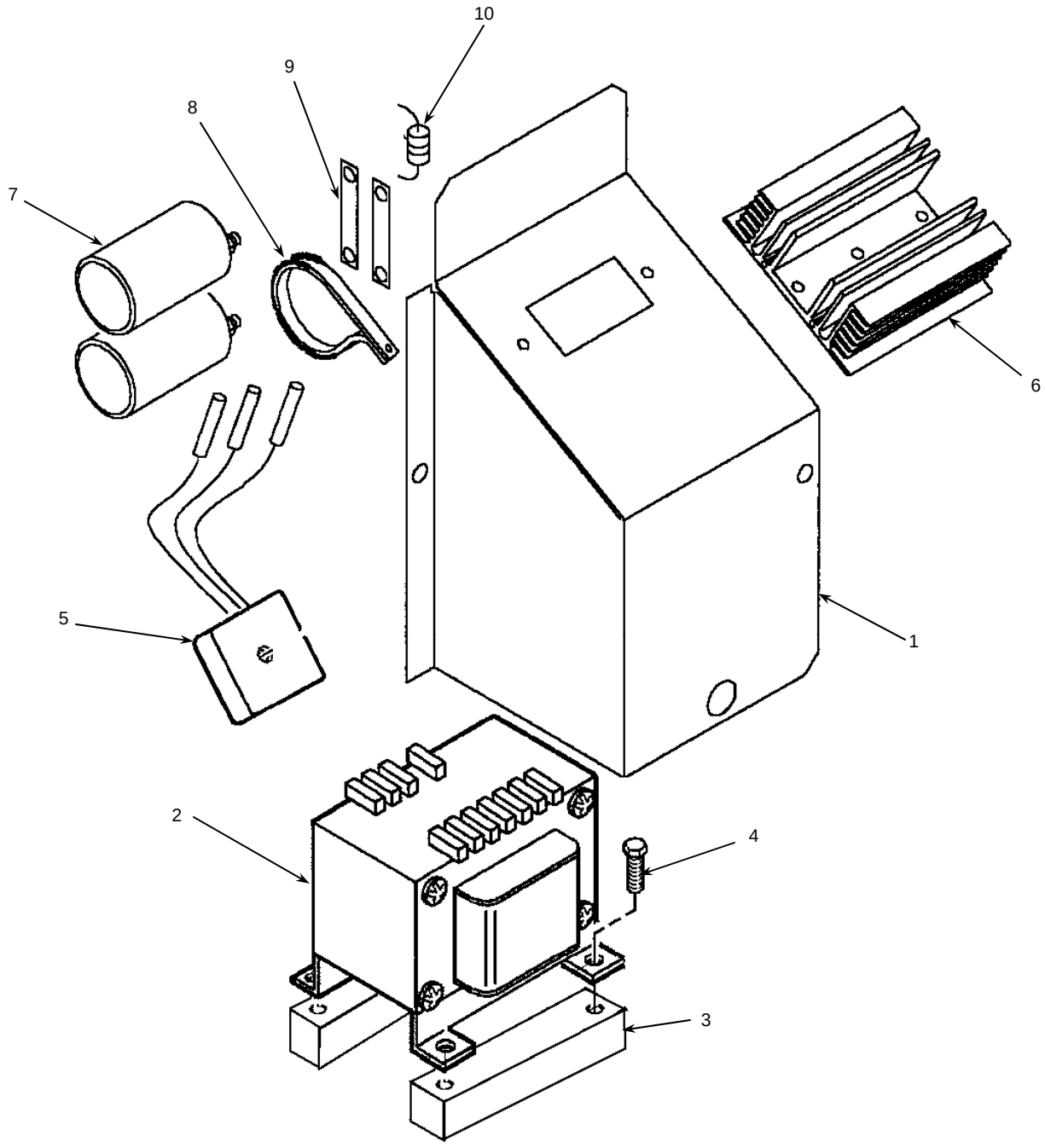


Figure 11. Transformer Components.

(1) ITEM NO.	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USEABLE ON CODE (UOC)	(7) QTY
					Group 030310 Transformer Components FIG. 11. Transformer Components	
1	XBFZZ		61510	91-9983	Cover-Transformer	1
2	PAFZZ	5950-01-518-7320	61510	41-3435	Transformer	1
3	XBFZZ		61510	923576	Spacer-Transformer	2
4	XBFZZ		61510	55-8546	Screw-Transformer	4
5	PBFZZ	5961-01-518-7489	61510	41-3438	Rectifier, Semiconductor Device, Unitized	1
6	XBFZZ		61510	41-977	Radiator	1
7	PBFZZ	5910-01-518-7342	61510	41-2992	Capacitor (24v)	2
8	XBFZZ		61510	91-6691	Clamp-Capacitor	2
9	XBFZZ		61510	41-3134	Jumper-Capacitor	2
10	PAFZZ	5905-01-519-2725	61510	44-9925	Resistor	1

END OF FIGURE

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
GROUP 0304 ADR-300 REFRIGERATOR ENCLOSURE COMPONENTS

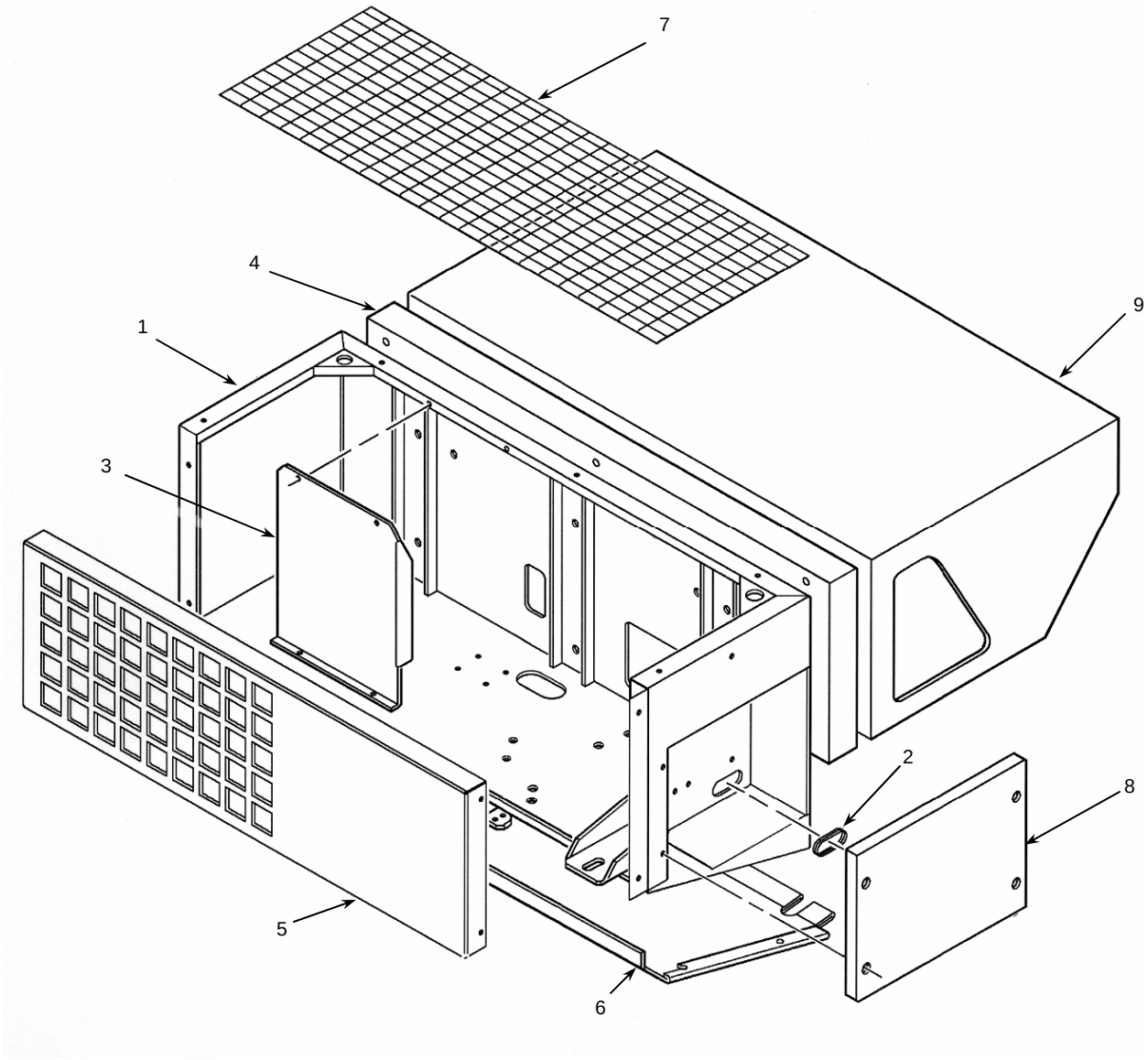


Figure 12. ADR-300 Refrigerator Enclosure Components.

(1) ITEM NO.	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USEABLE ON CODE (UOC)	(7) QTY
					Group 0304 ADR-300 Refrigerator Enclosure Components	
					Figure 12. ADR-300 Refrigerator Enclosure Components	
1	XBFZZ		61510	98-5648	Frame - Condenser	1
2	XBFZZ		61510	33-2923	Grommet	5
3	XBFZZ		61510	92-101	Panel - Blockoff	1
4	XBFZZ		61510	91-9990	Bulkhead	1
5	XBFZZ		61510	98-5652	Grille - Condenser (Front)	1
6	XBFZZ		61510	98-5653	Panel - Bottom	1
7	XBFZZ		61510	98-5654	Grille - Condenser (Top)	1
8	XBFZZ		61510	98-5655	Cover - Control Box	1
9	XBFZZ		61510	98-5649	Housing - Evaporator	1

END OF FIGURE

OPERATOR'S, UNIT, AND DIRECT SUPPORT MAINTENANCE
NATIONAL STOCK NUMBER (NSN) INDEX

STOCK NUMBER	FIG.	ITEM
6645-01-066-5840	9	6
5930-01-230-5340	4	3
5920-01-464-4348	10	9
4110-01-500-3614	1	2
4110-01-500-3618	1	2
4110-01-500-3621	1	1
	2	1
4110-01-500-3622	1	1
	2	1
5920-01-504-0729	9	7
5950-01-518-7320	11	2
5925-01-518-7338	10	19
5910-01-518-7342	11	7
5998-01-518-7389	10	3
5310-01-518-7443	2	11
5310-01-518-7445	5	6
5961-01-518-7489	11	5
5945-01-518-7497	10	6
5945-01-518-7509	10	21
5930-01-518-7554	8	1
5930-01-518-7556	7	28
	8	8
4520-01-518-7604	8	14
5905-01-518-7813	8	4
6110-01-518-8113	8	9
	9	2
4140-01-518-8169	6	4
	8	2
4140-01-518-8170	8	3
1670-01-518-8200	2	17
5930-01-518-8463	7	27
	8	7
4110-01-518-8491	7	1
4130-01-518-8499	7	12
5330-01-518-8504	2	16
4130-01-518-8505	7	11
5945-01-518-8517	7	15
5945-01-518-8526	7	16
4820-01-518-8554	7	29
4820-01-518-8574	6	2
1670-01-518-8587	2	18
5999-01-518-8753	6	10
	8	13
6680-01-519-2675	7	14
5935-01-519-2681	10	4
5935-01-519-2682	10	5
5920-01-519-2684	10	7
5920-01-519-2688	10	8
5935-01-519-2693	10	11
5920-01-519-2712	10	16
5925-01-519-2713	10	18
5925-01-519-2717	10	20
5905-01-519-2725	11	10
5935-01-519-2736	10	10
5930-01-519-3107	2	4
4720-01-519-3110	2	2
5930-01-519-3128	4	4
4110-01-519-3147	5	2
9535-01-519-3157	5	11
5365-01-519-3183	2	6
5340-01-519-3346	2	8
5340-01-519-3347	2	10
5340-01-519-3351	2	9
5340-01-519-3353	2	21
6210-01-519-3354	4	1
5110-01-519-3565	6	3
5340-01-519-3591	2	5
5935-01-519-3617	8	12
7110-01-519-3841	3	1
6150-01-519-5311	8	10
	10	12
6145-01-519-6921	8	11
5920-01-521-0511	10	17
4140-01-528-4101	8	3
9520-01-542-1188	10	13

END OF WORK PACKAGE

OPERATOR'S, UNIT, AND DIRECT SUPPORT MAINTENANCE PART NUMBER (P/N) INDEX

PART NUMBER	FIG.	ITEM
PS15ACI	4	3
100-100 P25-29-120V	4	2
102-0722	7	1
119223	2	2
11-9223	6	9
22-1073	7	29
2825	6	8
33-2801	6	11
33-2923	12	2
35183-301	2	22
36098-002	4	5
41-3097	10	18
41-1507	9	4
41-2992	11	7
41-3091	10	19
41-3097	10	15
41-3098	8	6
41-3099	10	20
41-3134	11	9
41-3136	8	1
41-3156	6	10
	8	13
41-3361	10	6
41-3423	9	5
41-3435	11	5
41-3438	11	2
41-3440	8	5
41-3441	8	10
	10	12
41-3442	8	11
41-3445	8	12
41-3451	10	12
41-3707	10	7
41-4180	10	16
41-4259	10	3
41-5051	7	16
41-5863	10	17
41-876	10	4
41-898	10	14
41-905	10	10
41-928	10	11
41-942	10	15
41-946	10	5
44-5703	9	6
41-977	11	6

PART NUMBER	FIG.	ITEM
44-8030	7	28
	8	8
44-8064	7	27
	8	7
44-9344	10	8
44-9524	10	9
44-9758	10	7
44-9925	11	10
45-1395	8	14
45-1780	8	9
	9	2
50148-121	1	2
50148-123	1	2
50148-201	2	6
50148-213	5	3
50148-214	5	4
50148-717	5	10
50148-718	5	1
50149-120	1	1
	2	1
50149-121	1	1
	2	1
55-2181	7	23
55-7006	7	6
55-8249	7	4
55-8546	11	4
55-8576	7	3
55-8577	7	5
55-9364	8	4
58400-763	2	17
58400-764	2	18
60363-204	3	2
60363-602	3	1
60363-717	3	7
60363-718	3	5
60363-719	3	3
60363-720	3	4
60363-721	3	6
60402-002	2	16
61-1120	6	3
66-7682	7	14
66-7878	7	15
66-8471	7	12
66-9314	6	2

PART NUMBER	FIG.	ITEM
66-9963	6	16
66-9964	6	13
66-9965	6	15
66-9966	7	17
66-9967	7	18
66-9968	7	19
66-9969	7	20
66-9970	7	21
66-9971	7	22
66-9972	7	24
66-9973	7	25
66-9974	7	26
67-1619	7	7
67-1620	6	5
67-1798	7	11
78-1370	8	3
78-1378	8	2
78-1378	6	4
81002-051	3	9
	3	10
81037-002	2	14
81083-002	2	19
81096-004	2	12
81096-006	2	13
81098-003	5	5
81099-001	2	15
82004-004	5	6
8229249	9	7
83001-004	2	20
83010-004	2	11
86025-017	2	7
86025-018	2	4
86025-019	2	5
86025-020	2	9
86025-021	2	8
86032-001	4	1
86032-002	4	4
86035-021	2	21
860363-002	2	3
86055-025	5	2
86425-002	3	8
87011-019	5	11
88000-075	5	8

PART NUMBER	FIG.	ITEM
88000-077	5	7
88000-078	5	9
88000-079	5	12
91-240	8	15
91-6408	7	13
91-6417	7	2
91-6691	11	8
91-9602	10	1
91-9613	9	3
91-9626	10	2
91-9983	11	1
91-9985	7	8
91-9986	7	9
91-9987	7	10
91-9988	6	12
91-9989	6	14
91-9990	12	4
91-9993	10	11
92-101	12	3
923576	11	3
98-5648	12	1
98-5649	6	1
	12	9
98-5650	6	6
98-5651	6	7
98-5652	12	5
98-5653	12	6
98-5654	12	7
98-5655	12	8
98-5656	9	1

CHAPTER 8
SUPPORTING INFORMATION
FOR
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FEET
(ADR-300)

OPERATOR' S, UNIT, AND DIRECT SUPPORT MAINTENANCE REFERENCES

SCOPE

This work package lists field manuals, forms, technical manuals and miscellaneous publications referenced in this manual or otherwise relevant to the employment of the ADR-300.

FIELD MANUALS

FM 3-5	NBC Decontamination
FM 4-25.4	First Aid
FM 10-450-4	Multi-Service Helicopter Sling Load: Single-Point Load Rigging Procedures
FM 31-70	Basic Cold Weather Manual
FM 31-71	Northern Operations
FM 38-700	Packaging of Materiel for Preservation
FM 38-701	Packaging of Materiel for Packing

FORMS

DA Form 2028	Recommended Changes to Publications and Blank Forms
DA Form 2404	Equipment Inspection and Maintenance Worksheet
DA Form 2408-9	Equipment Control Record
SF 361	Transportation Discrepancy Report
SF 362	Report of Packaging and Handling Deficiencies
SF 364	Report of Discrepancy (ROD)
SF 368	Product Quality Deficiency Report

MISCELLANEOUS PUBLICATIONS

AFIM 24-204	Preparing Hazardous Materials for Military Air Shipments
AR 700-138	Army Logistics Readiness and Sustainability
CTA 8-100	Army Medical Department Expendable/Durable Items
CTA 50-970	Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items)
TK 5984-10	Diagnosing Thermo King Refrigeration Systems
T&T 134 (CAGEC 43904)	Service Bulletin: Flushing Refrigeration Lines

PAMPHLETS

DA PAM 738-751 (TAMMS-A)	Functional Users Manual for the Army Maintenance Management Systems-Aviation
DA PAM 750-8	The Army Maintenance Management System (TAMMS) Users Manual
MTMCTEA PAM 55-19	Military Traffic Management Command Transportation Engineering Command

TECHNICAL MANUALS

TM 38-470	Storage and Maintenance of Army Prepositioned Stock Materiel
TM 750-244-3	Destruction of Army Material to Prevent Enemy Use

END OF WORK PACKAGE

OPERATORS, UNIT MAINTENANCE AND DIRECT SUPPORT MAINTENANCE ALLOCATION CHART (MAC)

INTRODUCTION

The Army Maintenance System MAC

This introduction provides a general explanation of all maintenance and repair functions authorized at the two maintenance levels under the Two-Level Maintenance System concept.

The MAC (immediately following the introduction) designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component shall be consistent with the capacities and capabilities of the designated maintenance levels, which are shown on the MAC in column (4) as:

Field - includes three subcolumns, Crew (C), Service (O), and Field (F).

Sustainment – includes two subcolumns, General Support (H) and Depot (D).

The maintenance to be performed below depot and in the field is described as follows:

1. Service maintenance. The responsibility of a using organization to perform maintenance on its assigned equipment. It normally consists of inspecting, servicing, lubricating, adjusting, and replacing parts, minor assemblies, and subassemblies. The replace function for this level of maintenance is indicated by the letter “O” in the third position of the SMR code. An “O” appearing in the fourth position of the SMR code indicates complete repair is possible at the service maintenance level.

2. Field maintenance. Maintenance accomplished on a component, accessory, assembly, subassembly, plug-in unit, or other portion, either on the system or after it is removed. The replace function for this level of maintenance is indicated by the letter “F” appearing in the third position of the SMR code. An “F” appearing in the fourth position of the SMR code indicates complete repair is possible at the field maintenance level. Items are returned to the user after maintenance is performed at this level.

3. Below Depot sustainment. Maintenance accomplished on a component, accessory, assembly, subassembly, plug-in unit, or other portion, either on the system or after is removed. The replace function for this level of maintenance is indicated by the letter “H” appearing in the third position of the SMR code. An “H” appearing in the fourth position of the SMR code indicates complete repair is possible at the below depot sustainment maintenance level. Items are returned to the supply system after maintenance is performed at this level. The tools and test equipment requirements table (immediately following the MAC) lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from the MAC. The remarks table (immediately following the tools and test equipment requirements) contains supplemental instructions and explanatory notes for a particular maintenance function.

Maintenance Functions

Maintenance functions are limited to and defined as follows:

1. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel.) This includes scheduled inspection and gaugings and evaluation of cannon tubes.

2. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards on a

3. scheduled basis, i.e., load testing of lift devices and hydrostatic testing of pressure hoses.

4. Service. Operations required periodically to keep an item in proper operating condition, e.g. to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases. This includes scheduled exercising and purging of recoil mechanisms. The following are examples of service functions:

    a. Unpack. To remove from packing box for service or when required for the performance of maintenance operations.

    b. Repack. To return item to packing box after service and other maintenance operations.

    c. Clean. To rid the item of contamination.

    d. Touch up. To spot paint scratched or blistered surfaces.

    e. Mark. To restore obliterated identification.

4. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper or position, or by setting the operating characteristics to specified parameters.

5. Align. To adjust specified variable elements of an item to bring about optimum or desired performance

6. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments of test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

7. Remove/install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

8. Paint. To prepare and spray color coats of paint so that the ammunition can be identified and protected. The color indicating primary use is applied, preferably, to the entire exterior surface as the background color of the item. Other markings are to be repainted as original so as to retain proper ammunition identification.

9. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. “Replace” is authorized by the MAC and assigned maintenance level is shown as the third position code of the Source, Maintenance and Recoverability (SMR) code.

10. Repair. The application of maintenance services, including fault location/troubleshooting, removal/installation, disassembly/assembly procedures and maintenance actions to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

NOTE

The following definitions are applicable to the “repair” maintenance function: Services. Inspect, test, service, adjust, align, calibrate, and/or replace.

Fault location/troubleshooting. The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or Unit Under Test (UUT).

Disassembly/assembly. The step by step breakdown (taking apart) of a spare/functional group coded item to the level of its least component, that is assigned an SMR code for the level of maintenance under consideration (i.e. identified as maintenance significant).

Actions. Welding, grinding, riveting, straightening, facing, machining, and/or resurfacing.

11. Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

12. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (e.g., hours/miles) considered in classifying Army equipment/components.

Explanation of Columns in the MAC

Column (1) Group Number. Column (1) lists Functional Group Code (FGC) numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the Next Higher Assembly (NHA).

Column (2) Component/Assembly. Column (2) contains the item names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

Column (3) Maintenance Function. Column (3) lists the functions to be performed on the item listed in column (2). (For a detailed explanation of these functions refer to “Maintenance Functions” outlined above).

Column (4) Maintenance Level. Column (4) specifies each level of maintenance authorized to perform each function listed in column (3), by indicating work time required (expressed as manhours in whole hours or decimals) in the appropriate subcolumn. This work time figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function varies at different maintenance levels, appropriate work time figures are to be shown for each level. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC. The symbol designations for the various maintenance levels are as follows:

Field:

C Crew maintenance
O Service maintenance
F Field maintenance

Sustainment:

L Specialized Repair Activity (SRA)
H Below Depot
D Depot Maintenance

NOTE

The “L” maintenance level is not included in column (4) of the MAC. Functions to this level of maintenance are identified by work time figure in the “H” column of column (4), and an associated reference code is used in the REMARKS column (6). This code is keyed to the Remarks, and the SRA complete repair application is explained there.

Column (5) Tools and Equipment Reference Code. Column (5) specifies, by code, those common tool sets (not individual tools), common Test, Measurement and Diagnostic Equipment (TMDE), and special tools, special TMDE, and support special equipment required to perform the designated function. Codes are keyed to the entries in the tools and test equipment table.

Column (6) Remarks Code. When applicable, this column contains a letter code, in alphabetic order, which is keyed to the remarks table entries.

Explanation of Columns in the Tools and Test Equipment Requirements

Column (1) – Tool or Test Equipment Reference Code. The tool or test equipment reference code correlates with a code used in column (5) of the MAC.

Column (2) – Maintenance Level. The lowest level of maintenance authorized to use the tool or test equipment.

Column (3) – Nomenclature. Name or identification of the tool or test equipment.

Column (4) – National Stock Number (NSN). The NSN of the tool or test equipment.

Column (5) – Tool Number. The manufacturer's part number.

Explanation of Columns in Remarks

Column (1) – Remarks Code. The code recorded in column (6) of the MAC.

Column (2) – Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC.

UNIT MAINTENANCE
MAINTENANCE ALLOCATION CHART (MAC)

Table 1. Maintenance Allocation Chart for the ADR-300.

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools & Equipment Reference Code	(6) Remarks Code
			Field			Sustainment			
			Crew	Service	Field	Below Depot	Depot		
			C	O	F	H	D		
00	ADR-300	Inspect	0.5						
		Test	0.5						
		Service		1.0				3	
01	Insulated Container (IC)	Inspect	0.3						
		Repair			0.5			1,4	A
01	Door Panel	Inspect	0.1						
		Repair			0.5			4	
01	Cargo Restraint Rails	Remove/Install		0.5				3	
01	Handle Unit, Door	Remove/Install			0.3			3	
0103	Shelf Assembly	Inspect	0.1						
		Remove/Install			0.3			5	
02	IC Electrical System	Inspect	0.2						
		Test		0.5				2,3	
02	Fixture, Lighting	Inspect	0.1						
		Repair		0.8				2,3	
02	Connector Receptacle	Repair		0.1				2,3	
		Test		1.0				2,3	
		Replace		0.3				2,3	
02	Light Indicator	Inspect	0.2						
		Replace		0.5				2,3	
02	Switch, Toggle	Inspect	0.2						
		Repair		0.1				2,3	
		Replace		0.3				2,3	
03	Refrigeration Unit (RU)	Inspect		0.8				3	
		Test			2.0			5	
		Service			2.0			5	
		Remove/Install		0.5				3	
0301	Valve - Expansion	Replace			3.0			5	
0301	Coil - Evaporator	Remove/Install			2.0			5	
0301	Condensate Drain Heater	Replace			0.5			4	
0302	Coil - Condenser	Remove/Install			2.0			5	
0302	Filler-Drier, Refrigerant	Replace			2.0			5	
0302	Tank - Receiver	Replace			2.0			5	
0302	Relay, Electromagnetic	Replace			2.0			5	
0302	Compressor (D2 11)	Remove/ Install			2.0			5	
0302	Valve, Regulator, System, Pressure	Remove/Install			2.0			5	
0303	Electrical System	Test			1.0			2,4	
0303	Low Pressure Cut-out Switch	Replace			1.0			5	

Table 1. Maintenance Allocation Chart for the ADR-300.

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools & Equipment Reference Code	(6) Remarks Code
			Field			Sustainment			
			Crew	Service	Field	Below Depot	Depot		
			C	O	F	H	D		
0303	Evaporator Fan Assembly	Replace			2.0			4	
0303	Electric Heating Element	Replace			2.0			4	
0303	High Pressure Cut-Out Switch	Replace			2.0			5	
0303	Condenser Fan Assembly	Remove/Install			0.5			4	
031006	Unit Controller	Replace			0.3			4	
0303	Push switch	Remove/Install			1.0			4	
030308	Contactor (24 V)	Remove/Install			0.8			2,4	
030308	RU Circuit Breakers	Replace			0.5			4	
030310	Transformer	Remove			0.3			3	
		Install			0.6			3	

Table 2. Tools and Test Equipment for ADR-300.

(1) Tool or Test Equipment Reference Code	(2) Maintenance Level	(3) Nomenclature	(4) National Stock Number	(5) Tool Number
1	F	Disk Sander	5310-01-396-6236	CAGEC 60933, P/N 7335
2	O,F	Multimeter	6625-00-914-4113	
3	O	Tool Kit, General Mechanics, Automotive	5180-00-177-4033	
4	F	Tool Kit, Org. Maintenance Common No. 1	4901-00-754-0654	
5	F	Tool Kit, Refrigeration Service	5180-00-596-1474	
6	F	Threaded Insert Anvil		CAGEC 0VK23, P/N 23611377030
7	F	Threaded Insert Installation Tool		CAGEC 0VK23, P/N 23615301000
8	F	3/8 – 24 Mandrel		CAGEC 0VK23, P/N 23611377620

Table 3. Remarks for ADR-300.

Remarks Code	Remarks
A	Container repairs are limited to non-structural elements. Panel damage area must be no larger than a 1.5" x 3" (3.8 cm x 7.6 cm) rectangle and no closer than 12" from a panel edge. More extensive or structural damage should be repaired by an approved depot.

END OF WORK PACKAGE

OPERATOR'S , UNIT, AND DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
COMPONENTS OF END ITEM (COEI) LIST AND BASIC ISSUE ITEMS (BII) LIST

INTRODUCTION

Scope

This work package lists COEI and BII for the ADR-300 to help you inventory items for safe and efficient operation of the equipment.

General

The COEI and BII information is divided into the following lists:

Components of End Item (COEI). This list is for information purposes only and is not authority to requisition replacements. These items are part of the ADR-300. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Items of COEI are removed and separately packaged for transportation or shipment only when necessary. Illustrations are furnished to help you find and identify the items.

Basic Issue Items (BII). These essential items are required to place the ADR-300 in operation, operate it, and to do emergency repairs. Although shipped separately packaged, Bll must be with the ADR-300 during operation and when it is transferred between property accounts. Listing these items is your authority to request/requisition them for replacement based on authorization of the end item by the TOE/MTOE. Illustrations are furnished to help you find and identify the items.

Explanation of Columns in the COEI List and BII List

Column (1) Illus Number. Gives you the number of the item illustrated.

Column (2) National Stock Number (NSN). Identifies the stock number of the item to be used for requisitioning purposes.

Column (3) Description, Part Number/(CAGEC). Identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The stowage location of COEI and BII is also included in this column. The last line below the description is the part number and the Commercial and Government Entity Code (CAGEC) (in parenthesis)..

Column (4) Usable on Code. When applicable, gives you a code if the item you need is not the same for different models of equipment. These codes are identified below:

There are no Usable On Codes applicable to the ADR-300.

Column (5) U/I. Unit of Issue (U/I) indicates the physical measurement or count of the item as issued per the National Stock Number shown in column (2).

Column (6) Qty Rqr. Indicates the quantity required.

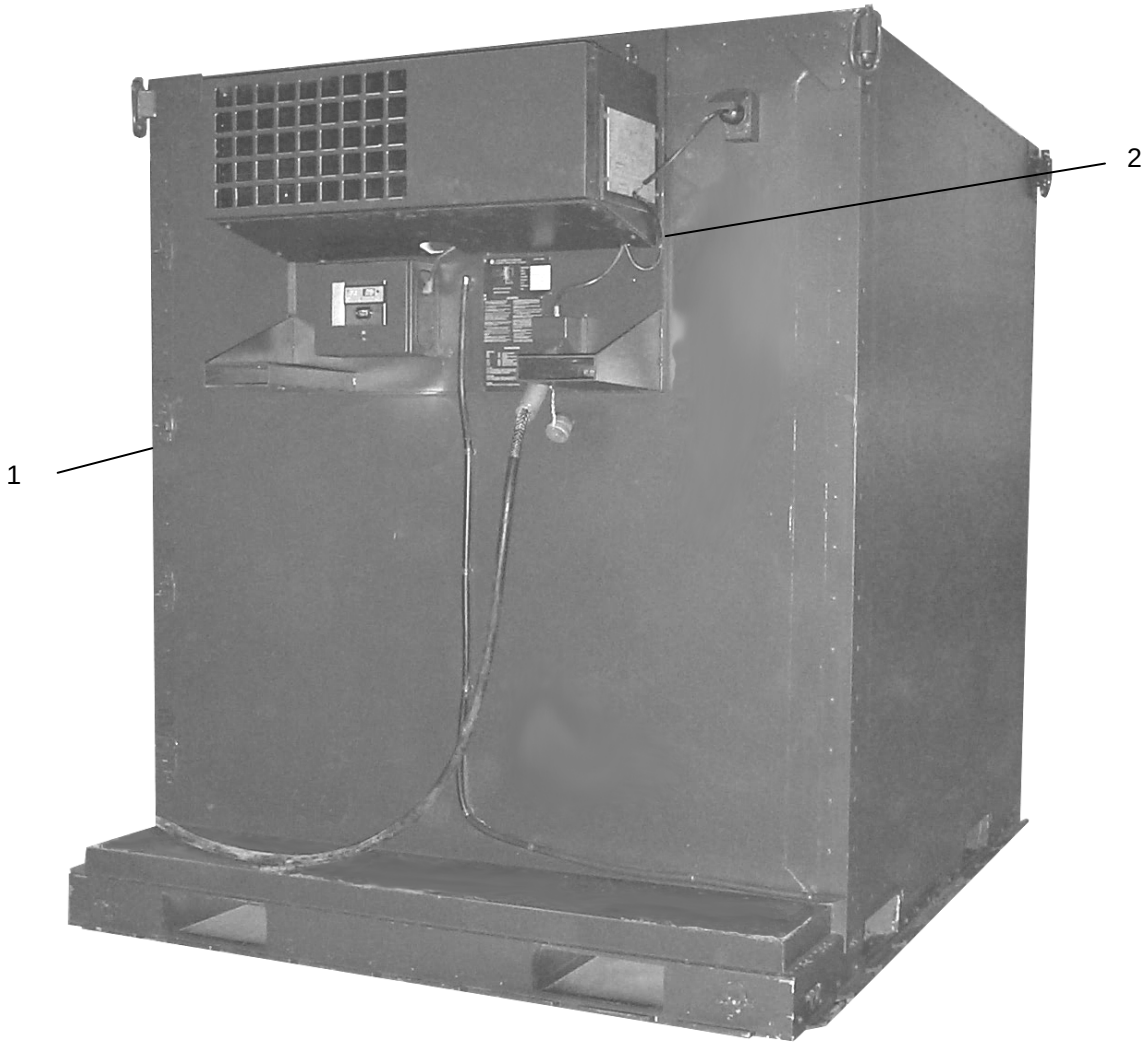


Table 1. Components of End Item List.

(1) Illus Number	(2) National Stock Number (NSN)	(3) Description, Part Number/(CAGEC)	(4) Usable On Code	(5) U/I	(6) Qty Rqr
1	4110-01-500-3621	Insulated Container Assembly, ADR-300, Green / (80298) / 50149-124	FSF	Ea.	1
1	4110-01-500-3622	Insulated Container Assembly, ADR-300, Tan / (80298) / 50149-125	FTZ	Ea.	1
2	4110-01-500-3614	Refrigeration Unit, ADR-300, Green / (80298) / 50148-126		Ea.	1
2	4110-01-500-3618	Refrigeration Unit, ADR-300, Tan / (80298) / 50148-127		Ea.	1

ARMY TM 10-4110-262-13&P
AIR FORCE TO 40R7-6-1

TECHNICAL MANUAL

OPERATOR'S, UNIT, AND DIRECT SUPPORT
MAINTENANCE MANUAL
(INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST)

ADVANCED DESIGN REFRIGERATOR, 300 Cubic Foot
(ADR-300)
NSN 4110-01-465-4158 (Green)
NSN 4110-01-465-4564 (Tan)

DISTRIBUTION STATEMENT A-Approved for public release; distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY

31 MARCH 2004

Table 2. Basic Issue Items (BII).

(1) Illus Number	(2) National Stock Number (NSN)	(3) Description, Part Number/(CAGEC)	(4) Usable On Code	(5) U/I	(6) Qty Rqr
1	4110-01-465-4158 4110-01-465-4564	TM 10-4110-262-13&P		Ea.	1

END OF WORK PACKAGE

OPERATOR' S, UNIT, AND DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
EXPENDABLE AND DURABLE ITEMS LIST

INTRODUCTION

Scope

This work package lists expendable and durable items that you will need to operate and maintain the ADR-300. This list is for information only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V Repair Parts; and Heraldic Items), Field and Garrison Furnishings and Equipment or CTA 8-100, Army Medical Department Expendable/Durable Items.

Explanation of Columns in the Expendable/Durable Items List

Column (1) Item No. This number is assigned to the entry in the list and is referenced in the narrative instructions to identify the item (e.g., Use light oil lubricant (item 11, WP 0067).).

Column (2) Level. This column identifies the lowest level of maintenance that requires the listed item (include as applicable: C = Operator/Crew, O = Unit/AVUM, F = Direct Support/AVIM, H = General Support, D = Depot).

Column (3) National Stock Number (NSN). This is the NSN assigned to the item which you can use to requisition it.

Column (4) Item Name, Description, Part Number/(CAGEC). This column provides the other information you need to identify the item. The last line below the description is the part number and the Commercial and Government Entity Code (CAGEC) (in parentheses).

Column (5) U/I. Unit of Issue (U/I) code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc."

Table 1. Expendable and Durable Items List.

(1) Item No.	(2) Level	(3) National Stock Number (NSN)	(4) Item Name, Description, Part Number/(CAGEC)	(5) U/I
1	F		Acid Test Kit (58727) TKO [440-01-057-1583]	EA
2	F		Adhesive (39428) 75425A67 [8040-01-492-9717]	QUART
3	C		Anti-seize thread compound (08854) 12112 [8030-01-481-9218]	PINT
4	F	8010-01-060-7176	Body Filler (19207) 12259539	Oz.
5	F	9150-00-064-4106	Compressor Oil, Polyol Ester (01767) VISCOSINEYH	GL
6	F	5975-01-223-7310	Conduit, Electrical, PVC, ½-inch (82918) 458-54865-1	INCH
7	F	4110-01-464-0346	ESD Wrist Strap (61510) 204-622	Pkg.
8	F		Heat transfer compound	
9	F	6810-01-075-5546	Isopropyl Alcohol (53390) 7618-19-4	
10	F		Lamp, Incandescent, 100 W	
11	C		Light Oil Lubricant	
12	F		Mixing Containers (non-plastic)	
13	F		Primer (80298) 93034-004	
14	F		Putty Knife (flexible)	
15	F		Rags (cleaning and buffing)	
16	F		Refrigerant R404A	
17	F		RU Outer Seal (80298) 50148-214	
18	F		Sand Paper, 100 grit (disk)	
19	F		Sand Paper, 300 grit (disk)	
20	F		Sand Paper, 600 grit (disk)	
21	F		Sealant (80298) 93077-008	
22	F		Thread Sealer, Refrigerant (04544) 203-393	
23	F		3/8-24 Threaded Insert (80298) 84025-001	
			End of List	

END OF WORK PACKAGE

OPERATOR' S, UNIT, AND DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
TOOL IDENTIFICATION LIST

INTRODUCTION

Scope

This work package lists all common tools and supplements and special tools/fixtures needed to maintain the ADR-300.

Explanation of Columns in the Tool Identification List

Column (1) Item No. This number is assigned to the entry in the list and is referenced in the initial setup to identify the item (e.g., Extractor (WP 0090, Item 32)).

Column (2) Item Name. This column lists the item by noun nomenclature and other descriptive features (e.g., Gage, belt tension).

Column (3) National Stock Number (NSN). This is the National Stock Number (NSN) assigned to the item; use it to requisition the item.

Column (4) Part Number/(CAGEC). Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity) which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items. The manufacturer's Commercial and Government Entity Code (CAGEC) is also included.

Column (5) Reference. This column identifies the authorizing supply catalog or RPSTL for items listed in this work package.

Table 1. ADR-300 Tool Identification List.

(1) Item No.	(2) Item Name	(3) National Stock Number (NSN)	(4) Part Number/(CAGEC)	(5) Reference
1	Disk Sander	5130-01-396-6236	7335/60933	
2	Multimeter	6625-00-914-4113	369-60741	
3	Shop Equipment, Automative Vehicle	4901-00-754-0654	SC4910-95CLA74/ 19204	
4	Tool Kit, General Mechanics	5180-01-454-3787	12B470000-59678	
5	Tool Kit, Refrigeration Service	5180-00-596-1474	SC5180-90-CL-N18 50980	

END OF WORK PACKAGE

OPERATOR' S, UNIT, AND DIRECT SUPPORT MAINTENANCE MANDATORY REPLACEMENT PARTS LIST

MANDATORY REPLACEMENT PARTS LIST

This work package includes a list of all mandatory replacement parts referenced in the task initial setups and procedures. These are items that must be replaced during maintenance whether they have failed or not. This includes items based on usage intervals such as miles, time, rounds fired, etc.

Table 1. Mandatory Replacement Parts List.

Item No.	Part Number/ (CAGEC)	National Stock Number (NSN)	Nomenclature	Qty
1	MK20AUP / 88044	6625-00-431-8936	Refrigerant Filler-Drier	1

END OF WORK PACKAGE

OPERATOR' S, UNIT, AND DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
SUPPORT ITEMS

Support Items required for the ADR-300 are listed in WPs 0068– 0071

END OF WORK PACKAGE

OPERATOR' S, UNIT, AND DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
GLOSSARY

Term	Definition
Advanced Design Refrigerator (ADR-300)	A 300 cubic foot refrigerated shipping container consisting of an insulated container and a removable refrigeration unit.
Capacity	The amount of heat that can be transported by the refrigeration system in a given period of time. The capacity of a system depends on the operating temperatures inside and outside the IC as well as the physical condition of the refrigerator hardware.
Captive Screw	A screw that is retained by one of the components of an assembly that is held together by the screw. The ADR-300 condenser section cover includes six captive screws to secure the cover on the condenser section. These screws remain in the condenser section cover when it is removed from the system.
Charging	The process of adding refrigerant to the refrigeration system. Charging may include adding a full charge to an evacuated system or adding refrigerant to a partially charged system.
Circuit Breaker	A device used to limit electrical current in a circuit. A circuit breaker is also used to cut off all power to the circuit it supplies.
Circuit Card Assembly (PC Board)	The printed circuit board housed in the RU electrical enclosure. The ADR-300 circuit card assembly provides most of the control circuit signals to the ADR-300.
Compressor	A mechanical device used to raise the pressure of a contained fluid. The ADR-300 compressor pumps the refrigerant from the low-pressure side of the refrigeration circuit to the high-pressure side.
Condenser Section	That portion of the Refrigerator that is outside the IC. The condenser section exhausts heat to the outside environment.
Connector	A device used to connect one or more electrical wires so that they can be separated when necessary and reconnected.
Contactor	An electrical device that switches a high voltage circuit on or off based on a relatively low voltage control signal. The ADR-300 high voltage system includes two contactors that switch the motor and electric heater circuits based on 12-volt signals from the circuit card assembly.
Continuity Check	A continuity check is a measure of resistance between two points of an electrical circuit. "Continuity" means that there is a measurable resistance, or conductance, between the two points. "No continuity" means that there is an infinite resistance or no conductivity between the two points.
Cooling Mode	The operating mode in which the ADR-300 cools (removes heat from) the interior of the IC. The RU is normally in the cooling mode when the interior temperature is above the set point.
Discharge Side	The high-pressure (condenser) side of the refrigeration system.

Electromagnetic Relay (Solenoid Valve)	A valve that is opened or closed on the basis of an electric control signal or voltage. The ADR-300 uses a electromagnetic relay to direct the flow of refrigerant during the defrost cycle.
Electrostatic Discharge (ESD)	An electric arc from a charged body to a neutral or oppositely charged body. ESD is a “shock” commonly experienced, often in a dry environment, when an individual touches a grounded object. ESD can seriously damage digital devices such as the ADR-300 microprocessor.
Evacuate	The process of removing all air and refrigerant from the refrigeration system. This is usually done with a vacuum pump attached to the service valves of the ADR-300 RU.
Evaporator Section	That section of the refrigerator that is inside the IC. The evaporator section absorbs heat from the air inside the container. This cools the air to maintain the set point.
High-Side	The high-pressure (condenser) side of the refrigeration system.
Insulated Container (IC)	One of the two components of the ADR-300 system. The IC includes the floor walls and roof and all attaching hardware as well as a removable shelf system inside the container.
Light Indicator	A small light that, when illuminated, indicates a specific system condition. The ADR-300 light indicator, mounted on the container exterior, near the door, indicates that the interior light is turned on.
Line Side	The input terminal for a circuit breaker. The line side is energized by the source of power to the breaker.
Load Side	The output terminal for a circuit breaker. The load side is energized when the breaker is closed and de-energized when the breaker is open.
Low-Side	The low-pressure (evaporator) side of the refrigeration system.
Ohm	A unit of electrical resistance equal to that of a conductor in which a current of one ampere is produced by a potential of one volt across its terminals.
Power Entry Connector	The electrical connector from which power is supplied to a system from an external source.
Preventive Maintenance	Maintenance or service operations that are required on a regular or recurring basis to keep the ADR-300 system in good working order.
Pump-down	The process of removing all air and refrigerant from the evaporator side or the entire refrigeration system. The evaporator side may be pumped-down by the system compressor. The entire system is usually pumped-down with a vacuum pump attached to the service valves of the ADR-300 RU.
Refrigerant	The fluid contained in a refrigeration system that carries heat from the cold side to the hot side. The refrigerant in the ADR-300 is R404A.
Refrigerant Charge	The amount of a refrigerant required by a refrigeration system to operate properly. The refrigerant charge is usually measured by weight.
Refrigeration Unit (RU)	One of the two components of the ADR-300 system. The RU is the mechanical system and associated controls that maintain the temperature inside the IC at the required set point.

Refrigerator	A component of the Refrigeration Unit that includes the mechanical components for transporting the refrigerant from the cold section to the hot section and back to the cold section.
Relay	A device that switches an electrical circuit on or off based on a secondary control circuit.
Saturation Pressure	The pressure at which a fluid of a given temperature will exist in both liquid and vapor states. Saturation pressures of a refrigerant determine the evaporator and condenser coil temperatures for a given refrigeration system.
Set Point	The air temperature inside the IC that is being maintained by the RU.
SF368	Product Quality Deficiency Report – the form to be used to report design or operational deficiencies or recommendations for improvements to the ADR-300 system
Suction Side	The low-pressure (evaporator) side of the refrigeration system.
Tag Wires	Wires are tagged or marked to indicate the terminals or mating wires from which they will be removed before a service operation. This insures that the wires will be reconnected properly after the service operation is completed.
Unit Controller	The component of the RU that is used to input commands to the refrigerator control system. The controller includes a digital display and input keys for inputting and modifying stored information.
VAC	Volts – alternating current
VDC	Volts – direct current
Work Package (WP)	A section of this manual that describes a specific characteristic or service procedure for the ADR-300.

OPERATOR' S, UNIT, AND DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
ALPHABETICAL INDEX

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END OF WORK PACKAGE

ARMY TM 10-4110-262-13&P
AIR FORCE TO 40R7-6-1

By Order of the Secretaries of the Army and Air Force:

PETER J. SCHOOMAKER
General, United States Army
Chief of Staff

Official:

JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army
0703903

T. MICHAEL MOSELY
GENERAL, USAF
Chief of Staff

Official:
BRUCE CARLSON
General, USAF
Commander, Air Force Materiel Command

DISTRIBUTION:

To be distributed in accordance with initial distribution number (IDN) 256789 requirements for TM 10-4110-262-13&P.

These are the instructions for sending an electronic 2028

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however only the following fields are mandatory: 1, 3, 4,5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27.

From: "Whomever" whomever@avma27.army.mil

To: soldier.pubs@natick.army.mil

Subject: DA Form 2028

1. ***From:*** Joe Smith
2. ***Unit:*** home
3. ***Address:*** 4300 Park
4. ***City:*** Hometown
5. ***St:*** MO
6. ***Zip:*** 77777
7. ***Date Sent:*** 19-OCT-93
8. ***Pub no:*** 55-2840-229-23
9. ***Pub Title:*** TM
10. ***PublicationDate:*** 04-JUL-85
11. ***Change Number:*** 7
12. ***Submitter Rank:*** MSG
13. ***Submitter FName:*** Joe
14. ***Submitter*** *MName:*T
15. ***Submitter LName:*** Smith
16. ***Submitter Phone: (***123) 123-1234
17. ***Problem:*** **1**
18. ***Page****:* 2
19. ***Paragraph****:* 3
20. ***Line:*** 4
21. ***NSN:*** 5
22. ***Reference:*** 6
23. ***Figure:*** 7
24. ***Table:*** 8
25. ***Item:*** 9
26. ***Total:*** 123
27. ***Text:***

This is the text for the problem below line 27.

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is ODISC4.	Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE *21 October 2003*

TO: *(Forward to proponent of publication or form) (Include ZIP Code)* COMMANDER TACOM Life Cycle Management Command ATTN: AMSTA-LC-SECT 15 KANSAS STREET NATICK, MA 01760-5052	FROM: *(Activity and location) (Include ZIP Code)* *PFC Jane Doe* *CO A 3rd Engineer BR* *Ft. Leonardwood, MO 63108*

PART I – ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
TM 10-1670-296-23&P	30 October 2002	Unit Manual for Ancillary Equipment for Low Velocity Air Drop Systems

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON *(Provide exact wording of recommended changes, if possible).*
	0036 00-2				*1*	*In table 1, Sewing Machine Code Symbols, the second sewing machine code symbol should be MD ZZ not MD 22.* *Change the manual to show Sewing Machine, Industrial: Zig-Zag; 308 stitch; medium-duty; NSN 3530-01-181-1421 as a MD ZZ code symbol.*

**Reference to line numbers within the paragraph or subparagraph.*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
Jane Doe, PFC	508-233-4141	Jane Doe *Jane Doe*

TO: (*Forward direct to addressee listed in publication)*	FROM: (*Activity and location) (Include ZIP Code)*	DATE
COMMANDER TACOM Life Cycle Management Command ATTN: AMSTA-LC-SECT 15 KANSAS STREET NATICK, MA 01760-5052	*PFC Jane Doe* *CO A 3rd Engineer BR* *Ft. Leonardwood, MO 63108*	*21 October 2003*

PART II – REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE
TM 10-1670-296-23&P	30 October 2002	Unit Manual for Ancillary Equipment for Low Velocity Air Drop Systems

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION
0066 00-1					*4*			*Callout 16 in figure 4 is pointed to a D-Ring. In the Repair Parts List key for figure 4, item 16 is called a Snap Hook. Please correct one or the other.*

PART III – REMARKS (*Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

UASPPC V3.00

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is ODISC4.	Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
TO: *(Forward to proponent of publication or form) (Include ZIP Code)* Commander TACOM Life Cycle Management Command ATTN: AMSTA-LC-SECT Kansas Street, Natick, MA 01760-5052.	**FROM:** *(Activity and location) (Include ZIP Code)*	

PART I – ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
TM 10-4110-262-13&P	07 February 2007	Operator's, Unit, and Direct Support Maintenance Manual (Including Repair Parts and Special Tools List) for Advanced Design Refrigerator, 300 Cubic Foot (ADR-300)

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON *(Provide exact wording of recommended changes, if possible).*

**Reference to line numbers within the paragraph or subparagraph.*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

TO: (*Forward direct to addressee listed in publication)*	**FROM:** (*Activity and location) (Include ZIP Code)*	**DATE**
Commander TACOM Life Cycle Management Command ATTN: AMSTA-LC-SECT Kansas Street, Natick, MA 01760-5052.		

PART II – REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

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PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III – REMARKS (*Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is ODISC4.	Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
TO: *(Forward to proponent of publication or form) (Include ZIP Code)* Commander TACOM Life Cycle Management Command ATTN: AMSTA-LC-SECT Kansas Street, Natick, MA 01760-5052.	**FROM:** *(Activity and location) (Include ZIP Code)*	

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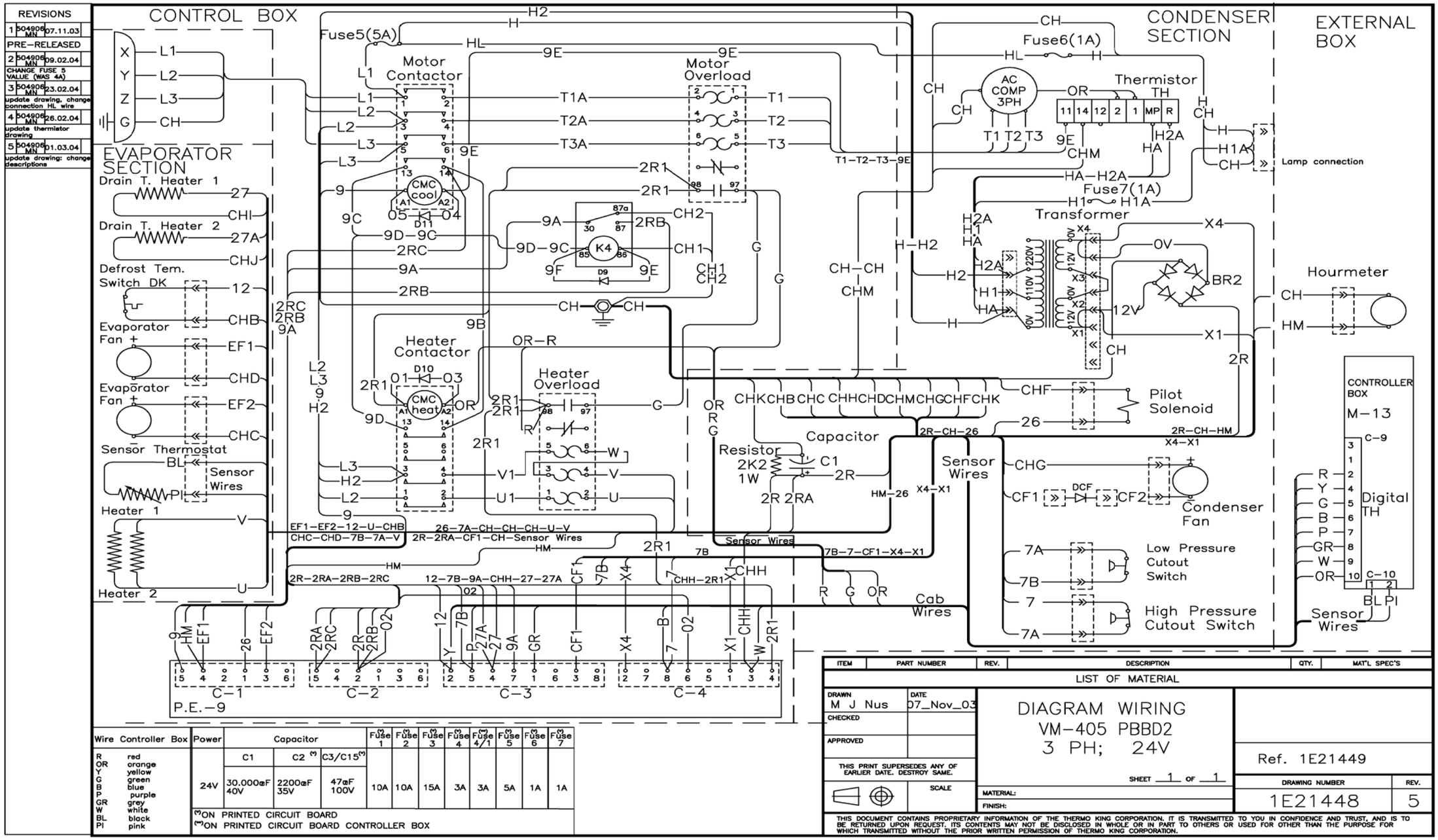
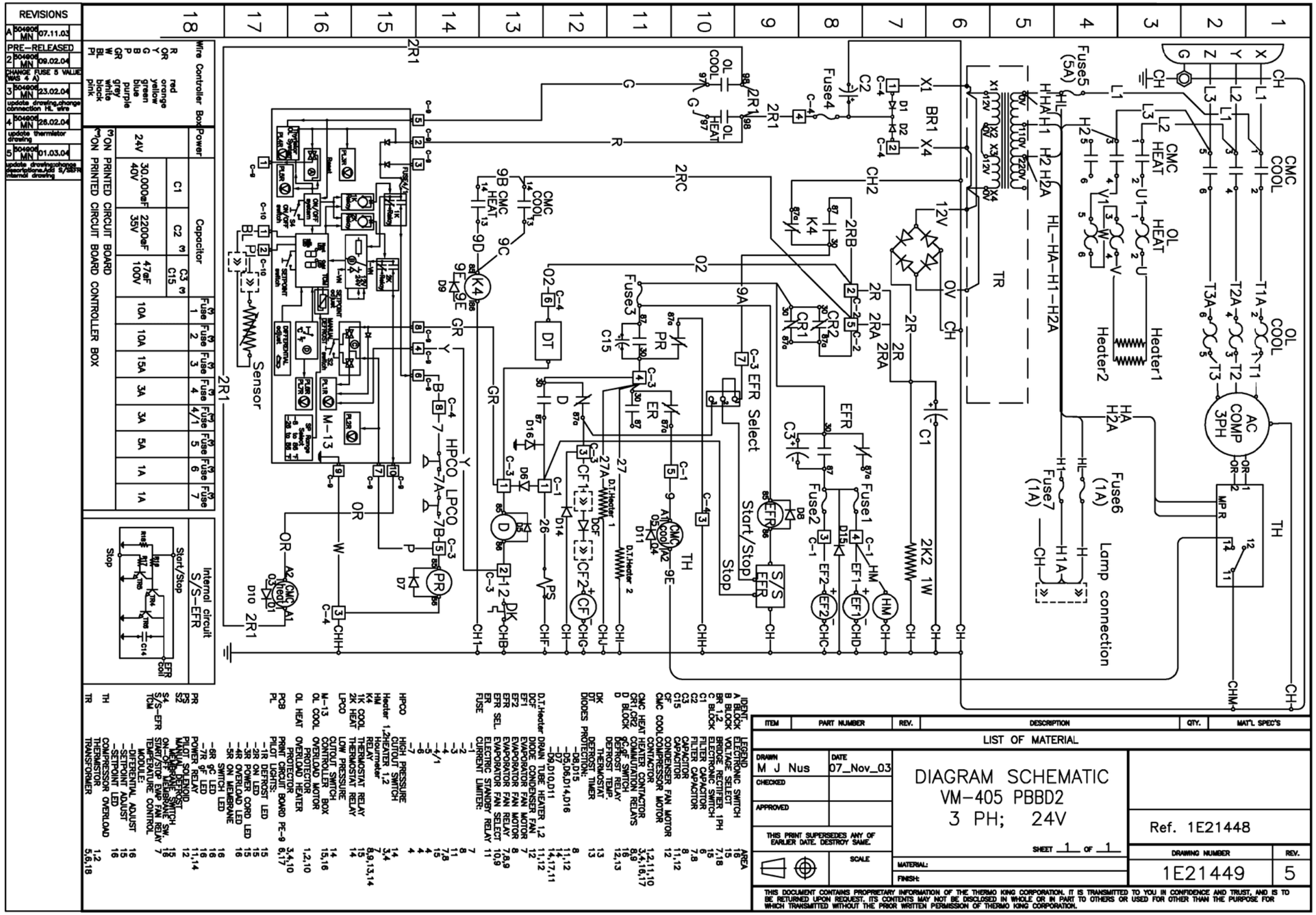
TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE



FO-1. Wiring Diagram.
FP-1/FP-2 Blank



FO-2. Schematic Diagram.

FP-3/FP-4 Blank

REVISIONS						
ECO	SYM	DESCRIPTION	DATE	BY	CHK	APP
2060	A	RELEASED	4.10.99	JT	MN	LG
78265	B	ADD R18	29-Sep-00	JL	MN	MR

G01

12v / 24v

			TH1	BT106A	7	C15	47µF/100V	12
PCB/PE9	PC BOARD 160x100					C14	0,1µF/250V POLY	10
6 units	PC supports nylon		T6	BD135	9	C10	47pF CERAMIC	7
S1	EFR SELECT	7,8	T5	BC548B	8,9	C9	10µF/25V	6
S2	12V/24V SELECT	5,6	T4	BC548B	8,9	C8	1nF CERAMIC	6
			T1	BC548B	7,8	C7	1nF CERAMIC	6
8 units	FASTON FEMALE 6.3					C6	1µF/100V POLYESTER	5
24 units	FASTON MALE 6.3		IC1	MC14541	6,7	C5	10µF/25V	6,7
						C4	100µF/35V	4,5
						C3	47µF/100V	16
			D16	BY255	12	C2	2200µF/35V	6,7
			D15	BY255	11			
ER	BURNDY SUPPORT RELAY	13,14	D14	BY255	10	P1	POT AJUSTE TEMPOR.470 K	4,5
D	BURNDY SUPPORT RELAY	11,12	D13	1N4007	7			
EFR	BURNDY SUPPORT RELAY	12,13	D12	1N4007	7	R18	1K5 5% 1W	8
PR	BURNDY SUPPORT RELAY	10,11	D11	1N4148	7	R17	4K7 5% 1/4W	8,9
CR1,2	BURNDY SUPPORT RELAY	10,14	D10	1N4007	6,7	R16	4K7 5% 1/4W	7
			D9	1N4007	10	R9	3K9 5% 1/4W	7
			D8	1N4007	10	R8	220 5% 1/4W	7
CON4	CONNECTOR(8 PINS)	3,4	D7	1N4007	9	R7	8K2 5% 1/4W	7
CON3	CONNECTOR(8 PINS)	8,9	D6	1N4007	9	R6	100K 5% 1/4W	6
CON2	CONNECTOR(6 PINS)	16	D5	1N4007	10	R5	56K 5% 1/4W	6
CON1	CONNECTOR(6 PINS)	16	D2	BY255	7	R4	100K 5% 1/4W	6
			D1	BY255	7	R3	100K 5% 1/4W	5
						R2B	2K4 5% 1/4W	6
SWAB	SWITCH 2 POSITION	4,5	DZ1	9,1v. 400mW	5,6	R2A	220 5% 1/4W	6
IDENT	VALUE	AREA	IDENT	VALUE	AREA	IDENT	VALUE	AREA

VM-400-50 V200-50 V200-20 V405 VM-305 VM-400-20	V095
3 ph.	1 ph.

NOTE: Coat the PC BOARD with 5246A26H01 (FINE-L-KOTE)

NOTA: Impregnar la placa con la laca 5246A26H01 (FINE-L-KOTE)

ITEM	PART NUMBER	REV.	DESCRIPTION	QTY.	MAT'L SPEC'S
			LIST OF MATERIAL		

DRAWN JAUME. T	DATE 27/08/99	PC BOARD No.9.2 3PH/1PH ; 12V/24V	
CHECKED M J NUS	13/10/99		
APPROVED LORENZO	27/10/99		
THIS PRINT SUPERSEDES ANY OF EARLIER DATE. DESTROY SAME.		SHEET 1 OF 5	
SCALE		MATERIAL:	DRAWING NUMBER 1B20556 / REV. B
		FINISH:	

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 3 2.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Weights

1 centigram = 10 milligrams = .15 grain
1 decigrarn = 10 centigrams = 1.54 grains
1 gram = 10 decigrams = .035 ounce
1 dekagrarn = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .15 5 sq. inch
1 sq. decimeter =100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	Iiters	.473	milliliters	fluid ounces	.034
quarts	Iiters	.946	liters	pints	2.113
gallons	Iiters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

_F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	_C

PIN: 081369-000