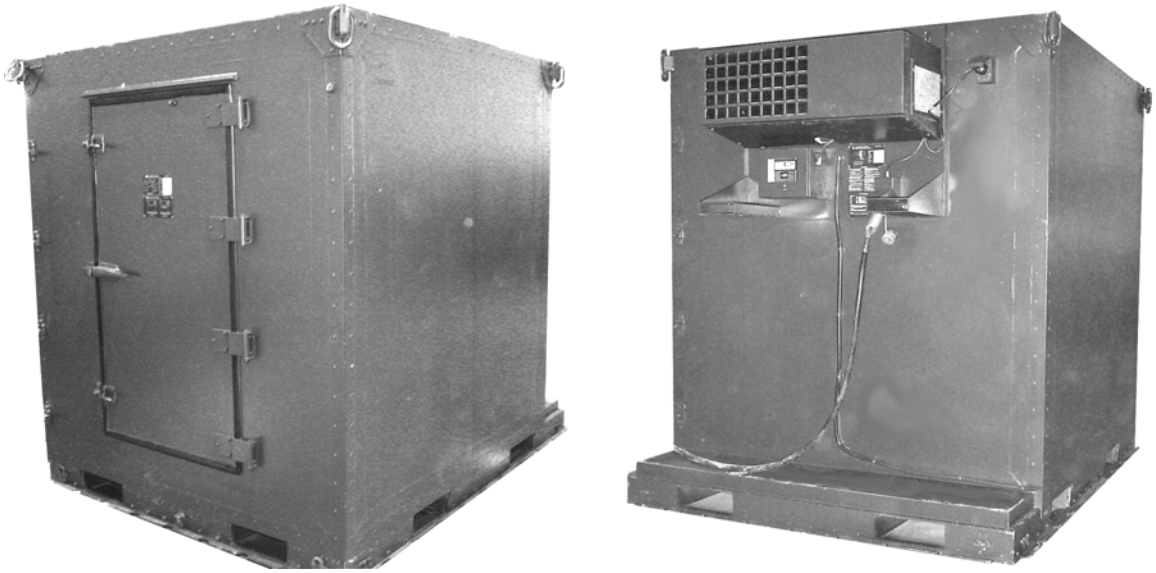
ARMY TM 10-4110-262-13&P
AIR FORCE TO 40R7-6-1

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)



HEADQUARTERS, DEPARTMENTS OF THE ARMY AND AIR FORCE

31 MARCH 2004

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 ICONS

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

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

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

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

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

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

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

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

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

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

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.

INSERT LATEST UPDATED PAGES / WORK PACKAGES. DESTROY SUPERSEDED DATA

LIST OF EFFECTIVE PAGES

Note: The portion of text affected by the update is indicated by a vertical line in the outer margins of the page. Updates to illustrations are indicated by miniature pointing hands. Updates to wiring diagrams are indicated by shaded areas.

Dates of issue for the original manual is:

Original…31 Mar… 2004

TOTAL NUMBER OF PAGES FOR FRONT AND REAR MATTER IS 28 AND TOTAL NUMBER OF WORK PACKAGES IS 70 CONSISTING OF THE FOLLOWING:

Page / WP No.	*Revision No.	Page/WP No.	*Revision No.
Front Cover	0		
a-b	0		
A-B	0		
i-iii/(iv Blank)	0		
v/(vi Blank)	0		
WP 0001-0070	0		
Glossary	0		
Index	0		
Foldout Pages	0		
Authentication	0		
Electronic 2028 Instructions	0		
Sample DA 2028	0		
DA 2028s	0		
Back Cover	0		

*Zero in this column indicates an original page or work package.

TM 10-4110-262-13&P
T.O. 40R7-6-1

HEADQUARTERS
DEPARTMENTS OF THE ARMY AND AIR FORCE
WASHINGTON, D.C., 31 MARCH 2004

TECHNICAL MANUAL

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

ADVANCED DESIGN REFRIGERATOR (ADR-300)

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

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. For 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, U.S. Army Tank-Automotive Command and Armament Command, ATTN: AMSTA-LC-CECT, Kansas Street, Natick, MA 0176- 5052. You may also send in your recommended changes via electronic mail directly to amssbriml@natick.army.mil. A reply will be furnished to you. Instructions for sending an electronic 2028 may be found at the back of this manual immediately preceding the hard copy 2028.

For Air Force - Forward 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.

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HOW TO USE 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 contains references and other supporting information. Chapter 7 also 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.

Manual Organization and Page Numbering System. The manual is divided into seven 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 YY-ZZ where XXXX is the work package number (e.g. 0010 is work package 10). In this numbering structure, YY is the revision number for that work package and ZZ represents the number of the page within that work package. A page number such as 0010 00-1/(2 Blank) means that page 1 contains information but page 2 of that work package has been intentionally left blank.

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 WP 0010 00 (i.e. Work Package 0010 00).

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.

OPERATOR' S, UNIT, AND DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
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), illustrated below. 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)

ADR-300 Front View

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 738-750, Functional Users Manual for the Army Maintenance Management System (TAMMS); 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 do not like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to the address specified in DAPAM 738-750, Functional Users Manual for the Army Maintenance Management System (TAMMS) or as specified by the acquiring agency. We will send you a reply.

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, Product Quality Deficiency Report. 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 738-750.

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 Materiel to Prevent Enemy Use.

PREPARATION FOR STORAGE OR SHIPMENT

See shipment and movement sections (Work Package 0005 00) for 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), Work Packages 0052 00 – 0063 00. Common names are not used in this manual. The following table relates abbreviations and acronyms that are used in this manual to the meaning of each term.

LIST OF ACRONYMS/ABBREVIATIONS

µm	micron	HSL	Helicopter Sling Lift
A	Ampere	HVAC/R	Heating, Ventilation, Air Conditioning and Refrigeration
AC	Alternating Current	IAW	In Accordance With
ADR	Advanced Design Refrigerator	IC	Insulated Container
Btu	British Thermal Unit	in.	Inch
Btu/h	British Thermal Unit per Hour	inHg	Inch of Mercury
CARC	Chemical Agent Resistant Coating	Hz	Hertz (cycles per second)
cm	Centimeter	Kg	Kilogram
cm^3	Cubic Centimeter	kPa	Kilo Pascal
CMC	Compressor Motor Contactor	kW	Kilo Watt
CPC	Corrosion Prevention and Control	lb	Pound
ºC	Degrees Celsius	LED	Light Emitting Diode
ºF	Degrees Fahrenheit	LPCO	Low Pressure Cutout Switch
DC	Direct Current	MTMCTEA	Military Traffic Management Command Transportation Engineering Command
DSV	Discharge Service Valve	MHE	Material Handling Equipment
DTS	Defrost Termination Switch	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

LIST OF ACRONYMS/ABBREVIATIONS – Continued

psig	Pounds per Square Inch - gauge	TEV	Thermostatic Expansion Valve
r/min	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
		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

Chapter 1
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)
4110-01-465-4158 / 4110-01-465-4564
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 refrigeration unit
- Exterior paint is non-CARC

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

Insulated Container – The insulated container is constructed from aluminum-skinned composite panels mounted on a formed aluminum skid. The skid includes forklift pockets and cargo rails 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 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 hook and handle assemblies. Directly above the door, a drip-edge deflects water run-off from the open door. Also mounted above the door is a pilot light to indicate when the interior light is energized.

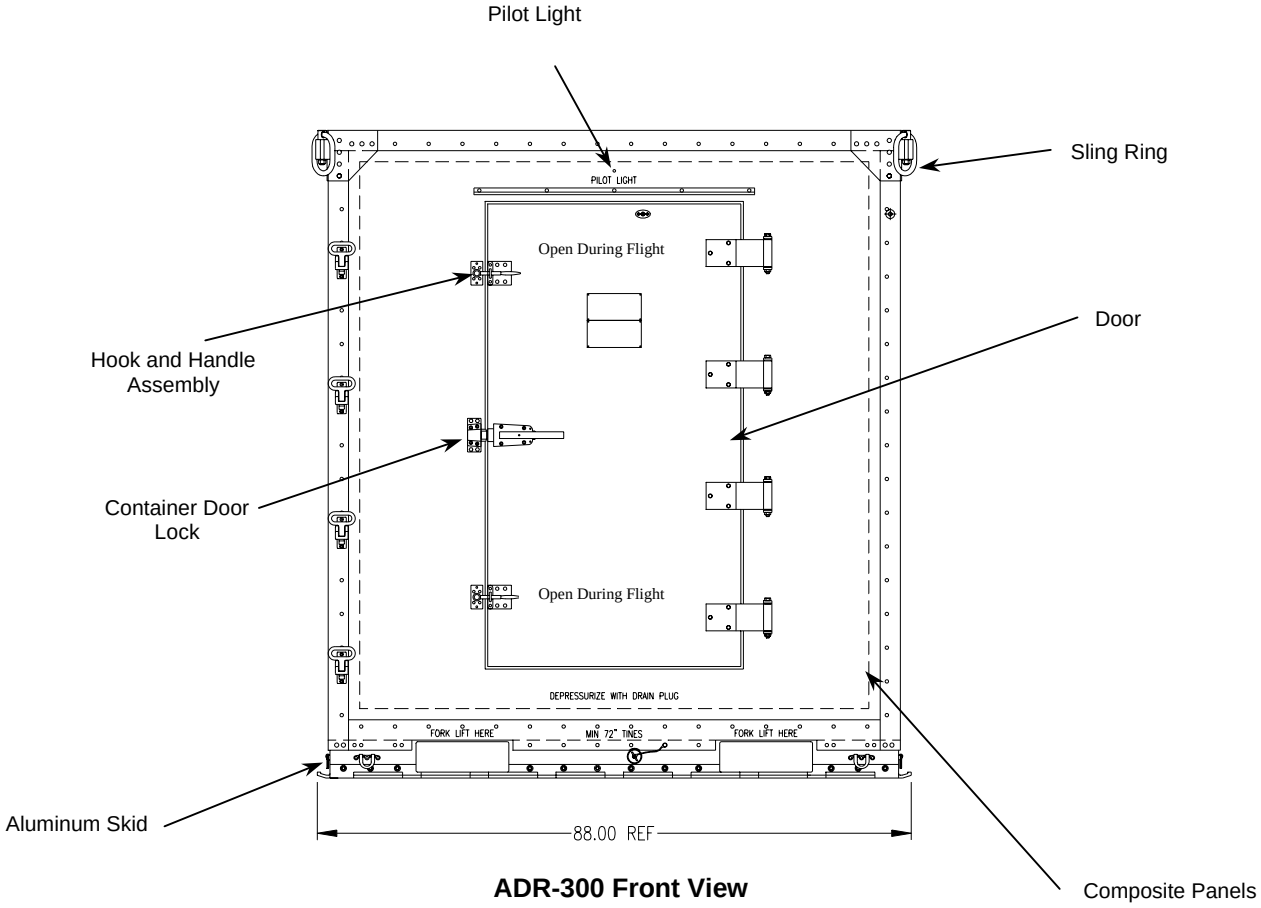
At the refrigerator end, the container wall is recessed from the pallet edge to provide an aisle between adjacent containers when loaded in an aircraft. The key feature of this wall is the refrigeration unit (RU) that is mounted on the top of the wall panel. Also, to the right of the RU, is an electrical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

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

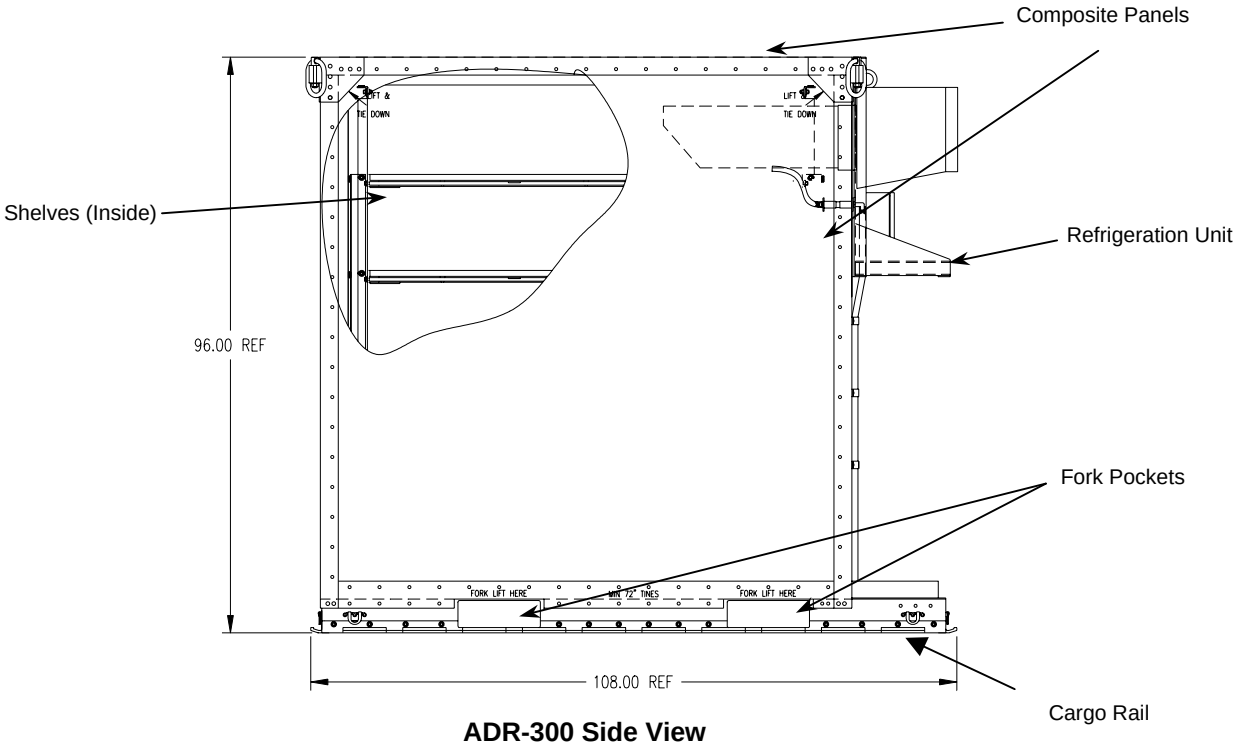
Inside the IC, the floor surface includes a tread pattern to reduce slipping and improve traction. Racks of five removable/adjustable shelves stand parallel to each side wall. Each rack consists of 15 deck sections, five frames, two front (vertical) supports and two rear (vertical) supports. Two horizontal top supports 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 welded aluminum 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.



ADR-300 Front View



ADR-300 Side View

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	
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 Condenser Fan Motor and Defrost Solenoid	15 A	
Fuse 4/1 Control Panel (located in control panel enclosure)	3 A	
Fuse 4 Control Panel (located on PC Board in RU electrical enclosure)	3 A	
Fuse 5 Transformer	4 A	

Table 1. ADR-300 Technical Characteristics - Continued.

Condenser Fan Motor				
Voltage	26 VDC			
Power	180 W			
r/min	2800			
Full Load Current	6.5A			
Evaporator Fan Motors (2 motors)				
Voltage	26 VDC			
Power	100 W			
r/min	2800			
Full Load Current	4.1 A each			
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 r/min	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

R404A Saturation Temperature and Pressure

The following table presents temperatures and corresponding pressures for saturated refrigerant R404A.

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

ADR-300 Temperature Sensor 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
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
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

The IC is an insulated box constructed from foam-filled 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 an interior light 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.

Refrigeration Unit

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

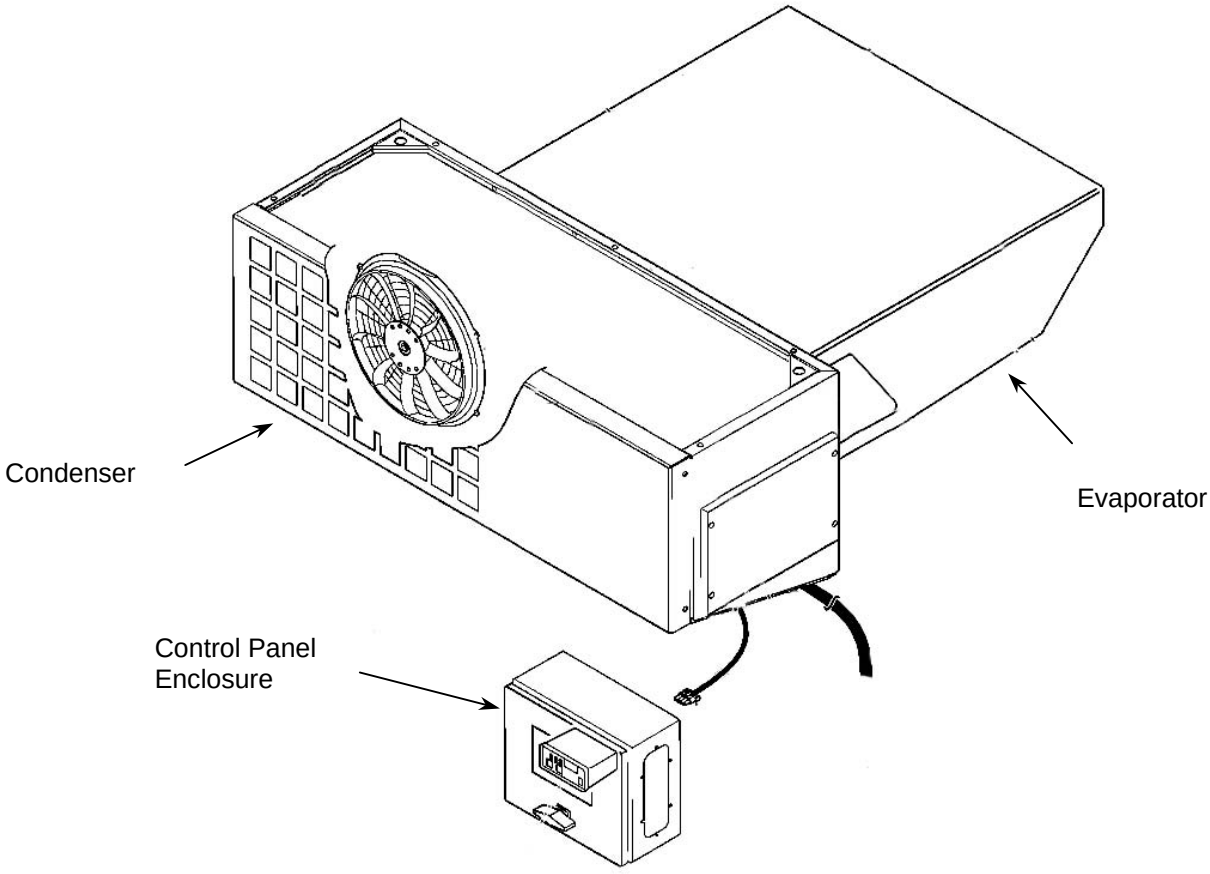
The refrigerator uses R-404A in a vapor compression cycle to remove heat from the IC interior. The evaporator (cold) section of the refrigerator protrudes into the container interior. The evaporator fan draws the interior air through the evaporator coil where heat is transferred from the air to the refrigerant.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

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

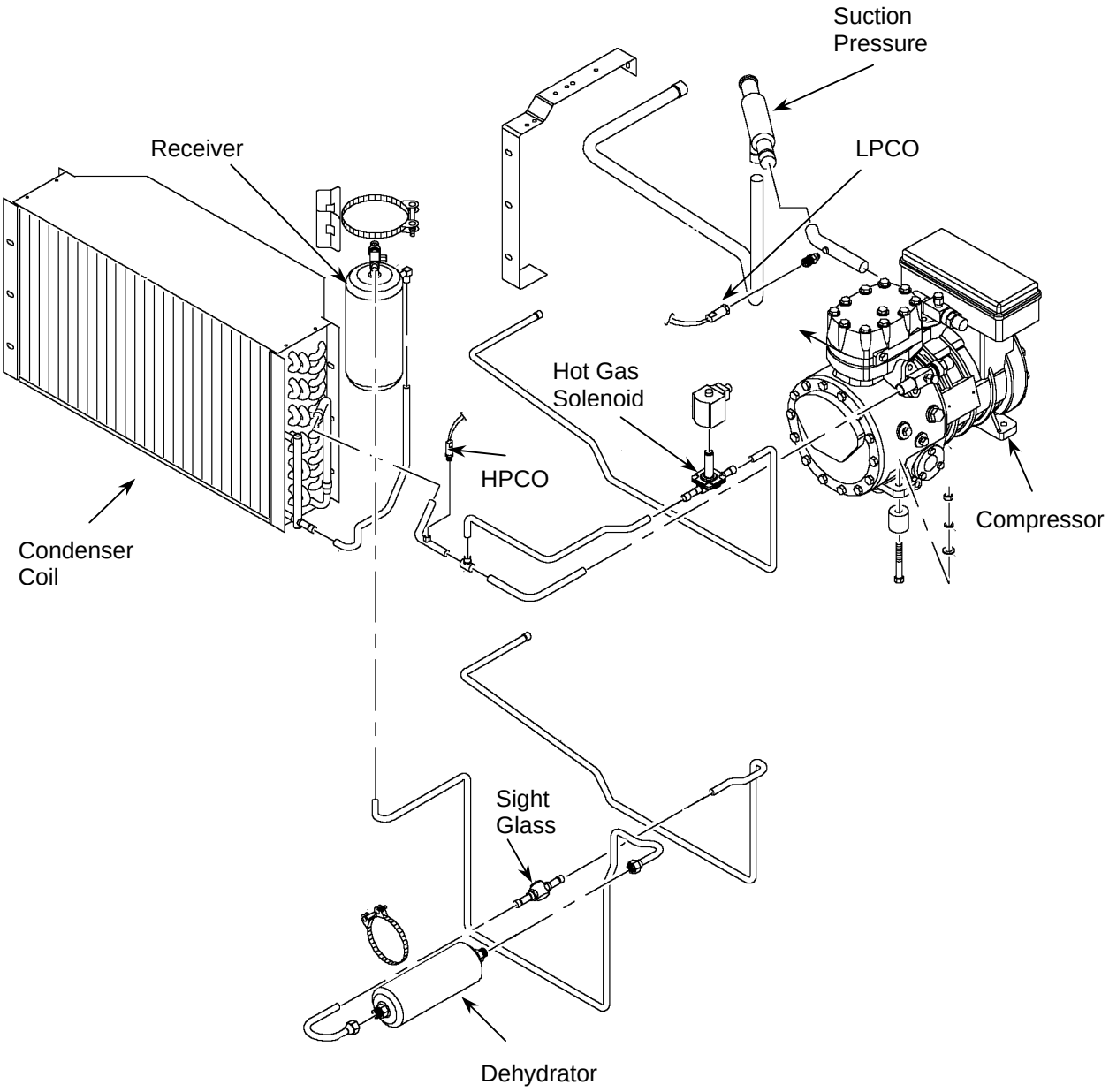
Outdoor air is drawn through the condenser coil, which is at the face of the outside enclosure. After passing through the coil, the air is exhausted through the top of the enclosure.

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

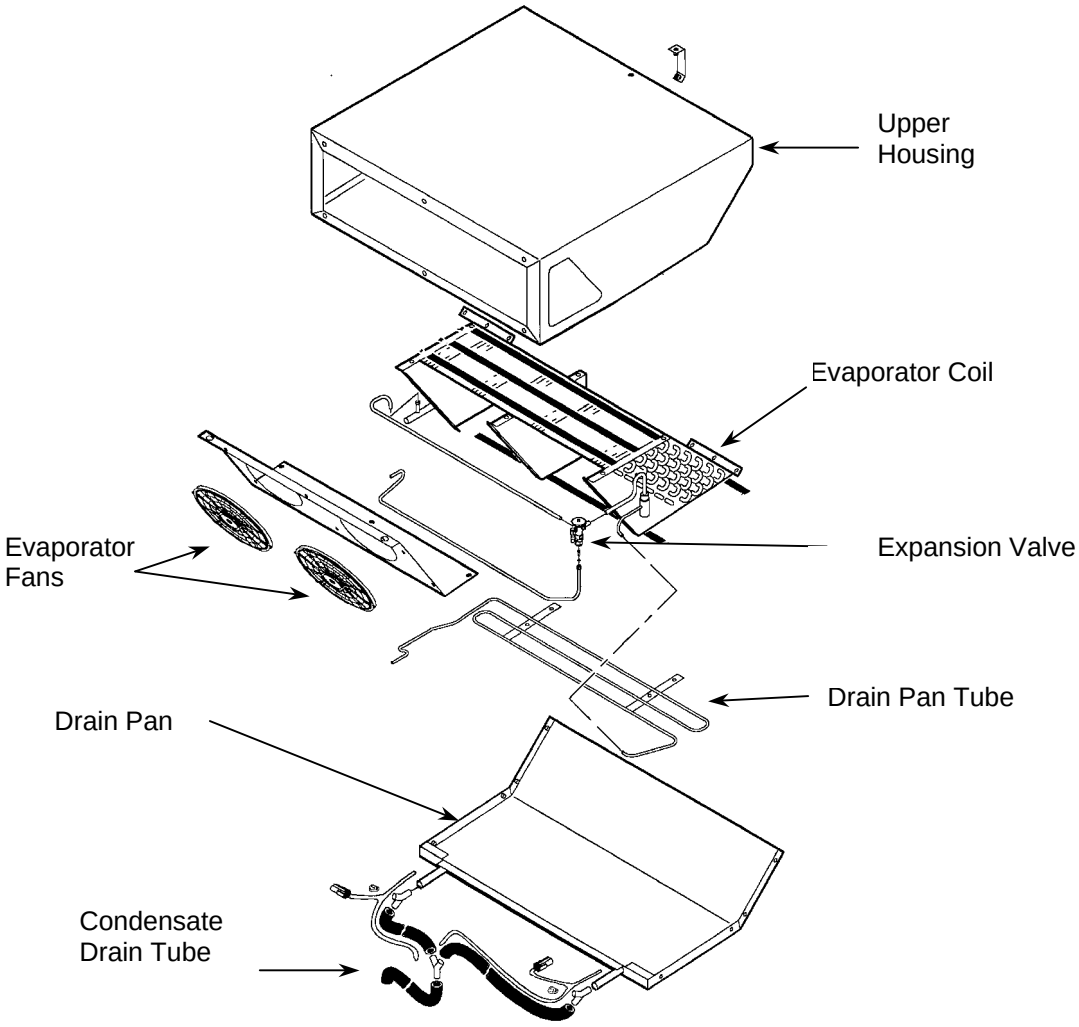
The unit controller, located in the control panel enclosure, includes a keypad for entering control commands and a display that provides system operating information to the operator.



ADR-300 Refrigerator



Condenser Section Components



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 RU 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 which will then pass power to wire 7 to the high pressure cutout pressure switch (HPCO) and on through the low pressure cutout pressure 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 PC board 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 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 drain tube heaters from the power relay. These heaters are used to prevent the condensate tubes 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 lower than the set point on the controller power to the blue wire at pin 6 of connector C-9 is shut off, but power is now available to pin 10 and the orange wire to the heat contactor (CMC 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 PC board to the defrost relay. This relay is grounded through the defrost klixon (DK) in the evaporator when this thermostat is below freezing at 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 pilot solenoid (PS). This 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 klixon opens after the evaporator is defrosted and warms up.

There is also a timer built into the relay PC board 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 PC board. 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 PC board 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 psig.

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 defrost termination switch is closed.

The timer has two switches and a red, round selector located on the PC board 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, see Work Package 0029 00

Manual Defrost Switches

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

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 defrost termination switch is closed and the unit is in Cool mode.

Defrost Termination Switch (mechanized)

The Defrost Termination 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 defrost termination switch to ground, the defrost relay is energized. This energizes the Solenoid Valve and de-energizes the fan relay.
The defrost relay stays energized until the defrost cycle is terminated by the defrost termination switch or the On/Off switch is pressed.

Defrost Solenoid Valve

The hot gas valve is an electrical valve that controls the flow of refrigerant through the refrigeration system.

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

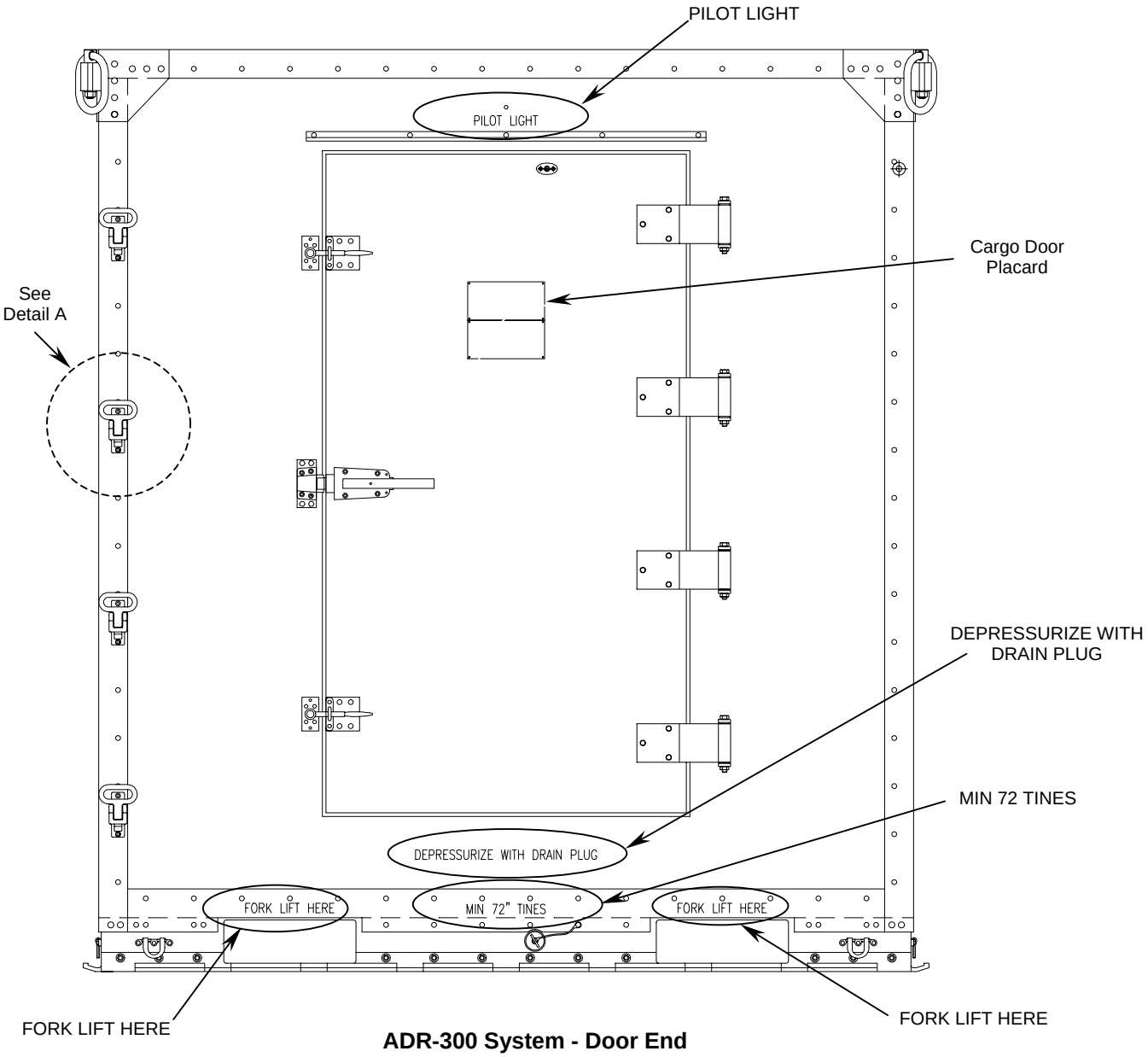
END OF WORK PACKAGE

Chapter 2
Operator Instructions
For
Advanced Design Refrigerator, 300 Cubic Foot
(ADR-300)

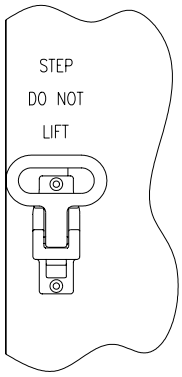
OPERATOR'S, UNIT, AND DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS

General

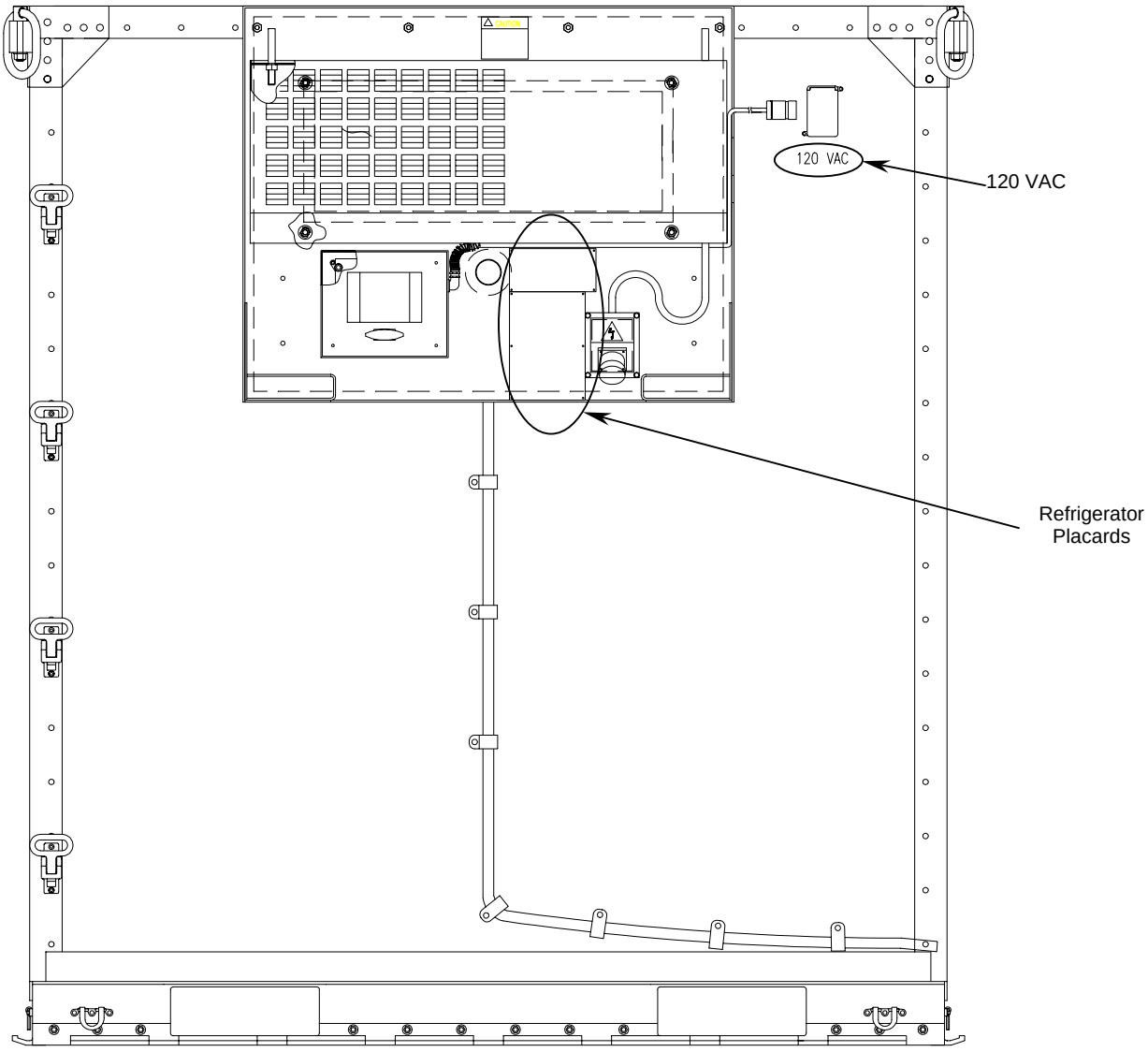
This work package contains information on the controls and indicators of the ADR-300. The Figures below show the locations of the controls and indicators found on the ADR-300. Subsequent figures and tables explain the functions of the identified controls and indicators.



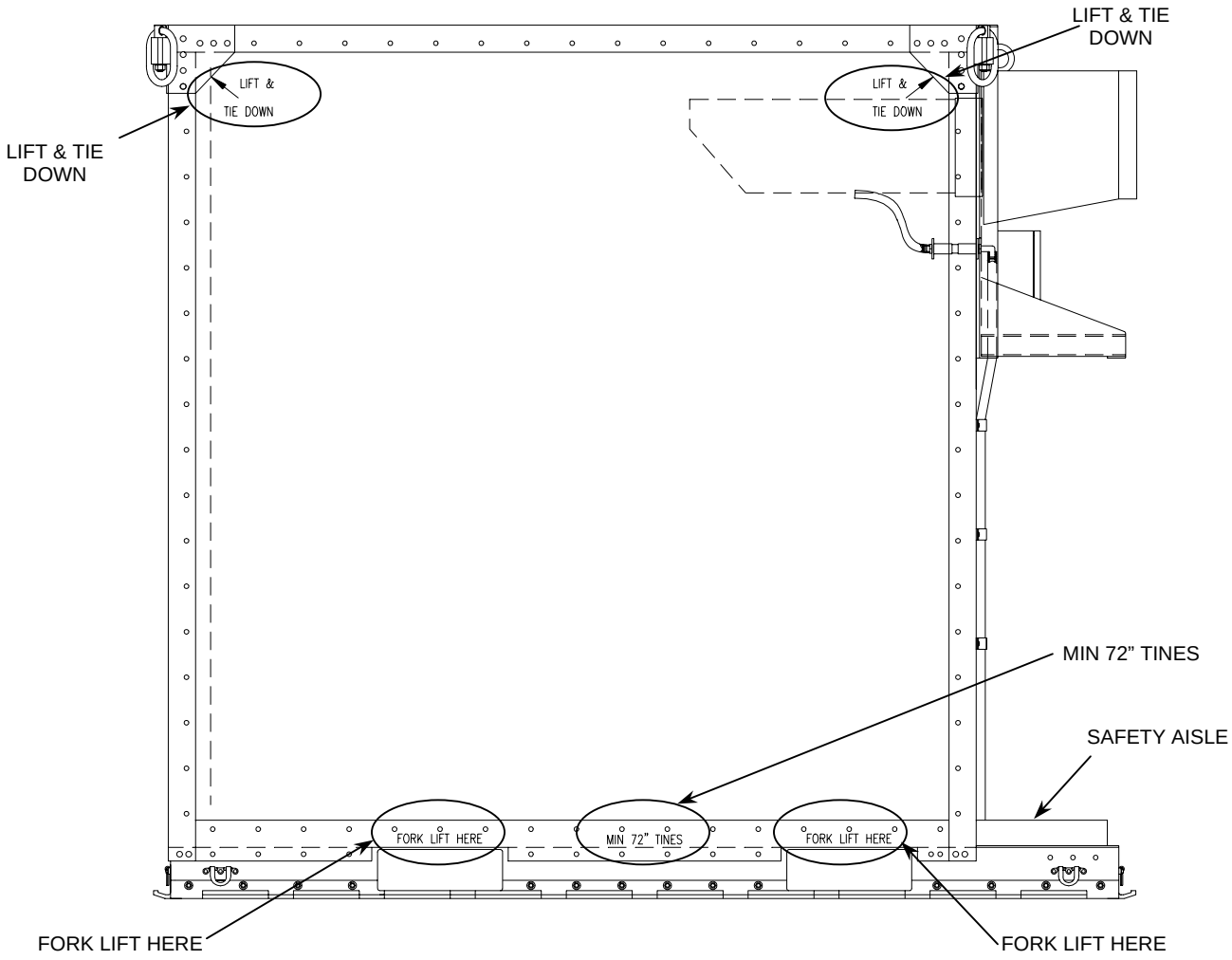
ADR-300 System - Door End



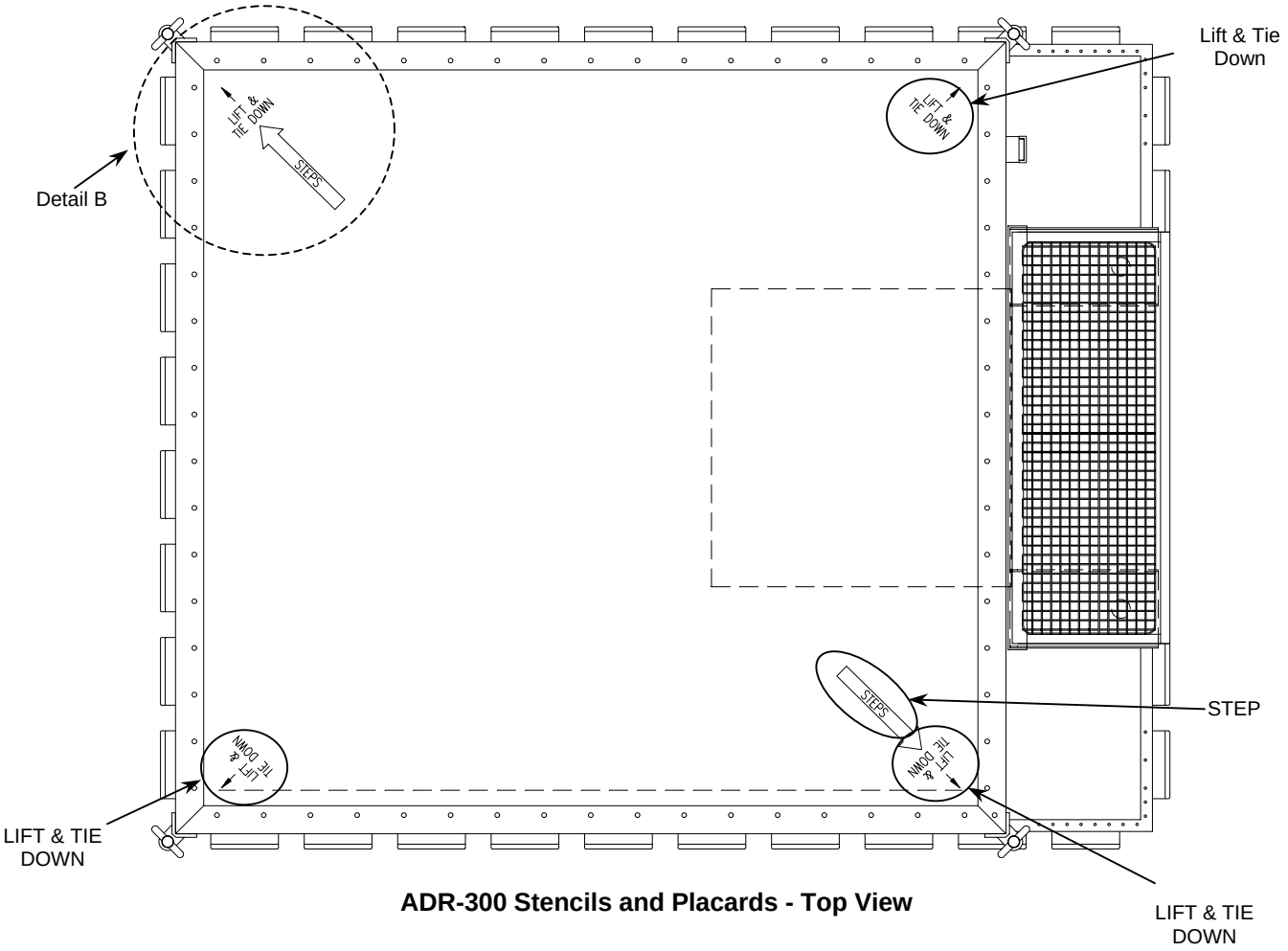
Detail A



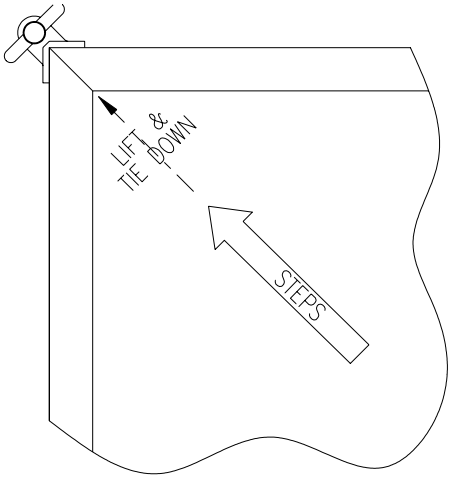
ADR-300 Stencils and Placards - Refrigeration Unit (RU) End



ADR-300 Stencils and Placards - Side View



ADR-300 Stencils and Placards - Top View



Detail B

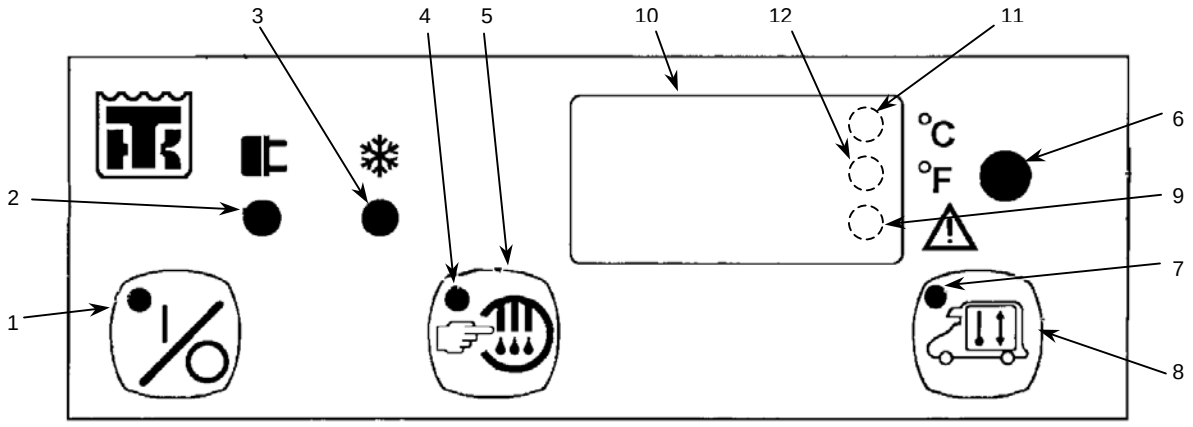


Table 1. ADR-300 Unit Controller Display and Keypad.

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

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. The controller features and functions are described below:

Unit Controls

(1) ON/OFF Key / ON Indicator Light

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.

(2) Power Cord Indicator Light

When this light is on, it indicates that the unit is connected to an AC power supply.

(3) Unit Operation / Cooling Mode Indicator Light

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.

(4) Defrost Indicator Light

When this light is on, it indicates that the unit is in the defrost mode.

(5) Manual Defrost Key

Press this key to start the defrost cycle. The unit will not defrost unless the defrost termination switch is closed and the evaporator coil temperature s below 36 ºF (2 ºC).

(6) Thermostat Dial

Turn this dial to adjust the thermostat setpoint.

NOTE

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

(7) Setpoint Key

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.

(8) Setpoint Key Indicator Light

When this light is on, the display is indicating the setpoint temperature.

(9) AC Overload Indicator

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.

(10) Digital Display

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.

(11) Celsius Indicator Light

When this light is on, it indicates that the temperature is being displayed in degrees Celsius (ºC).

(12) Fahrenheit Indicator Light

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 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.

Enter the Setpoint

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.

NOTE

Do not change the setpoint unless the setpoint indicator is illuminated.

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 seconds.

END OF WORK PACKAGE

OPERATOR'S, UNIT, AND DIRECT SUPPORT MAINTENANCE

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

4110-01-465-4158 / 4110-01-465-4564

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. See Work Package 0006 00, 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 (see WP 0002 00). 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. See Work Package 0029 00 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.

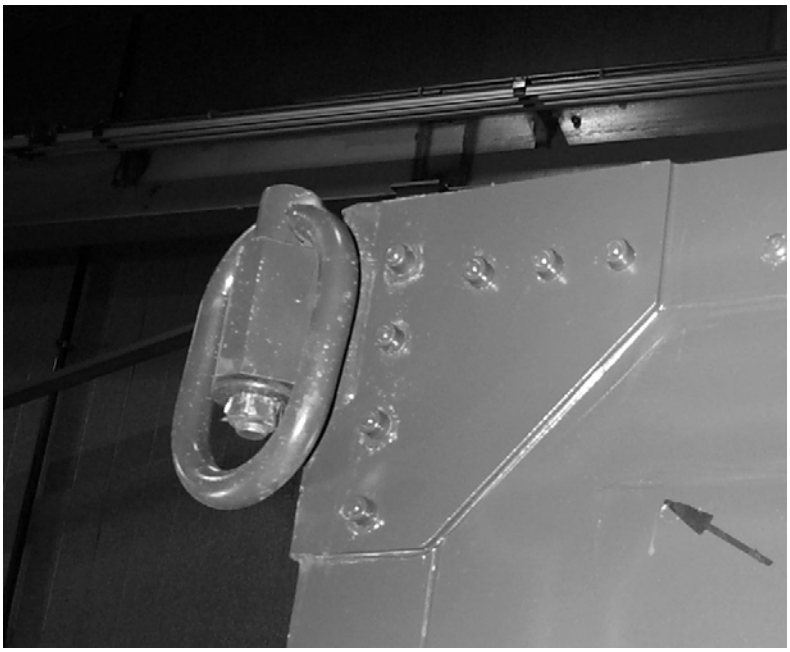
WARNING

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 in the upper corners of the container as shown in the following figure.



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.

WARNING

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.

CAUTION

Do not open the container door when the folding steps 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.

Folding Step (Deployed)

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 Work Package 0010 00.

OPERATING PROCEDURES

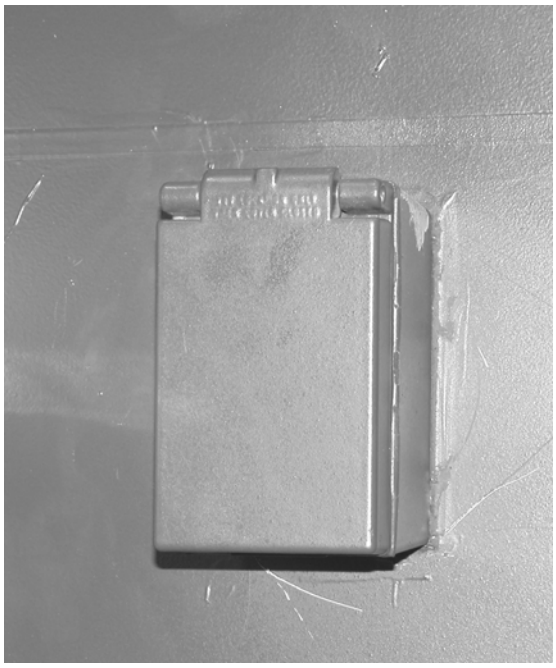
Connect the Power Supply

WARNING

The ADR-300 electrical system uses high voltage power. (1) Do not attempt to alter or repair electrical wiring. (2) 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.

Turn all switches to the OFF position. Plug the power supply cable into a 208/230 VAC, 3-phase, 50-60 Hz supply outlet. Plug the other end of the power supply cable into the five-pin cannon plug on the RU. Plug the IC power supply cord into the IC power input connector.

Cannon Plug (RU Power Supply)



IC Power Entry Connector Enclosure

Operate the ADR-300

After the external power source is connected, the RU may be operated through the controller. The unit controller keypad and display icons are illustrated on the next page.

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 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 seconds.

NOTE

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

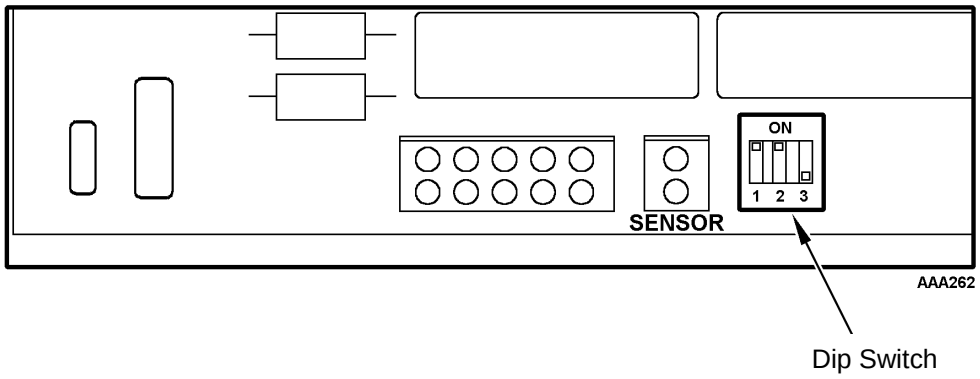
4. Verify that the new setpoint was entered by pressing the setpoint key and checking the display.

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 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 in the proper position.
3. ON for Celsius
4. OFF for Fahrenheit
5. Replace the cover.



Back of Controller with Cover Removed

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 normally located in the evaporator return airflow.

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 to the 12 o'clock position.
5. Replace the cover and place the controller back in its bracket.

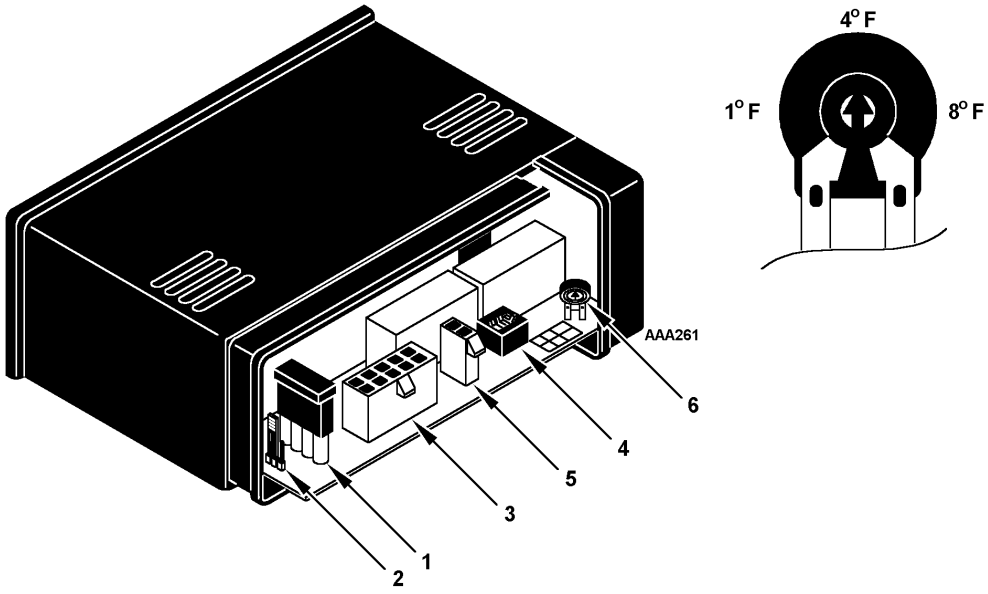


Table 2. Adjusting the Setpoint Differential.

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

Initial Digital Display Test

1. Turn the unit on.

NOTE

See what appears on the digital display. This is the temperature 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. Refer to the Display Diagnosis Chart to see what to check next.

Table 1. Display Diagnosis 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

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, 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 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.

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

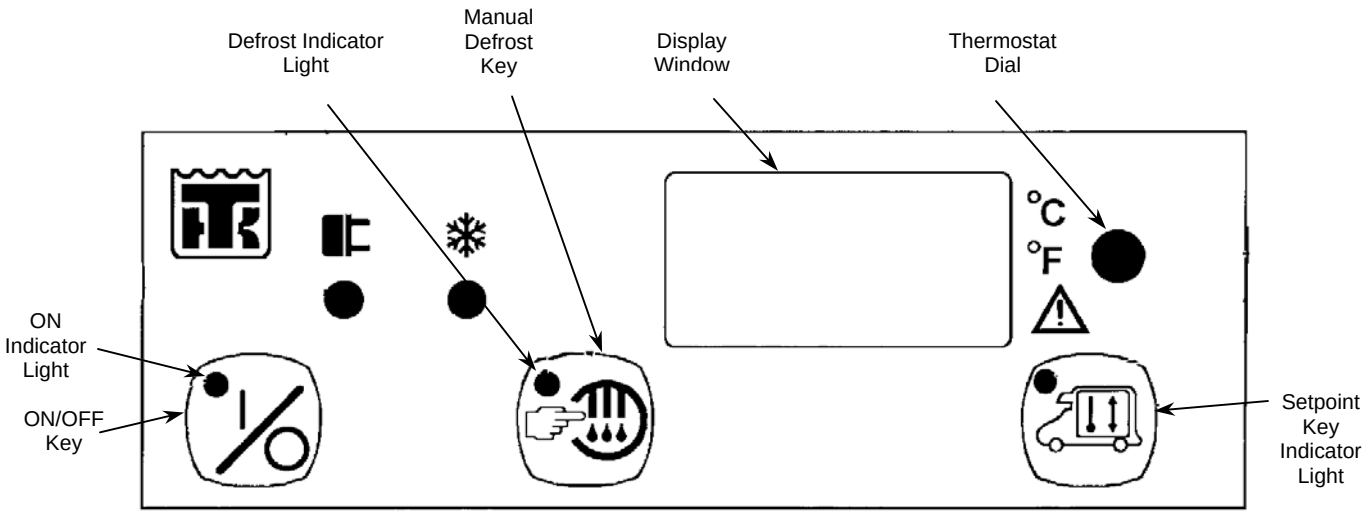
The range for the thermometer is –40 to 99 °F (-40 to 38 ºC). Normally the thermometer reading appears on the digital display. Pressing the Setpoint key causes the thermostat setpoint to appear on the digital display for 10 to 15 seconds.

Initiating a Manual Defrost Cycle

During a defrost cycle, the defrost indicator light will appear in the display. Before initiating a manual defrost cycle, make sure the unit is not already in a defrost cycle. The IC interior temperature must be below 36 °F (2.2 °C) for a manual defrost cycle to start.

1. Press the manual defrost key.

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



ADR-300 Unit Controller Display and Keypad

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 as well as two rotating hook and handle assemblies that serve as back-up locks. To open the door:

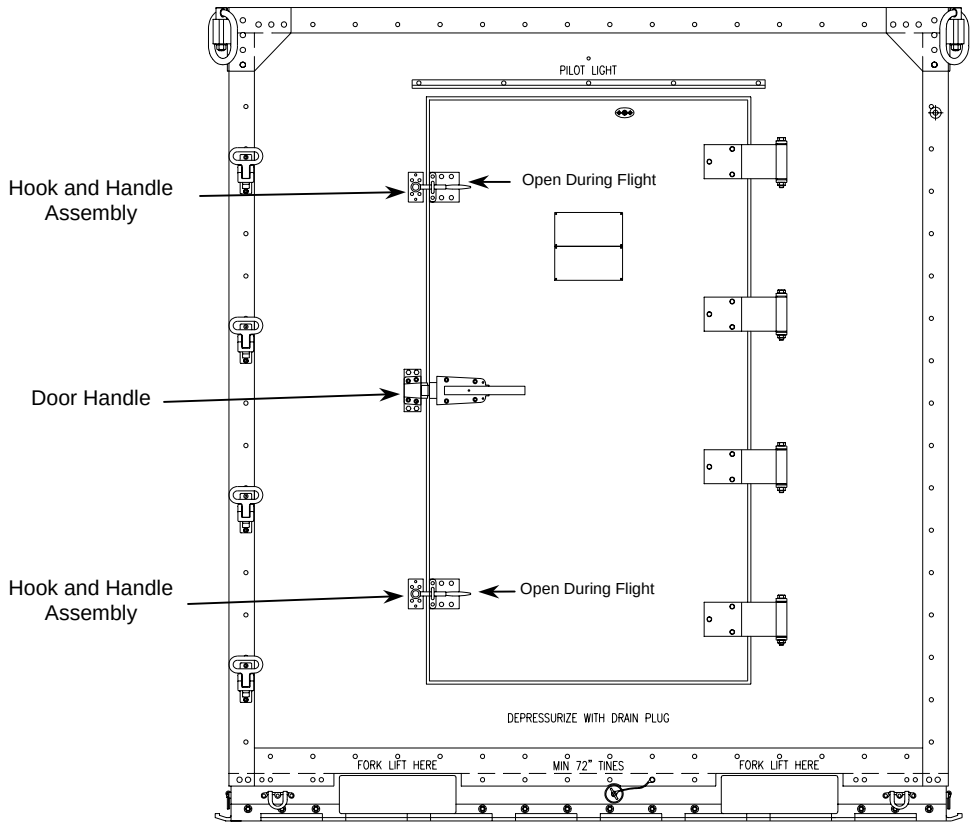
1. Rotate the two hook and handle assemblies to the vertical position.

2. Pull the door handle 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 hook and handle assemblies to the vertical position

2. Push the plunger toward the outside.



Loading the ADR-300

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.

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, see Work Package 0015 00. Ensure the cargo restraint rail is not damaged prior to loading.

If cargo is to be shipped on shelves:

1. Make sure the total weight supported by any single shelf does not exceed 300 pounds.
2. 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.
3. Make sure the weight on each shelf is distributed over as much of the shelf area as possible.
4. If the shelf load is concentrated in one place, place that item as close as possible to one end of the shelf.
5. Restrain all items with straps, ropes or other appropriate restraints to prevent movement in any direction.

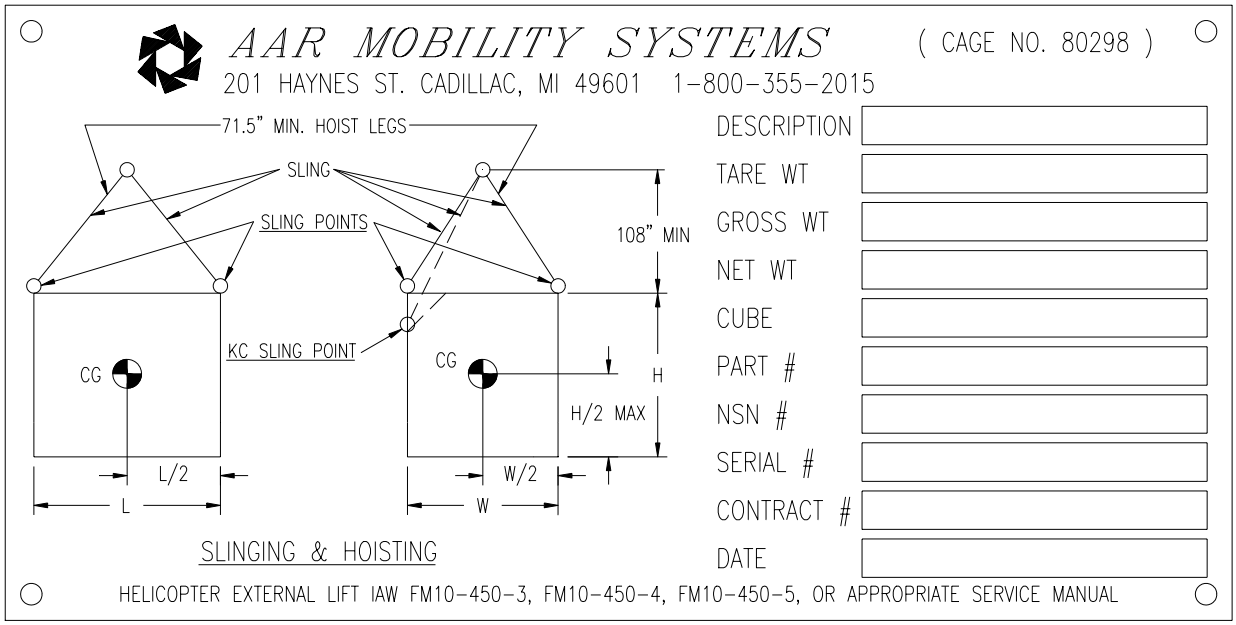
If cargo is to be shipped in bulk:

1. Make sure the total cargo weight does not exceed 3,600 pounds (1,634 kg) on the floor.
2. Load the cargo on the container floor so that it does not touch the container outside walls.
3. Restrain the cargo with straps, ropes or other suitable devices coupled to the tie-down rings at the perimeter of the floor.

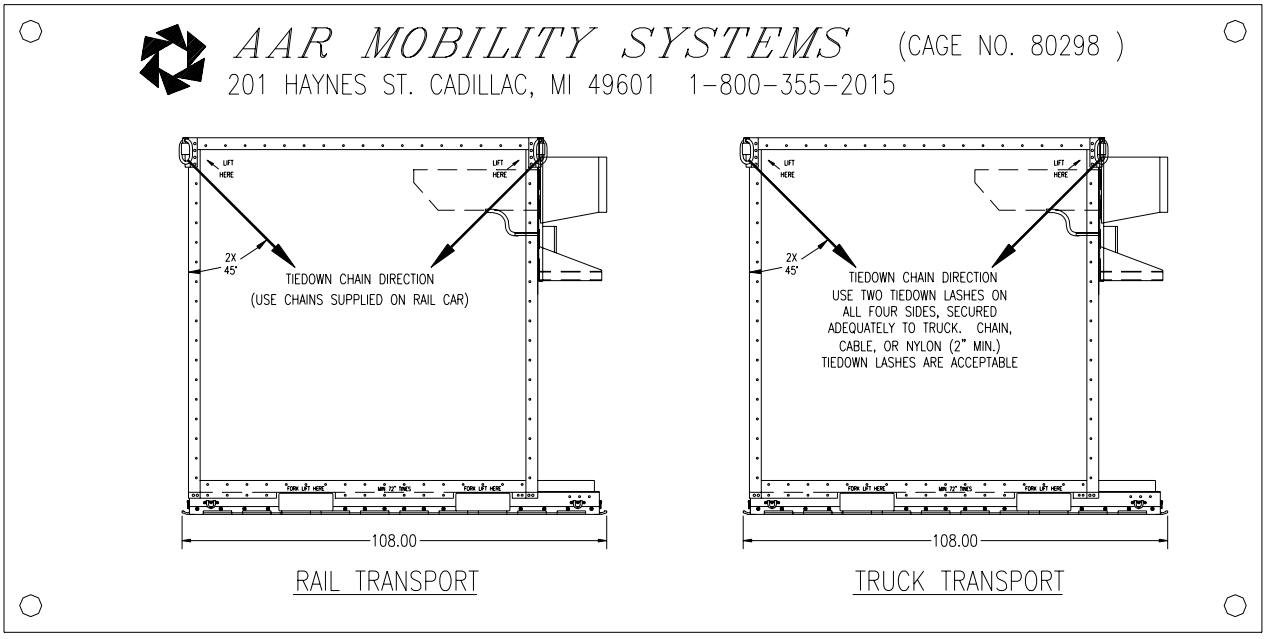
DECALS AND INSTRUCTION PLATES

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

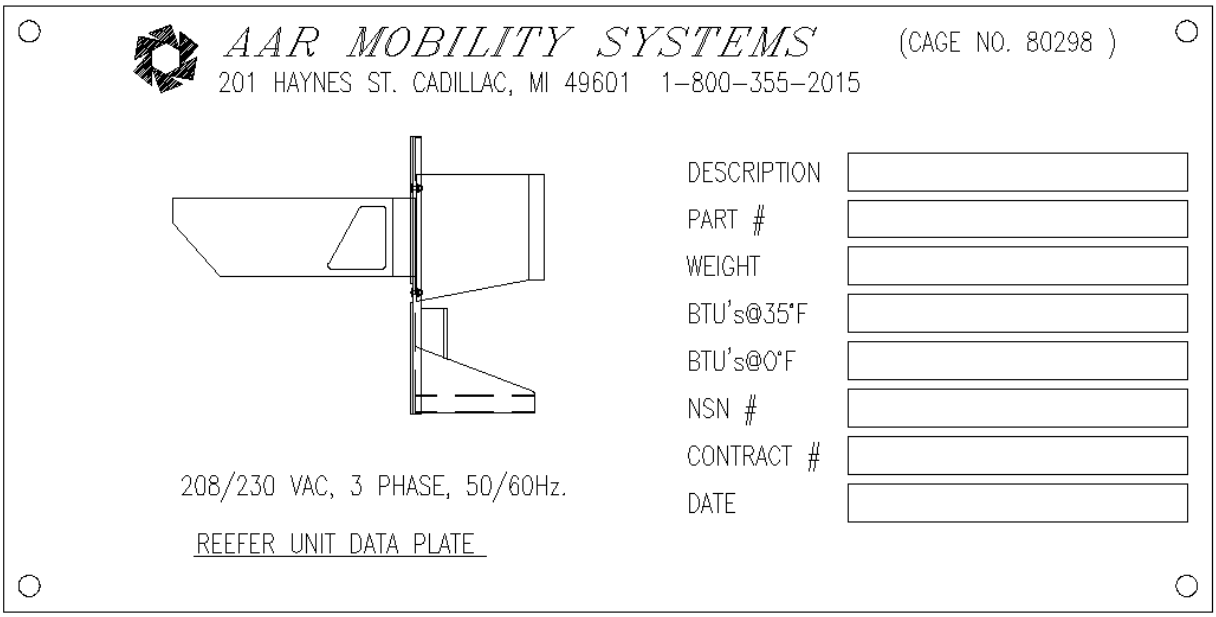
Cargo Door Placard



Shipping and Tie-Down Placard



Refrigeration Unit Placard



Unit Controls Placard

UNIT CONTROLS

ON/OFF SWITCH: TURNS THE UNIT ON OR OFF. ALSO, PRESS THIS SWITCH TO START THE UNIT WHEN THE UNIT HAS BEEN STOPPED BY THE HEATING OR COOLING OVERLOAD RELAY.

UNIT OPERATION INDICATOR LIGHT: GREEN LIGHT INDICATES COOLING MODE; RED LIGHT INDICATES HEATING MODE.

SETPOINT DISPLAY: DIGITAL DISPLAY WILL NORMALLY DISPLAY INLET AIR TEMPERATURE. DEPRESSING THE SETPOINT SWITCH WILL DISPLAY THE SETPOINT TEMPERATURE FOR 10–15 SECONDS.

SETPOINT ADJUSTMENT:

1. DEPRESS SETPOINT SWITCH
2. TURN SETPOINT DIAL.

CAUTION: DO NOT TURN THE SETPOINT DIAL WITHOUT FIRST DISPLAYING THE SETPOINT TEMPERATURE (DEPRESSING THE SETPOINT SWITCH). SETPOINT CAN BE ADJUSTED WITHOUT PUSHING THE SETPOINT SWITCH!

AUTOMATIC DEFROST (HOT GAS BYPASS): WILL TERMINATE DEFROST CYCLE IF COIL TEMPERATURE IS ABOVE FREEZING.

MANUAL DEFROST: PRESS THE MANUAL DEFROST SWITCH TO ENERGIZE DEFROST CYCLE. DEFROST CYCLE WILL AUTOMATICALLY END WHEN COIL TEMPERATURE IS ABOVE FREEZING.

TERMINATING MANUAL DEFROST CYCLE: PRESS THE ON/OFF SWITCH TWICE.

AC OVERLOAD INDICATOR: WHEN INDICATOR LIGHT IS ON, IT INDICATES THE OVERLOAD RELAY HAS OPENED AND THE UNIT HAS BEEN STOPPED. PRESS THE ON/OFF SWITCH TO RESET THE UNIT.

HIGH PRESSURE CUTOUT SWITCH: LOCATED IN THE DISCHARGE LINE; OPENS AT 450 PSI AND CLOSES AT 375 PSI.

LOW PRESSURE CUTOUT SWITCH: LOCATED IN SUCTION LINE; OPENS BELOW 5–11 INCHES OF VACUUM AND CLOSES AT 4–7 PSI.

ELECTRICAL ROUTING

POWER APPLIED:

FUSE 1	24VDC	EVAP FAN 1 & HOURMETER.
FUSE 2	24VDC	EVAP FAN 2
FUSE 3	24VDC	EVAP FAN RELAY, POWER RELAY, DEFROST RELAY, COMP CONTACTOR, COND. FAN RELAY.
FUSE 4	24VDC	POWER PCB (PIN 2), OVERLOAD HEAT/ COOL CURUIT, HEAT CONTACTOR.
FUSE 5	120VAC	TRANSFORMER POWER.
FUSE 6,7	120VAC	LIGHT CURCUIT FOR CONTAINER.
FUSE 4/1	24VDC	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.

Other 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 input connector. 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 the ADR-300 section of this work package.

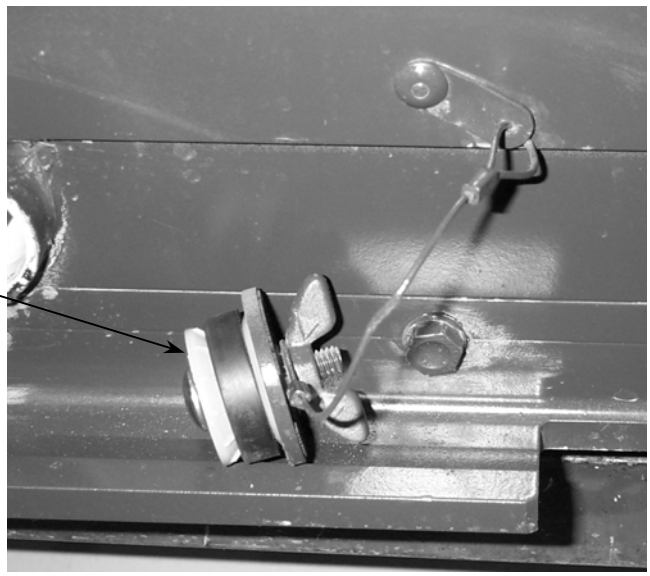
2. Turn off the interior light.

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 hook and handle 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, located under the door on the front face of the IC, is installed.
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 work package.



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 as described in Work Package 0017 00.
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.

Vehicle Loading

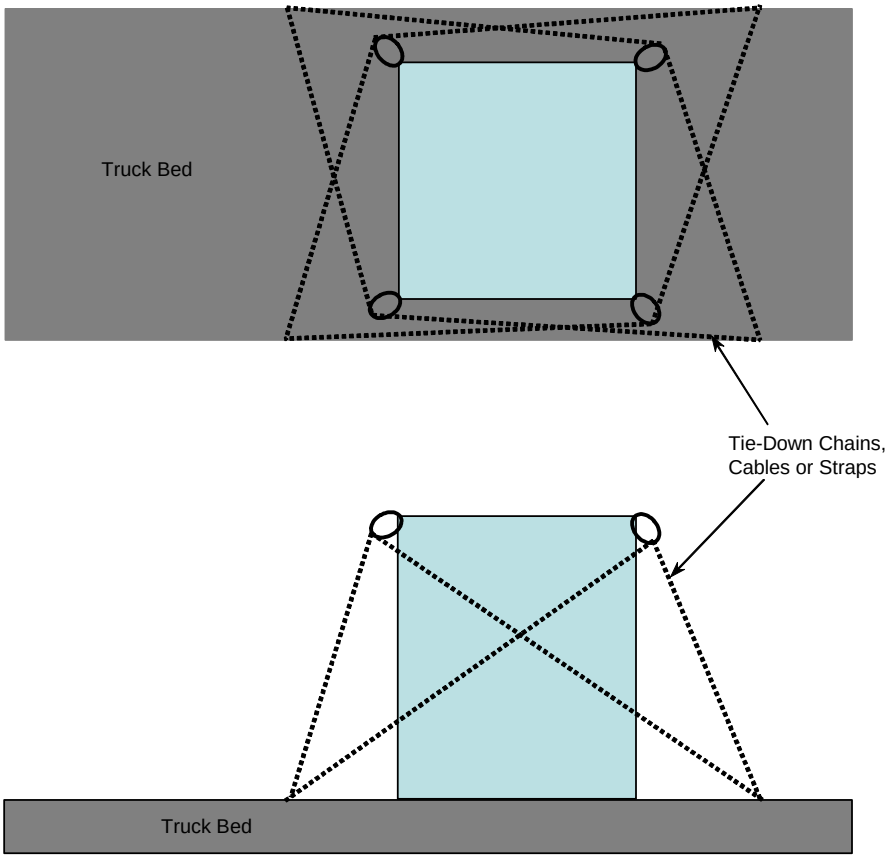
The ADR-300 may be transported on a variety of flatbed vehicles. Insure that the selected vehicle load capacity exceeds the total gross weight of the loaded container (10,000 lb). Lift the ADR-300 onto the vehicle with either a forklift or overhead crane. Secure the container to the vehicle bed with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

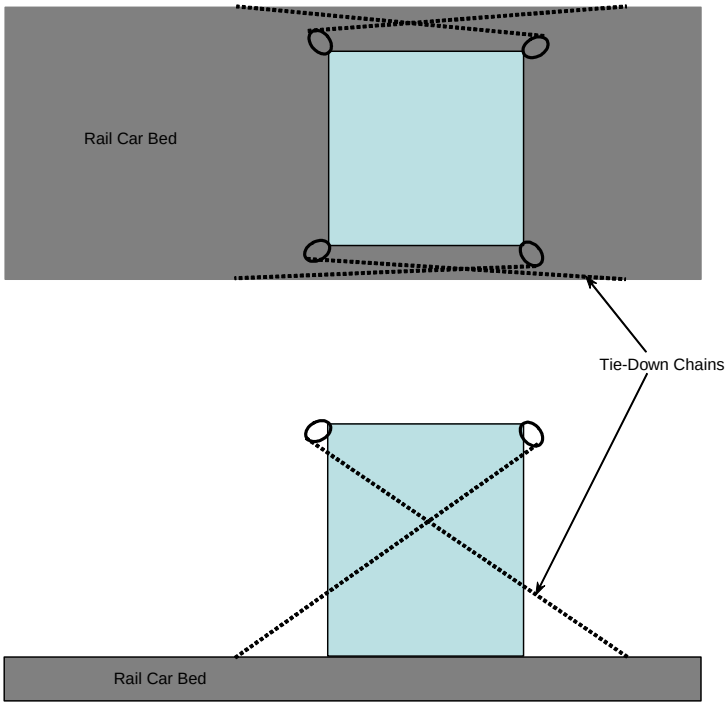
Note that manufacturing tolerances may cause the container base to be slightly wider than the 5-ton truck bed with the side rails in place. In these instances, one of the cargo restraint rails may be removed from the container base to provide side-to-side clearance.

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



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 as illustrated below.



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; FM10- 10-450-3) 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 AFJMAN 24-204 / TM 38-250 / NAVSUP PUB 505 / MCO P4030.19F / DLAM 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 hook and handle 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.

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

We recommend a slight slope for drainage.

2. Wash the container interior and exterior as described in Work Package 0014 00. Allow the container interior to dry thoroughly before closing it for storage.

END OF WORK PACKAGE

OPERATOR'S, UNIT, AND DIRECT SUPPORT MAINTENANCE

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

4110-01-465-4158 / 4110-01-465-4564

OPERATION UNDER UNUSUAL CONDITIONS

UNUSUAL ENVIRONMENT/WEATHER

Refer to Operation Under Normal Conditions (WP 0005 00) 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; or
- 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 as described in Work Package 0005 00 or adjust the defrost timer as described in WP 0029 00.

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 00 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.

Total loss of refrigerator from evaporation – A rapid and total loss of refrigerant, as may result from a broken refrigerant line, 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 hook and handle 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, see operator troubleshooting procedures, Work Package 0007 00. Many problems may be solved by checking the following:

- Is the power cord plugged into an appropriate power supply (see Work Package 0005 00)?
- Is the setpoint correctly programmed into the RU control panel (see Work Package 0005 00)?
- Are the container door and all other openings in the container closed?

More detailed troubleshooting procedures are outlined in Work Package 0007 00. If these steps do not solve the problem,

1. Request assistance from your supervisor or
2. Replace the RU as described in Work Package 0023 00 with another RU known to be functioning properly.

END OF WORK PACKAGE

Chapter 3
Operator 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)

4110-01-465-4158 / 4110-01-465-4564

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

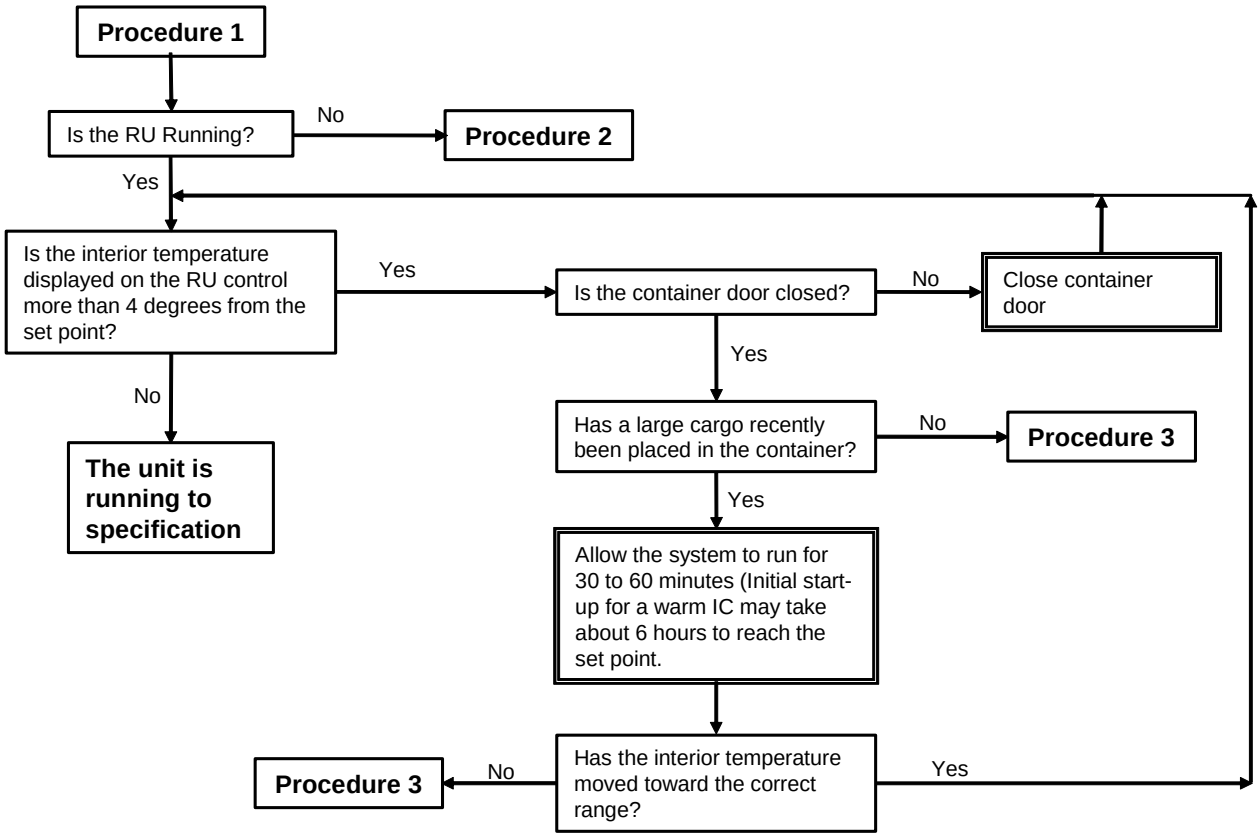
The ADR-300 electrical system uses high voltage power. Do not attempt to alter or repair electrical wiring. Operator repairs should be limited to coupling / decoupling existing connectors. Serious injury and death can result from electrical shock.

WARNING

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.

Malfunction/Symptom	Troubleshooting Procedure
Failure to maintain interior temperature	1
Refrigeration Unit does not operate	2
Refrigeration Unit runs but does not maintain required temperature	3

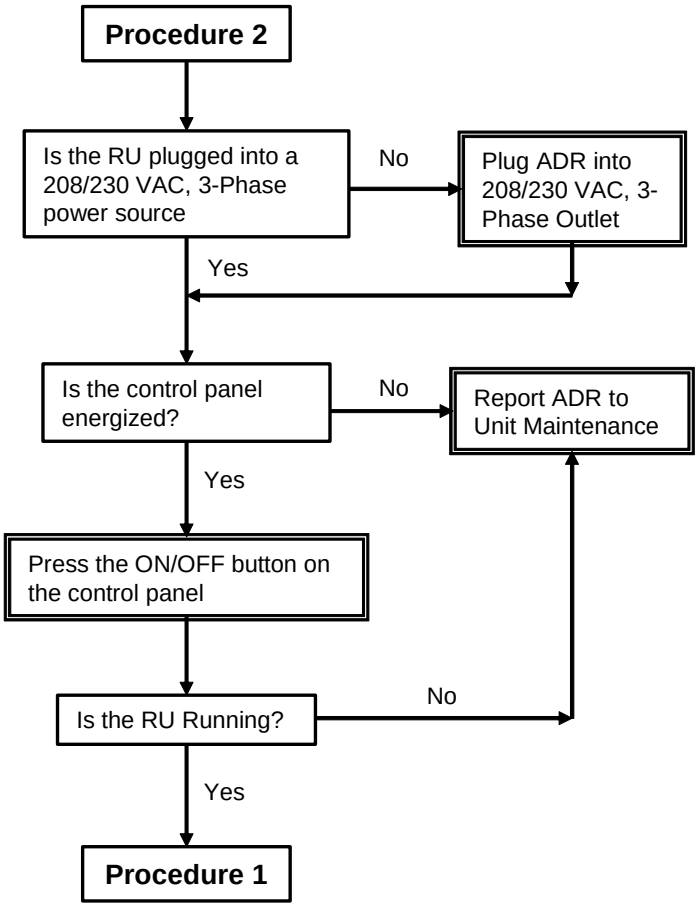
Procedure 1 Covers: **Failure to maintain interior temperature**
Initial Setup: **ADR-300 in operation**
Maintenance Level: **Operator**
Materials / Parts: **None**



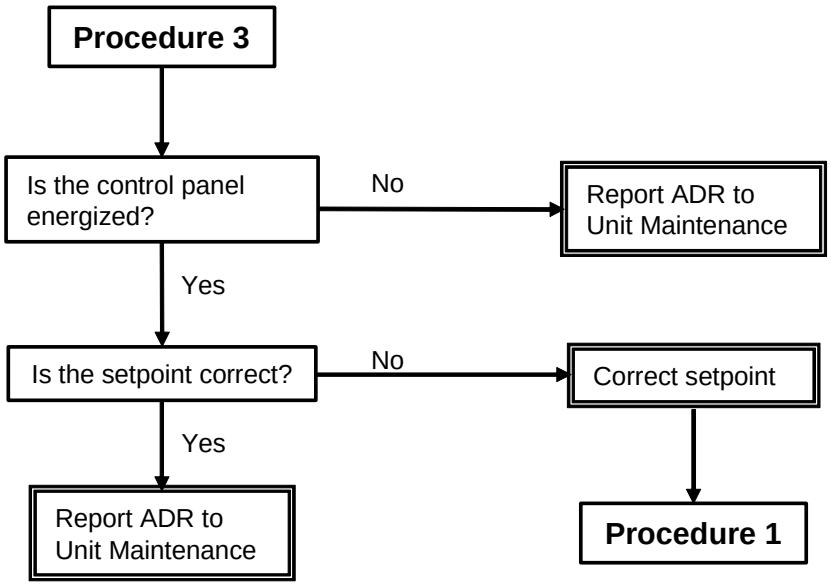
Procedure 2 Covers: **Refrigeration Unit does not operate**
Initial Setup: **ADR-300 in operation**
Maintenance Level: **Operator**
Materials / Parts: **None**

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
Operator Maintenance
For
Advanced Design Refrigerator, 300 Cubic Foot
(ADR-300)

OPERATOR' S, UNIT, AND DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
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 738-750.

Inspection

Perform the inspections described in Work Packages 0011 00, 0012 00, and 0013 00. 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 listed in Work Package 0010 00.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
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 for unit maintenance. For further information on how to use this form, see DA PAM 738-750.

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 oil lubricant 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 0014 00.

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, 281 CUBIC FOOT (ADR-281)
4110-01-465-4158 / 4110-01-465-4564
PREVENTIVE MAINTENANCE, CHECKS AND SERVICES INSTRUCTIONS

INITIAL SETUP

Tools and Special Tools
None

Materials and Parts
Light Oil Lubricant (WP 0068 00, Item 11)

Personnel Required
Operator

References
None

Equipment Conditions
ADR-300 set-up and operating (WP 0005 00 for ADR-300 Set-up)

Table 1. Preventative Checks and Services.

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.	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.
			Inspect the sling ring brackets for separation from the IC.	Deformed, separated, or missing sling ring brackets.
			Inspect the exterior drain plug and condensate drain tube to confirm it is properly restrained.	Missing drain plug or condensate drain tube or improperly restrained condensate drain tube.
			Inspect cargo restraint rails for deformation, cracks, breaks or corrosion.	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 door 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 insure the door 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 Checks and Services - 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 top supports 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	Interior Light Assembly, Light Switch, Pilot Light	Inspect the light switch on the container interior. Note any damage to the switch. Confirm that power is connected to the RU. Switch on the interior light. Confirm that the light is illuminated and the light enclosure is intact. Confirm that the pilot light on the container exterior is lit. Switch off the light.	The light switch, light fixture or pilot light 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 that it is undamaged 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 Checks and Services - 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 in accordance with Work Package 000500. 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 Checks and Services - 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 Work Package 0014 00.	

LUBRICATION REQUIREMENTS

ADR-300 lubrication requirements are summarized below:

Table 2. ADR-300 Lubrication 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
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
INSULATED CONTAINER (IC) INCLUDING DOOR
INSPECT

INITIAL SETUP

Tools and special tools
None

Materials and Parts
None

Personnel Required
Operator

References
None

Equipment Conditions
ADR-300 set up and connected to a power supply (See WP 0005 00 for set-up procedures.

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.

CAUTION

Do not open the container door when the folding steps are deployed. Failure to comply may result in damage to the equipment.

3. Open the door. Note any resistance in the movement of the freezer door latch 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 freezer door release and the hook and handle 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 pilot light. 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 WORK PACKAGE

OPERATOR MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
SHELF ASSEMBLY
INSPECT

INITIAL SETUP

Tools and special tools
None

Materials and Parts
None

Personnel Required
(1)

References
None

Equipment Conditions
ADR-300 set up and connected to a power supply (See WP 0005 00 for set-up procedures.

GENERAL

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

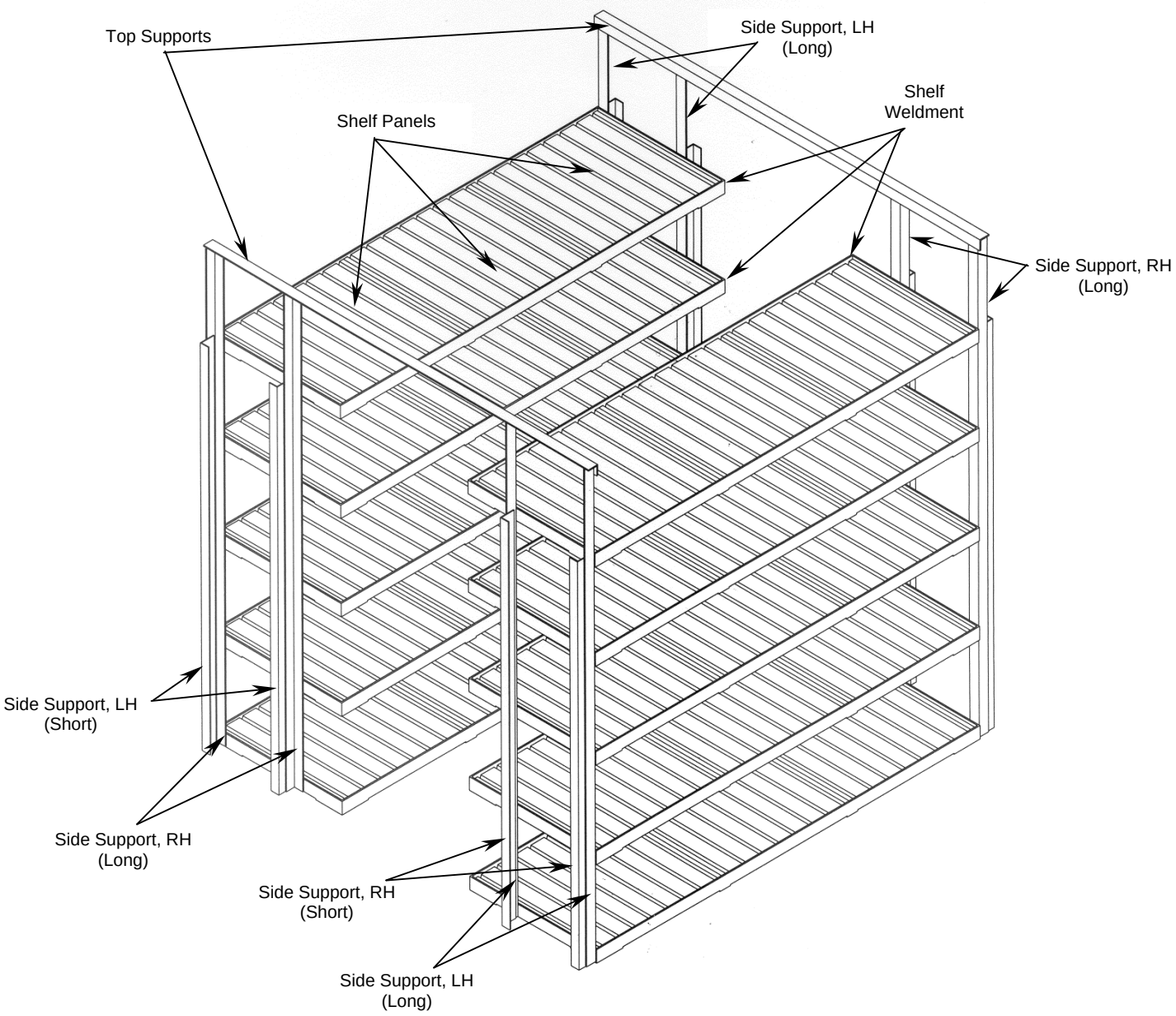
Each shelf includes three shelf panels supported by a shelf weldment, a rectangular frame that spans the distance between the vertical supports. The weldment is attached to the vertical supports with a single bolt in each corner.

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

INSPECT

Inspect the shelf system according to the following steps.

1. Inspect all solid decking panels for bends or warping. Also, confirm that the panels are not soiled or corroded.
2. Inspect the weldment 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.



END OF WORK PACKAGE

OPERATOR MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
INSULATED CONTAINER (IC) ELECTRICAL SYSTEM
INSPECT

INITIAL SETUP

Tools and special tools
None

Materials and Parts
None

Personnel Required
(1)

References
None

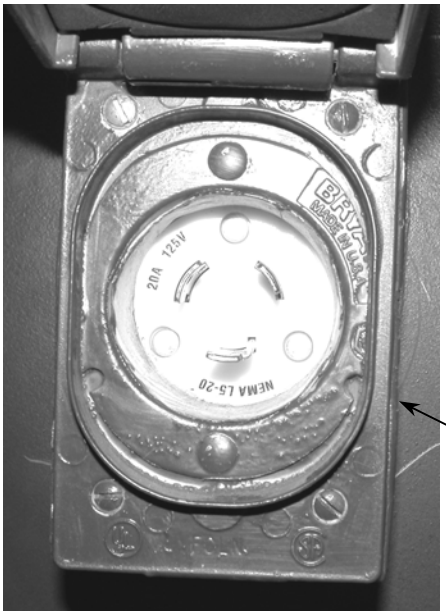
Equipment Conditions
ADR-300 set up (See WP 0005 00 for set-up procedures). IC power supply cord connected.

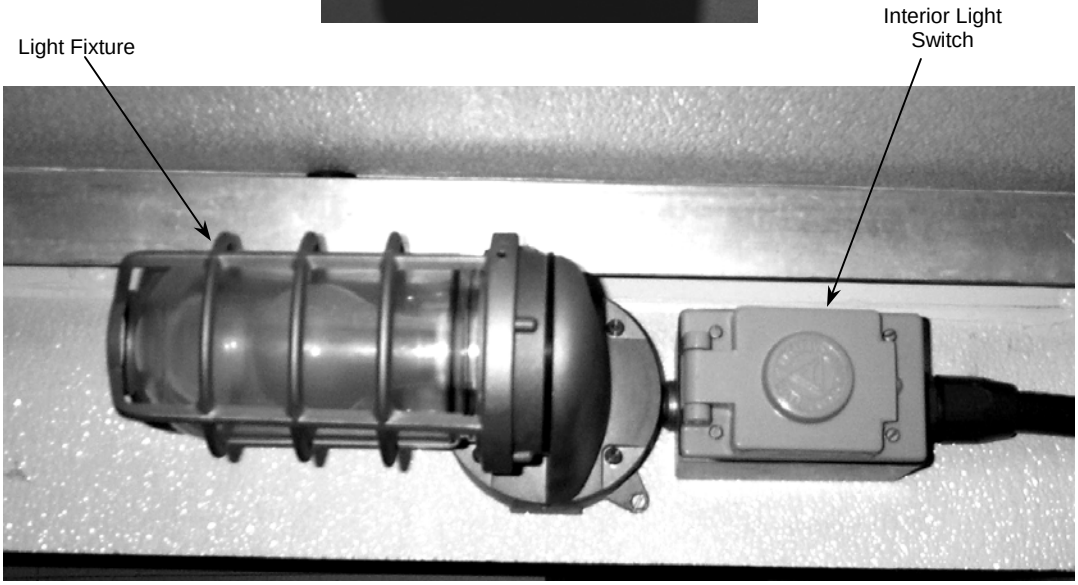
GENERAL

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, the interior light fixture, conduit protecting the wires between the light fixture and the switch, the light switch and the pilot light on the container exterior.

INSPECT

1. Inspect the power entry connector 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.
2. Connect a 120 VAC power source to the power entry connector.
3. Inspect the pilot light fixture 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 interior light 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 light bulb 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 pilot light both turn on when the switch is on and turn off when the switch is off.





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OPERATOR MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
INSULATED CONTAINER AND REFRIGERATION UNIT
SERVICE

INITIAL SETUP

Tools and special tools
None

Materials and Parts
None

Personnel Required
Operator

References
None

Equipment Conditions
ADR-300 disconnected from all power sources.

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.
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.

NOTE

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

7. Ensure that the door to the RU controller enclosure is closed, the power input connectors 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 WORK PACKAGE

Chapter 5
Unit Maintenance
For
Advanced Design Refrigerator, 300 Cubic Foot
(ADR-300)

UNIT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
SHELF ASSEMBLY
REMOVE/INSTALL

INITIAL SETUP

Tools and special tools
Tool Kit, Organizational Maintenance
(WP 0051 00, Table 2, Item 4)

Materials and Parts
None

Personnel Required
(2)

References
None

Equipment Conditions
ADR-300 set up (See WP 0005 00 for set-up procedures.

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

Be careful not to cut or break skin. Edges of the shelf panels are sharp. Failure to comply may result in serious injury to personnel.

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

3. Remove the four bolts supporting each shelf weldment and the three bolts securing the bottom weldment to the IC floor. Remove each shelf weldment from the IC and stow the parts with the shelf panels.

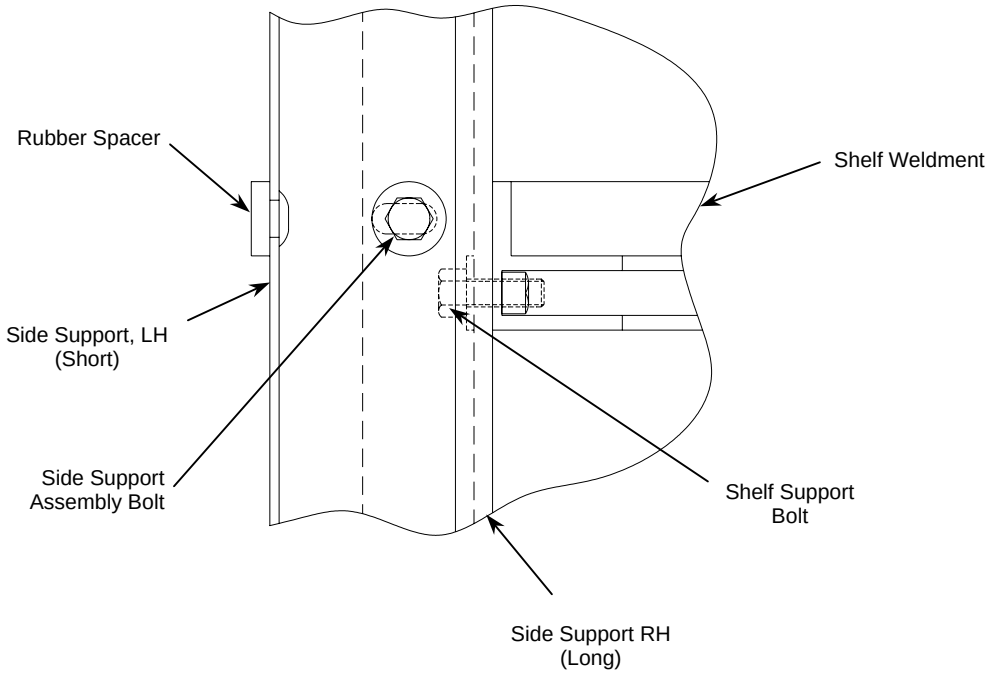
4. Remove the four bolts holding each top support to the long side supports. Remove the top supports from the container and stow the parts with the shelf panels.

5. Remove the side supports from the container and stow them with the shelf panels.

INSTALL

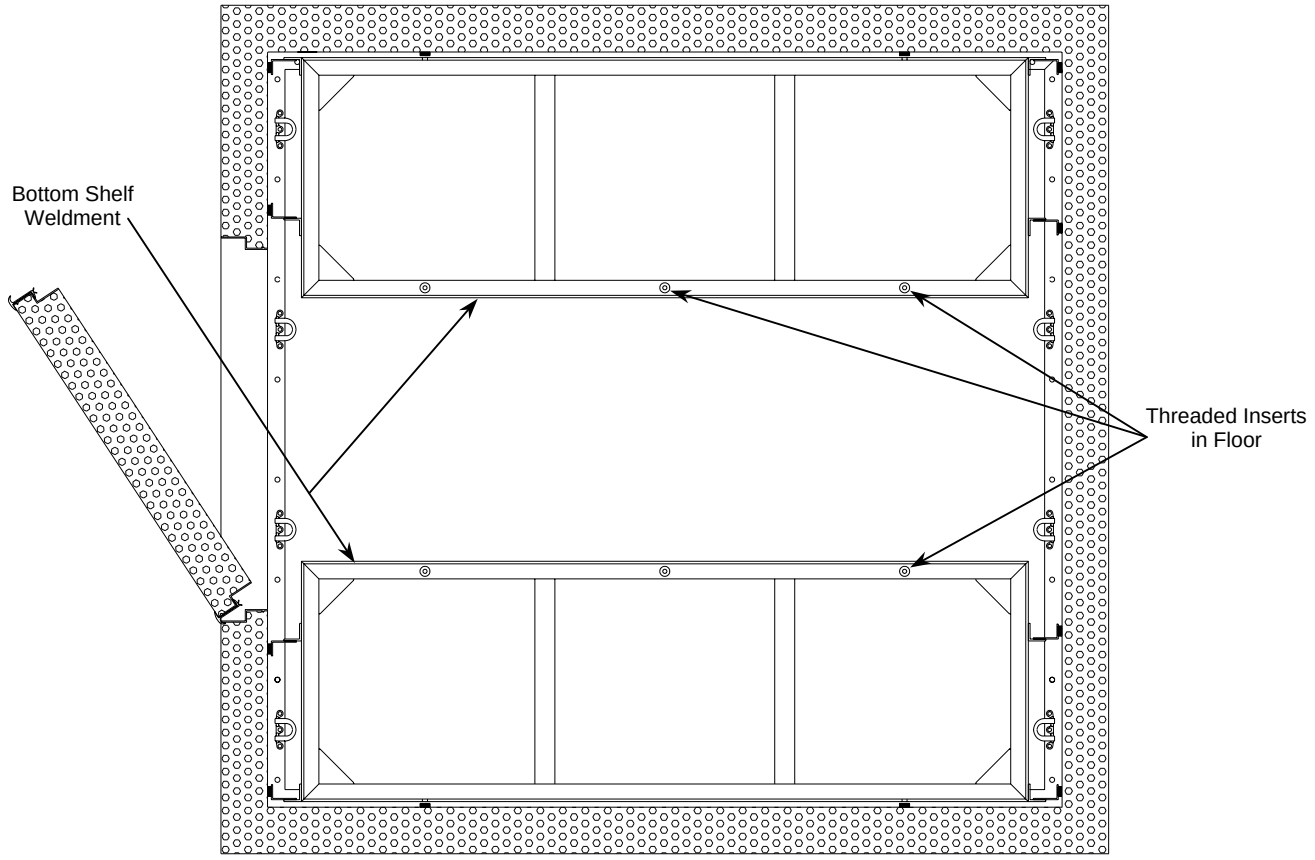
To install the shelf system in the ADR-300, follow these steps:

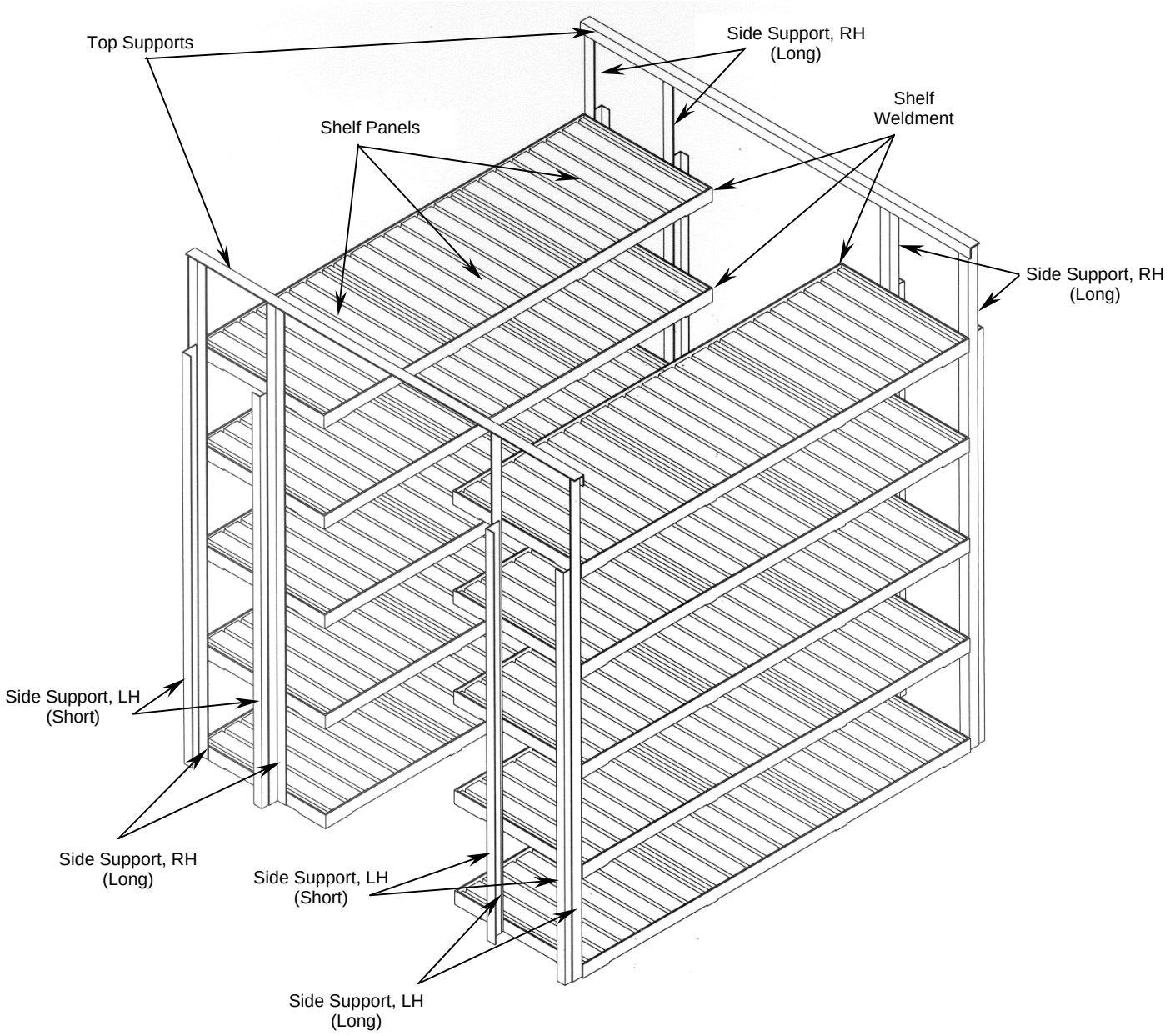
1. If side supports are not pre-assembled, assemble, four right-side support sets, each consisting of one long left-hand side support joined to one short right-hand side support. Leave nuts loose to allow adjustment in the width of the assembly.



2. Assemble four left-side support sets, consisting of one long right-hand side support joined to one short left-hand side support. Leave nuts loose to allow adjustment in the width of the assembly.
3. Confirm that four rubber spacers are installed in each short side support.
4. Position one shelf weldment on the container floor and align the bolt holes in the weldment with the three threaded inserts in the container floor. Thread three bolts through the weldment into each of the inserts. Do not tighten the bolts.
5. Facing the shelves, position two right-side support sets at the right end of the weldment. Insert the shelf support bolts 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 at the left end of the weldment. Insert the shelf support bolts 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 are installed on each of the two top supports. Place one top support on top of the four long side supports at the RU-end of the container with the vertical surface of the top support toward the shelf.
9. Match the holes in the side supports and the top support 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 toward the container end wall until the rubber spacer is snug against the wall. Tighten the side support assembly bolts 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 to the floor.
14. Install three shelf panels (with the ribs facing up) on each weldment.





END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
REFRIGERATION UNIT (RU)
INSPECT

INITIAL SETUP

Tools and special tools
Tool Kit, Organizational Maintenance
(WP 0051 00, Table 2, Item 4)

Materials and Parts
None

Personnel Required
Unit Maintenance

References
Insulated Container, Including Door
(WP 0011 00)

Equipment Conditions
ADR-300 set up (See WP 0005 00 for set-up procedures.)

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 Work Package 0011 00.

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.

Inspect

1. Turn off the RU at the control panel.
2. Unplug the power supply cable from the RU.
3. Check tightness of the eight mounting bolts 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. 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 and exhaust grille and set aside. Remove the control box cover on the electrical enclosure.

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.

      (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 condensate drain to ensure it is not restricted or damaged.

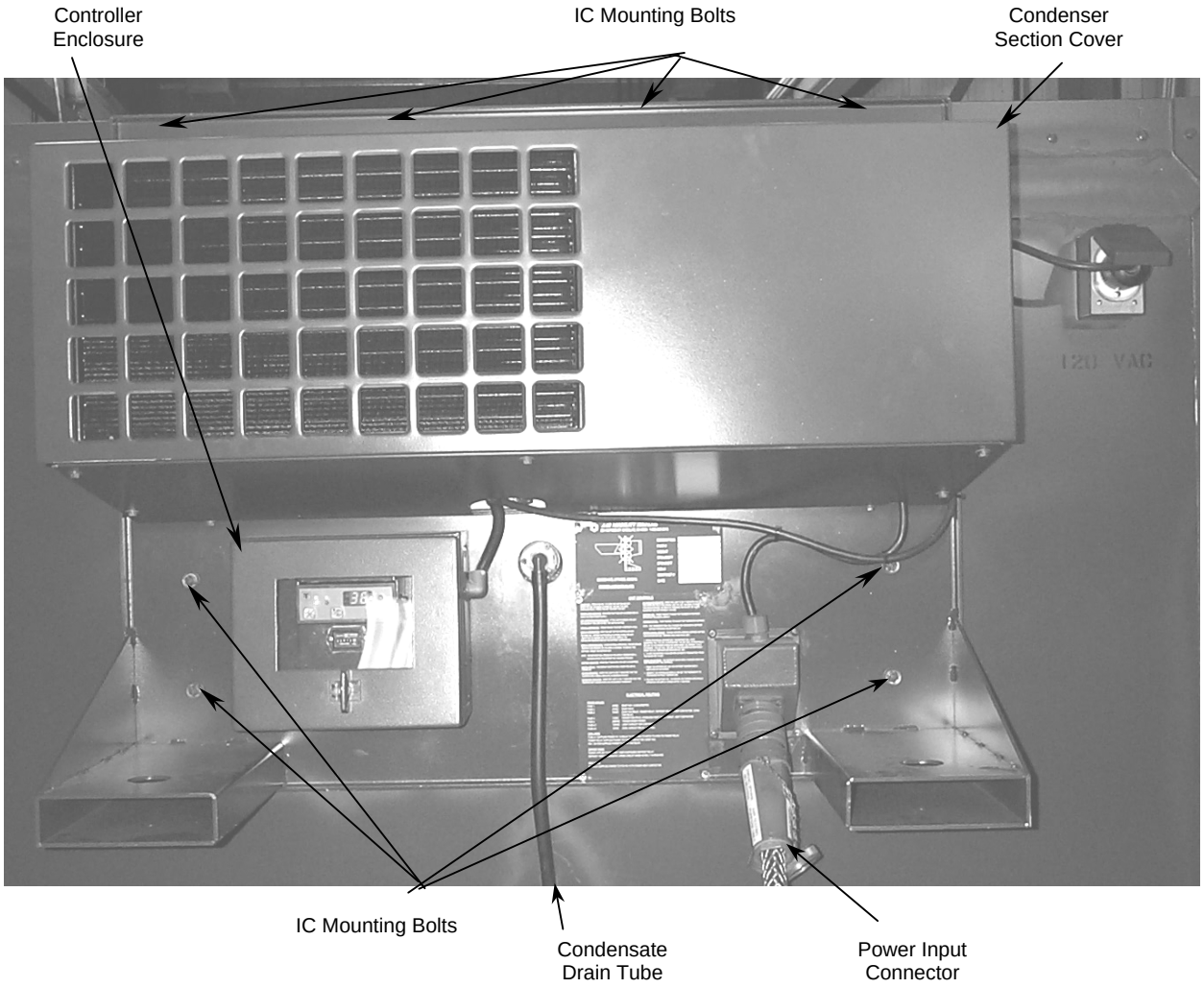
11. Inspect the RU interior (evaporator) section and drain. Note any damage to the enclosure or missing or loose fasteners.

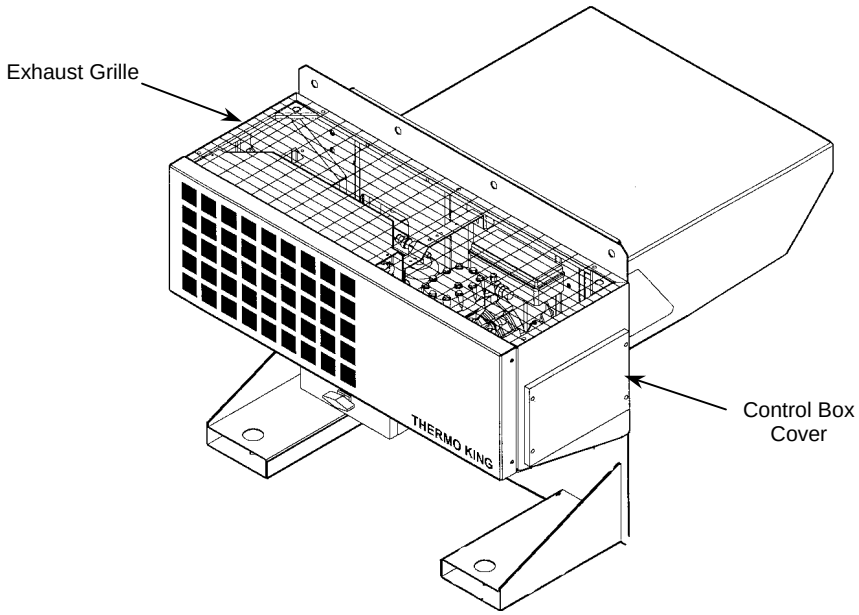
12. Plug the RU into a 208/230 VAC, 50-60 Hz, three-phase electrical source. Start the RU and note the interior temperature. Set the controller setpoint:

    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.


Controller Enclosure
IC Mounting Bolts
Condenser Section Cover
120 VAC
IC Mounting Bolts
Condensate Drain Tube
Power Input Connector



END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
INTERIOR LIGHT ASSEMBLY
REPLACE

INITIAL SETUP

Tools and special tools
Screw driver

Materials and Parts
Light bulb, Incandescent, 100 W
(WP 0068 00, Item 10)

Personnel Required
(1)

References
None

Equipment Conditions
ADR-300 set up and connected to a power supply (See WP 0005 00 for set-up procedures).

GENERAL

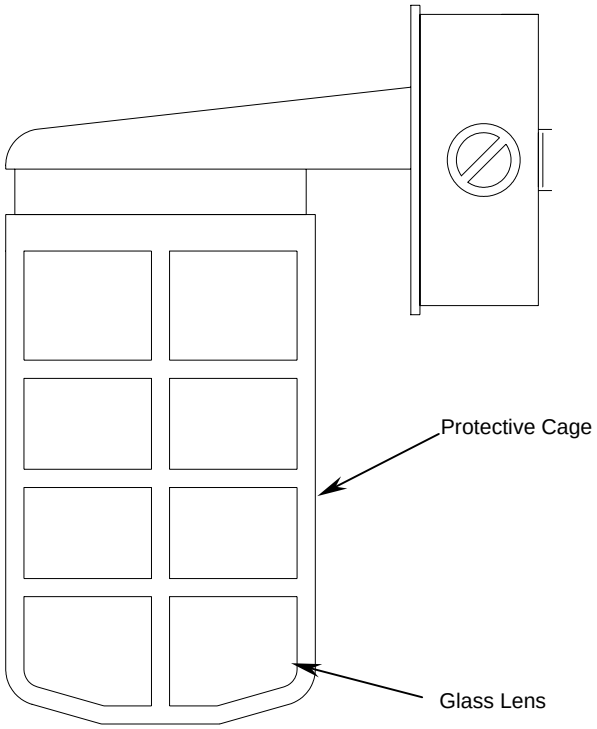
The light fixture inside the IC uses a conventional 100-Watt incandescent light bulb. This type of bulb periodically fails and requires replacement. To replace the bulb, use the steps below.

REPLACE

Light Bulb

1. Loosen the setscrew that holds the cage in place.
2. Unscrew the protective cage from the fixture. Remove the cage and set it aside.
3. Unscrew the lens from the fixture in the same manner as the protective cage. Set the lens aside.
4. Remove the failed light bulb from the fixture. Dispose of the failed bulb.
5. Install a new bulb by screwing the new bulb into the empty socket by hand. Do not over tighten.
6. Turn on light switch to confirm light bulb works. If not refer to electrical system troubleshooting.
7. Replace the lens. Use only hand force to screw on the lens. Do not over tighten.
8. Replace the protective cage. Use only hand force to screw on the cage. Do not over tighten.

9. Tighten the setscrew to prevent the cage from rotating.
10. Reconnect the IC Power Supply Cable to the IC power entry connector.
11. Check the operation of the fixture by switching the light on.



END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
IC ELECTRICAL SYSTEM
TEST

INITIAL SETUP

Tools and special tools
Multimeter (WP 0051 00, Table 2, Item 2),
Tool Kit, Organizational Maintenance
(WP 0051 00, Table 2, Item 4)

Materials and Parts
None

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

References
IC Interior Light Switch Repair and
Replacement (WP 0021 00)
IC Interior Light Assembly Replacement
(WP 0019 00)

Equipment Conditions
ADR-300 set up and connected to a power source (See WP 0005 00 for set-up procedures).

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 IC power entry connector.
2. Using a multimeter, test the voltage applied to the IC power entry connector.
3. Confirm that a 110 -120 VAC 50-60 Hz source is present at the plug. If it is not present go to the section entitled, If the Pilot Light Works and the Interior Light Does Not, Step 3 on 0018 00-3.
4. Plug the IC power supply cable back into the IC power entry connector.
5. Test the overall system function by switching the interior light on. If both the interior light and the exterior pilot light illuminate, 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 IC power entry connector.
2. Remove the light switch cover.
3. Remove the light switch from the box and the pull it to the extent of the wires.
4. Reconnect the power at the power entry connector.
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 power entry connector and the light switch.
8. Disconnect the RU main power supply from the ADR-300.
9. To test the light switch:
    a. Disconnect the IC power supply cable from the IC power entry connector to de-energize the IC electrical system.
    b. Remove the switch cover from the light 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 Pilot Light Works and the Interior Light Does Not, Step 3 on the next page.
10. If the switch is not good, replace the switch (see Work Package 0022 00).

If the Interior Light Works and the Pilot Light Does Not

Replace the pilot light (see Work Package 0021 00).

If the Pilot Light Works and the Interior Light Does Not

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

   a. Disconnect the IC power supply cable from the IC power entry connector 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 light bulb from the fixture. Check the bulb for continuity.

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

   f. If there is no continuity, replace the bulb (See Work Package 0017 00).

   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 light bulb, 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 (see Work Package 0020 00).

3. If voltage is not present at the IC power entry connector 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 IC power entry connector. 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. Open the RU electrical enclosure and check voltage between the load sides of Fuses 6 and 7. If no voltage is detected, go to Step 3 on the WP 0018 00-1. 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 IC power entry connector. 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.

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 IC power entry connector. 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 IC power entry connector. 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 IC power entry connector. If voltage is present, return the ADR-300 to service.

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
IC INTERIOR LIGHT ASSEMBLY
REPAIR

INITIAL SETUP

Tools and Special Tools
Multimeter (WP 0051 00, Table 2, Item 2),
Tool Kit, Organizational Maintenance
(WP 0051 00, Table 2, Item 4)

Materials and Parts
Interior Light Assembly (WP 0056 00, Item 1)

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

References
IC Electrical System Test (WP 0017 00)
PMCS (WP 0010 00)

Equipment Conditions
ADR-300 set up and connected to a power source (See WP 0005 00 for set-up procedures)

GENERAL

This section outlines the procedures for removing and reinstalling the IC interior light assembly. Before beginning this procedure, confirm that the light bulb is operational (see Work Package 0010 00, item 4). The light assembly 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 IC power entry connector.

2. Remove the cage, lens and light bulb from the light fixture as outlined in WP 0017 00.

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

4. Examine the wire connections. Ensure the connections are secure.

5. Twist the loose ends, and secure the connection with a wire nut. 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 light bulb and test the fixture operation. Replace the lens, setscrew, and cage as described in WP 0017 00.

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
IC POWER ENTRY CONNECTOR
REPAIR AND REPLACE

INITIAL SETUP

Tools and special tools
Tool Kit, Organizational Maintenance
(WP 0051 00, Table 4, Item 5)
Multimeter (WP 0051 00, Table 2, Item 2)

Materials and Parts
IC Power Entry Connector
(WP 0056 00, Item 4)
Sealant (WP 0068 00, Item 21)
Putty Knife (WP 0068 00 Item 14)

Personnel Required
Electrical Technician MOS 51 (AFSC 3E)

References
WP 0018 00

Equipment Conditions
ADR-300 set up and connected to a power source (See WP 0005 00 for set-up procedures).

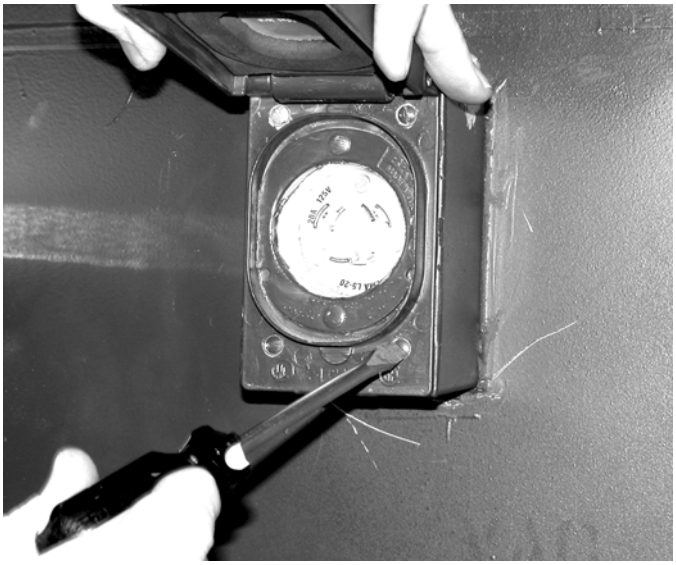
GENERAL

This work package outlines steps for testing, repairing and replacing the power entry connector on the rear of the IC exterior. Before beginning this procedure, complete the IC electrical system test outlined in Work Package 0018 00. The power entry connector should only be replaced by an identical assembly or an approved substitute.

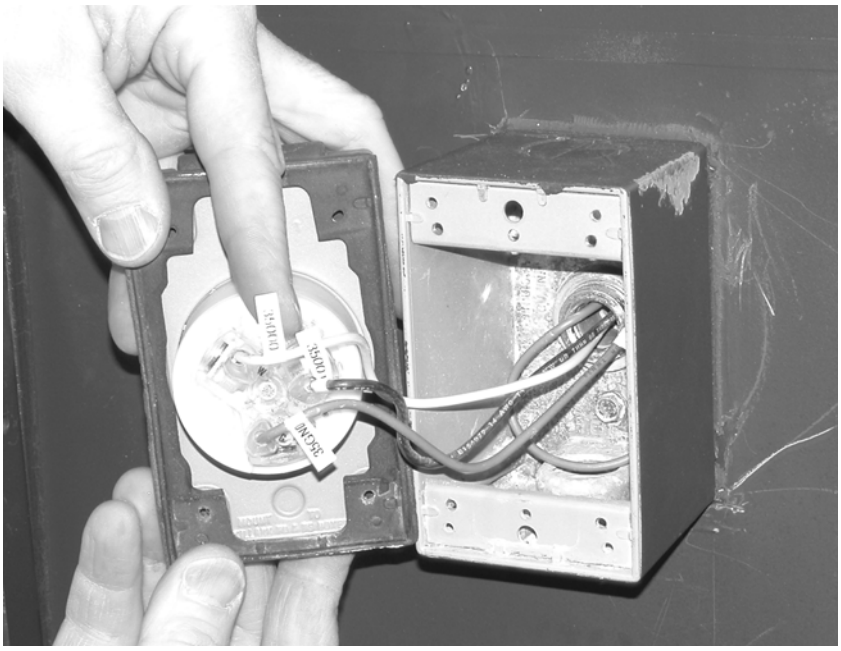
REPAIR

1. Confirm that power is disconnected from the IC power entry connector.

2. Remove the four screws that retain the cover plate for the input connector.



3. Pull the connector 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 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 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, 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 input connector and test the operation of the IC electrical system as described in Work Package 0018 00.

REPLACE

Power Entry Connector Receptacle Box

1. Ensure power is disconnected.

2. Remove receptacle from the receptacle box.

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.

7. Remove the remaining sealant with a putty knife.
8. If necessary, add sealant around the nipple to prevent infiltration.
9. Thread on the new power entry 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 as described in Steps 10 – 13 in the repair procedure above.

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
IC INTERIOR LIGHT SWITCH AND PILOT LIGHT
REPAIR

INITIAL SETUP

Tools and special tools
Tool Kit, Organizational Maintenance
(WP 0051 00, Table 2, Item 4)
Multimeter (WP 0051 00, Table 2, Item 2)

Materials and Parts
Interior Light Switch (WP 0056 00, Item 5)
Pilot Light (WP 0056 00, Item 3)
Sealant (WP 0068 00, Item 21)

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

References
WP 0018 00

Equipment Conditions
ADR-300 set up (See WP 0005 00 for set-up procedures).

GENERAL

This work package outlines steps for repairing and replacing the interior light switch and/or the pilot light in the insulated container. Before beginning this procedure, complete the IC electrical system test outlined in Work Package 0018 00. The light switch or pilot light should be replaced only by an identical part or an approved substitute.

REPAIR

Light 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 IC power entry connector.

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

3. Remove two screws that retain the light 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 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.

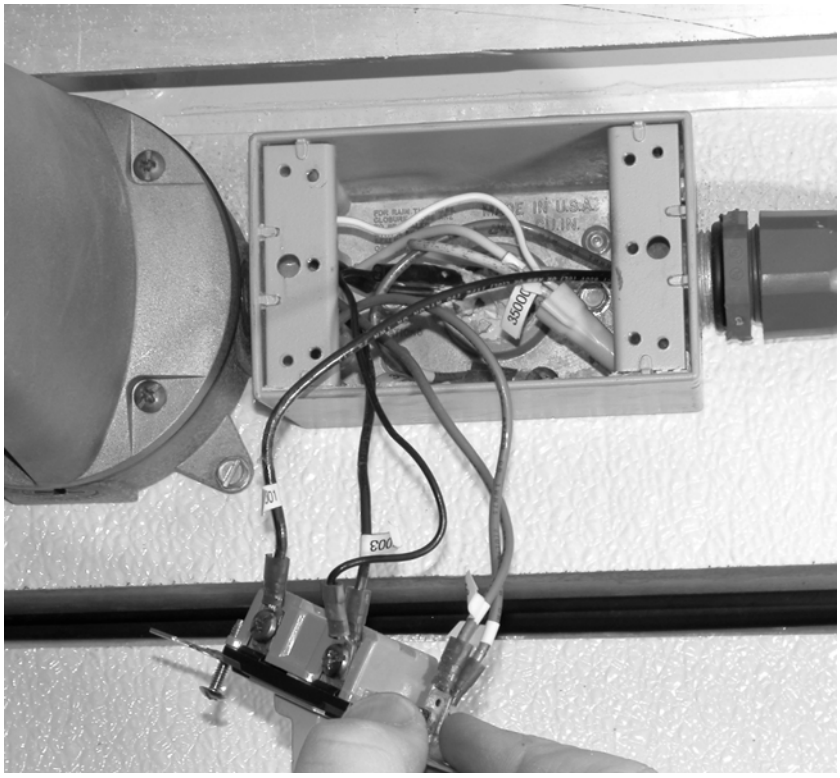
7. Inspect the light switch. If the switch is damaged, go to Step 9.

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 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.



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 input connector and test the operation of the IC electrical system as described in Work Package 0018 00.

Pilot Light

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

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

3. Remove two screws that retain the light 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 light fixture.

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

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

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

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

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

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

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

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

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

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

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

18. Reinstall the light 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 a 110 VAC 60 Hz power supply to the power input connector and test the operation of the IC electrical system as described in Work Package 0019 00.

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
CARGO RESTRAINT RAIL
REMOVE/INSTALL

INITIAL SETUP

Tools and special tools
Tool Kit, Organizational Maintenance (WP 0051 00, Table 2, Item 4)
Threaded Insert Installation Tool (WP 0051 00, Table 2, Item 7)
Threaded Insert Anvil (WP 0051 00, Table 2, Item 6)
3/8 – 24 Mandrel (WP 0051, Table 2, Item 8)

Materials and Parts
Cargo Restraint Rail (Short) (WP 0054 00, Item 16)
Cargo Restraint Rail (Long) (WP 0054 00, Item 17)
Anti-seize thread compound (WP 0068 00, Item 3)
3/8-24 Threaded Insert (WP 0068 00, Item 23)

Personnel Required
1 Person

References
None

Equipment Conditions
ADR-300 set up and connected to a power source (See WP 0005 00 for set-up procedures).

GENERAL

This work package 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.

WARNING

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 rail to be removed.
2. Remove the 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 holes 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 holes 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 shirt during flight. Failure to comply may result in 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.

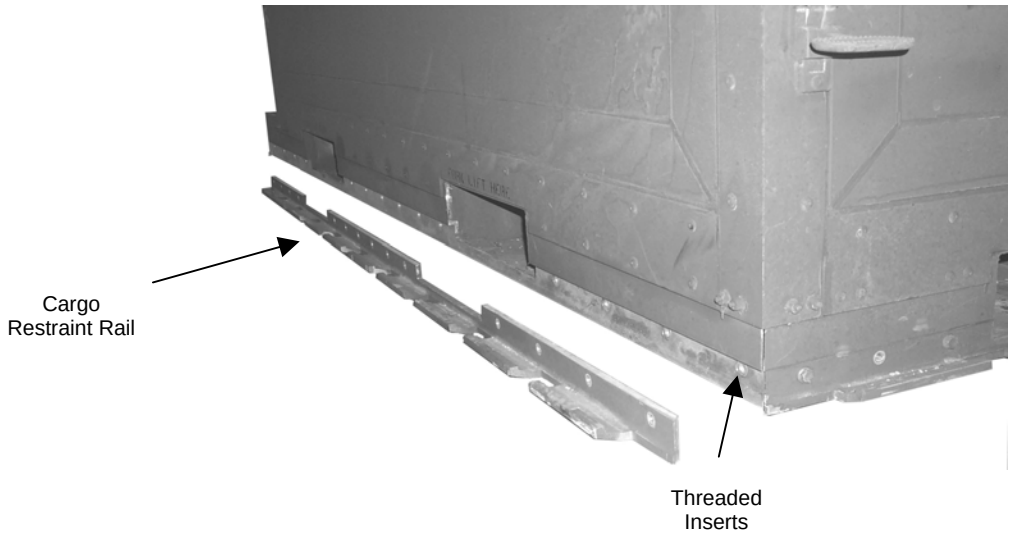
INSTALL

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.



END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
REFRIGERATION UNIT (RU)
REMOVE/INSTALL

INITIAL SETUP

Tools and special tools
Tool Kit, Organizational Maintenance
(WP 0051 00, Table 2, Item 4)

Materials and Parts
Adhesive (WP 0068 00, Item 2)
Outer Seal (WP 0057 00, Item 4)

Personnel Required
(2), and forklift driver

References
None

Equipment Conditions
ADR-300 set up and connected to a power source (See WP 0005 00 for set-up procedures).

GENERAL

This work package 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, disconnect the IC power supply cord from the IC power entry connector and secure the cord.

2. Disconnect the external condensate drain tube from the RU base plate.

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

CAUTION

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

4. From inside the IC, disconnect the two condensation drain tubes from the nipples on the drain pan. Tuck the drain tubes into the evaporator housing to ensure that they clear the opening in the IC wall.

5. 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).

6. 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.

7. Insert forklift tines into the fork pockets on the RU. Raise the forks just enough to support the RU without lifting the IC.

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

9. Remove 8 mounting bolts 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. Failure to comply may result in serious injury to personnel.

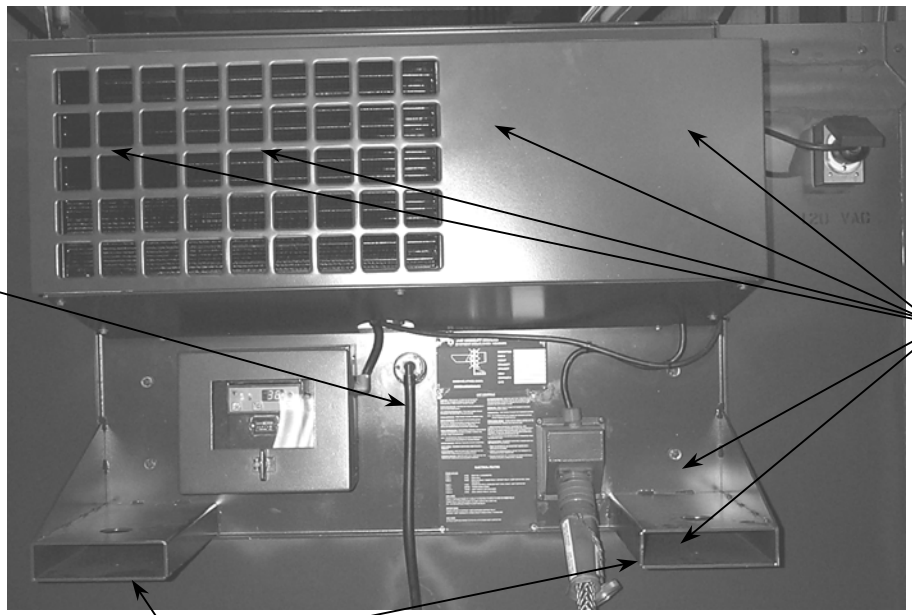
10. Using a spotter inside and outside of the IC, direct the forklift driver to slowly remove the evaporator section from the opening. The inside spotter shall guide the evaporator section through the opening in the container.

11. Slowly and gently, pull the RU straight back from the IC until the evaporator section is clear of 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. 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 condensate drain tube 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. Failure to comply 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 condensate drain tube fitting on the IC rear wall with the corresponding hole in the RU back plate.
8. Install eight mounting bolts through the bolt holes snugly, then tighten after all bolts are installed.

NOTE

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

9. Reconnect the external condensate drain tubes.

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

If a threaded insert is stripped replace it.

10. Connect the IC power supply cord to the IC power entry connector.
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 as described in Work Package 0005 00.

Threaded Insert

1. Remove the flange from the damaged threaded insert by drilling the threaded insert with a ½-in. (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 WORK PACKAGE

UNIT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
FUSE
TEST AND REPLACE

INITIAL SETUP

Tools and special tools
Tool Kit, Organizational Maintenance (WP 005100, Table 2, Item 4)

Materials and Parts
Fuse (WP 0062, Item 7)

Personnel Required
Electrical Technician MOS 51 (AFSC 3E) (1)

References
PMCS Instruction (WP 0010 00)

Equipment Conditions
ADR disconnected from all sources of power.

GENERAL

The ADR-300 RU uses eight fuses to protect various circuits from overload and damage. These are:

Table 1. ADR-300 Fuse Locations.

Fuse	Protected Components	Fuse Location
1	Evaporator Fan EF1, Drain Tube Heater	Electrical Enclosure PC Board
2	Evaporator Fan EF2, Drain Tube Heater	Electrical Enclosure PC Board
3	Condenser Fan Motor and Defrost Solenoid Coil (when energized), Compressor Motor Contactor, Condensate Drain Tube Heaters (1 and 2)	Electrical Enclosure PC Board
4	Control Panel Display, Heat Contactor	Electrical Enclosure PC Board
4/1	Control Panel Display	Rear of Display Enclosure
5	Transformer	Electrical Enclosure Upper Left Corner
6	Interior Light Assembly	Electrical Enclosure Upper left Corner
7	Interior Light Assembly	Electrical Enclosure Upper Left Corner

REMOVE

Fuses 1, 2, 3, 4

1. Open the RU electrical enclosure by removing the retaining bolts in each of the four corners of the cover.
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.
4. Remove the back cover to access the fuse.
5. Remove the fuse.

Fuses 5, 6, and 7

Unscrew the fuse holder and remove the fuse from the socket.

TEST

Fuse 1

1. Remove Fuse 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 2

1. Remove Fuse 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. 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. 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 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 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 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

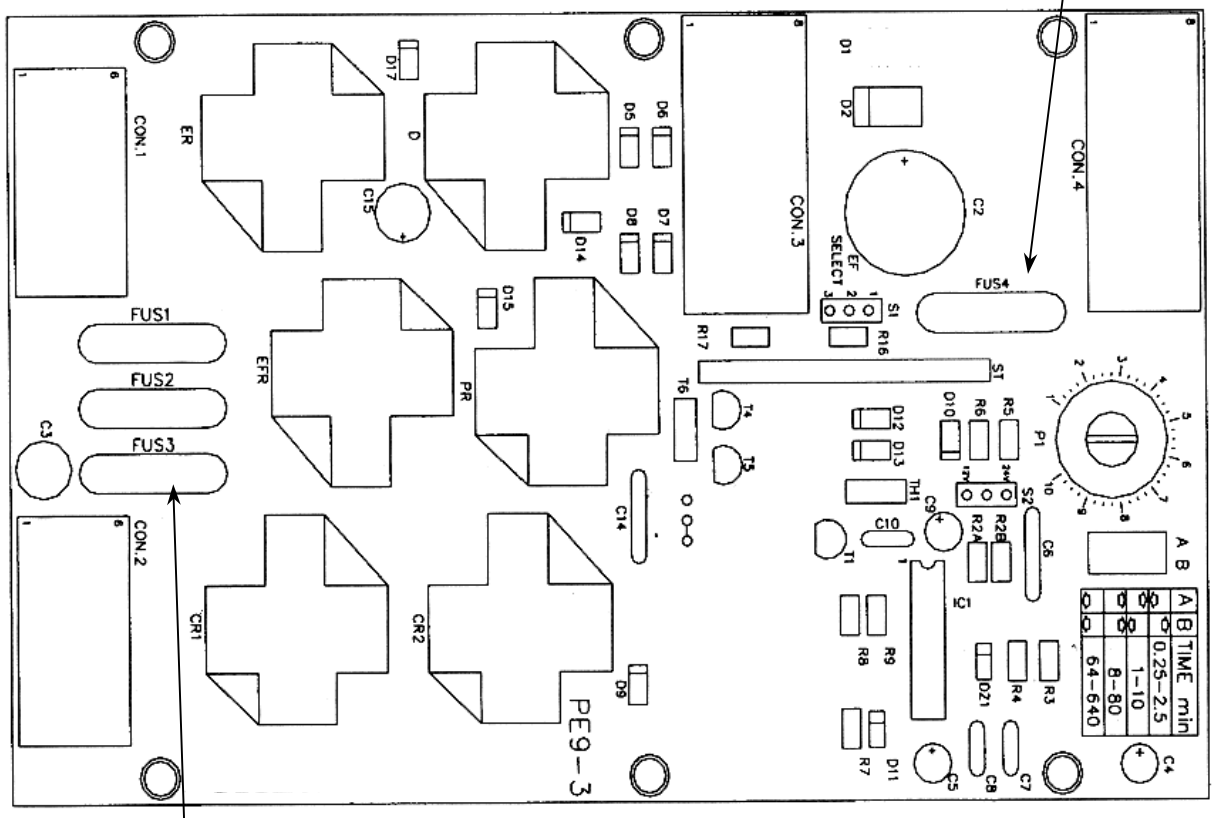
1. Hold the fuse with needle-nose pliers and align the fuse terminals with the socket on the PC Board.
2. Push the fuse into the socket until the fuse body is seated.

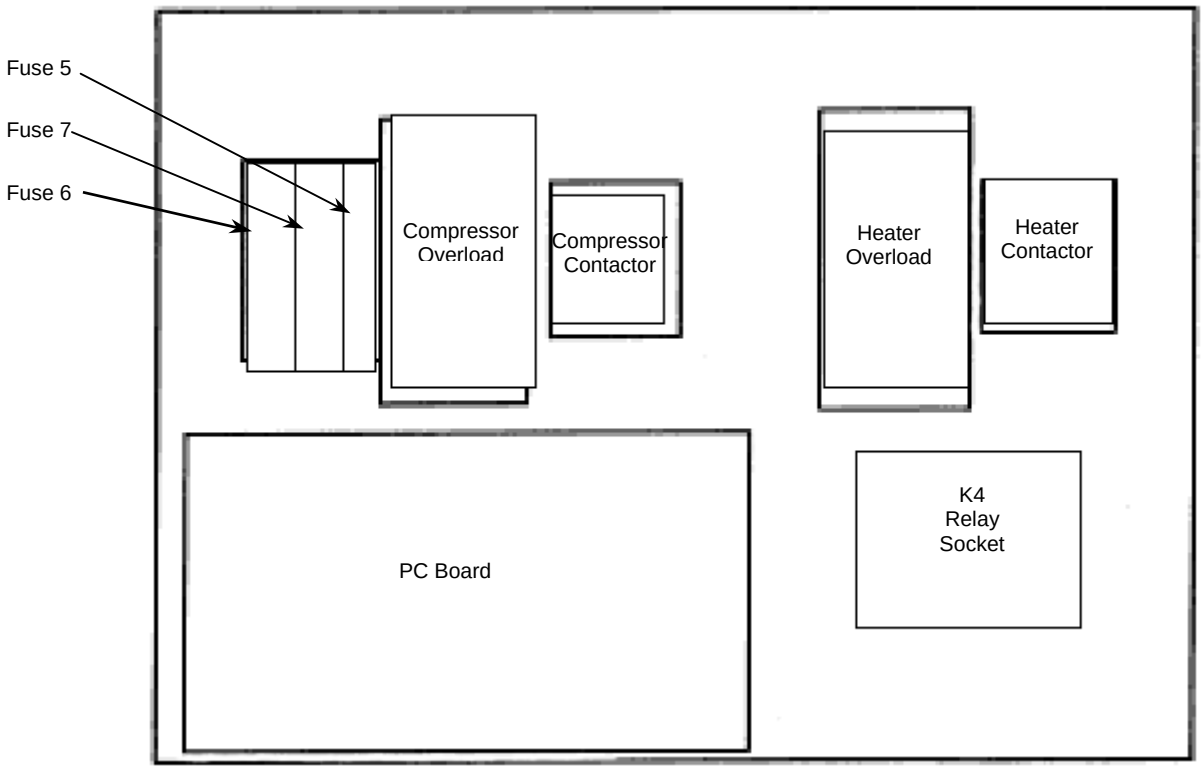
Fuse 4/1

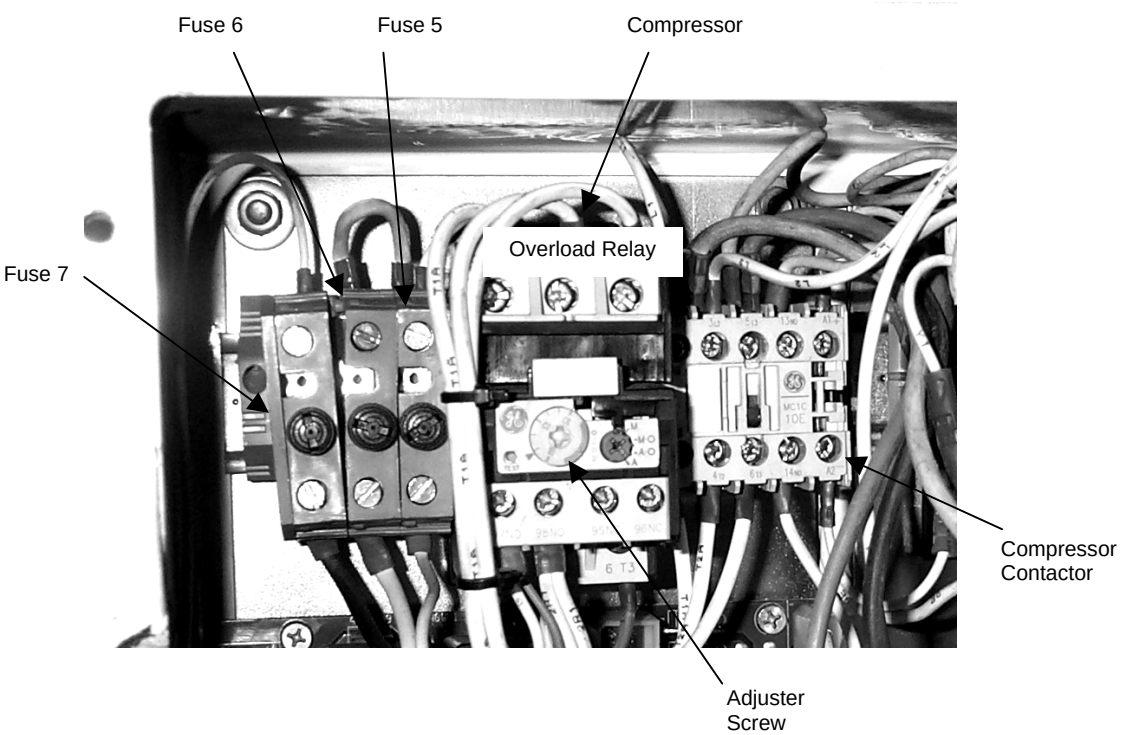
1. Insert the replacement fuse in the controller socket. Reinstall the back cover.
2. Install the controller into the mounting bracket.
3. Tighten the setscrews.
4. Close the cover and secure the cover by turning the handle ¼ turn.

Fuse 5, 6, and 7

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


Fuse 4
CON.1
CON.2
CON.3
CON.4
FUS1
FUS2
FUS3
FUS4
ER
EFR
PR
D
CR1
CR2
PE9-3
EF SELECT
A B
A B TIME min
0.25-2.5
1-10
8-80
64-640
Fuses 1, 2, and 3





END OF WORK PACKAGE

Chapter 6
Direct Support
For
Advanced Design Refrigerator, 300 Cubic Foot
(ADR-300)

DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
INSULATED CONTAINER
REPAIR

INITIAL SETUP

Tools and special tools
Tool Kit, Organizational Maintenance (WP 0051, Table 2, Item 4)
Disk Sander (WP 0051, Table 2, Item 1)

Materials and 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 (See WP 0005 00 for set-up procedures)

GENERAL

The side and roof panels of the ADR-300 include an aluminum outer skin, a foam core and a fiberglass inner skin. 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

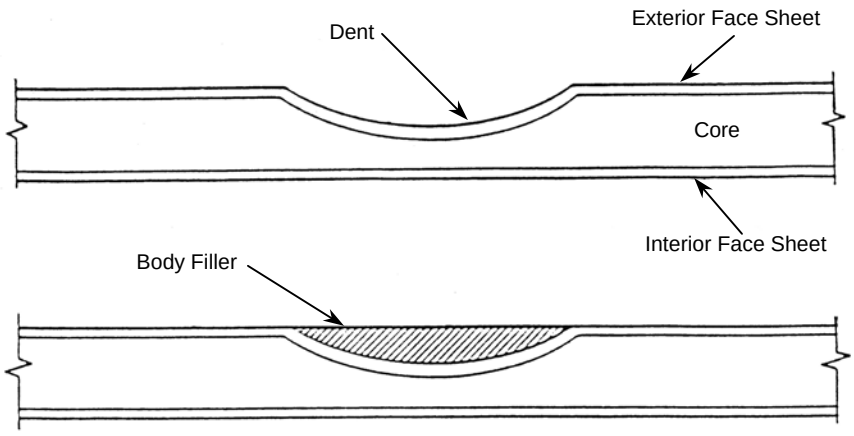
Dents or Depressions – Aluminum Bonded Material

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 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.



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 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.

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.

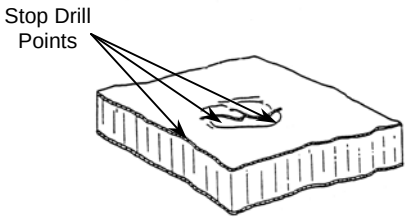
2. Drill a hole at the ends of all tears or cracks (“stop-drill”) in the face skin with a 1/8-in. drill bit.

WARNING

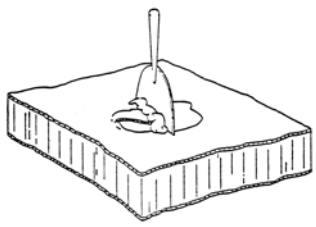
Isopropyl alcohol is toxic and flammable. Do not consume internally and avoid inhaling vapors. Good, general ventilation is normally adequate. Avoid all sources of ignition. Failure to comply may result in serious injury or death to personnel.

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

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, fill the damaged area with body filler. 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.

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. Three levels of damage are classified below.

Structural Damage. 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. This level of damage includes minor gouges in the panel core. Follow repair procedure Steps 1-4.

Cosmetic Repair. Minor surface scratches. Follow repair procedure steps 1-4.

Structural

Surface

Cosmetic

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.

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.

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 WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
DOOR PANEL
REPAIR AND REPLACE

INITIAL SETUP

Tools and special tools
Tool Kit, Organizational Maintenance
(WP 0051 00, Table 2, Item 4)

Materials and Parts
Door Seal (WP 0054 00, Item 15)
Adhesive (WP 0068 00, Item 2)
Sealant (WP 0068 00, Item 21)

Personnel Required
2 persons

References
Insulated Container Panel Repairs
(WP 0026 00)

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 Work Package 0025 00. This work package outlines procedures for replacing the door seal and door lock hardware.

EXCLUDED PROCEDURES

The following repair procedures are not authorized for field implementation:

- Hinge replacement
- Door Assembly 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 door seal by peeling it from the door inside and outside surfaces.

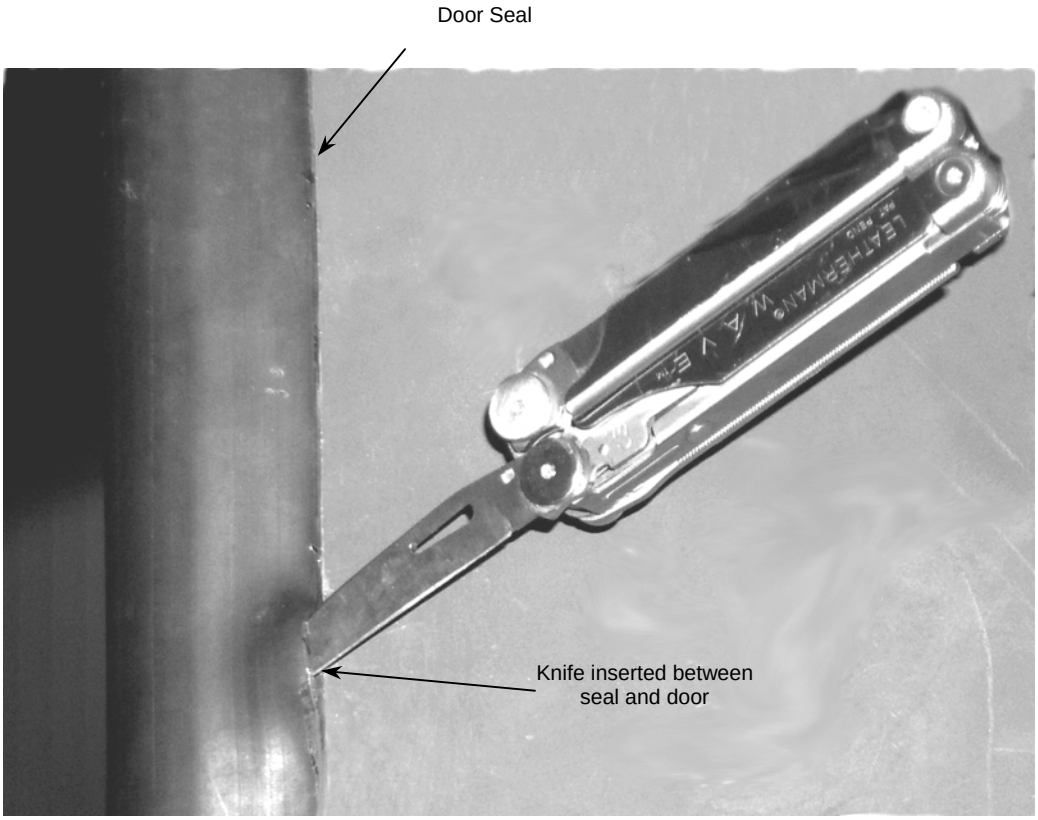
NOTE

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 (see figure). 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.



INSTALL

1. Fit the new door 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 door 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.

REMOVE

Door Handle

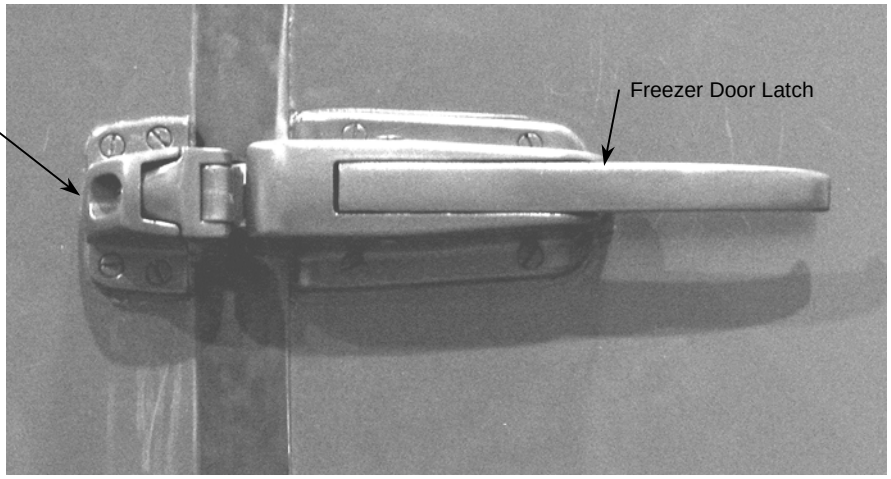
1. Open the door to disengage the freezer door latch from the freezer door keeper.

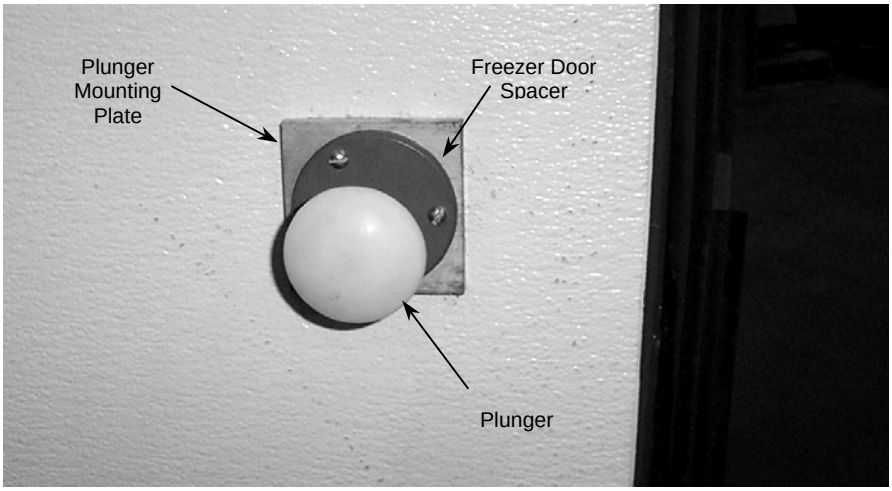
2. Remove three screws from the plunger mounting plate on the inside surface of the door. Remove the plunger and plate from the door and set aside.

3. Score around the perimeter of the freezer door latch to loosen the old sealant.

4. Remove the two screws furthest from the edge of the door on the freezer door latch assembly. Remove the freezer door spacer (metal ring) from the inside surface and set aside.

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





INSTALL

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

2. Support the exterior freezer door latch assembly 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 freezer door spacer 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 freezer door latch assembly. Thread the screws into the threaded holes in the freezer door spacer.

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 with the small threaded holes in the freezer door spacer. Thread the three screws from the inside assembly into the holes in the freezer door spacer.

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

9. Verify proper operation of door handle.

REMOVE

Hook and Handle Assembly

1. Drive out the inside hook and handle assembly handle retaining roll pin.

2. Remove the setscrew on the inside assembly handle.

3. Remove the retaining nut and washer from the hook and handle assembly and slide the interior lock handle of 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

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

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
FREEZER DOOR KEEPER
REMOVE/INSTALL

INITIAL SETUP

Tools and special tools
Tool Kit, Organizational Maintenance
(WP 0051 00, Table 2, Item 4)

Materials and Parts
Keeper – Freezer Door (WP 0054 00, Item 7)

Personnel Required
1 person

References
None

Equipment Conditions
No required condition

REMOVE

1. With a knife, scribe around the perimeter of the keeper to cut the sealant. Be careful to avoid cutting or gouging the container skin.
2. Remove the four mounting screws from the keeper exterior (see figure).
3. Remove the keeper assembly from the IC.

NOTE

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

INSTALL

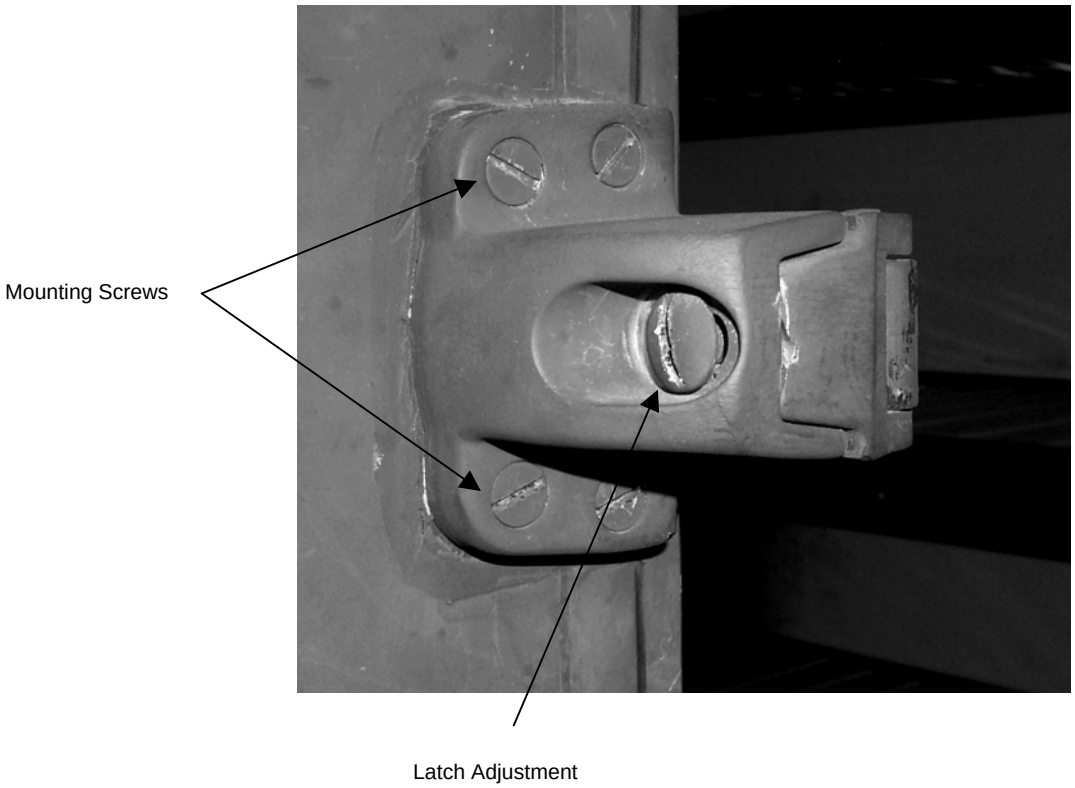
1. Remove any residual sealant from the container surface with a knife.

CAUTION

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

2. Hold the keeper in position on the container surface and align the four holes in the keeper with the threaded inserts in the IC.
3. Thread the four screws through the keeper 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 keeper).
6. Slide the latch to the desired position and tighten the mounting screws.
7. Repeat Steps 4-6 to readjust the latch as necessary.
8. Caulk the perimeter of the latch with sealant and tighten the screws securely.



END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
REFRIGERATION UNIT
TEST

INITIAL SETUP

Tools and special tools
Tool Kit, Refrigeration Service
(WP 0051 00, Table 2, Item 5)
Multimeter (WP 0051 00, Table 2, Item 2)

Materials and 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 (See WP 0005 00 for set-up procedures).

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:

1. **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, loose body panels, warm loads, and poor insulation.

2. **Dirt On Coils** - Dirt on the condenser or evaporator coils acts as an insulator, reducing the capacity of the unit.

3. **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.

4. **Faulty Expansion Valve Adjustment** - 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.

5. **Excessive Oil** - Too much compressor oil in the system may result in lower than normal suction pressure as well as lowered capacity.

6. **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 dehydrator.

7. **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.

8. **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.

9. **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.

10. **Restricted or Wet Dehydrator** - If the outlet line of the dehydrator is colder than the inlet line, the dehydrator is either saturated with moisture or is dirty and must be replaced.

11. **Dirt in the Expansion Valve Screen** – Perform a low side pump down. Remove the screen and clean. If the moisture is in the refrigeration system, it will collect at the expansion valve and freeze. This is indicated by abnormally low suction pressure. Clean the system, replace the dehydrator, pressurize and check for leaks, and evacuate the low side. Return the unit to normal operation.

12. **Ice on the Evaporator Coil** - Run the unit through a manual defrost cycle to remove the ice.

13. **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.

14. **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

Refrigeration System Operating Problems

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

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 motor

Condition	Possible Cause	Remedy
	Compressor wiring defective	Close power supply start or disconnect switch.
	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	Check DC motor polarity
	Restricted expansion valve (low pressure cutout)	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
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

Condition	Possible Cause	Remedy
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	Check 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	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 or sweating suction line	Frosted evaporator coil	Initiate manual defrost
	Evaporator airflow restricted	Clean evaporator coil and inspect evaporator fan.
Frosted liquid line	Restricted dehydrator 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 dehydrator.
	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.

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: High Pressure Internal Liquid Leak to Low Side

   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

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

Conditions That Can Cause Low Discharge Pressure

1. Low box temperature.
2. Cold ambient temperature.
3. Low refrigerant charge.
4. Low-side restriction.
5. Worn compressor.
6. Incorrect refrigerant.

Diagnosing Using the Liquid Line

The liquid line should be slightly warmer than the surrounding air.

1. A low refrigerant charge may cause the liquid line to be warmer than normal.

2. 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

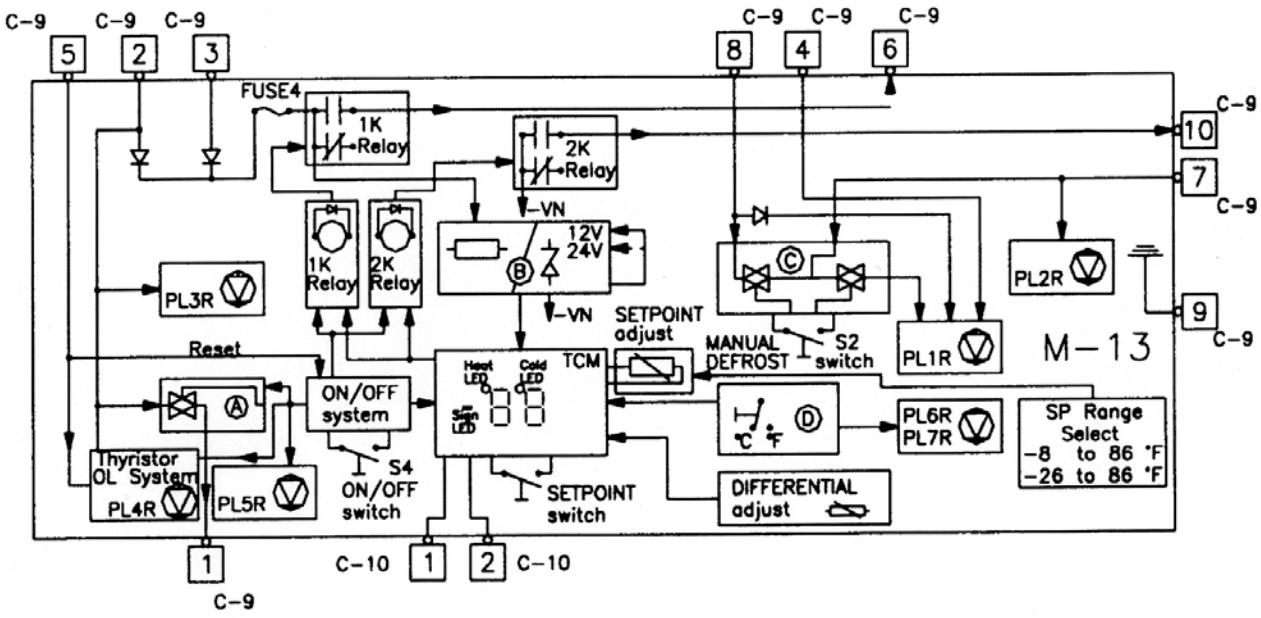
This procedure covers only control box PC board functions and does not address all possible electrical contingencies.

PC board Diagnostic Hints

The balance of this work package 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 work package.



NOTE

Ensure Pin 9 (W) is properly grounded.

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 Fuse 4/1 located in the unit controller
	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 DTS.
	Press the manual defrost switch and check for 24 VDC on Pin 8.
	Replace unit controller

Symptom	Corrective Action
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.
	Run an ice bath test on the sensor. See sensor calibration data in WP 0002 00
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	Check overload protector LED. If on, check overload protector.
	Check F4 fuse on the printed circuit board in the RU electrical enclosure
	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

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

4110-01-465-4158 / 4110-01-465-4564

REFRIGERATOR COMPONENT (INCLUDING ELECTRICAL)

TEST AND ADJUST

INITIAL SETUP

Tools and special tools
Tool Kit, Refrigeration Service
(WP 0051 00, Table 2, Item 5)
Multimeter (WP 0051 00, Table 2, Item 2)

Materials and Parts
Refrigerant, R404A (WP 0068 00, Item 16)

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

References
Equipment Description and Data (WP 0002 00)
Refrigeration Unit Service (WP 0031 00)
Compressor Remove/Install (WP 0033 00)
Electrical Enclosure Contactors
Remove/ Install (WP 0035 00)
Defrost Termination Switch Removal and
Replacement (WP 0043 00)

Equipment Conditions
ADR-300 set up and connected to a power source (See WP 0005 00 for set-up procedures).

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 above 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 and evacuated unit by weight WP 0031 00.

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 (WP 0031 00). If the system does not pass the low side pump down procedure, repair before continuing.

Compressor Functionality

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).

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. Open the compressor suction valve.

8. Uncover the condenser.

9. If pressure is below 200 psig, replace the compressor.

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 compressor oil and R404A.

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.

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 temperature sensor.

3. Defrost the evaporator and stabilize the box 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 00.

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, adjust the suction pressure regulator until the suction pressure is maintained at 65 psig.

6. Remove the manifold gauge assembly.

7. Perform system operation check in WP 0010 00.

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 removing power to the RU.

To test contractors:

1. To determine if the HPCO contacts are closed, disconnect each HPCO connector. Check for continuity through the HPCO switch.

2. To determine if the HPCO is functioning properly, do the following:

Connect a manifold gauge assembly to suction and discharge service valves.

Set the thermostat well below the IC temperature so that the unit will be in cool.

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 high pressure cut-out will switch off the unit.

NOTE

Unit will restart over the discharge pressure drops below 450 psi ± 10 psi.

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 compressor will stop.

4. If not, replace the LPCO.

Dehydrator

Indications that the dehydrator may need to be replaced are:

1. Moisture indicated in the sight glass – The sight glass indicates on the presence of moisture. If moisture is present, replace the dehydrator.

2. Condensation or frost on the refrigeration lines downstream from the dehydrator – Frost, condensation, or a temperature differential across the dehydrator indicates a restriction.

3. When the system has been open for an extended period of time during service.

4. During system cleanup.

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 backseated. Install a high pressure manifold gauge assembly on the receiver tank outlet valve, gauge the receiver tank outlet valve, and confirm that the receiver tank is being pressurized. If it is not being pressurized, the obstruction may be in the receiver. Recover the refrigerant and remove the receiver as outlined in WP 0039 00. 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.

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.

L1 to L2	208/230 VAC
L1 to L3	208/230 VAC
L2 to L3	208/230 VAC
L1 to ground	120 VAC
L2 to ground	120 VAC
L3 to ground	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 plug receptacle to t he individual terminal L1, L2, L3 and plug receptacle pins.

5. Replace defective conductor and/or receptacle if required.

Heater Circuit

1. Adjust the set point to 10 ºF above box temperature to initiate the heat cycle.

2. If heater rods 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 rods and ohm rods separately. Replace as necessary.

10. If heater rods are correct, replace conductor from the overload to the heater rods.

Defrost Drain Heater

1. Check for 24 VDC at the drain pan heater connectors.

2. If voltage is present, replace heater resistive wires.

3. If voltage is not present, check voltage on load side of fuse 3.

4. If no voltage is present on load side of fuse 3, replace the fuse.

5. If voltage is present, check normally open contacts of power relay and defrost relay. Replace faulty relays as needed.

6. If relay passes checks, check power on connector C1 circuit 26.

7. If power is present, replace conductor to heater connector.

8. If power is not present, replace the PC board.

Contactors

1. Index the unit to run in either the heat or a cool mode depending on the contractor being checked.

2. Verify the coil has a voltage (24 VDC).

3. Using a multimeter, determine if 208/230 VAC is present on the line side of contractor between L1, L2, L3 (heat contractor will be L2 and L3).

4. If proper voltage is not present in Step 3, then troubleshoot loss of incoming power.

5. If proper voltage is present, then disconnect and tape T1A, T2A, and T3A (heat contractor is U1 and V1) wires.

6. Check for 208/230 VAC is present on the load side of contractor between terminals 2, 4, and 6 (heat contractor 2 and 4).

7. If proper voltage is not present, then replace contractors.

Evaporator Fan Cycling (non-cycling EF selector)

The evaporator fan selector is located in the RU PC board. 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 to 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 C2 located in the RW 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.

Heatsink

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.

Relays

Power relay

24 VDC supplies control voltage to the compressor contactor, condenser fan motor, evaporator fan relay coil, defrost solenoid and defrost drain tube heaters.

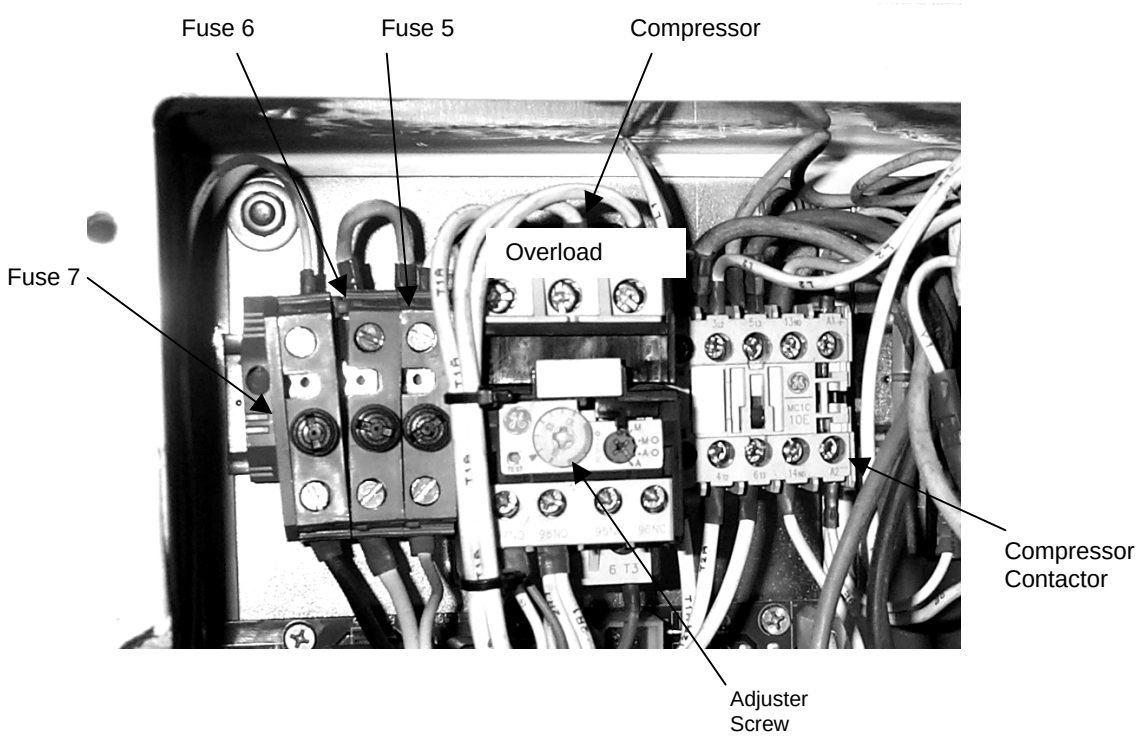
Compressor Overload – Adjust

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 setting by rotating the adjuster screw 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.



Defrost relay

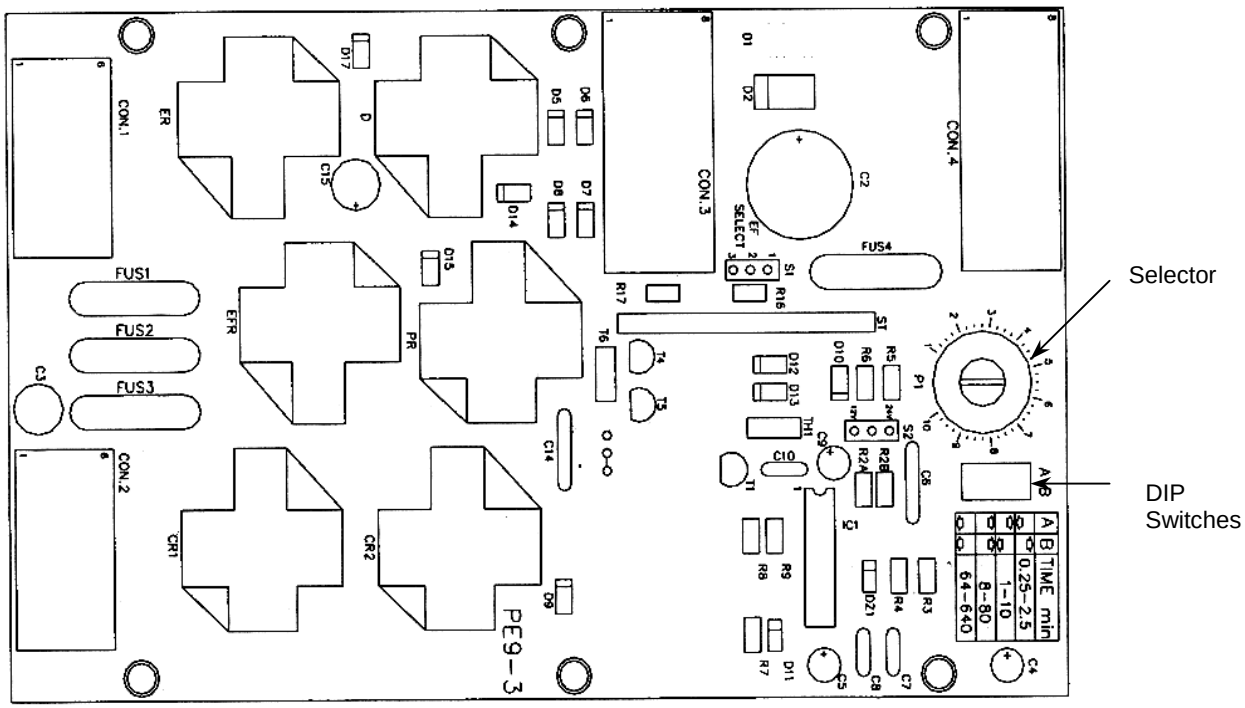
1. 124 VDC control voltage is supplied by the defrost timer during normal operation or by the RU controller when manual defrost has been initiated.
2. The ground for the defrost relay coil is provided through the DTS.

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 and a red, round selector. The timer is set from factory at 4 hours. To change the setting of the Defrost timer, proceed as follows:



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

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).

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 1 (below).

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.

1. Check the defrost termination switch.

   a. Place a jumper wire between both switch terminals.

   b. Press the Manual Defrost switch.

   c.If the unit shifts to Defrost, the defrost termination 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 Printed Circuit Board.

7. If voltage is not present on Pin 8 C-9, follow Cab Control Box troubleshooting directions.

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 pump the mechanized terminals.
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 Solenoid Valve must be activated.

Defrost Termination Switch (DTS)

If the ADR-300 does not switch to the defrost cycle, the problem may be defective DTS or a fault on the printed circuit board. Test the DTS as follows:

NOTE

The DTS 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 DTS terminal connector located near the TEV sensing bulb.
3. Place a jumper wire between the two terminals of the DTS harness.
4. Press the manual defrost button. If the ADR-300 shifts to defrost, the DTS 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 defrost termination switch as outlined above. If the ADR-300 does not shift to defrost:

1. Open the RU electrical enclosure and check 24 VDC between connector C3 (Terminal 1) and connector C3 (Terminal 2).

NOTE

Terminal 1 is positive and Terminal 2 is negative.

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 PC board 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 DTS contactor.
8. If no continuity is detected then remove the jumper wire installed in step 3 of the Defrost Termination Switch section above and check between C3 (terminal 2) and wire 12 located in the DTS 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 DTS 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.
14. If no continuity is detected, then make sure the pin connector is firmly seated in both harness connectors.
15. If continuity is still not detected, replace wire harness.

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 between the fuse.
   f. If no continuity, replace the fuse. If continuity, replace the unit controller.

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
SUCTION PRESSURE REGULATOR
REMOVE/INSTALL

INITIAL SETUP

Tools and special tools
Tool Kit, Refrigeration Service
(WP 0051 00, Table 2, Item 5)

Materials and Parts
Rags (WP 0068 00, Item 15)
Solder

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

References
Preventive Maintenance, Checks and Services
(WP 0010 00)
Refrigerator Component Test and Adjust
(WP 0029 00)

Equipment Conditions
ADR-300 Disconnected from all power sources.

REMOVE

1. Install the manifold gauge assembly.
2. Perform the low-side pump down until suction pressure gauge reads 0 psi.
    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 the suction pressure gauge reads 0 psi.
3. Remove the condenser support bracket.
4. Remove the suction line insulation.
5. Remove the LPCO switch and the schrader valve core.
6. Unsolder the suction pressure regulator.

INSTALL

CAUTION

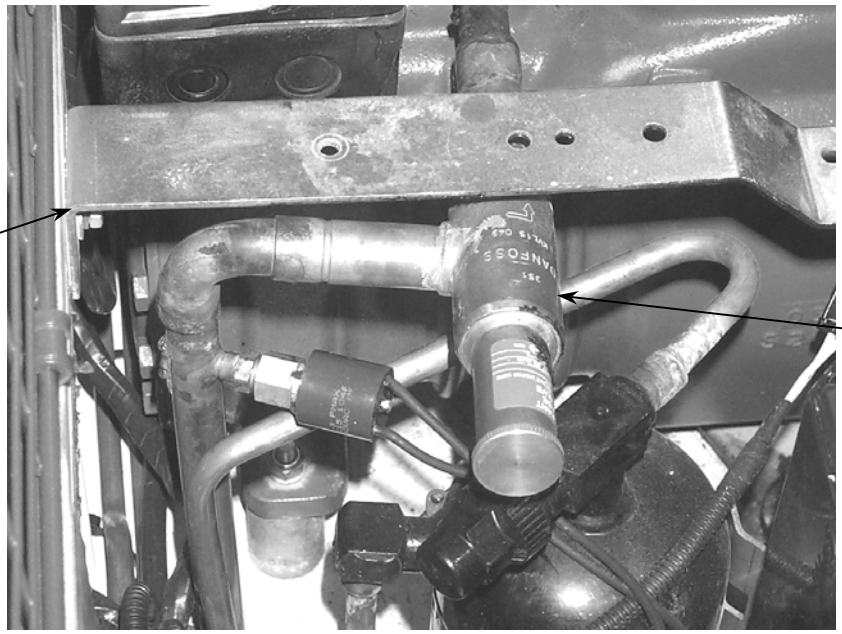
Do not contaminate the system when preparing refrigeration tubing for soldering. Contamination may cause restrictions in the refrigeration system. Failure to comply may result in damage to the equipment.

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. Pump down the low side to a vacuum of 15 in.
   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 00.
7. Remove the manifold gauge assembly.
8. Perform system operation check IAW WP 0010 00 PMCS, Item 7.
9. Re-insulate the suction line.
10. Reinstall the condenser support bracket.



END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
REFRIGERATION UNIT
SERVICE

INITIAL SETUP

Tools and special tools
Tool Kit, Refrigeration Service
(WP 0051 00, Table 2, Item 5)

Materials and Parts
Refrigerant, R404A (WP 0068 00, Item 16)
AU Compressor

Personnel Required
HVAC Technician (MOS 52C, AFSC 3E1x1) (2)

References
None

Equipment Conditions
ADR-300 set up and connected to a power source (See WP 0005 00 for set-up procedures).

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.

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 evacuation 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 charging equipment hoses. Find and repair the leak.

5. Open the vacuum valve at the vacuum pump, start the vacuum pump, and evacuate the system to 500 microns.

6. When the system reaches 500 microns, close the manifold gauges and turn off the vacuum pump. The system is now ready to charge.

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.

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 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.

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 cut out (LPCO) 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 an PMCS procedures as described in WP 0010 00, Items 7 and 8.

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 until the remaining oil is ½ full.

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.

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 dehydrator 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 dehydrator 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 dehydrator, install a new dehydrator 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.
3. Change the compressor oil as described in this WP.
4. Change the expansion valve nozzle.
5. Change the dehydrator as described in WP 0037 00.
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 dehydrator, and begin process starting from Step 3.
10. If the acid test passes, perform low-side pump down (as described previously in this work package).

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.

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 (see WP 0023 00).
2. Remove the evaporator grille.
3. Remove the drain pan (see WP 0044 00).
4. Remove the assembly fan.
5. Thoroughly wash with water (Do not use excessive pressure)
6. Reinstall fan assembly.
7. Reinstall drain pan (see WP 0044 00).
8. Reinstall the evaporator grille.
9. Reinstall the RU on the IC (see WP 0023 00).

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 grille.
2. Remove the front condenser cover.
3. Remove the fan motor from the fan assembly.
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 WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
CONDENSER FAN
REMOVE/INSTALL

INITIAL SETUP

Tools and special tools
Tool Kit, Refrigeration Service
(WP 0051 00, Table 2, Item 5)

Materials and Parts
None

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

References
None

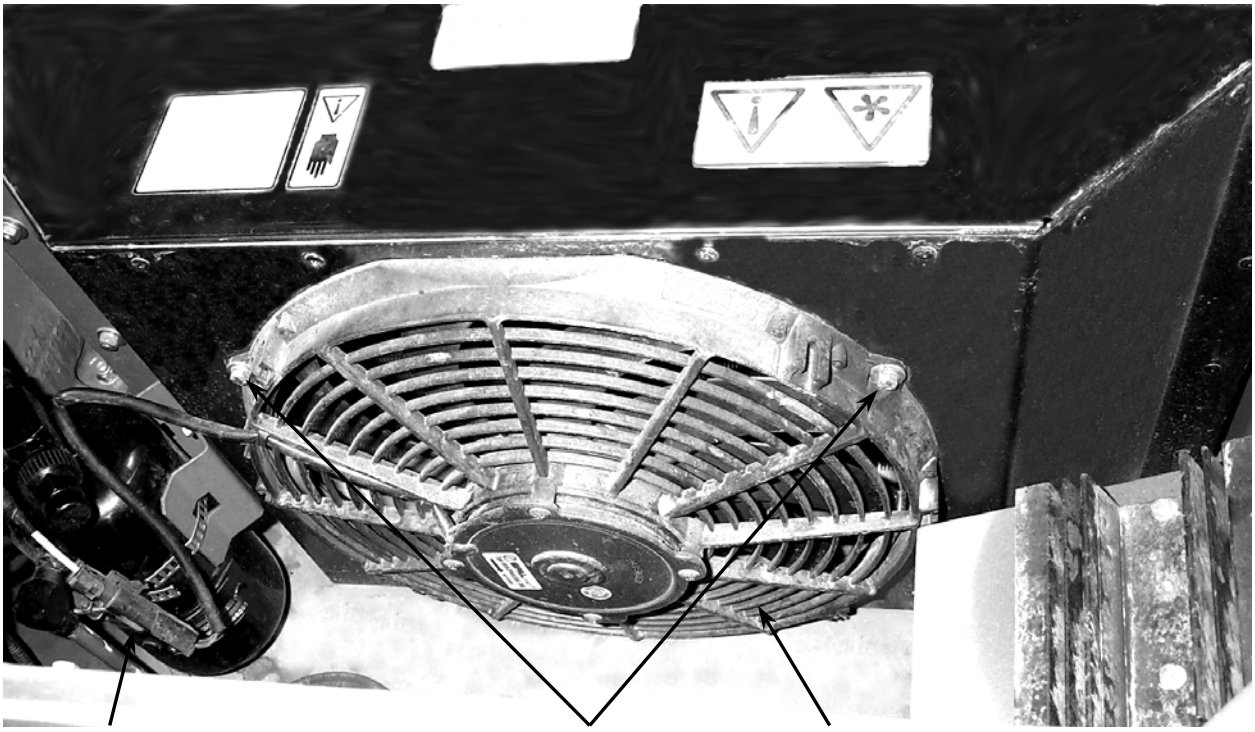
Equipment Conditions
ADR-300 or RU disconnected from all power supplies.

REMOVE

1. Remove the condenser section exhaust grille.
2. Disconnect the electrical power supply to the fan at the connector. Cut the wire ties as necessary.
3. Remove the four bolts that hold the condenser fan in the condenser enclosure. Retain the bolts.
4. Remove the fan from the condenser section.

INSTALL

1. Position the condenser fan in the fan shroud and align the mounting holes.
2. Reinstall the fan mounting bolts. Don’t over tighten.
3. Connect the fan wires. 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.



END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
REFRIGERATION UNIT COMPRESSOR
REMOVE/INSTALL

INITIAL SETUP

Tools and special tools
Tool Kit, Refrigeration Service
(WP 0051 00, Table 2, Item 5)

Materials and Parts
Rags (WP 0068 00, 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.

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.

NOTE

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.

NOTE

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. Open the electrical box on top of the compressor. Tag the wires and disconnect all wires to the compressor and remove them from the box.

5. Remove the condenser support bracket.

6. Remove the suction line insulation.

7. Remove the LPCO switch.

   a. Locate the low pressure cut-out switch near the receiver on the suction line (see figure). 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 core of the LPCO switch schrader valve.

9. Wrap the suction pressure regulator with a wet cloth.

10. Unsolder the suction pressure regulator at the elbow just above the schrader valve.

11. Unbolt the suction line from the compressor.

12. Remove the suction pressure regulator.

13. Remove the HPCO switch.

   a. Disconnect the wires from the switch.

   b. Remove the HPCO switch using a backup wrench.

14. Unbolt the discharge service valve.

15. Unsolder the high pressure line just to the left of the HPCO switch port.

16. Gently bend the discharge lines to clear the compressor.

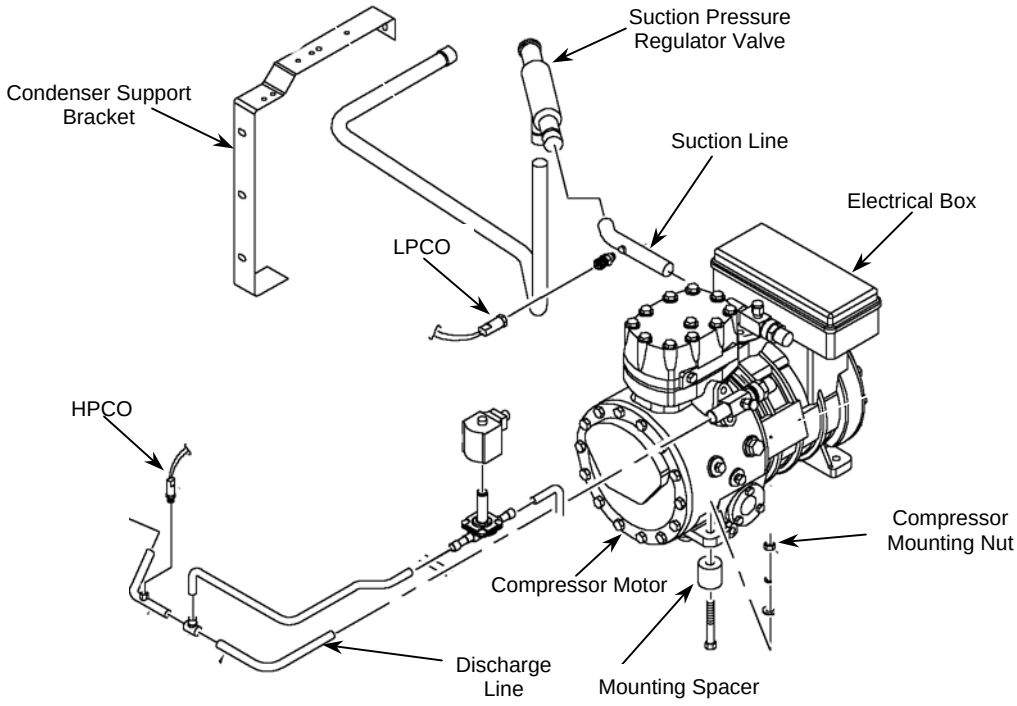
17. Remove the four compressor mounting nuts and mounting spacers.

18. 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.

19. 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 oil to the compressor to equal the amount of oil in the compressor removed. Always check to make sure that the compressor contains the proper amount of oil. Follow the system cleanup procedures to remove old oil from the system.

1. Place the compressor in position and install the four mounting nuts.
2. Wrap the suction pressure regulator with a wet cloth.
3. Remove the service valve gaskets. Clean the surfaces.
4. Install the new service valve gasket.

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.

5. Solder and connect the suction and discharge lines.
6. Reinstall the LPCO schrader valve core.
7. Reinstall the LPCO and HPCO.
8. Insulate the suction line.
9. Install the condenser support bracket.
10. Replace the dehydrator as described in WP 0037 00.
11. Pressurize the system and check for leaks.
12. Insert the wires disconnected from the old compressor into the compressor electrical box and connect them to the appropriate terminals. Reinstall the cover.
13. Evacuate the system and recharge.
14. Perform system operation check in WP 0010 00.
15. Reinstall condenser front and top grilles and bottom panels.

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
REFRIGERATION UNIT CONDENSER COIL, EVAPORATOR COIL AND COPPER TUBE
REMOVE/INSTALL

INITIAL SETUP

Tools and special tools
Tool Kit, Refrigeration Service
(WP 0051 00, Table 2, Item 6)

Materials and Parts
Refrigerant, R404A (WP 0068 00, Item 16)
Compressor Oil (WP 0068 00, Item 6)
Copper tubing (WP 0058 00 and WP 0058 00) 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.

NOTE

It is good practice to replace the dehydrator 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 0057 00 and WP 0058 00, 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 as described below:

a. Recover the refrigerant.

b. Remove the suction pressure regulator and install a temporary suction line cleanup filter.

c. Change the compressor oil as described in WP 0031 00.

d. Change the expansion valve nozzle.

e. Change the dehydrator as described in WP 0037 00.

f. Leak check, evacuate, and charge the system.

g. Run the unit for at least six hours.

h. Acid test the oil.

i. If the acid test fails, change the dehydrator, and begin process starting from Step c.

j. If the acid test passes, perform low side pump down (WP 0031 00).

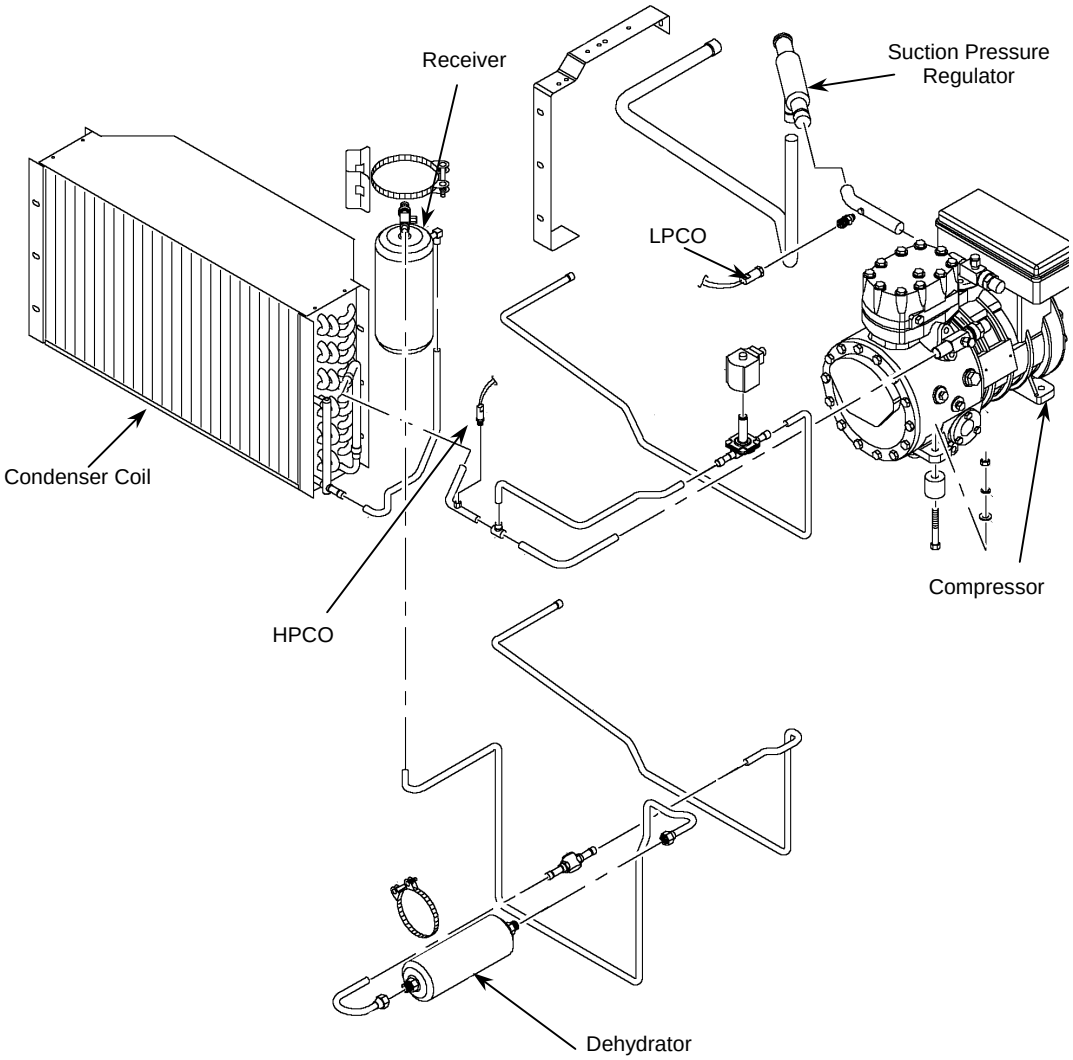
k. Remove the suction line cleanup filter.

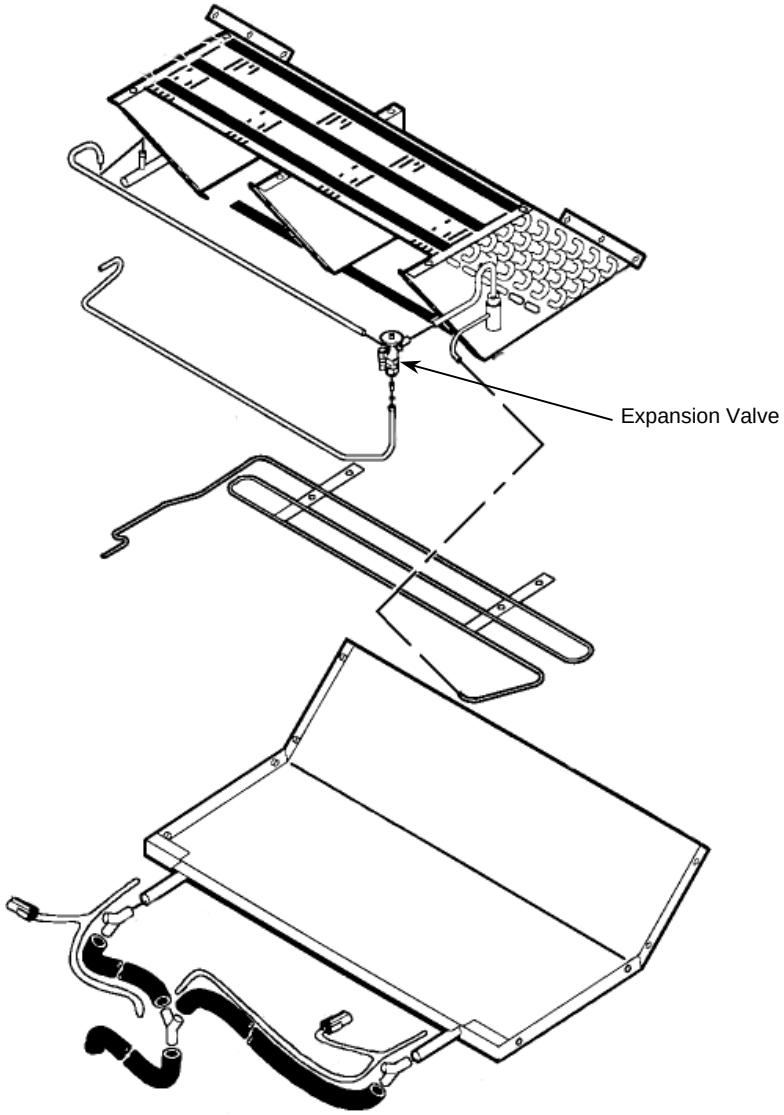
l. Reinstall the suction pressure regulator.

m. Leak check, evacuate, and open all valves.

n. Perform a system check.

5. Replace the dehydrator.
6. Pressurize the system with dry nitrogen and test for leaks.
7. Evacuate the system and recharge as described in WP 0031 00.
8. Reinstall the cover.


Receiver
Suction Pressure Regulator
LPCO
Condenser Coil
HPCO
Compressor
Dehydrator



END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
CONTACTOR
REMOVE/INSTALL

INITIAL SETUP

Tools and special tools
Tool Kit, Organizational Maintenance
(WP 0051 00, Table 2, Item 4)

Materials and Parts
Contactors (WP 0062 00, Item 18)

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

References
PMCS Instruction (WP 0010 00)

Equipment Conditions
ADR-300 disconnected from all sources of power.

REMOVE

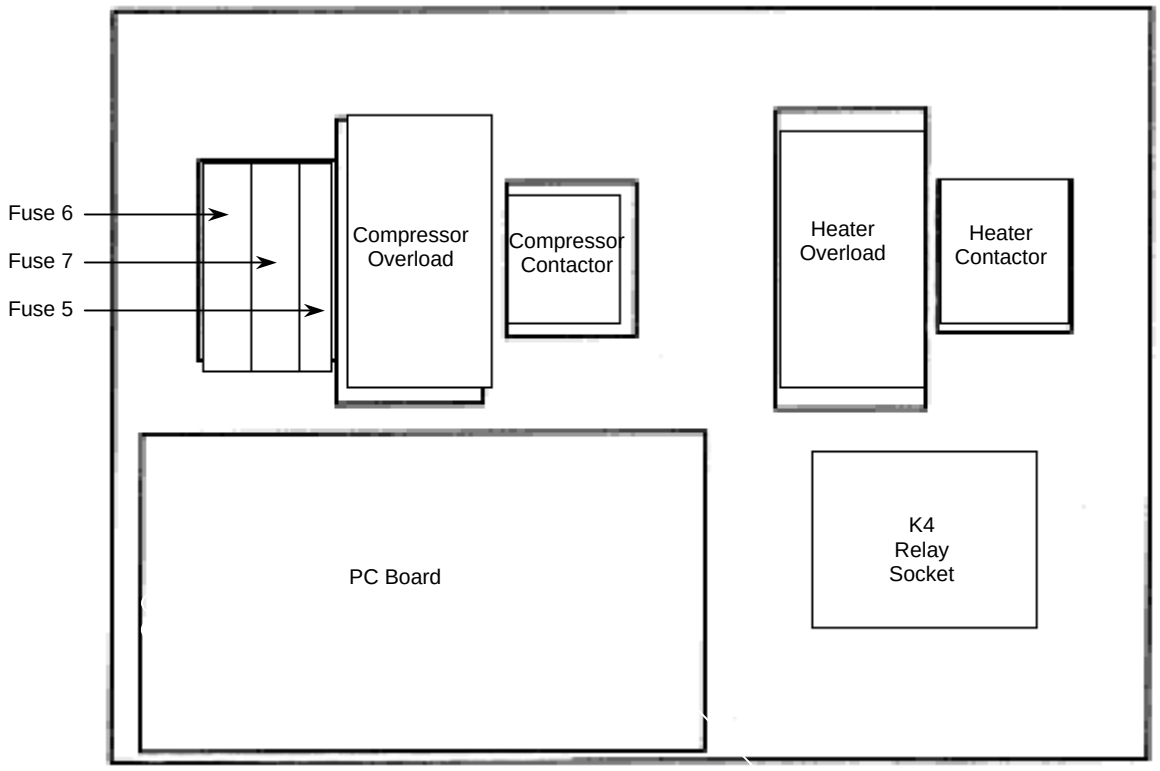
Contractor/ Relay

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 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 outlined in WP 0010 00 (PMCS No. 7).



END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
UNIT CONTROLLER
REMOVE/INSTALL

INITIAL SETUP

Tools and special tools
Tool Kit, Organizational Maintenance
(WP 0051 00, Table 2, Item 4)

Materials and Parts
Controller M13 (WP 0060 00, Item 9)

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

References
PMCS Instruction (WP 0010 00)

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 on each side of the controller.
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

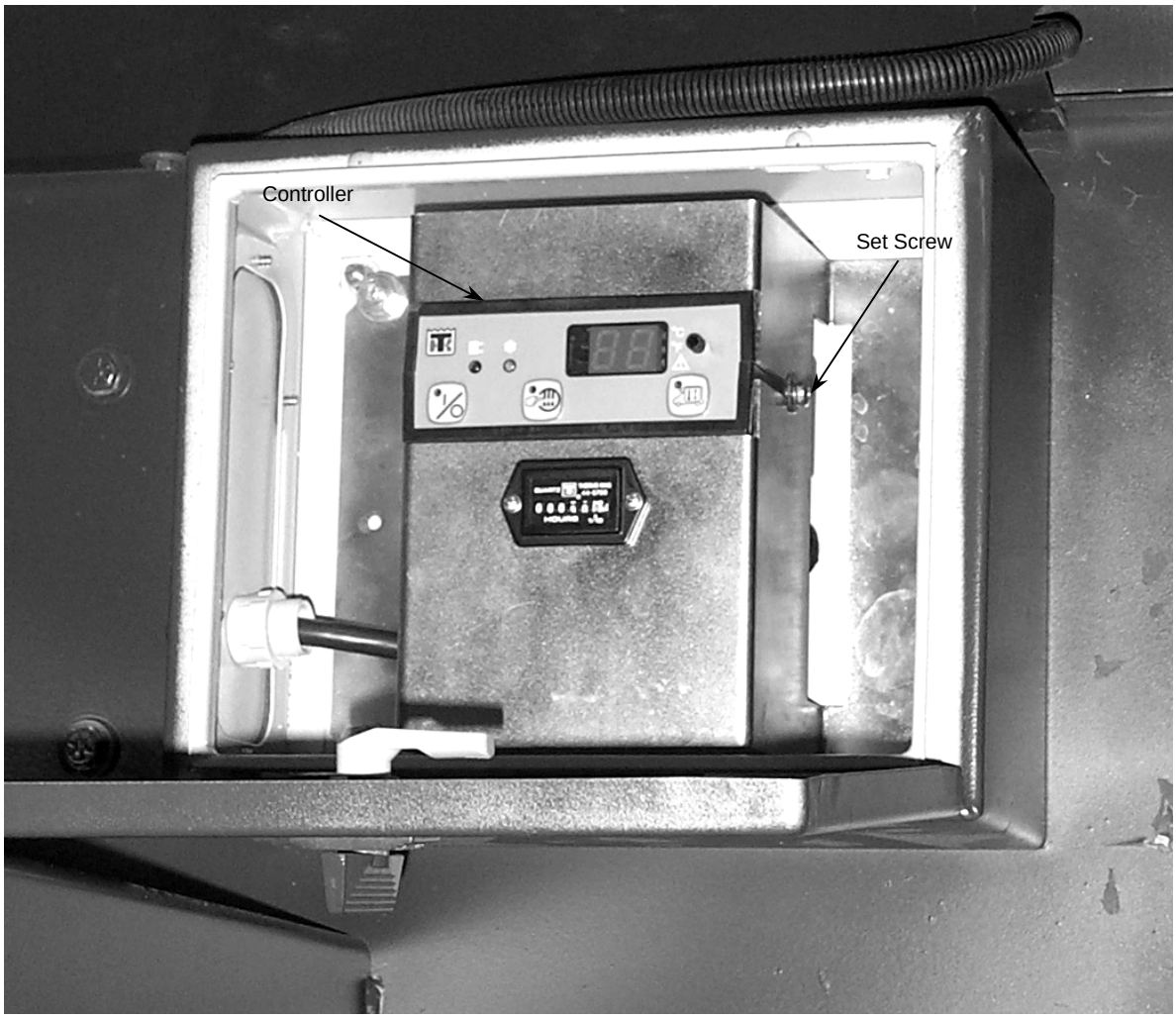
Be careful not to pinch the wires. Failure to comply may result in damage to equipment.

CAUTION

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 00, items 7 and 8.



END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
REFRIGERATION UNIT DEHYDRATOR
REMOVE/INSTALL

INITIAL SETUP

Tools and special tools
Tool Kit, Refrigeration Service
(WP 0051 00, Table 2, Item 5)

Materials and Parts
Refrigerant R404A (WP 0068 00, Item 16)
Compressor Oil (WP 0068 00, Item 5)

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

References
Refrigeration System Service (WP 0031 00)

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.

NOTE

Replace the dehydrator 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 and top grille.
2. Complete the low-side pump down procedure outlined in WP 0031 00.
3. Remove the clamp around the dehydrator.

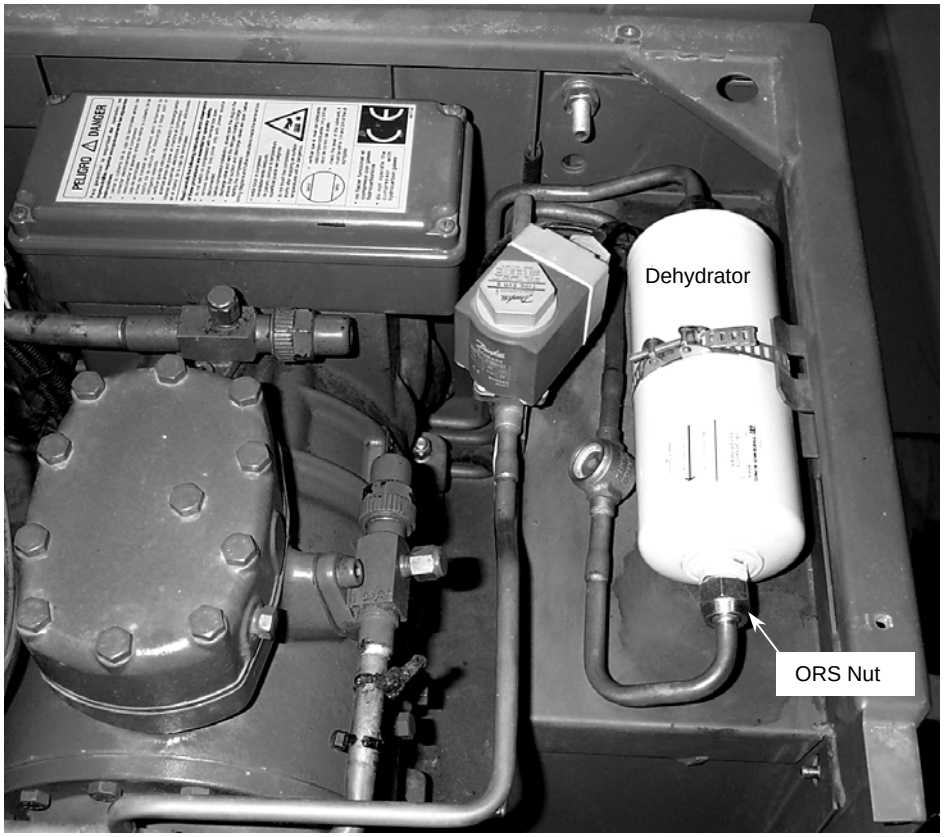
NOTE

Observe direction of refrigerant flow.

4. Disconnect the nuts at each end of the dehydrator, using a back-up wrench, and remove the dehydrator from the clamp.

INSTALL

1. Place new lubricated o-rings in the fittings on the ends of the dehydrator.
2. Install the new dehydrator ensuring the proper direction of refrigerant flow.
3. Tighten the inlet nut. Hold the dehydrator with a back-up wrench on the hex behind the fitting.
4. Thread the outlet nut onto the outlet fitting and tighten.
5. Install the clamp around the dehydrator and mounting bracket.
6. Check for leaks, evacuate, and return to proper operation IAW WP 0031 00.
7. Replace the condenser section top grille. Connect the RU to an appropriate power supply and operate the system while monitoring the refrigerant charge in the sight glass.
8. Adjust the refrigerant charge as necessary IAW WP 0031 00.



END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
REFRIGERATION UNIT RECEIVER TANK
REMOVE/INSTALL

INITIAL SETUP

Tools and special tools
Tool Kit, Refrigeration Service
(WP 0051 00, Table 2, Item 5)

Materials and Parts
Refrigerant, R404A (WP 0068 00, Item 16)
Compressor Oil (WP 0068 00, Item 5)
Tank Receiver (WP 0059 00, Item 11)

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

References
Refrigeration System Service (WP 0031 00)
Dehydrator Removal and Replacement
(WP 0037 00)

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.

NOTE

Replace the dehydrator (see WP 0038 00) 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.

4. Remove the mounting clamp.

5. Remove the receiver tank.

INSTALL

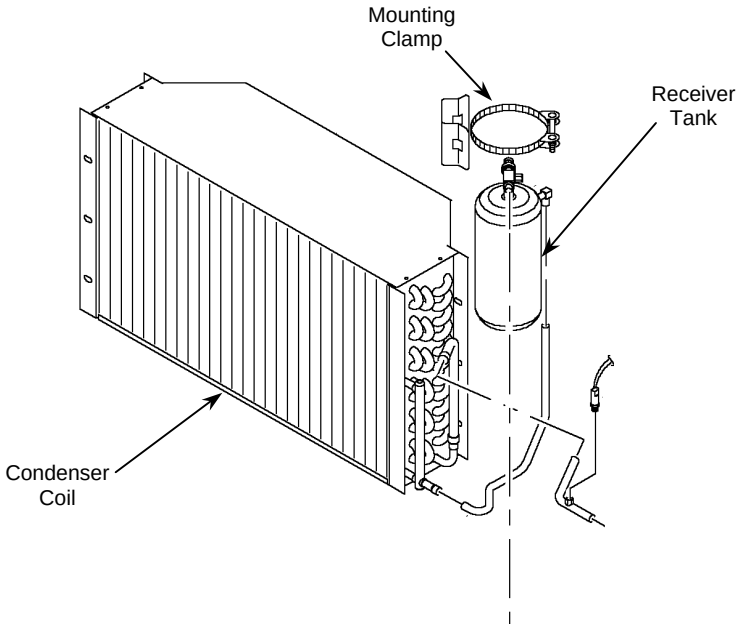
CAUTION

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 in the unit and install the mounting clamp.
3. Solder the refrigerant line to the receiver tank.
4. Install a new dehydrator in accordance with WP 0037 00.
5. Leak check and evacuate IAW 0031 00.
6. If no leaks are found, recharge and check system operation in accordance with WP 0031 00.



END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
REFRIGERATION UNIT HIGH PRESSURE CUT-OUT SWITCH
REPLACE

INITIAL SETUP

Tools and special tools
Tool Kit, Refrigeration Service
(WP 0051 00, Table 2, Item 5)

Materials and Parts
Refrigerant R404A (WP 0068 00, Item 16)
Compressor Oil (WP 0068 00, Item 5)
High Pressure Cut-out Switch
(WP 0059 00, Item 27)
Thread Sealer, Refrigerant
(WP 0068 00, Item 22)

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

References
Refrigeration System Service (WP 0031 00)
PMCS (WP 0010 00)

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

NOTE

Replace the dehydrator whenever the high side is opened or when the low side is opened for an extended period of time.

REPLACE

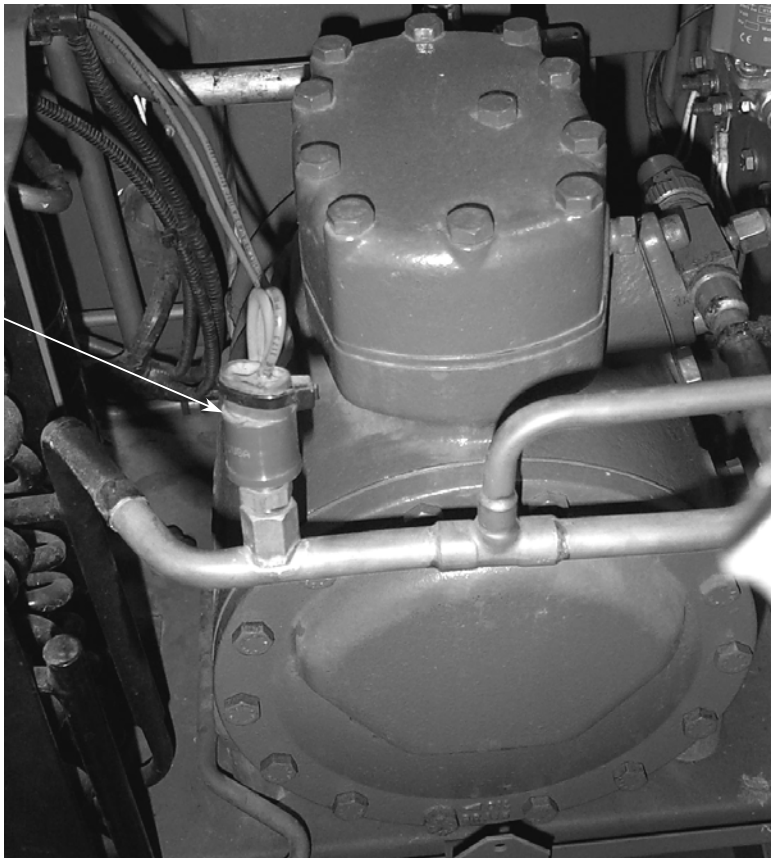
1. Remove the condenser section front and top grilles.
2. Recover the refrigerant charge as outlined in WP 0031 00.
3. Disconnect the wires. Remove the defective switch using a backup wrench.

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 switch.
2. Install and tighten the switch using a backup wrench. Reconnect the wires.
3. Pressurize the refrigeration system and test for leaks in accordance with WP 0031 00.
4. If no leaks are found, evacuate and charge the system in accordance with WP 0031 00.
5. Perform the refrigerator operation check in accordance with WP 0010 00 (PMCS No.7).



END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
REFRIGERATION UNIT HOT GAS SOLENOID VALVE
REMOVE/INSTALL, REPLACE

INITIAL SETUP

Tools and special tools
Tool Kit, Refrigeration Service
(WP 0051 00, Table 2, Item 5)

Materials and Parts
Refrigerant R404A (WP 0068 00, Item 16)
Compressor Oil (WP 0068 00, Item 5)
Solenoid Valve (WP 0059 00, Item 16)

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

References
Refrigeration Unit Service (WP 0031 00)
PMCS (WP 0010 00)

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.

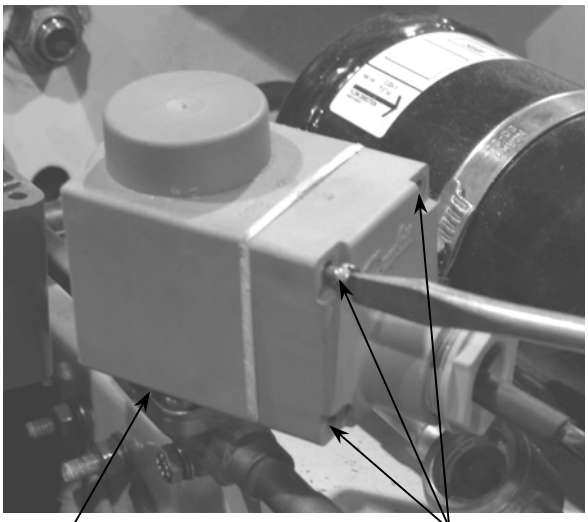
NOTE

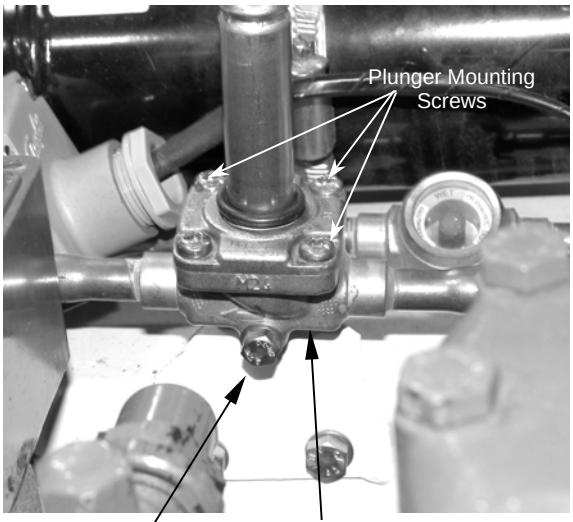
Replace the dehydrator whenever the high side is opened or when the low side is opened for an extended period of time.

REMOVE

Solenoid Valve Coil

1. Remove the four screws from the solenoid valve coil.
2. Separate the two halves of the coil.
3. Gently pry the coil from the valve stem.
4. Refer to the install procedure to install the valve coil.


Solenoid
Valve Coil
Connector
Mounting Screws


Plunger Mounting
Screws
Valve Body
(Coil Removed)
Mounting Bolt

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 securing the valve plunger to the valve body.
3. Remove the plunger assembly and valve diaphragm. Note which face of the diaphragm is oriented toward the plunger.
4. Remove the mounting bolt under the valve body attached to the bracket.

CAUTION

Protect the wires 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 damaged, unsolder the hot gas lines from the valve body and remove the valve from the unit.

INSTALL

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.
3. Remove the four screws from the compressor terminal box and move the box to make room for re-soldering the valve body.
4. Install the mounting bolt to the bracket.

CAUTION

Protect the wires from the torch during de-soldering and re-soldering. Failure to comply may result in damage to equipment.

5. Solder the inlet and outlet connections. After the valve body cools, assemble the diaphragm and valve plunger. Attach the compressor terminal box. Attach the wires that were removed from the back of the control panel.
6. Pressurize the system with dry nitrogen and check for leaks as outlined in WP 0031 00.
7. If no leaks are found, reinstall the solenoid coil:
   a. Gently push the coil onto the stem until it snaps into place.
   b. Reinstall the electrical plug with the four screws.
8. Evacuate the low side and perform the low side pump up procedure in accordance with WP 0031 00.
9. Complete the refrigerator operation check in accordance with WP 0010 00 (item 7).

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 00.
4. Complete the refrigerator operation check in accordance with WP 0010 00 (item 7).

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
EVAPORATOR FAN
REPLACE

INITIAL SETUP

Tools and special tools
Tool Kit, Organizational Maintenance
(WP 0051 00, Table 2, Item 4)

Materials and Parts
Fan & Motor – Evaporator (WP 0060 00, 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 connector nearest the motor and cut the wire tie that restrains the wire.
2. Remove the four bolts that hold the fan in the baffle. Remove the fan.
3. Position the replacement fan in the baffle plate opening. Install the four bolts and torque to 10 ft-lbf.
4. Connect the fan electrical leads to the fan power 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, replace the evaporator fan.

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
LOW PRESSURE CUTOUT SWITCH
REPLACE

INITIAL SETUP

Tools and special tools
Tool Kit, Organizational Maintenance
(WP 0051 00, Table 2, Item 4)

Materials and Parts
Switch – Low Pressure Cutout
(WP 0059 00, Item 28)

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

References
PMCS Instruction (WP 0010 00)
Refrigeration Unit Service (WP 0031 00)

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.

REPLACE

1. Remove the condenser section front grille and top grille.
2. Locate the low pressure cut-out switch near the receiver on the suction line (see figure). Cut any wire ties restraining the switch wires.
3. Disconnect the weather-tight connector on the light switch wires.

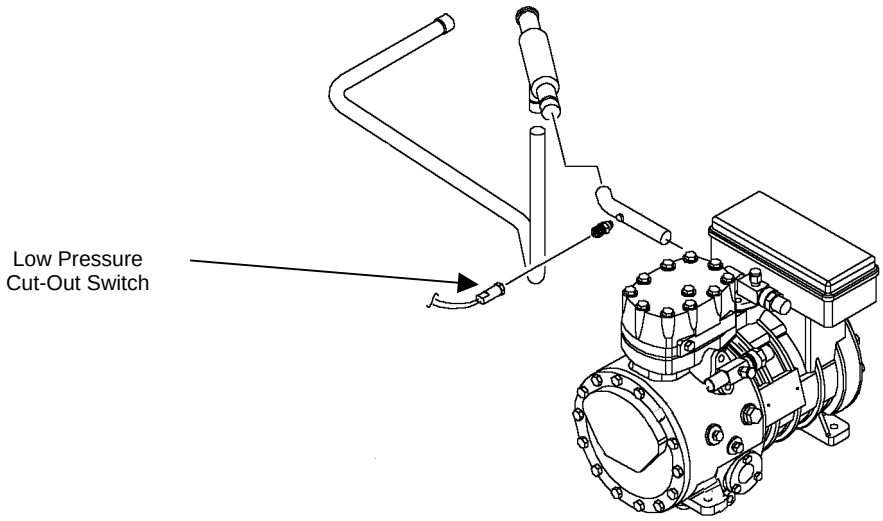
CAUTION

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 switch and remove it from the schrader valve.
5. Thread the switch over the schrader valve. Tighten the switch securely.
6. Connect the switch wires to the connector separated in Step 3 above.
7. Secure the wires and connector with wire ties.

8. Check for leaks IAW WP 0031 00.

9. Reconnect the RU to an appropriate power supply and perform the refrigerator operation check IAW WP 0010 00 (Item No. 7).



END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
DEFROST TERMINATION SWITCH (DTS)
REMOVE/INSTALL

INITIAL SETUP

Tools and special tools
Tool Kit, Organizational Maintenance
(WP 0051 00, Table 2, Item 4)

Materials and Parts
Switch, Defrost Termination
(WP 0060 00, Item 1)

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

References
PMCS Instruction (WP 0010 00)

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.

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.

CAUTION

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.

DTS

1. Remove the two screws holding the DTS on the side of the evaporator coil.
2. Cut the wire ties.
3. Disconnect the DTS wire from the refrigerator wiring harness at the connector.
4. Remove the DTS.

INSTALL

DTS

1. Position the DTS so that the screw holes align with the mounting holes in the evaporator coil.
2. Insert the mounting screws and tighten.
3. Connect the DTS 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.

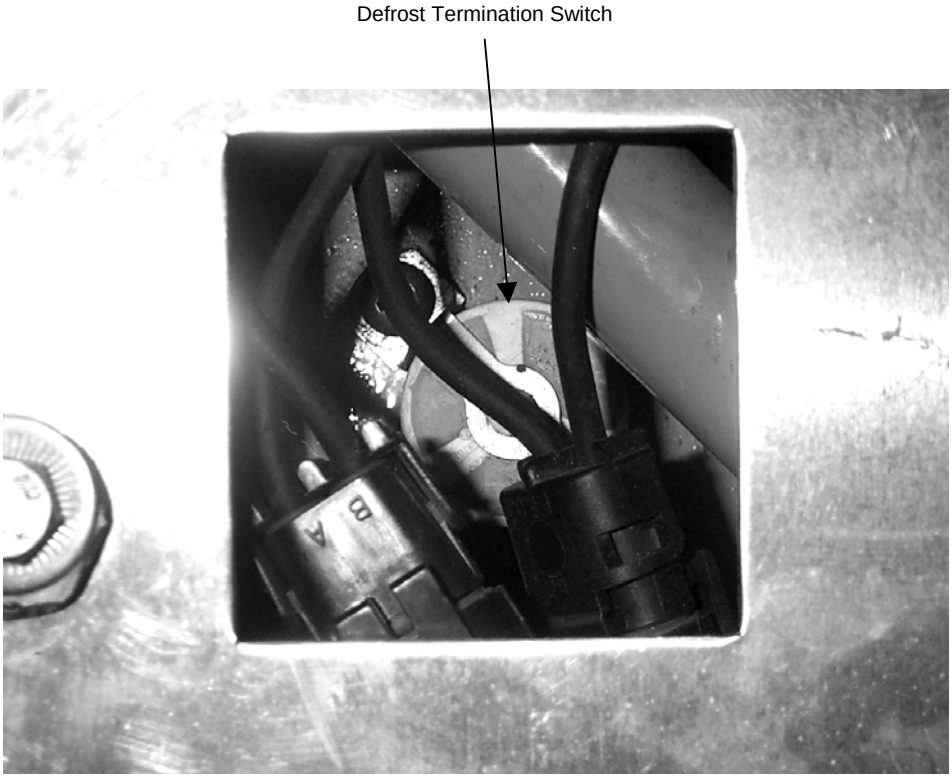
Drain Pan

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
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
ELECTRIC HEATING ELEMENT
REMOVE/INSTALL

INITIAL SETUP

Tools and special tools
Tool Kit, Organizational Maintenance
(WP 0051 00, Table 2, Item 4)

Materials and Parts
Electric Heating Element (WP 0060 00, Item 16)

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.

1. Remove the four screws from the bottom of the evaporator drain pan.

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.

CAUTION

Take care to avoid bending, kinking or otherwise damaging the hot gas heating coil.

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 defrost termination 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 on the coil by gently rotating the clips away from the evaporator coil. Take care to avoid bending or damaging coil fins.

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.

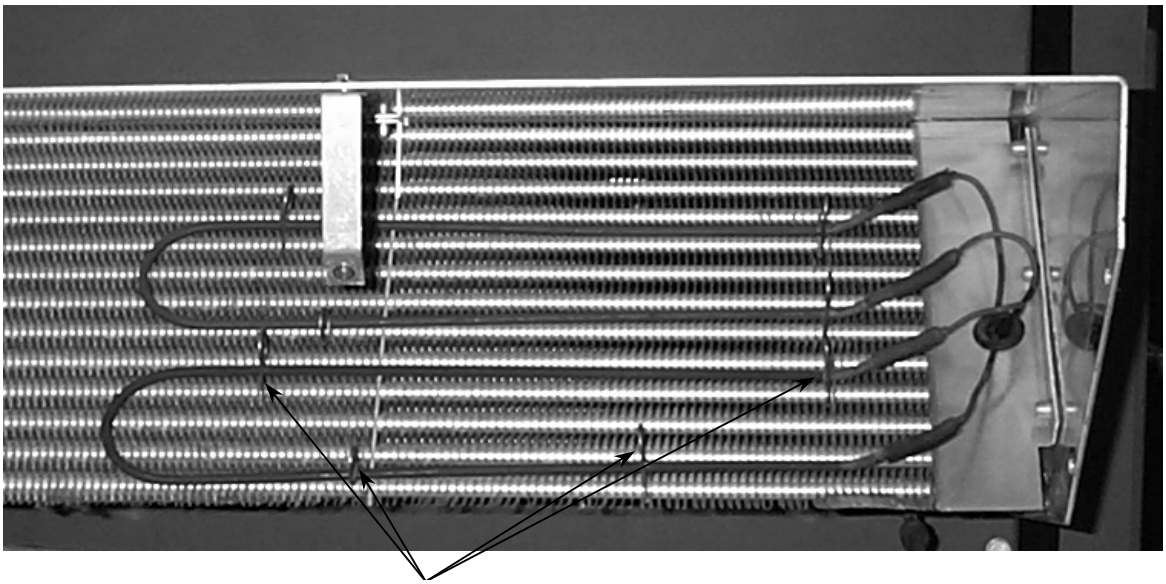
Drain Pan

1. Support the drain pan in position.

NOTE

If necessary, 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.



Retaining Clips

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
CONDENSATE DRAIN HEATER
REMOVE/INSTALL

INITIAL SETUP

Tools and special tools
Tool Kit, Organizational Maintenance
(WP 0051 00, Table 2, Item 4)

Materials and Parts
Harness – Heater, Drain Tube
(WP 0060 00, Item 15)

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 from the drain tubes to their respective electrical connectors. Disconnect the heater wires.

2. Remove the heater wires from the condensate drain tubes through the “Y” fitting at the rear of the condensate drain pan.

INSTALL

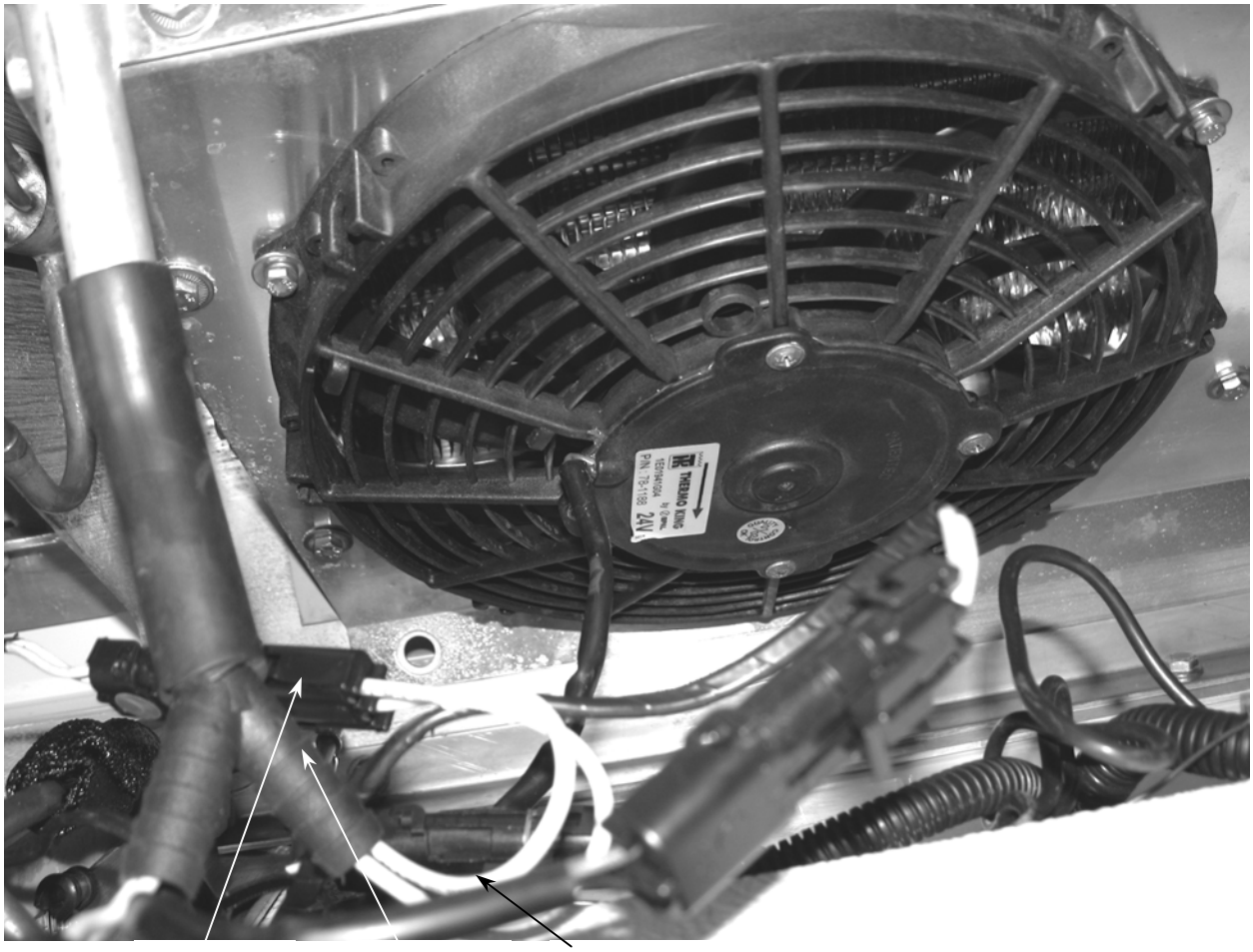
1. Insert the looped end of one drain heater wire into each of the two condensate drain hoses.

2. Insert the wire into the “Y” fitting 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 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.



END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
REFRIGERATION UNIT EXPANSION VALVE ASSEMBLY
REMOVE/INSTALL

INITIAL SETUP

Tools and special tools
Tool Kit, Refrigeration Service
(WP 0051 00, Table 2, Item 5)

Materials and Parts
Refrigerant R404A (WP 0068 00, Item 16)
Compressor Oil (WP 0068 00, Item 5)
Valve - Expansion (WP 0058 00, Item 2)
Cloth

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

References
Refrigeration Unit Service (WP 0031 00)
Defrost Termination Switch Removal
(WP 0043 00)
Operation Under Usual Conditions
(WP 0005 00)
Preventative Maintenance Checks and Services
(WP 0010 00)

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.

NOTE

It is good practice to replace the filter dehydrator 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 and remove the thermostatic expansion valve (TEV) sensing bulb from the suction line.

3. Using a backup wrench, remove the liquid line from the bottom of the TEV.

4. Gently bend the liquid line away from the valve.

5. Unsolder the two remaining lines from the TEV.

6. Remove the expansion valve 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.

2. Solder the equalizer line and the evaporator line in the new expansion valve.

3. Connect the liquid line to the expansion valve.

4. Clean the suction line where the TEV sensing bulb was removed.

5. Install the TEV sensing bulb on the suction line.

6. Replace insulation around the TEV sensing bulb.

7. 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 evacuation pump, stop the vacuum pump, and observe the reading on the vacuum gauge for 5 minutes. The pressure should not exceed 2000 microns.

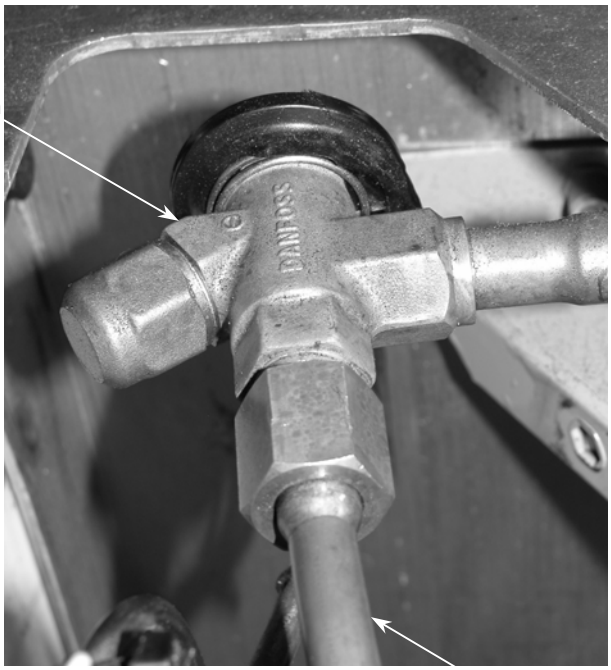
   d. If pressure does exceed 2000 microns, repeat step b. This time, if the pressure exceeds 2000 microns within 5 minutes, look for a leak in the system or in the evacuation and charging equipment hoses. Find and repair the leak.

e. Remove the jumper wire from the LPCO.

f. Reconnect the weather-tight connector.

g. Back-seat (open) the receiver tank outlet valve.

8. Perform the refrigerator operation check in accordance with WP 0010 (Item 7).



END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
TORQUE LIMITS

SCOPE

This work package 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)
0041	All bolts		10
0033	All bolts (unless otherwise specified)	Compressor	20

END OF WORK PACKAGE

Chapter 7

Supporting 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)
4110-01-465-4158 / 4110-01-465-4564
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.

PAMPHLETS

Functional Users Manual for the Army Maintenance Management System (TAMMS)	DA PAM 738-750
Military Traffic Management Command Transportation Engineering Command	MTMCTEA PAM 55-19

FIELD MANUALS

Basic Cold Weather Manual	FM 31-70
First Aid	FM 4-25.4
Multi-service Helicopter Sling load –Sling Point Rigging Procedures	FM 10-450-4
NBC Decontamination	FM 3-5
Northern Operations	FM 31-71
Packaging of Materials- Preservation	FM 38-700
Packaging of Materials for Packing	FM 38-701

FORMS

Equipment Control Record	DA Form 2408-9
Equipment Inspection and Maintenance Worksheet	DA Form 2404
Product Quality Deficiency Report	SF 368
Recommended Changes to Publications	DA Form 2028
Report of Discrepancy	SF 364
Report of Packaging and Handling Deficiencies	SF 362
Transportation Discrepancy Report	SF 361

TECHNICAL MANUALS

Destruction of Army Material to Prevent Enemy Use	TM 750-244-3
Storage and Maintenance of Army Prepositioned Stock Materiel	TM 38-470

MISCELLANEOUS PUBLICATIONS

Army Medical Department Expendable/Durable Items	CTA 8-100
Diagnosing Thermo King Refrigeration Systems	TK 5984-10
Expendable/Durable Items	CTA 50-970
Service Bulletin: Flushing Refrigeration Lines	T&T 134 (CAGEC 43904)

END OF WORK PACKAGE

ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
MAINTENANCE ALLOCATION CHART
INTRODUCTION

THE ARMY MAINTENANCE SYSTEM MAC

This introduction provides a general explanation of all maintenance and repair functions authorized at various maintenance levels under the standard Army Maintenance System concept.

The MAC (immediately following this 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:

Unit - includes two subcolumns, C (operator/crew) and O (unit) maintenance

Direct Support - includes an F subcolumn

General Support - includes an H subcolumn

Depot - includes a D subcolumn

The tools and test equipment requirements (immediately following the MAC) list the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from the MAC.

The remarks (immediately following the tools and test equipment requirements) contain supplemental instructions and explanatory notes for a particular maintenance function.

MAINTENANCE FUNCTIONS

Maintenance functions will be limited to and are 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 gauging and evaluation of consumables.

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 scheduled basis, i.e., load testing of lift devices and hydrostatic testing of pressure hoses.

3. 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.

4. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper 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. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. A "Replace" is authorized by the MAC and is shown as the third position code of the Source, Maintenance, and Recoverability (SMR) code.

9. Repair. The application of maintenance services, including fault location/troubleshooting, removal/installation, and 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.

10. 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.

11. 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 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 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 detailed explanation, refer to the previous section entitled '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 in mm/hr in whole hours or decimals) in the appropriate subcolumns. 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:

C - Operator or crew maintenance

O - Unit Maintenance

F - Direct Support Maintenance

L - Specialized Repair Activity (SRA)

H - General Support Maintenance

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 a work figure in the “H” column of Column (4), and an associated reference code is used in the REMARKS Column (6). The code is keyed by 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 special support equipment required to perform the designated function. Codes are keyed to the entries in the tools and test equipment table.

Column (6) Remarks. This column, when applicable, the 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 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, model number, or type 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.

ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
MAINTENANCE ALLOCATION CHART

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
			Unit		Direct Support	General Support		
			C	O	F	H		
00	Advanced Design Refrigerator (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
0101	Door Panel	Inspect	0.1					
		Repair			0.5		4	
0102	Cargo Restraint Rails	Remove/Install		0.5			3	
0103	Freezer Door Keeper	Remove/Install			0.3		3	
0104	Shelf Assembly	Inspect	0.1					
		Remove/Install			0.3		5	
02	IC Electrical System	Inspect	0.2					
		Test		0.5			2,3	
0201	Interior Light Assembly	Inspect	0.1					
		Repair		0.8			2,3	
0202	IC Power Entry Connector	Repair		0.1			2,3	
		Test		1.0			2,3	
		Replace		0.3			2,3	
0203	Pilot Light	Inspect	0.2					
		Replace		0.5			2,3	
0204	Interior Light Switch	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	Expansion Valve	Replace			3.0		5	
0302	Evaporator Coil	Remove/Install			2.0		5	
0303	Condensate Drain Heater	Replace			0.5		4	
0304	Condenser Coil	Remove/Install			2.0		5	
0305	Dehydrator	Replace			2.0		5	
0306	Receiver Tank	Replace			2.0		5	
0307	Hot Gas Solenoid Valve	Replace			2.0		5	
0308	Compressor	Remove/ Install			2.0		5	
0309	Suction Pressure Regulator	Remove/Install			2.0		5	
0310	Electrical System	Test			1.0		2,4	
031001	Low Pressure Cut-out Switch	Replace			1.0		5	
031002	Evaporator Fan Assembly	Replace			2.0		4	
031003	Electric Heating Element	Replace			2.0		4	
031004	High Pressure Cut-Out Switch	Replace			2.0		5	
031005	Condenser Fan Assembly	Remove/Install			0.5		4	

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
			Unit		Direct Support	General Support		
			C	O	F	H		
031006	Unit Controller	Replace			0.3		4	
031007	Defrost termination switch	Remove/Install			1.0		4	
03100701	Contactor (24 V)	Remove/Install			0.8		2,4	
03100702	RU Circuit Breakers	Replace			0.5		4	

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, PN 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

ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

SCOPE

This RPSTL lists and authorizes spare 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 Work Packages. These work packages containing lists of spares and repair parts authorized by this RPSTL for use in the performance of maintenance. These also include parts that 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 belts are listed with the components on which they are mounted. 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 Index Work Packages. There are two cross-reference indexes work packages in this RPSTL; the National Stock Number (NSN) Index, and the Part Number Index. The NSN index refers you to the figure and the item number. The Part Number Index work package also refers you to the figure and item number.

EXPLANATION OF COLUMNS IN THE RPSTL

Item No. (Column (1)). Indicates the number used to identify items called out in the illustration.

SMR Code (Column (2)). The Source, maintenance, and recoverability (SMR) code contains supply / requisitioning information, maintenance category authorization criteria and disposition instruction, as shown in the following breakout.

Source Code	Maintenance Code		Recoverability Code
x x	xx		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 an item .

*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 to get an item needed for maintenance, repair, or overhaul of an end item/equipment. Explanation of source codes follows.

Source Code	Application/Explanation
PA PB PC PD PE PF PG	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. NOTE: Items coded PC are subject to deterioration.
KO 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 category 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	Items with these codes are not to be requisitioned/requested individually. They must be made from bulk material that is identified by the part number in the DESCRIPTION AND USABLE ON CODE (UOC) column and listed in the Bulk Material group work package list in this 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 DSIAVIM Level AH - Assembled by GS level AL - Assembled by SRA AD - Assembled by Depot	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 third position code 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 its next higher assembly. (Refer to the NOTE below.)
XB	If an "XB" item is not available from salvage, order it using the CAGEC and P/N.
XC	Installation drawing, diagram, instruction sheet, field service drawing that is identified by manufacturer's part number.
XD	Item is not stocked. Order an "XP" coded item through normal supply channels using the Commercial and Government Entity Code (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 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 the support item. The maintenance code entered in the third position will indicate authorization to one of the following levels of maintenance.

Maintenance Code	Application/Explanation
C-	Crew or operator maintenance done within unit/AVUM maintenance.
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.
D-	Depot level can remove, replace, and use the item.

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 (per-form 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 (designate the specialized repair activity) 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.
Z-	Nonrepairable. 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 entered in the fifth position of the SMR Code as follows:

Recoverability Code	Application/Explanation
Z-	Nonrepairable item. When unserviceable, condemn and dispose of the item at the level of maintenance shown in 3rd position of SMR Code.
O-	Repairable item. When uneconomically repairable, condemn and dispose of the item at organizational or aviation unit level.
F-	Repairable item. When uneconomically repairable, condemn and dispose of the item at the direct support or aviation intermediate level.
H-	Repairable item. When uneconomically repairable, condemn and dispose of the item at the general support level.
D-	Repairable item. When beyond lower level repair capability, return to depot. Condemnation and disposal of item not authorized below depot level.
L-	Repairable 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.

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 5-digit numeric code that 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 manufacture, (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 P/N 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. P/Ns of bulk materials are referenced in this column in the line entry to be manufactured/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.

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 quantity indicates that the quantity is available with each application.

EXPLANATION OF CROSS REFERENCE INDEX WORK PACKAGES FORMAT AND COLUMNS

1. National Stock Number (NSN) Index

STOCK NUMBER Column. This column lists the NSN in National Item Identification Number (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 4 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 Section II and Section III.

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 Index work package. P/Ns, in this index, are listed by part number in ascending alphanumeric sequence (vertical arrangement of letter and number combination which place 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 P/N 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.

ITEM Column. The item number is that number assigned to the item as it appears in the figure referenced in adjacent figure number column.

3. Reference Designator Index work package. Reference designators in this index are listed in ascending alphanumeric sequence (vertical arrangement of letter and number combination 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).

Reference Designator Column. Indicates the reference designator 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 package.

Item Column. The item number is that number assigned to the item as it appears in the figure referenced in the adjacent figure number column.

SPECIAL INFORMATION

UOC. UOC appears in the lower left comer of the Description Column heading. Useable on codes are shown as 'UOC' in the Description Column justified left on the first line under the applicable item description/nomenclature. Uncoded items are applicable to all models. Identification of the UOCs used in this RPSTL are:

Code	Used On
FSF	ADR-300 (Green)
FTZ	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/P/N Index 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 National Stock Numbers or Part Numbers are Not Known

   First. Using the table of contents, determine the assembly or subassembly group to which the item belongs. This is necessary since figures are prepared for assembly groups and subassembly groups, and listings are divided into the same groups.

   Second. Find the figure covering the assembly group or subassembly 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 for the figure and item numbers. The NSNs and part numbers are on the same line as the associated item numbers.

2. When NSN Known

   First, if you have the NSN, look in the STOCK NUMBER column of the NSN index. 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 P/N and not the NSN, look in the PART NUMBER column of the P/N index. 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)
ADVANCED DESIGN REFRIGERATOR, 300-CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
GROUP 00 ADR-300

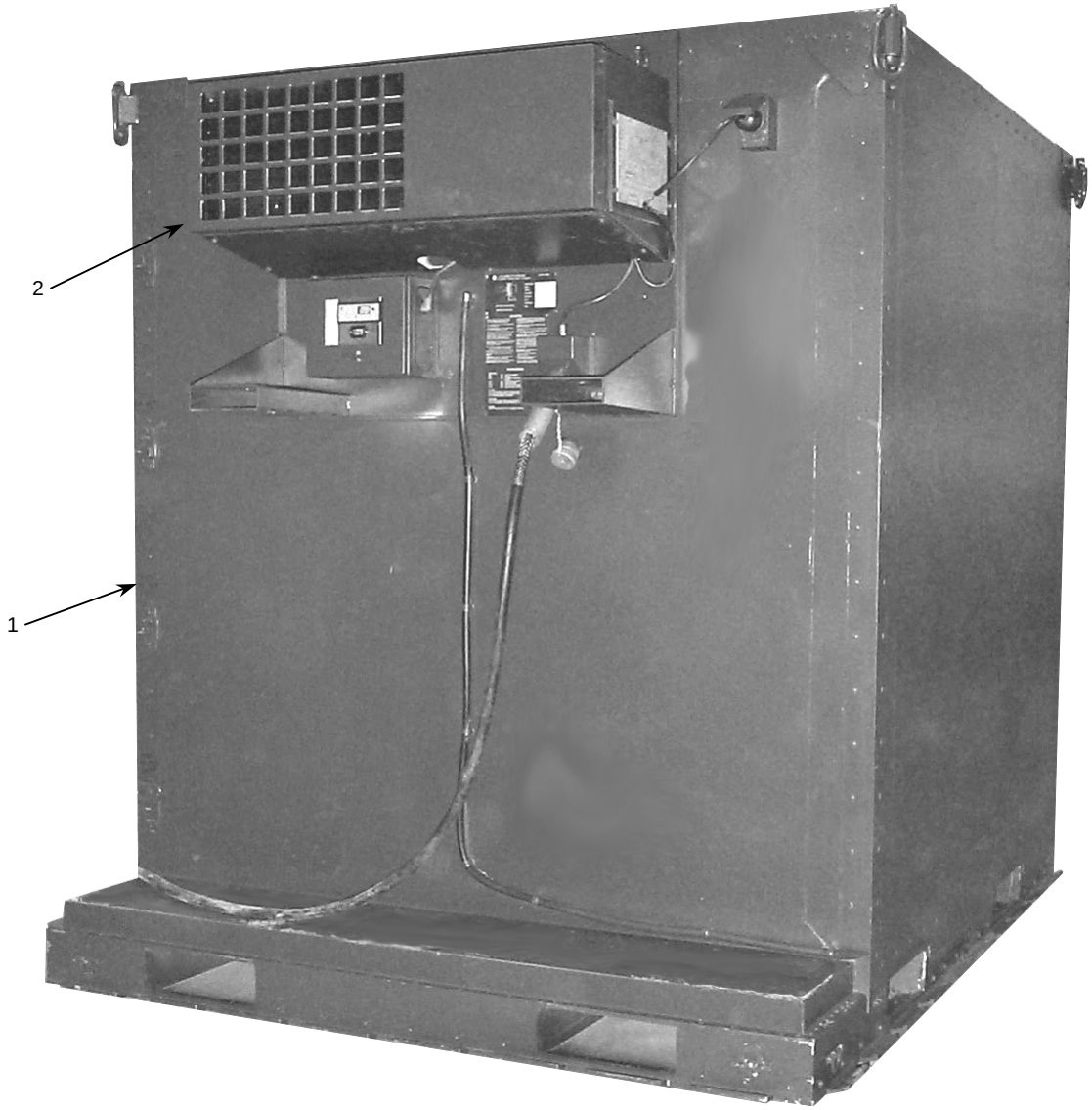


Figure 1. ADR-300.

(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	50148-126	Refrigeration Unit, ADR-300, UOC: FSF	1
	PDFFF	4110-01-500-3618	80298	50148-127	Refrigeration Unit, ADR-300, UOC: FTZ	
					END OF FIGURE	

END OF WORK PACKAGE

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
ADVANCED DESIGN REFRIGERATOR, 300-CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
GROUP 01 INSULATED CONTAINER (IC)

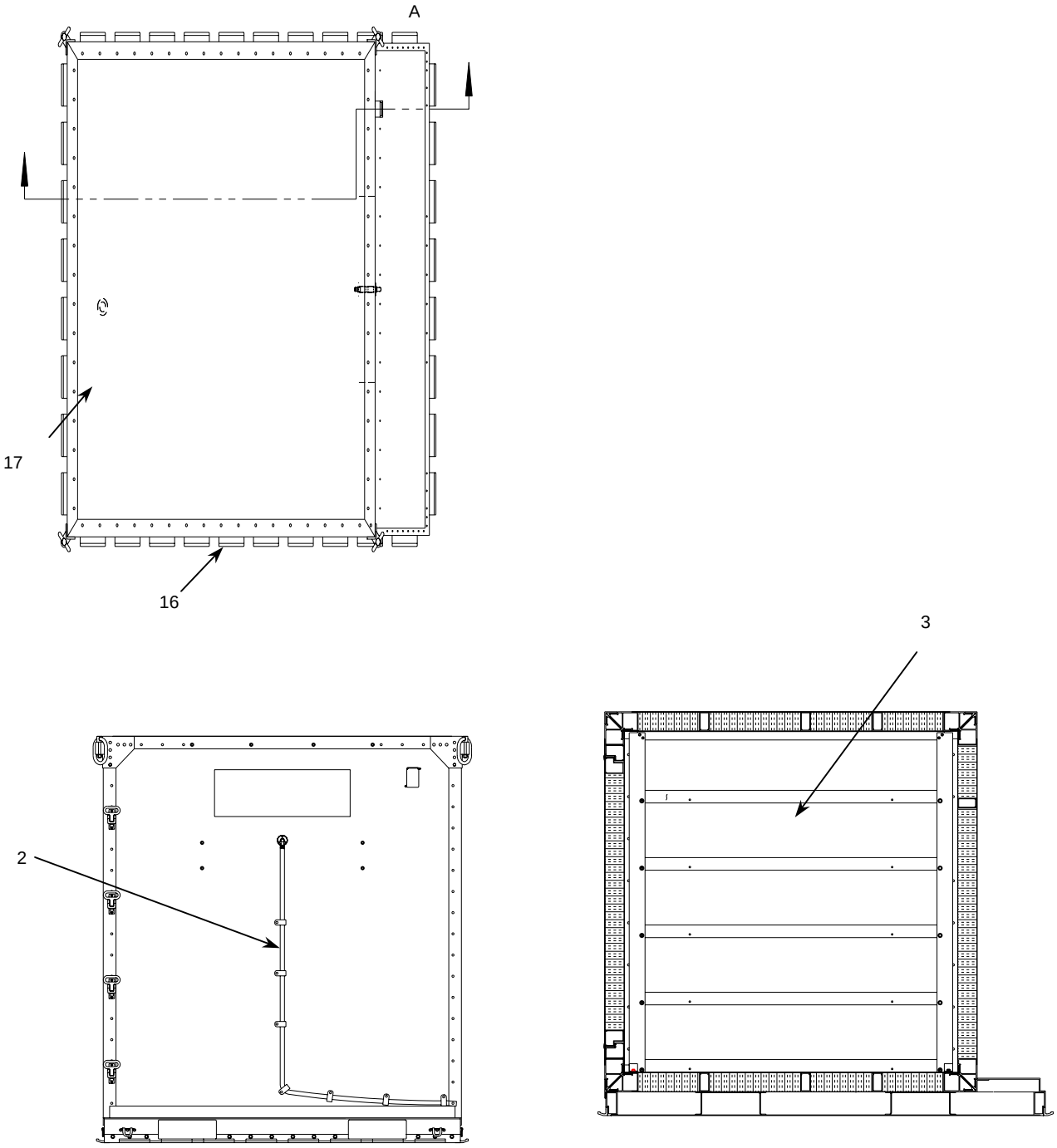


Figure 2. Insulated Container.
Sheet 1 of 3

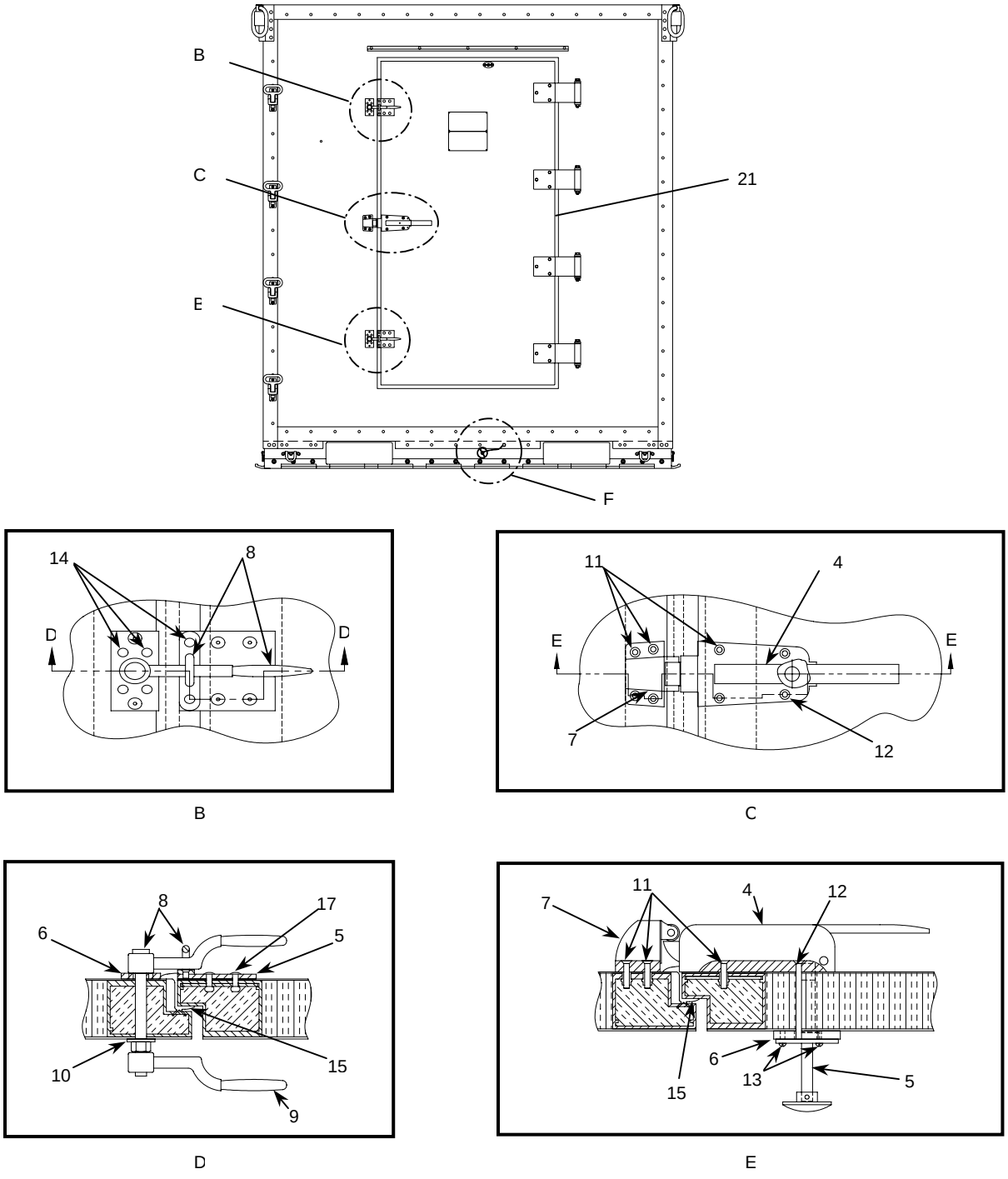
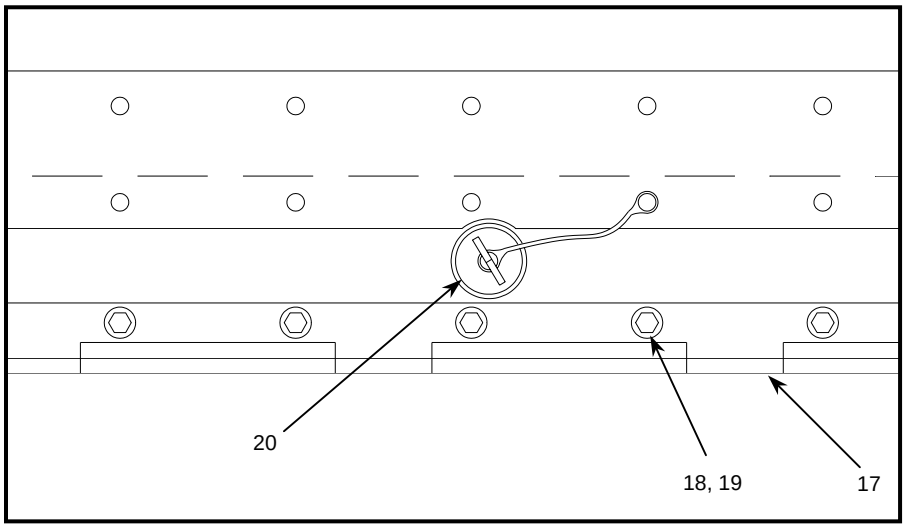


Figure 2. Insulated Container.
Sheet 2 of 3



F

Figure 2. Insulated Container.
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	
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	PDFFF		80298	119223	Condensate Drain Tube	1
3	XBOZZ		80298	60363-002	Shelf Assembly	1
4	PBOZZ		80298	86025-018	Latch, Freezer Door	1
5	PBOZZ		80298	86025-019	Release, Inside, Freezer Door	1
6	PBOZZ		80298	50148-201	Spacer, Freezer Door	1
7	PAOOO		80298	86025-017	Keeper, Freezer Door	1
8	PBOZZ		80298	86025-020	Hook and Handle Assembly	2
9	PBOZZ		80298	86025-021	Handle, Inside Release	2
10	XBOZZ		80298	83010-004	Washer, Sealing 1/2" Dia	2
11	XBOZZ		80298	81096-004	Screw, Countersunk, 1/4-20 x 1.25	6
12	XBOZZ		80298	81096-006	Screw, Countersunk, 1/4-20 x 3.25	2
13	XBOZZ		80298	81037-002	Screw, Round, 10-24 x 0.5	3
14	XBOZZ		80298	81099-001	Screw, Flat-Head, 10-24 x 3/8	12
15	PBFZZ		80298	60402-002	Door Seal	1
16	PBOZZ		80298	58400-763	Cargo Restraint Rail, Short	2
17	PBOZZ		80298	58400-764	Cargo Restraint Rail, Long	2
18	XBOZZ		80298	81083-002	Bolt 3/8"-24 x 1.328 (length)	52
19	XBOZZ		80298	83001-004	Washer, Lock 3/8"	52
20	PAOZZ		80298	86035-021	Plug, Drain, Expandable	1
21	XBFFF		80298	35183-301	Door Panel	1
					END OF FIGURE	

END OF WORK PACKAGE

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
ADVANCED DESIGN REFRIGERATOR, 300-CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
GROUP 0101 ADR-300 SHELF ASSEMBLY

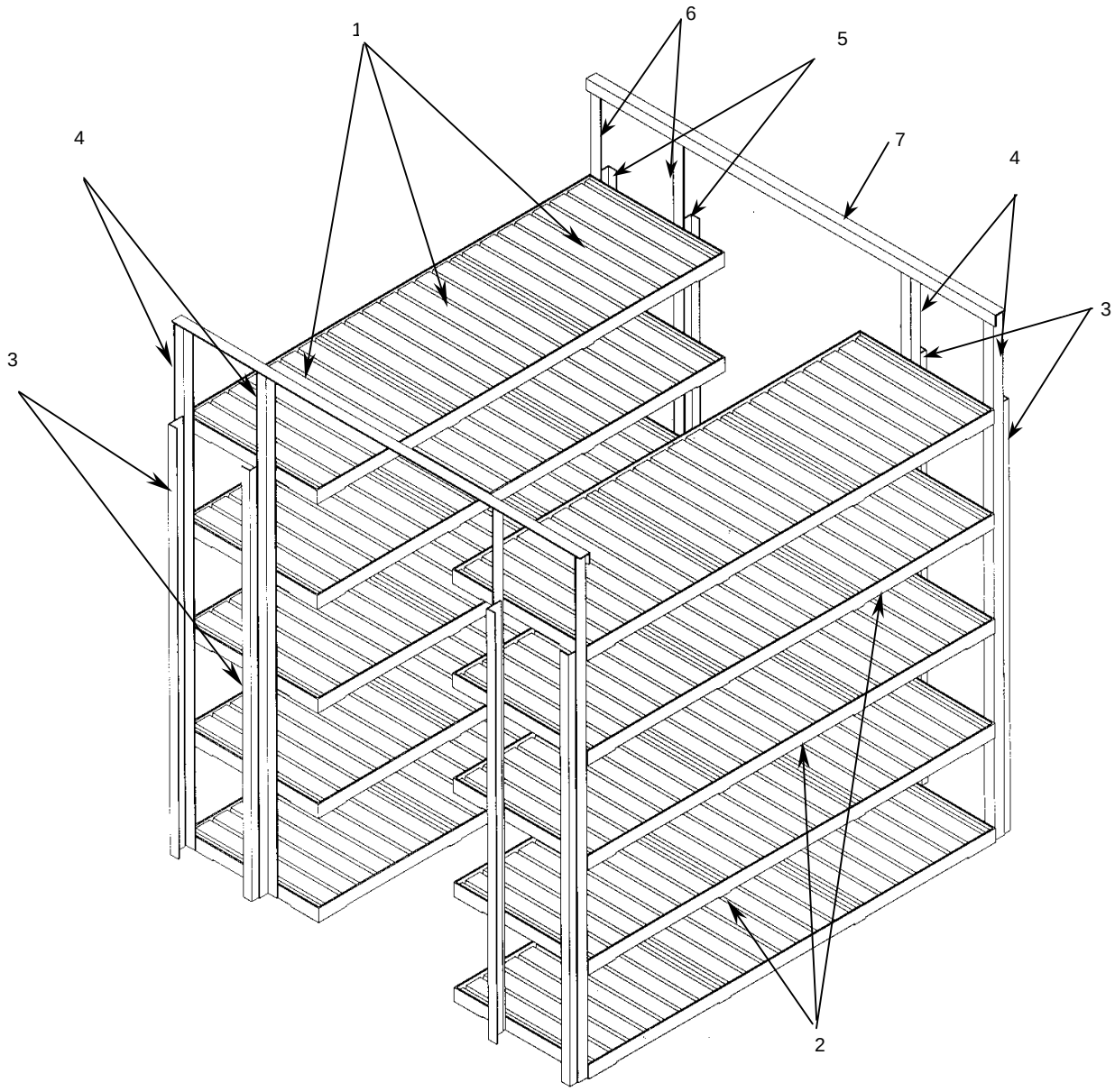


Figure 3. ADR-300 Shelf Assembly.

(Sheet 1 of 2)

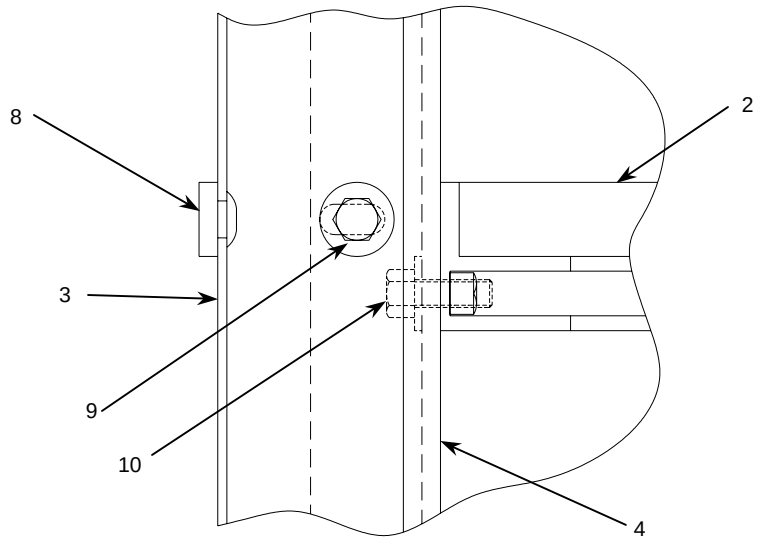


Figure 3. ADR-300 Shelf Assembly.
(Sheet 2 of 2)

(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	
					Figure 3. ADR-300 Shelf Assembly	2
1	PBOZZ		80298	60363-602	Shelf Panel	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	Top Support	2
8	PBOZZ		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	

END OF WORK PACKAGE

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
ADVANCED DESIGN REFRIGERATOR, 300-CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
GROUP 02 IC ELECTRICAL SYSTEM

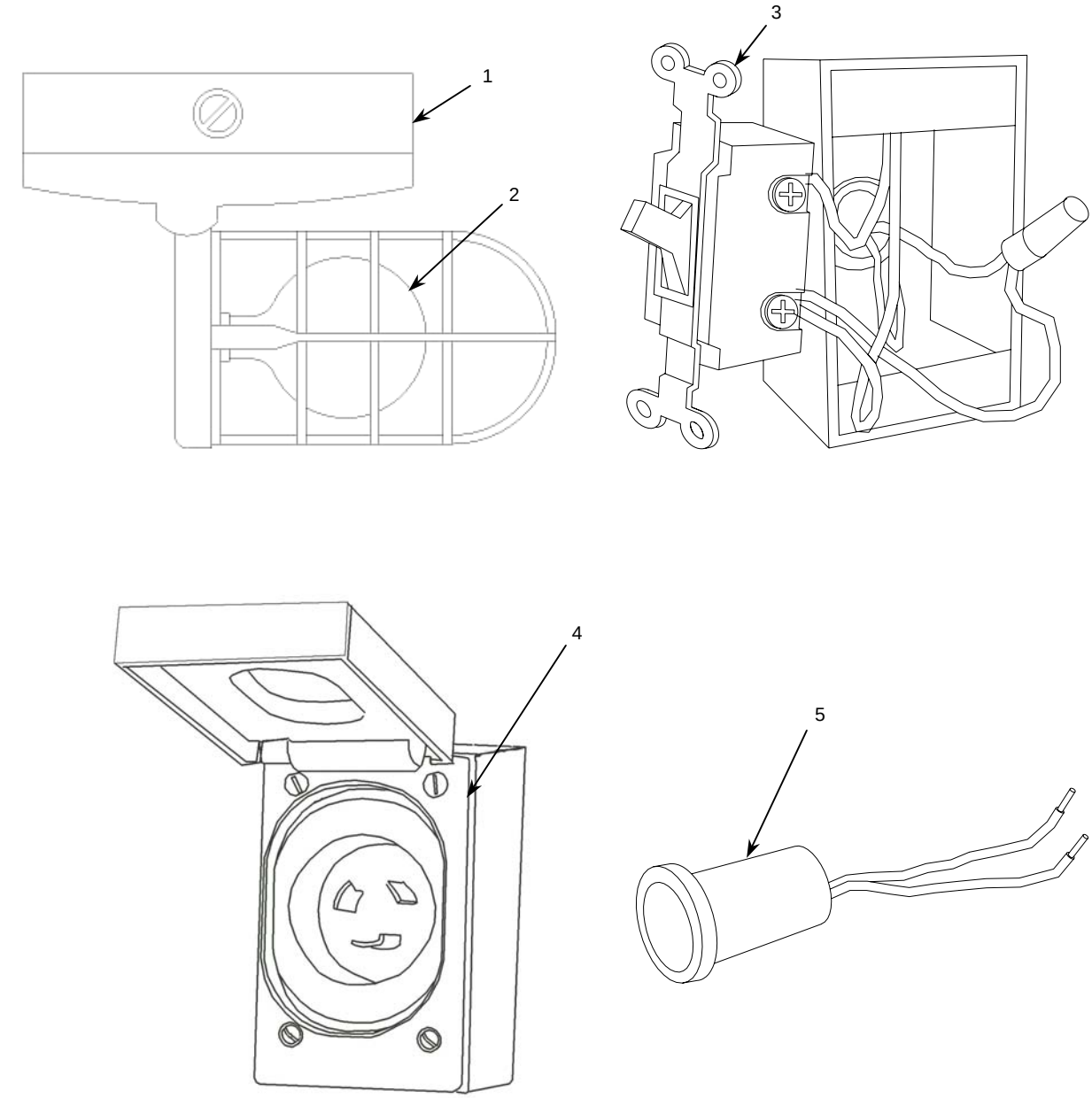


Figure 4. IC Electrical System Components.

(1) Item No.	(2) SMR Code	(3) NSN	(4) CAGEC	(5) Part Number	(6) Description and Useable On Code (UOC)	(7) QTY
					Group 02 Insulated Container Electrical System	
					Figure 4. IC Electrical System Components	
1	PAOZZ		80298	86032-001	Interior Light Assembly	1
2	PAOZZ	6240-00-269-9467	96906	MS15595-2	Light Bulb (100 W)	1
3	PAOZZ	5930-01-230-5340	81091	15AC1-1	Interior Light Switch	1
4	PAOZZ		80298	86032-002	IC Power Entry Connector	1
5	PAOZZ		80298	36098-002	IC Pilot Light	1
					END OF FIGURE	

END OF WORK PACKAGE

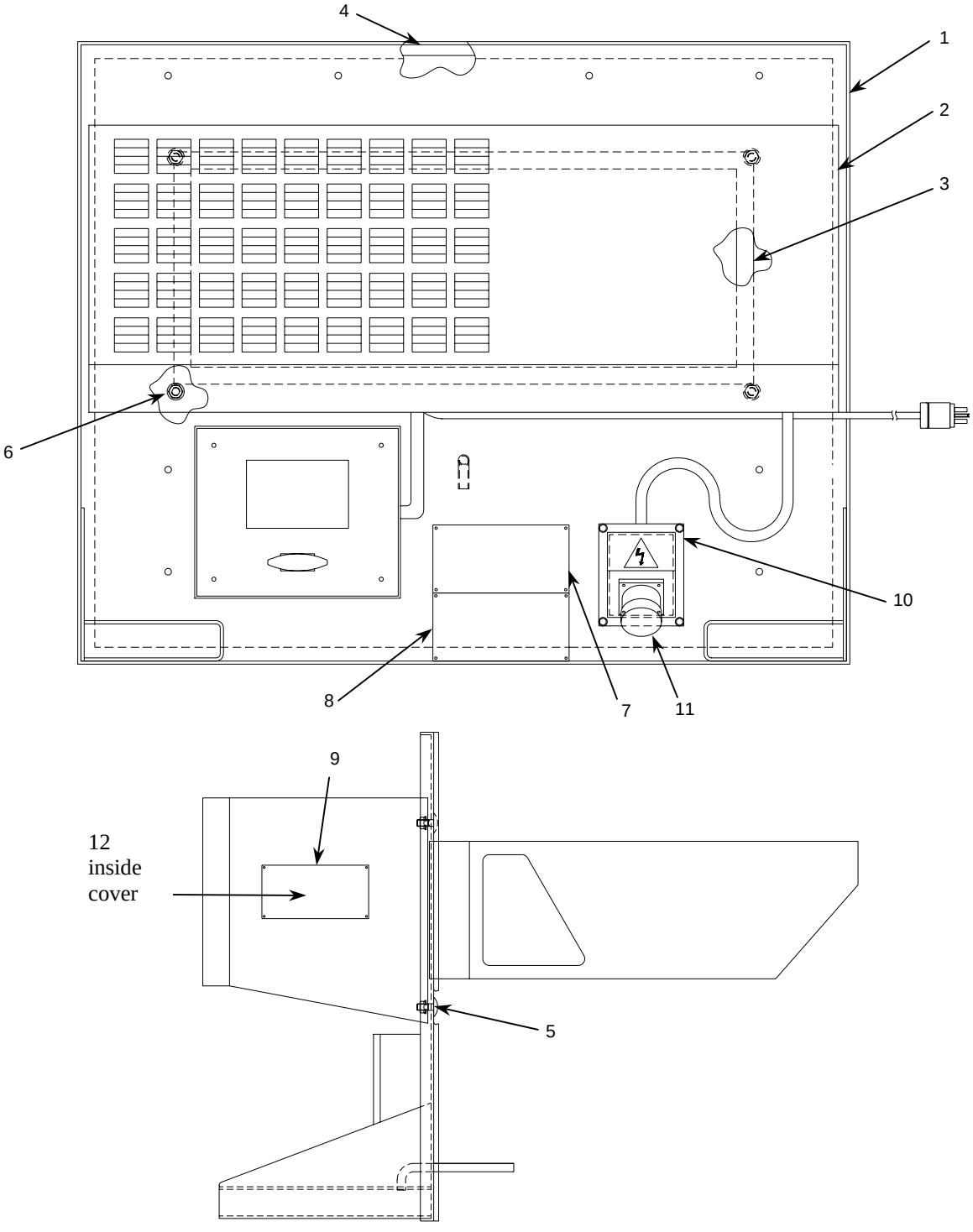


Figure 5. ADR-300 RU Assembly.

(1) Item No.	(2) SMR Code	(3) NSN	(4) CAGEC	(5) Part Number	(6) Description and Useable On Code (UOC)	(7) QTY
					Group 03 ADR-300 Refrigeration Unit (RU)	
					Figure 5 ADR-300 RU Assembly	
1	PDOFF		80298	50148-718	RU Base Plate	1
2	PDOFF		80298	86055-025	Reefer Unit, VM-405	1
3	PAOZZ		80298	50148-213	Inner Seal	1
4	PAOZZ		80298	50148-214	Outer Seal	1
5	XB0ZZ		80298	81098-003	Carriage Bolt	4
6	XB0ZZ		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	PAOZZ		80298	50148-717	Box, Electrical Connector	1
11	PAOZZ		80298	87011-019	Connector, Input	1
12	XB0ZZ		80298	88000-079	Electrical Wiring Diagram	1
					END OF FIGURE	

END OF WORK PACKAGE

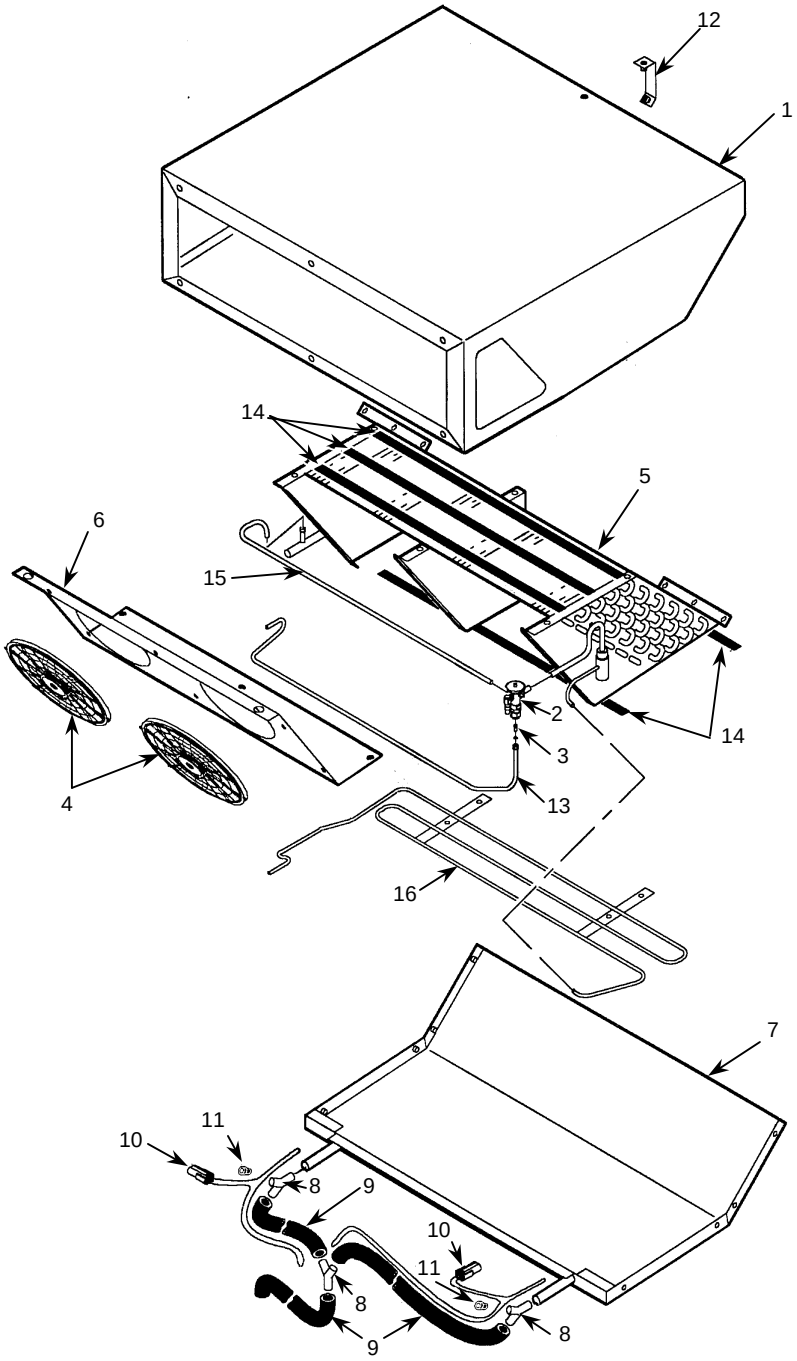


Figure 6. Evaporator Section Components.

(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 Figure 6. Evaporator Section Components	
1	XBOZZ		43904	98-5649	Housing - Evaporator	1
2	PAFZZ		43904	66-9314	Valve - Expansion	1
3	PAFZZ		43904	61-1126	Nozzle - Expansion Valve	1
4	PAFZZ		43904	41-3138	Fan & Motor - Evaporator	2
5	XBFZZ		43904	67-1620	Coil - Evaporator	1
6	XBFZZ		43904	98-5650	Plenum - Evaporator	1
7	XBFZZ		43904	98-5651	Pan - Drain	1
8	PAOZZ		43904	55-9258	Tee - Hose	3
9	PAOZZ		43904	11-9223	Hose - Drain	1
10	PAOZZ		43904	41-3156	Condensate Drain Heater	2
11	PAOZZ		43904	33-2801	Grommet - Drain Hose	2
12	XBFZZ		43904	91-9988	Brace - Reinforcement Assembly	1
13	XBFZZ		43904	66-9964	Tube - Liquid	1
14	PAOZZ		43904	91-9989	Strip - Foam Tape	5
15	XBFZZ		43904	66-9965	Tube - Equalizer	1
16	XBFZZ		43904	66-9963	Tube - Drain Pan	1
					END OF FIGURE	

END OF WORK PACKAGE

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
ADVANCED DESIGN REFRIGERATOR, 281-CUBIC FOOT (ADR-281)
4110-01-465-4158 / 4110-01-465-4564
GROUP 0302 CONDENSER SECTION COMPONENTS

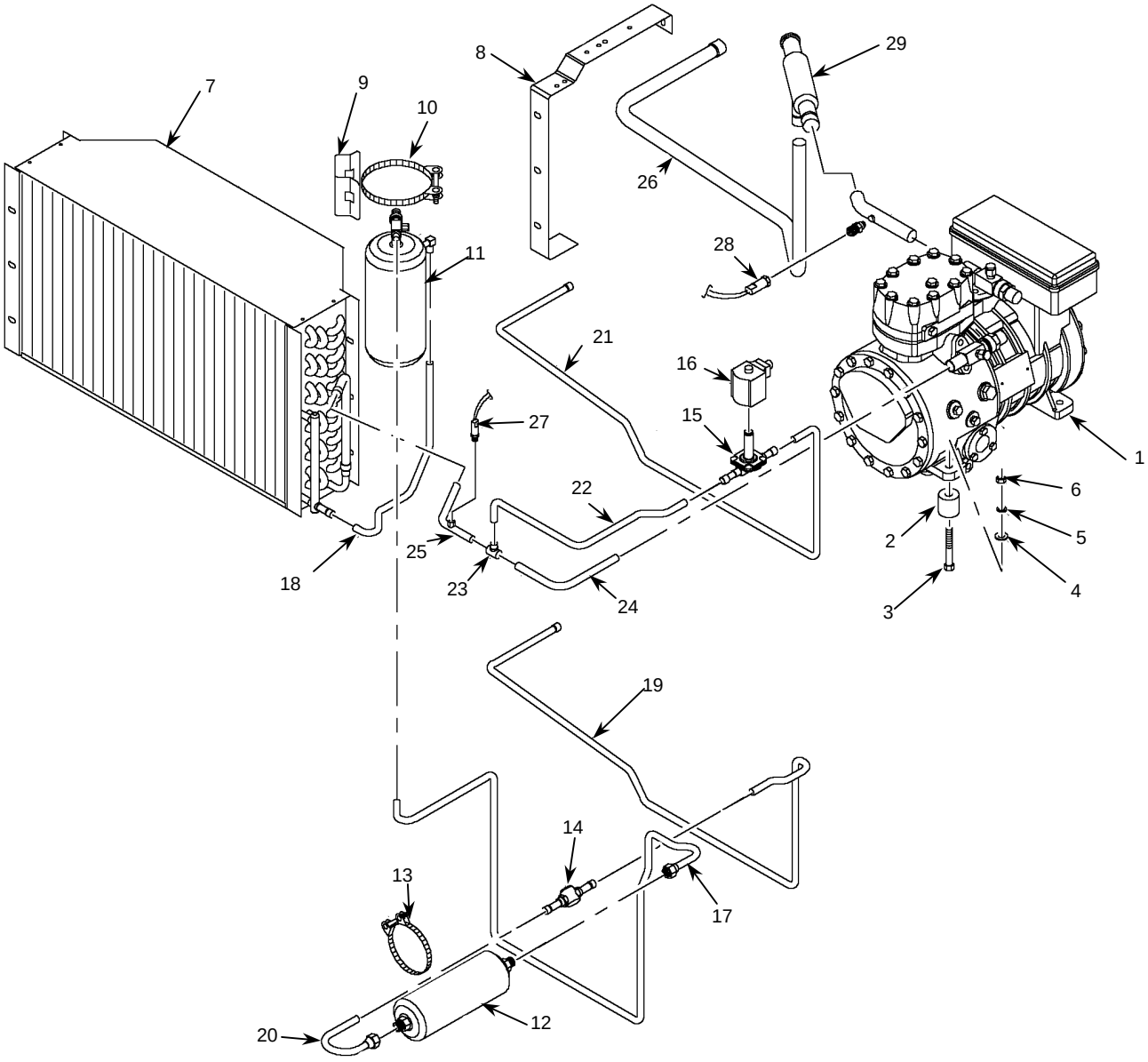


Figure 7. Condenser Section Components

(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	
					Figure 7. Condenser Section Components	
1	PBFZZ		43904	102-722	Compressor (D2 11)	1
2	XBFZZ		43904	91-6417	Spacer - Compressor Support	4
3	PAFZZ		43904	55-8576	Screw - Compressor	4
4	PAFZZ		43904	55-8249	Flat washer	4
5	PAFZZ		43904	55-8577	Washer - Special	4
6	PAFZZ		43904	55-7006	Nut	4
7	XBFZZ		43904	67-1619	Coil - Condenser	1
8	XBFZZ		43904	91-9985	Bracket - Condenser Coil	1
9	XBFZZ		43904	91-9986	Support - Receiver Tank	1
10	XBFZZ		43904	91-9987	Clamp - Receiver Tank	1
11	XBFZZ		43904	67-1798	Tank - Receiver	1
12	PBFZZ		43904	66-8471	Dehydrator	1
13	XBFZZ		43904	91-6408	Clamp - Dehydrator	1
14	PAFZZ		43904	66-7682	Indicator - Liquid	1
15	PAFZZ		43904	66-1002	Hot Gas Solenoid Valve Body	1
16	PAFZZ		43904	41-5051	Coil - Solenoid (24V)	1
17	XBFZZ		43904	66-9966	Tube - Receiver Tank To Dehydrator	1
18	XBFZZ		43904	66-9967	Tube - Condenser Coil To Receiver	1
19	XBFZZ		43904	66-9968	Tube - Sight Glass To Evaporator	1
20	XBFZZ		43904	66-9969	Tube - Dehydrator To Sight Glass	1
21	XBFZZ		43904	66-9970	Tube - Solenoid To Evaporator	1
22	XBFZZ		43904	66-9971	Tube - Tee To Solenoid	1
23	XBFZZ		43904	55-2181	Tee	1
24	XBFZZ		43904	66-9972	Tube - Compressor To Tee	1
25	XBFZZ		43904	66-9973	Tube - Tee To Condenser Coil	1
26	XBFZZ		43904	66-9974	Tube - Evaporator To Compressor	1
27	XBFZZ		43904	44-8064	Switch - High Pressure Cutout	1
28	XBFZZ		43904	44-8030	Switch - Low Pressure Cutout	1
29	XBFZZ		43094	22-1073	Pressure Regulator Valve	1
					END OF FIGURE	

END OF WORK PACKAGE

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
ADVANCED DESIGN REFRIGERATOR, 300-CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
GROUP 0303 ADR-300 ELECTRICAL COMPONENTS

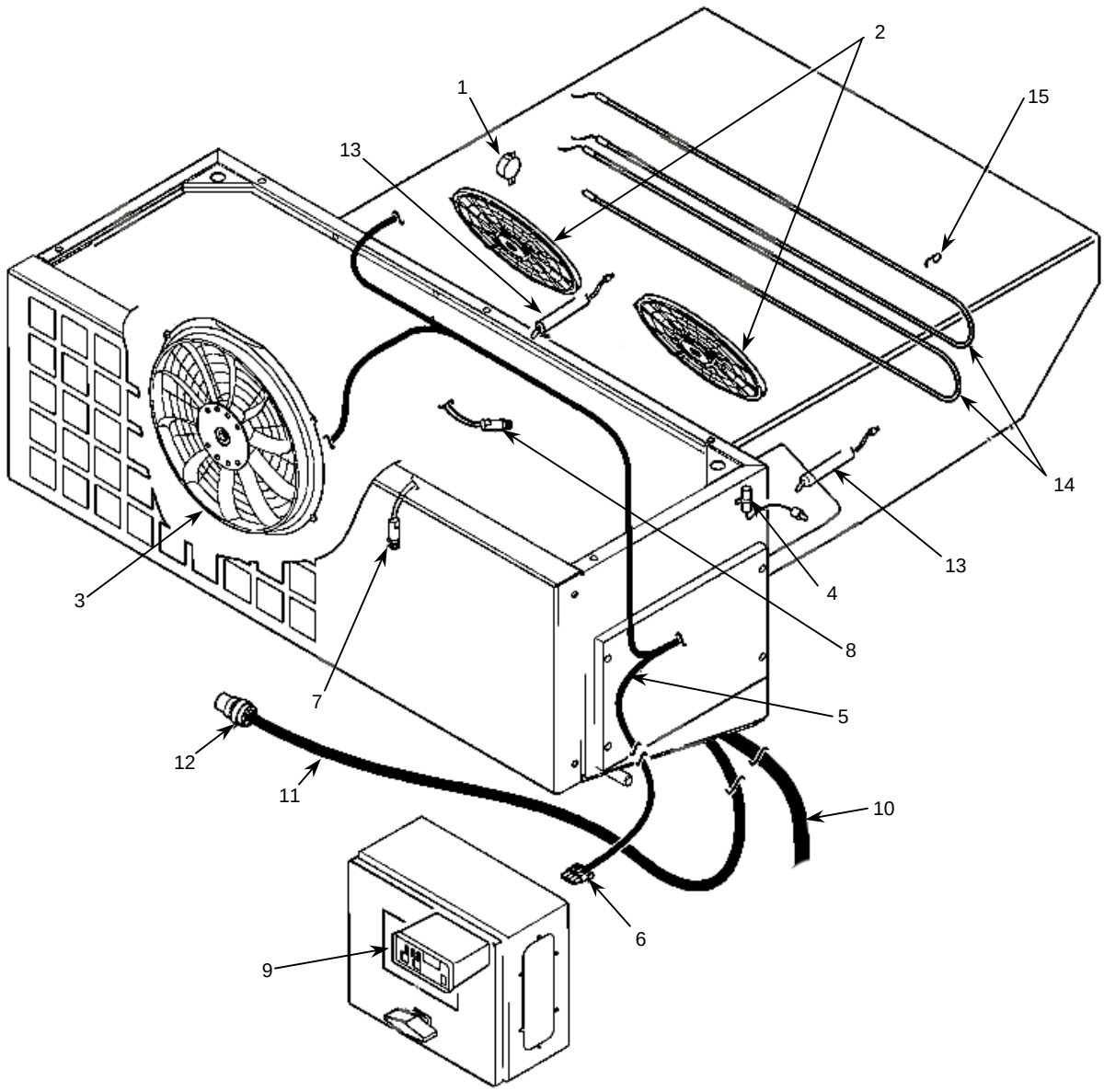


Figure 8. ADR-300 Electrical Components

(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 Figure 8. ADR-300 Electrical Components	
1	XBFZZ		43904	41-3136	Switch - Defrost Termination	1
2	XBFZZ		43904	78-1188	Fan & Motor - Evaporator	2
3	XBFZZ		43904	78-1202	Fan & Motor Condenser (24v)	1
4	XBFZZ		43904	41-3040	Sensor - Temperature	1
5	XBFZZ		43904	41-3440	Harness - Main	1
6	XBFZZ		43904	41-3098	Connector (10 Pin)	1
7	XBFZZ		43904	44-8064	Switch - High Pressure Cutout	1
8	XBFZZ		43904	44-8030	Switch - Low Pressure Cutout	1
9	PBFZZ		43904	45-1599	Controller M13	1
10	PBOFF		43904	41-3441	Cable - Power (3 Ph, 60 Hz)	1
11	PPOFF		43904	41-3442	Cable - Power (1 Ph, 60 Hz)	1
12	PAOZZ		43904	41-3445	Receptacle (1 Ph)	1
13	XBFZZ		43904	41-3156	Harness – Heater, Drain Tube	2
14	PBFZZ		43904	45-1395	Electric Heating Element (750 W, 230 VAC)	2
15	XBFZZ		43904	91-240	Retainer - Heater	8
					END OF FIGURE	

END OF WORK PACKAGE

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
ADVANCED DESIGN REFRIGERATOR, 300-CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
GROUP 030306 ADR-300 CONTROL BOX COMPONENTS

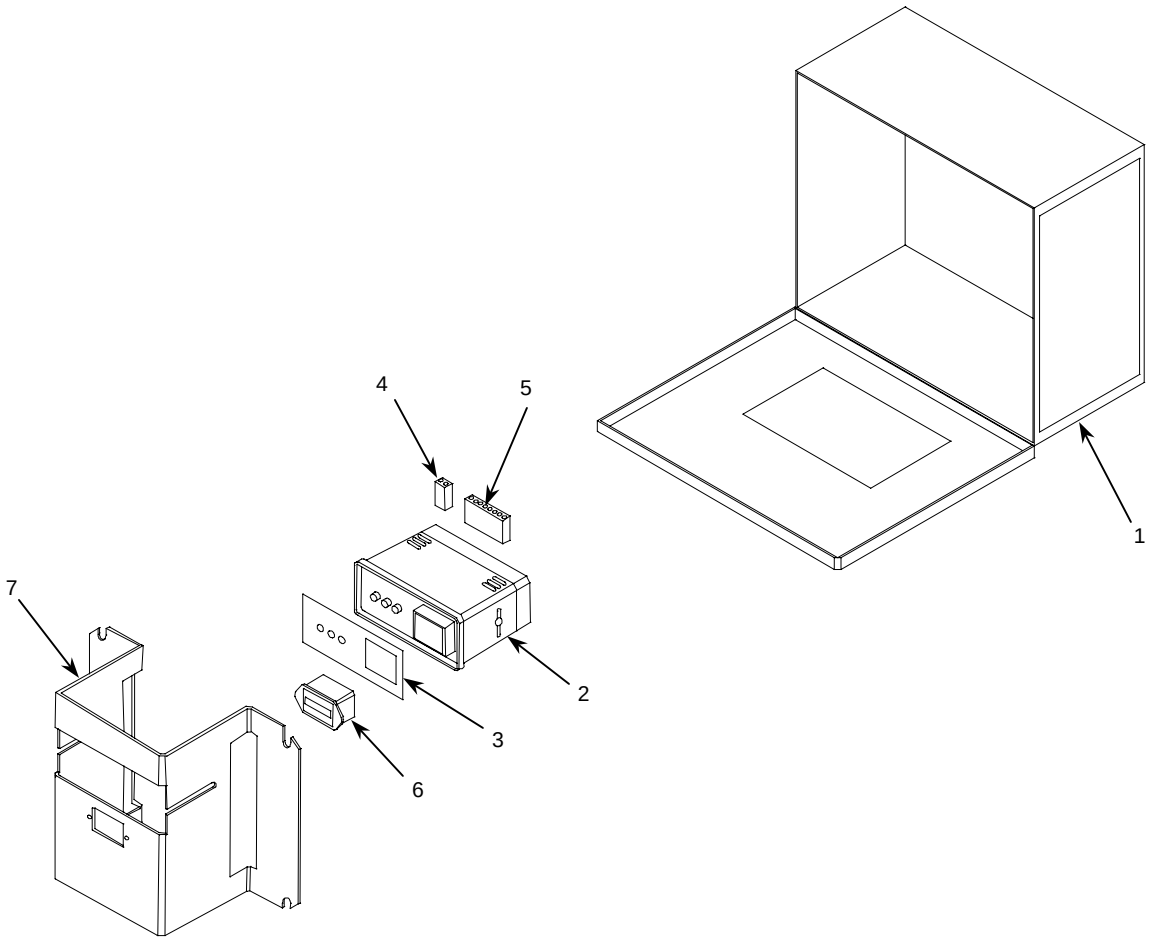


Figure 9. ADR-300 Control Box Components.

(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 Figure 9. ADR-300 Control Box Components	
1	XBFZZ		43904	98-5656	Box-Hermetic	1
2	PAFZZ		43904	45-1599	Controller (M13 L07, 12/24 V)	1
3	XBFZZ		43904	91-9613	Face- Controller	1
4	XBFZZ		43904	41-1507	Connector (2, Male)	1
5	XBFZZ		43904	41-3423	Connector (10, Male)	1
6	PAFZZ		43904	44-5703	Hourmeter	1
7	XBFZZ		43904	91-9994	Support-Controller	1
					END OF FIGURE	

END OF WORK PACKAGE

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
ADVANCED DESIGN REFRIGERATOR, 300-CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
GROUP 030308 ADR-300 ELECTRICAL ENCLOSURE COMPONENTS

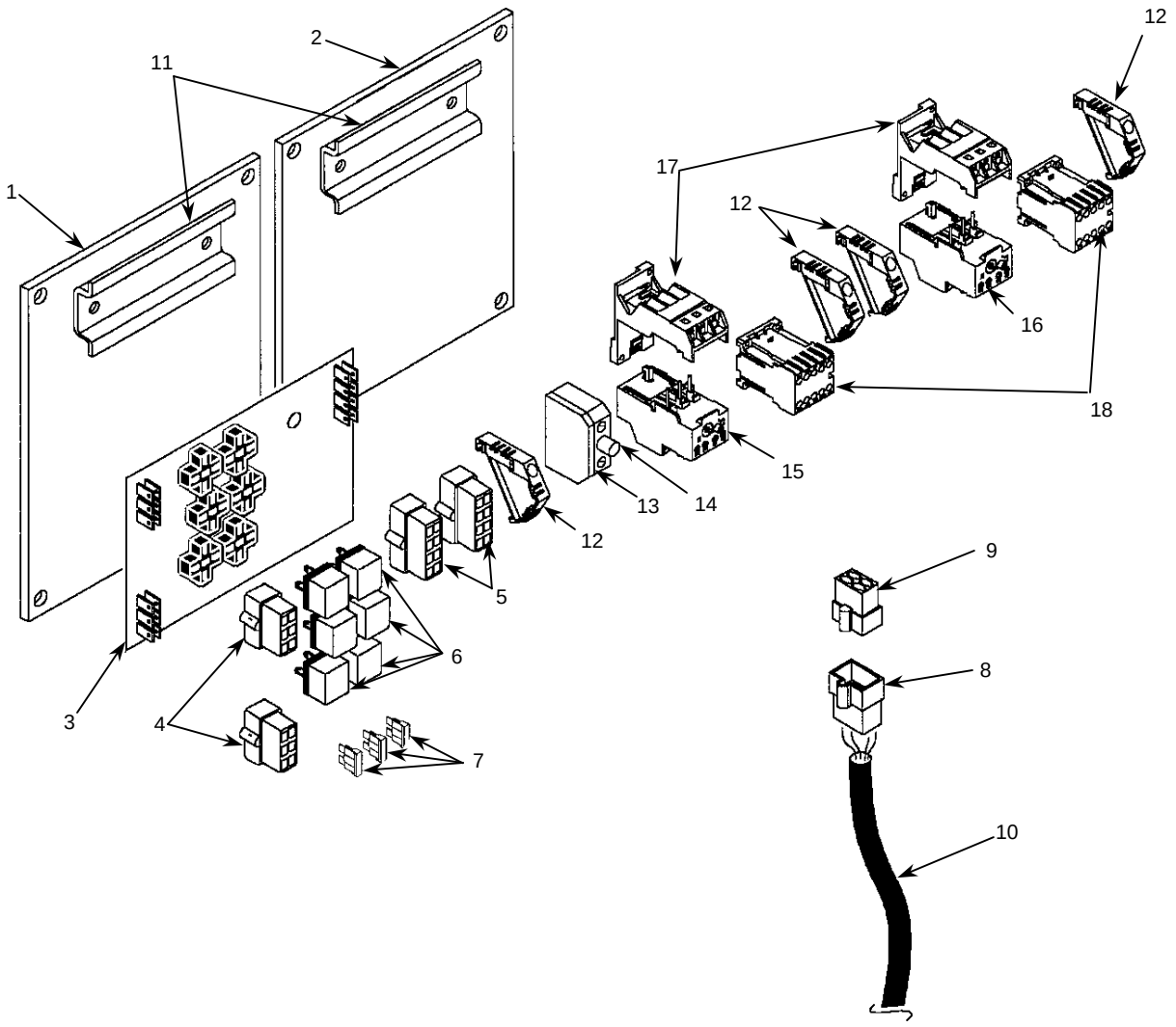


Figure 10. ADR-300 Electrical Enclosure Components

(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	
					Figure 10. ADR-300 Electrical Enclosure Components	
1	XBFZZ		43904	91-9602	Bracket - Control Box	1
2	XBFZZ		43904	91-9626	Bracket - Control Box	1
3	PAFZZ		43904	41-3247	Board - Printed Circuit (N.9.2 No Elec)	1
4	PAFZZ		43904	41-876	Connector (6 Pin)	2
5	PAFZZ		43904	41-946	Connector (8 Pin)	2
6	PAFZZ		43904	41-3707	Relay (24 V)	6
7	PAOZZ		43904	44-9758	Fuse (10 A)	2
	PAOZZ		43904	44-9344	Fuse (15 A)	1
	PAOZZ		43904	41-3451	Fuse (1 A)	1
8	PAFZZ		43904	41-928	Connector - Plug (4 Pin)	2
9	PAFZZ		43904	41-905	Connector - Socket (4 Pin)	1
10	PAFZZ		43904	41-3441	Cable - Power	1
11	XBFZZ		43904	91-9993	Channel - Din	2
12	XBFZZ		43904	41-898	Connector - End	4
13	XBFZZ		43904	41-942	Connector - Fuse 1	1
14	PAOZZ		43904	41-1028	Fuse (10 Amp)	1
15	PAOZZ		43904	41-3097	Breaker - Circuit (4 - 6 A)	1
16	PAOZZ		43904	41-3091	Breaker - Circuit (10 - 16 A)	1
17	PAFZZ		43904	41-3099	Socket - Circuit Breaker	1
18	PAFZZ		43904	41-1005	Contactor (24 V)	2
					END OF FIGURE	

END OF WORK PACKAGE

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
ADVANCED DESIGN REFRIGERATOR, 300-CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
GROUP 030310 TRANSFORMER COMPONENTS

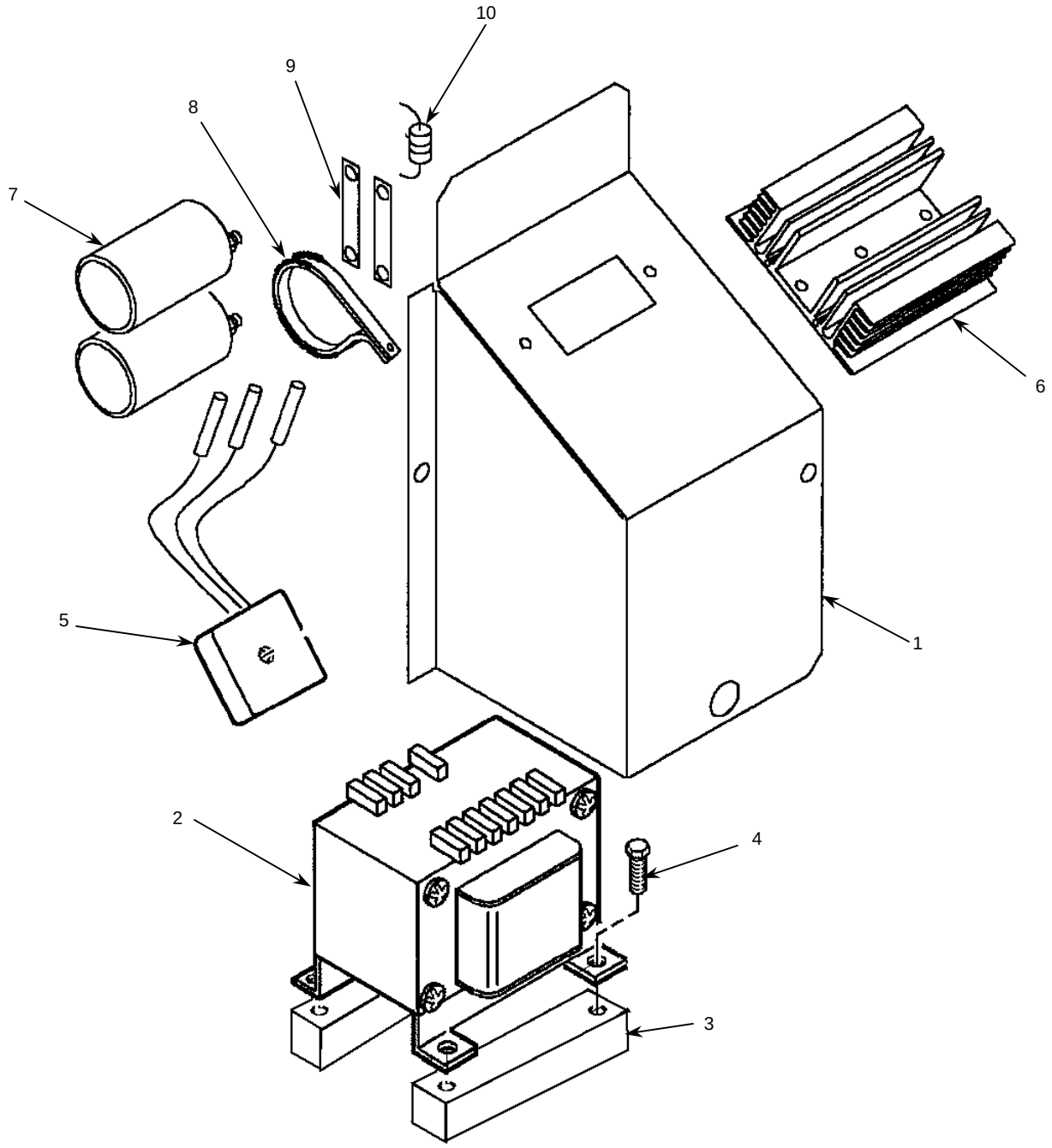


Figure 11. Transformer Components.

(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	
					Figure 11. Transformer Components	
1	XBFZZ		43904	91-9983	Cover-Transformer	1
2	PAFZZ		43904	41-3435	Transformer	1
3	XBFZZ		43904	923576	Spacer-Transformer	2
4	PAFZZ		43904	55-8546	Screw-Transformer	4
5	PBFZZ		43904	41-3438	Harness-Rectifier	1
6	XBFZZ		43904	41-977	Radiator	1
7	PBFZZ		43904	41-2992	Capacitor (24v)	2
8	XBFZZ		43904	91-6691	Clamp-Capacitor	2
9	XBFZZ		43904	41-3134	Jumper-Capacitor	2
10	PAFZZ		43904	44-9925	Resistor	1
					END OF FIGURE	

END OF WORK PACKAGE

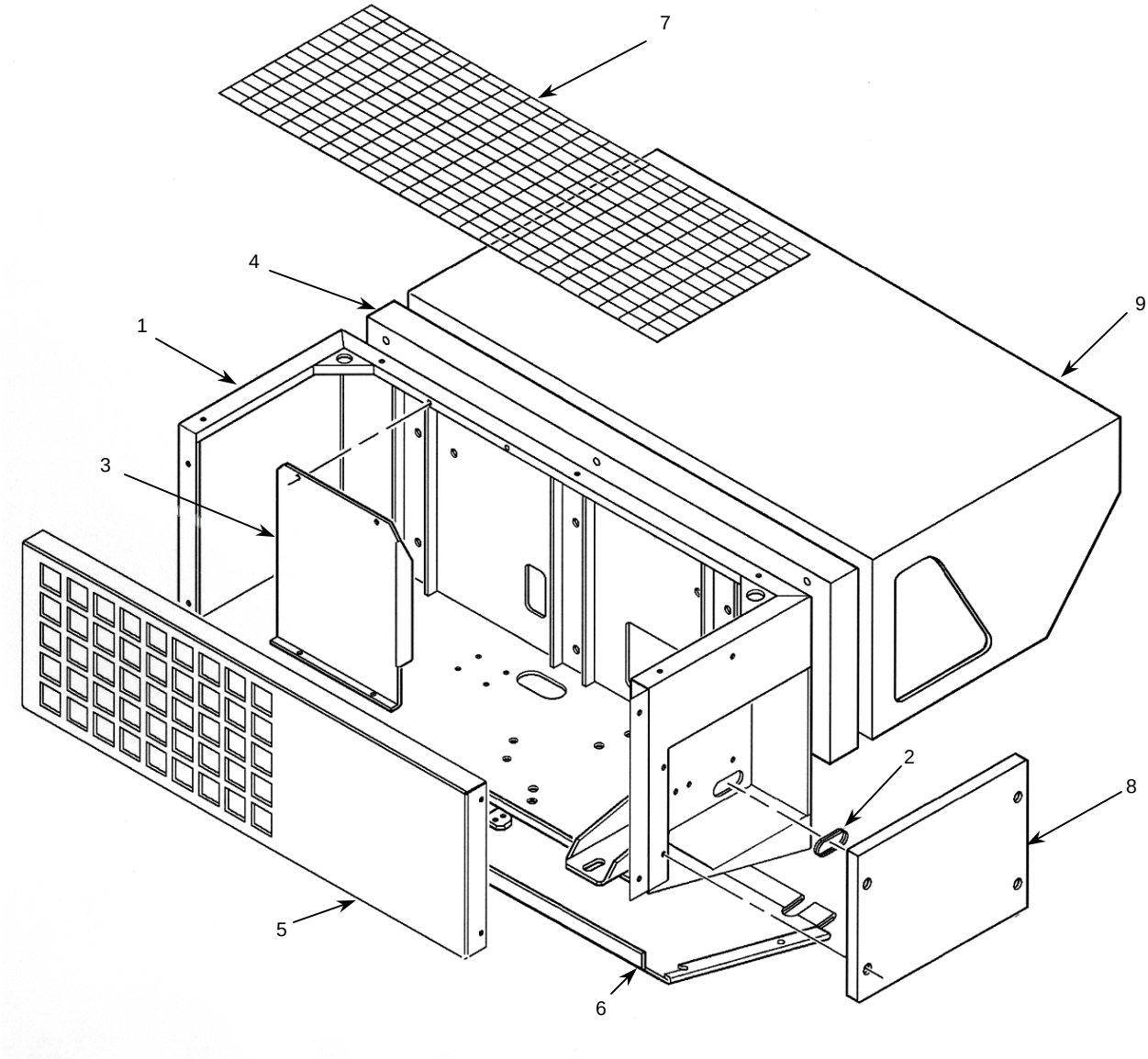


Figure 12. ADR-300 Refrigerator Enclosure Components.

(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		43904	98-5648	Frame - Condenser	1
2	XBFZZ		43904	33-2923	Grommet	5
3	XBFZZ		43904	92-101	Panel - Blockoff	1
4	XBFZZ		43904	91-9990	Bulkhead	1
5	XBFZZ		43904	98-5652	Grille - Condenser (Front)	1
6	XBFZZ		43904	98-5653	Panel - Bottom	1
7	XBFZZ		43904	98-5654	Grille - Condenser (Top)	1
8	XBFZZ		43904	98-5655	Cover - Control Box	1
9	XBFZZ		43904	98-5649	Housing - Evaporator	1
					END OF FIGURE	

END OF WORK PACKAGE

OPERATOR'S, UNIT, AND DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
NATIONAL STOCK NUMBER (NSN) INDEX

STOCK NUMBER	FIG.	ITEM
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5930-01-230-5340	4	3
4110-01-500-3614	1	2
4110-01-500-3618	1	2
4110-01-500-3621	1	1
4110-01-500-3622	1	1
5930-01-230-5340	4	3
6240-00-269-9467	4	2

END OF WORK PACKAGE

ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 4110-01-465-4564
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22-1073	7	29
33-2801	6	11
33-2923	12	2
35183-301	2	21
36098-002	4	5
41-1005	10	18
41-1028	10	14
41-1507	9	4
41-2992	11	7
41-3040	8	4
41-3091	10	16
41-3097	10	15
41-3098	8	6
41-3099	10	17
41-3134	11	9
41-3136	8	1
41-3138	6	4
41-3156	6	10
41-3156	8	14
41-3247	10	3
41-3423	9	5
41-3435	11	2
41-3438	11	5
41-3440	8	5
41-3441	8	10
41-3441	10	10
41-3442	8	11
41-3445	8	14
41-3451	10	
41-3707	10	6
41-5051	7	16
41-876	10	4
41-898	10	12
41-905	10	9
41-928	10	8
41-942	10	13
41-946	10	5
41-977	11	6
44-5703	9	6
44-8030	7	28
44-8030	8	8
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44-8064	8	7
44-9344	10	7
44-9758	10	7
44-9925	11	10

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45-1395	8	15
45-1599	8	9
45-1599	9	2
50148-126	1	2
50148-127	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
50149-120	2	1
50149-121	1	1
50149-121	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
55-9258	6	8
58400-763	2	16
58400-764	2	17
60363-002	2	3
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	15
61-1126	6	3
66-1002	7	15
66-7682	7	14
66-8471	7	12
66-9314	6	2
66-9963	6	16
66-9964	6	13
66-9965	6	15
66-9966	7	17
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81002-051	3	9
81002-051	3	10
81037-002	2	13
81083-002	2	18
81096-004	2	11
81096-006	2	12
81098-003	5	5
81099-001	2	14
82004-004	5	6
83001-004	2	19
83010-004	2	10
86025-017	2	7
86025-018	2	4
86025-019	2	5
86025-020	2	8
86025-021	2	9
86032-001	4	1
86032-002	4	4
86032-058	4	3
86035-021	2	20
86055-025	5	2
86425-002	3	8
88000-075	5	8
88000-077	5	7
88000-078	5	9
91-240	8	15
91-6408	7	13
91-6417	7	2
91-6691	11	8
91-9602	10	1
91-9613	9	3
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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

PART NUMBER	FIG.	ITEM
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91-9994	9	7
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923576	11	3
98-5648	12	1
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98-5649	12	9
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98-5651	6	7
98-5652	12	5
98-5653	12	6
98-5654	12	7
98-5655	12	8
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END OF WORK PACKAGE

ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
COMPONENTS OF END ITEM (COEI) LIST

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, identifies the stock number of the item to be used for requisitioning purposes.

Column (3), Description, CAGEC, and Part Number, 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 CAGEC (commercial and Government entity code) (in parentheses) and the part number.

Column (4), Usable on Code, 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/M (unit of measure), indicates how the item is issued for the National Stock Number shown in column (2).

Column (6), Qty Rqr, indicates the quantity required.

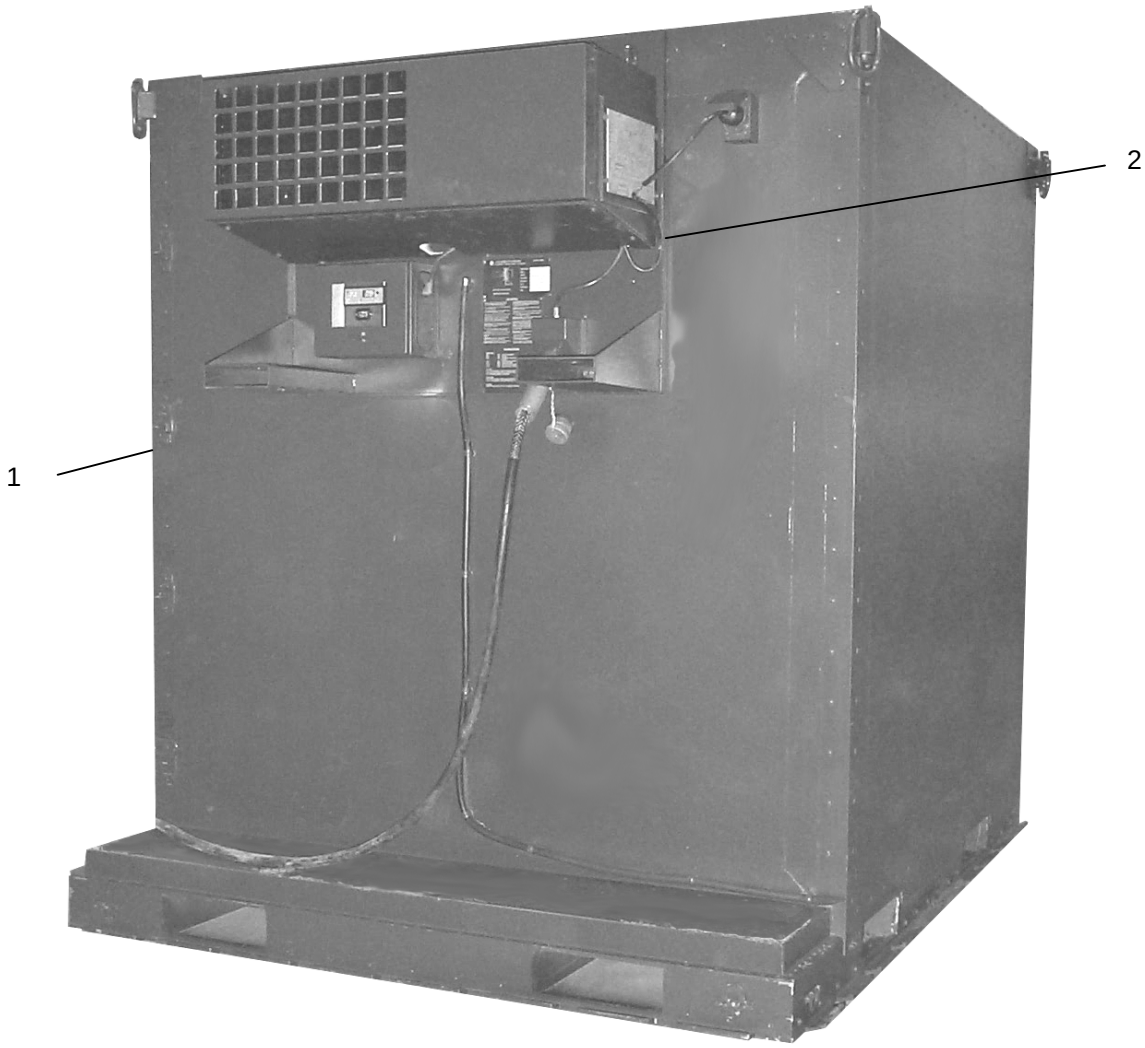
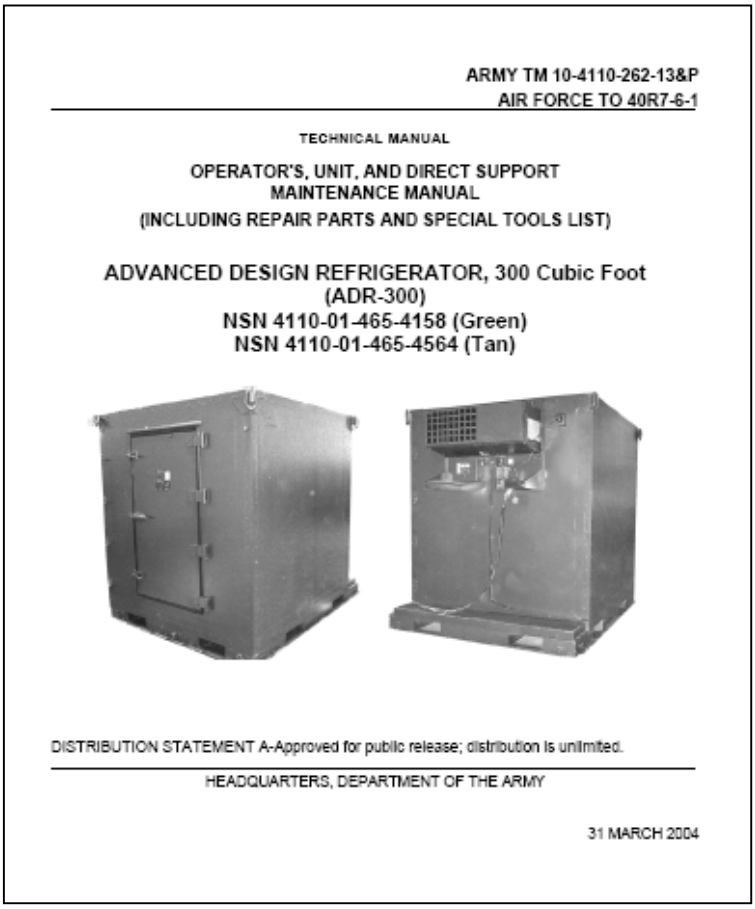


Table 1. Components of End Item.

(1) Illustration No.	(2) National Stock No.	(3) Description, CAGEC and Part Number	(4) Usable On Code	(5) Unit of Measure	(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 List.

(1) Illustration No.	(2) National Stock No.	(3) Description, CAGEC and Part Number	(4) Usable On Code	(5) Unit of Measure	(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)

4110-01-465-4158 / 4110-01-465-4564

EXPENDABLE AND DURABLE ITEMS LIST

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), or CTA 8-100, Army Medical Department Expendable/Durable Items.

Explanation of Columns in the Expendable/Durable Items List

Column (1) - Item Number. 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 23, WP 0067 00).).

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/A VIM, 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, Commercial and Government Entity Code (CAGEC), and Part Number (P/N). This column provides the other information you need to identify the item.

Column (5) - Unit of Measure (U/M). This code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc."

EXPENDABLE AND DURABLE ITEMS LIST

(1) Item No.	(2) Level	(3) National Stock Number (NSN)	(4) Item Name, Description, Commercial and Government Entity Code (CAGEC), and P/N	(5) Unit of Measure U/M
1	F		Acid Test Kit (43904) 203-346	
2	F		Adhesive (80298) 93002-033	
3	C		Anti-seize thread compound	
4	F		Body Filler	
5	F		Compressor Oil, Polyol Ester (43904) 203-413	
6	F		Conduit, Electrical, PVC, ½-inch (80298) 87092-011	
7	F		ESD Wrist Strap (43904) 204-622	
8	F		Heat transfer compound	
9	F		Isopropyl Alcohol	
10	F		Light Bulb, 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)

4110-01-465-4158 / 4110-01-465-4564

TOOL IDENTIFICATION LIST

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 Number. This number is assigned to the entry in the list and is referenced in the initial setup to identify the item (e.g., "Extractor (item 32, WP 0105 00)").

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. 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.

TOOL IDENTIFICATION LIST

Table 1. Tool Identification List.

(1) Item No.	(2) Item Name	(3) National Stock Number	(4) Part Number/CAGEC	(5) Reference
1	Disk Sander	5130-01-396-6236	7335/60933	
2	Multimeter	6625-00-914-4113		
3	Tool Kit, General Mechanics, Automotive	5180-00-177-4033		
4	Tool Kit, Organizational Maintenance, Common No. 1	4901-00-754-0654		
5	Tool Kit, Refrigeration Service	5180-00-596-1474		

END OF WORK PACKAGE

OPERATOR' S, UNIT, AND DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
MANDATORY REPLACEMENT PARTS LIST

SCOPE

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.

MANDATORY REPLACEMENT PARTS LIST

Table 1. Mandatory Replacement Parts List.

Item No.	Part Number/ CAGEC	NSN	Nomenclature	QTY
1	66-8471 / 43904		Dehydrator	1

END OF WORK PACKAGE

OPERATOR' S, UNIT, AND DIRECT SUPPORT MAINTENANCE
ADVANCED DESIGN REFRIGERATOR, 300 CUBIC FOOT (ADR-300)
4110-01-465-4158 / 4110-01-465-4564
SUPPORT ITEMS

Support Items required for the ADR-300 are listed in Work Packages 0067 00 – 0070 00.

END OF WORK PACKAGE

GLOSSARY

Term	Definition
Advanced Design Refrigerator	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.
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 PC board.
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.
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.
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.
PC Board	The printed circuit board housed in the RU electrical enclosure. The ADR-300 PC board provides most of the control circuit signals to the ADR-300.
Pilot Light	A small light that, when illuminated, indicates a specific system condition. The ADR-300 pilot light, mounted on the container exterior, near the door, indicates that the interior light is turned on.
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
Solenoid Valve	A valve that is opened or closed on the basis of an electric control signal or voltage. The ADR-300 uses a solenoid valve to direct the flow of refrigerant during the defrost cycle.
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	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)
4110-01-465-4158 / 4110-01-165-4564
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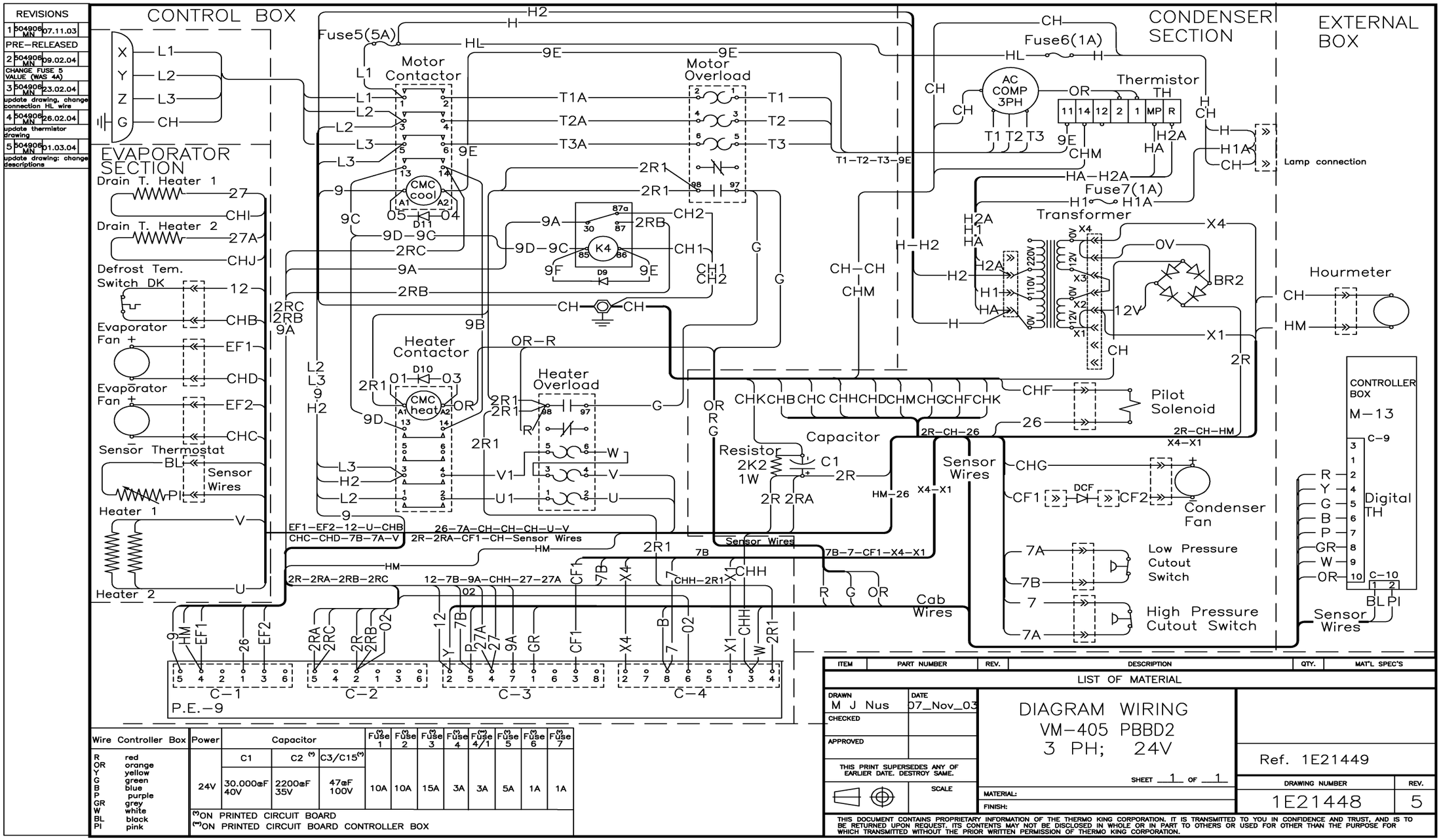
END OF WORK PACKAGE



Wire	Controller Box
R	red
OR	orange
Y	yellow
G	green
B	blue
P	purple
GR	grey
W	white
BL	black
PI	pink

Power	Capacitor			Fuse 1	Fuse 2	Fuse 3	Fuse 4	Fuse 4/1	Fuse 5	Fuse 6	Fuse 7
	C1	C2 (*)	C3/C15(*)								
24V	30.000µF 40V	2200µF 35V	47µF 100V	10A	10A	15A	3A	3A	5A	1A	1A

(*)ON PRINTED CIRCUIT BOARD
(**)ON PRINTED CIRCUIT BOARD CONTROLLER BOX

ITEM	PART NUMBER	REV.	DESCRIPTION	QTY.	MAT'L SPEC'S

LIST OF MATERIAL

DRAWN	DATE
M J Nus	07_Nov_03
CHECKED	
APPROVED	

THIS PRINT SUPERSEDES ANY OF EARLIER DATE. DESTROY SAME.

SCALE

MATERIAL:

FINISH:

DIAGRAM WIRING
VM-405 PBBD2
3 PH; 24V

SHEET 1 OF 1

Ref. 1E21449

DRAWING NUMBER	REV.
1E21448	5

Figure 1. Wiring Diagram.

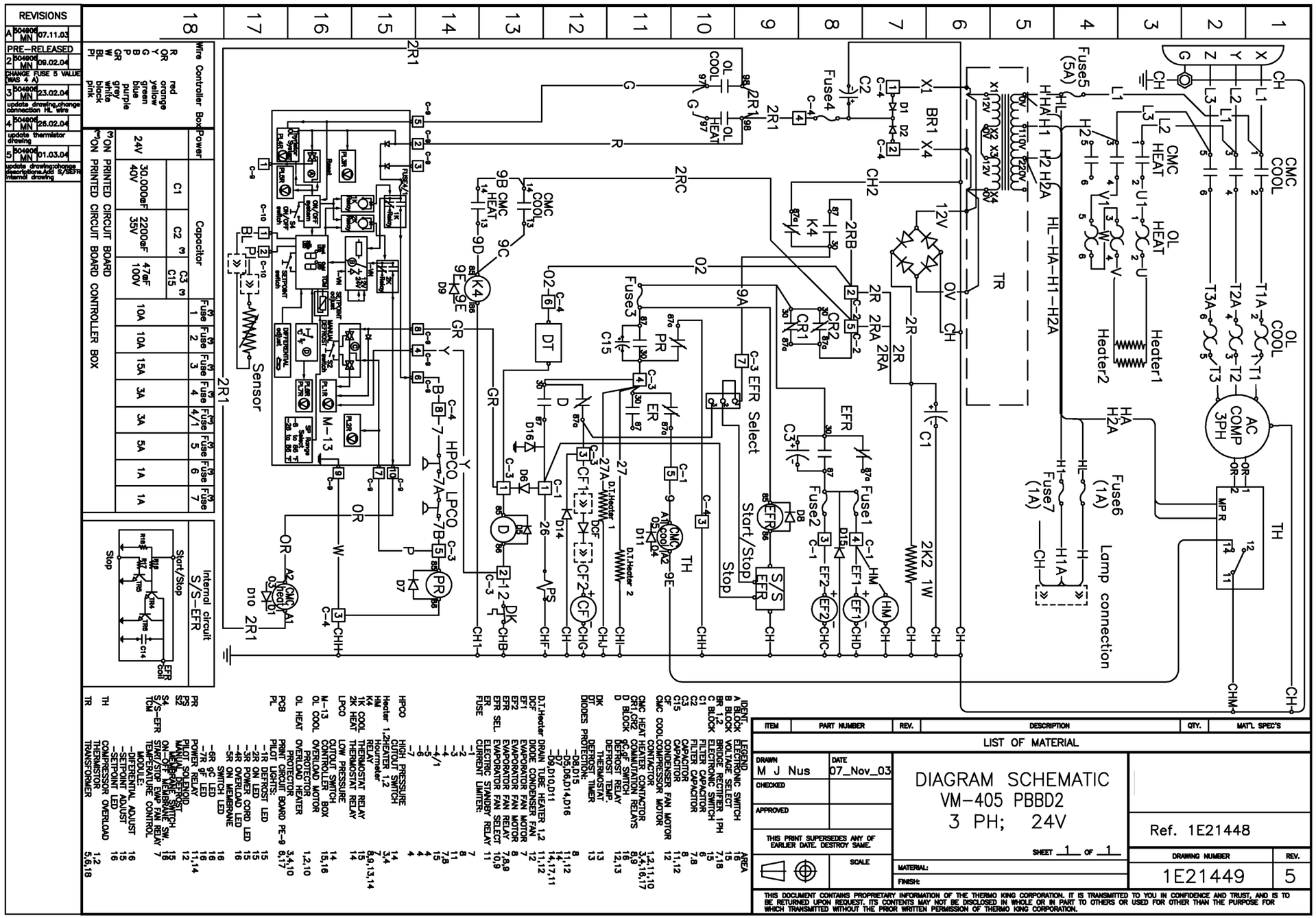


Figure 2. Schematic Diagram.

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:	

Figure 3. PC Board.

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

PETER J. SCHOOMAKER
General, United States Army
Chief of Staff

Official:

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
0406412

JOHN P. JUMPER
GENERAL, USAF
Chief of Staff

Official:
LESTER L. LYLES
General, USAF
Command, AFMC

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: amssbriml@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. Publication Date: 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
U.S. ARMY TANK-AUTOMOTIVE AND ARMAMENT COMMAND
ATTN: AMSTA LC-CECT
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 U.S. ARMY TANK-AUTOMOTIVE AND ARMAMENT COMMAND ATTN: AMSTA LC-CECT 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

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 U.S. Army Tank-automotive and Armament Command ATTN: AMSTA-LC-CECT 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	31 March 2004	Operator's, Unit, and Direct Support Maintenance Manual (Including Repair Parts and Special Tools List) 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 U.S. Army Tank-automotive and Armament Command ATTN: AMSTA-LC-CECT Kansas Street, Natick, MA 01760-5052.		

PART II – REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE
TM 10-4110-262-13&P	31 March 2004	Operator's, Unit, and Direct Support Maintenance Manual (Including Repair Parts and Special Tools List) Advanced Design Refrigerator, 300 Cubic Foot (ADR-300)

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 U.S. Army Tank-automotive and Armament Command ATTN: AMSTA-LC-CECT 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

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Commander U.S. Army Tank-automotive and Armament Command ATTN: AMSTA-LC-CECT Kansas Street, Natick, MA 01760-5052.		

PART II – REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

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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

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 = 32.8 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 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigrams = .035 ounce
1 dekagram = 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 = .155 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	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	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