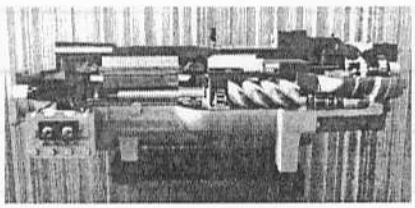
Trane Company

RTAA

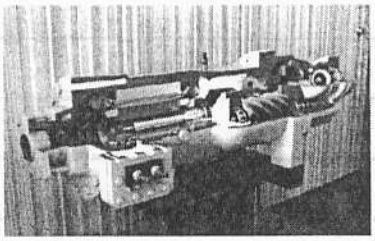
The Trane Model RTAA
Air-Cooled/Water Cooled
Rotary Liquid Chillers

HELIROTOR™ COMPRESSORS
Intermediate



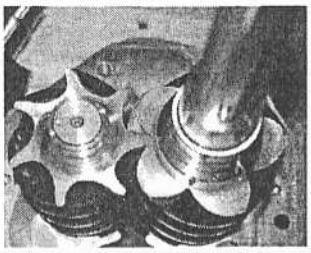
- Heart of RTAA
- 2, 3 Or 4 Compressors
- 99.5% Reliability

HELIROTOR™ COMPRESSORS
Intermediate



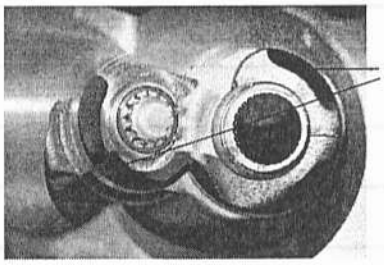
- RTAA-130 - 400
- 70 Ton
- 85 & 100 Ton
- Variable Load/Unload
- Gas Cooled Motor

HELIROTOR™ COMPRESSORS
Rotors



- Matched Pair
  - 1990-1996
- .0025 Rotor to Rotor
- .0060 Rotor to Bore
- Male - 5 Lobes
  - Motor Driven
- Female - 7 Cavities
  - Male Driven
- 3450 RPM

HELIROTOR™ COMPRESSORS
Suction Phase

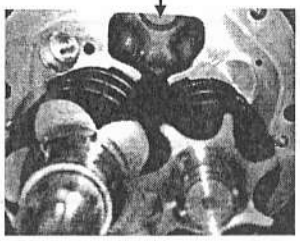


HELIROTOR™ COMPRESSORS
Discharge Phase

HELIROTOR™ COMPRESSORS

Discharge Phase

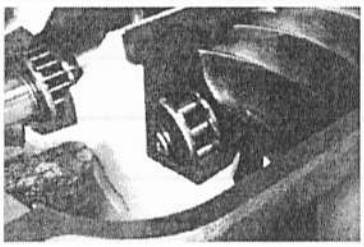
Discharge Port



HELIROTOR™ COMPRESSORS

Intermediate

Bearings

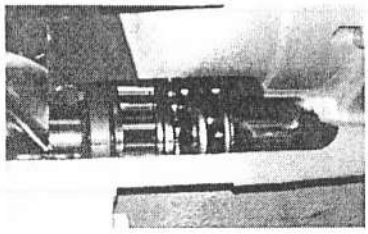


- 9 Bearings
- 2 in Suction End
- Low Friction
- Modest Oil Requirements
- Roller Bearings For Radial Thrust
- Pressed Fit

HELIROTOR™ COMPRESSORS

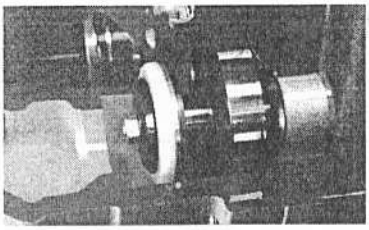
Intermediate

Bearings



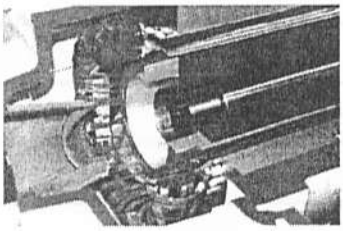
- 7 in Discharge End
- Low Friction
- Roller Bearings For Radial Thrust
- Ball Bearings For Axial Thrust

DISCHARGE CHECK VALVE
Intermediate



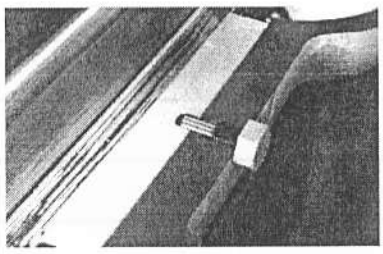
- Pressure Operated
- Prevents Backwards Free Wheeling
- Prevents Slugging

MOTOR ROTOR BOLT AND KEY



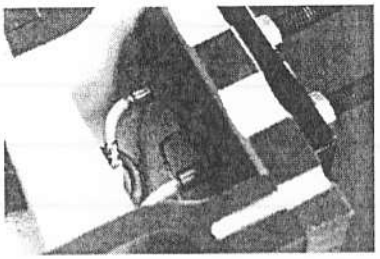
- Motor Construction
  - 3 Phase 2 Pole
  - X-Line
  - Y Delta
    - 130 - 200 Ton
  - Rotor Bolt And Keyed
- Motor Protection
  - 3 Winding Stats
  - Opens At 221° F
- Suction Strainer

STATOR BOLT



- Stator Bolt
- Stator Megging

MOTOR TERMINAL BOARD
Intermediate

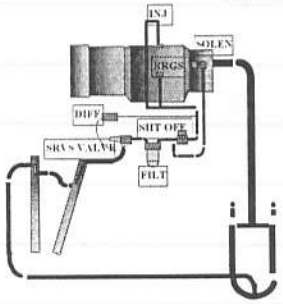


- Six Lead Motor
- Winding Stat Wires
- Two Piece Insulators
  - Can Be Repaired
- Inspect Periodically

HELIROTOR™ COMPRESSORS
Concerns

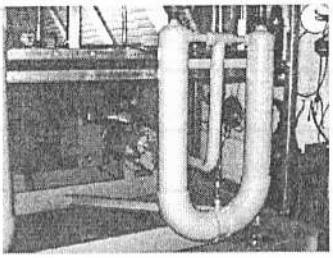
- Running into a Vacuum
- Proper Phasing
- Slugging
- Oil Loss
- Refrigerant Loss

OIL DISTRIBUTION SYSTEM
130 - 400 TON



- Compressor
- Oil Separator
- Oil Cooler Circuits
- Manual Service Valve
- 5 Micron Oil Filter
- Oil Shut Off Solenoid
- Bearing Lubrication
- Oil Injection with Check Valve
- Load/Unload Solenoids
- Differential Pressure Switch

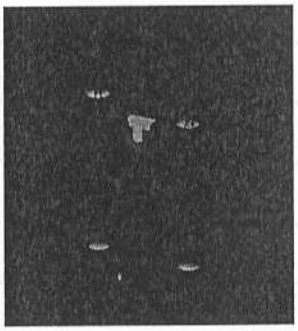
U-TUBE OIL SEPARATOR



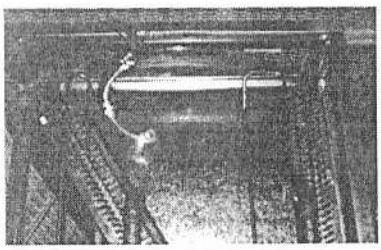
- One Separator Per Compressor
- Acts As An Oil Sump
- Maintains An Oil Level

U-TUBE OIL SEPARATOR

Top View

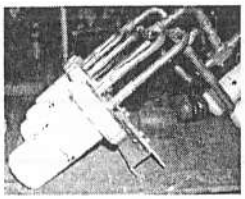


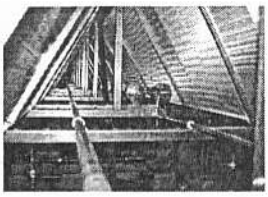
OIL COOLING CIRCUIT



- Integral to Condenser
- Oil Cooler Traps

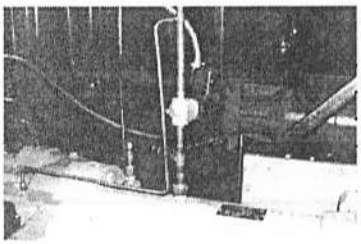
5 MICRON OIL FILTER
130 - 400





- Change After New System Start
- Isolation Valves

COMPRESSOR OIL DISTRIBUTION
INTERMEDIATE

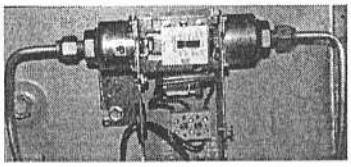


Bearings
Rotor Injection
Load Solenoid
DP Switch

RTAA OIL REQUIREMENTS

- Factory Oil Charged
  - OIL- 31
- Gallons On Nameplate
- OIL - 15 Is The Service Oil
- Testing
  - Acid Test Kit
  - Oil Analysis
- Remote Evaporator
  - Proper Piping

COMPRESSOR OIL PROTECTION
INTERMEDIATE

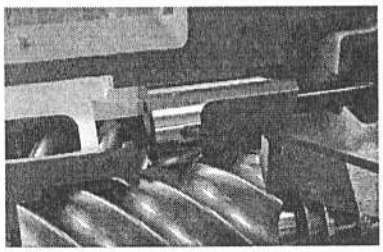


DP Switch
- Trips @ 50 PSID
- Monitors
  - Master Oil Solenoid
  - Oil Filter
  - Shut off Valve

LOAD/UNLOAD SOLENOIDS
INTERMEDIATE

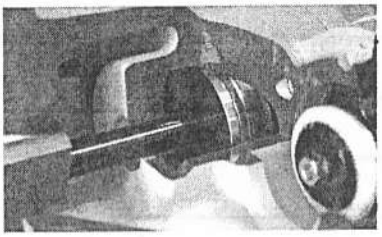
- Oil Inputs to Load

HELIROTOR™ COMPRESSORS
Intermediate



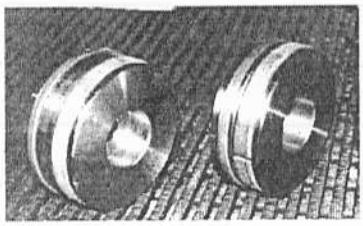
- SLIDE VALVE
  - –Hydraulically Controlled
  - –Unload Down to 25%

HELIROTOR™ COMPRESSORS
Intermediate



- Unloader Piston
  - Wear Ring
  - Compression Ring

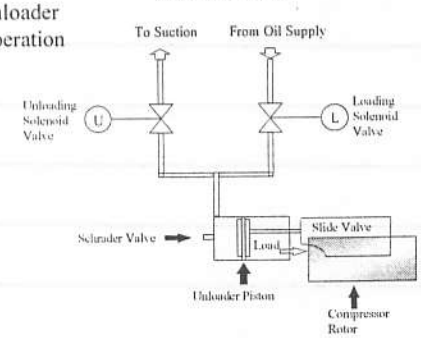
HELIROTOR™ COMPRESSORS
Intermediate



- Unloader Piston
- 85, 100 Ton

HELIROTOR™ COMPRESSORS
Intermediate

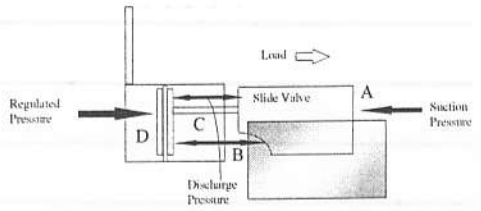
- Unloader Operation



HELIROTOR™ COMPRESSORS

Intermediate

Unloader Operation

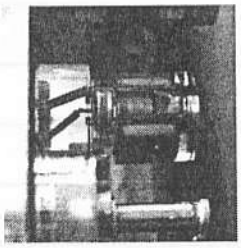


SLIDE VALVE OPERATION AND TROUBLESHOOTING

Oil Supply Is Tapped from Oil Supply Line

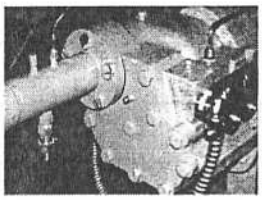
20 to 30 psig Below Discharge Pressure

SLIDE VALVE TROUBLESHOOTING



- Coils are 110 Volt
- During Start-up & Shutdown
  - Unload is Energized Continuously
- During Operation, Coils Are Pulsed
  - 40 to 400 Milliseconds Once Every 10 Seconds
- Insure the Valves are Electrically Correct Before Proceeding

SLIDE VALVE TROUBLESHOOTING



Connect a Gauge to the Schrader Valve and Start the Compressor

Apply Power to the Load Solenoid Valve

Pressure Should Rise to Within 20 to 30 psig of Discharge Pressure

SLIDE VALVE TROUBLESHOOTING

- If Pressure Fails to Rise, Suspect:
  - Clogged Oil Filter
  - Plugged Load Solenoid Valve
  - Leaking Unload Solenoid Valve
    - » (Verify there is No Unload Signal)
- Disconnect Power from Both Valve Coils
- Pressure Should Maintain
- If Pressure Drops, Suspect:
  - Leaking Unload Solenoid Valve

SLIDE TROUBLESHOOTING

- Energize Unload Valve
  - Until Pressure Drops
  - Between Suction and Condenser Pressures
- Disconnect Power from Both Valve Coils
  - Pressure Should Maintain
- If Pressure Rises, Suspect:
  - Leaking Load Solenoid Valve
- If Pressure Drops, Suspect:
  - Leaking Unload Solenoid Valve

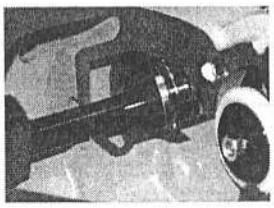
SLIDE VALVE TROUBLESHOOTING

- Apply Constant Power to the Unload Solenoid
- Pressure Should Drop to Suction Pressure
- If Pressure Does Not Drop, Suspect:
  - Plugged Unload Solenoid Valve
  - Leaking Load Solenoid Valve

SLIDE VALVE TROUBLESHOOTING

- To Verify a Leaking Solenoid Valve, a Piece of Shim Stock May be Placed Between the Valve and Gasket
- To Verify a Plugged Solenoid Valve, Valve Replacement Is Required

SLIDE VALVE TROUBLESHOOTING

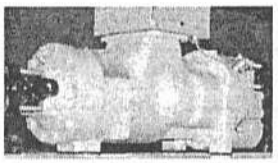


- If Solenoid Valves Operate But Motor Amperage Fails to Rise or Fall, Slide Valve Piston Could Be Hesitant to Move
  - Most Likely to Happen
    - On New Start-Up
    - After Extended Shut-Down

SLIDE VALVE TROUBLESHOOTING

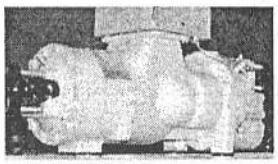
- Disconnect Wiring to Several Condenser Fans
  - Builds Up Oil Pressure
- Use Gauge Set to Apply Extra Pressure
  - Gain 20 to 30 Lbs
- Isolate the Compressor. Relieve Pressure Down to 2psi
  - Use a Smooth Rod Through the Schrader Port to Move the Piston

HELIROTOR™ COMPRESSORS
General Purpose



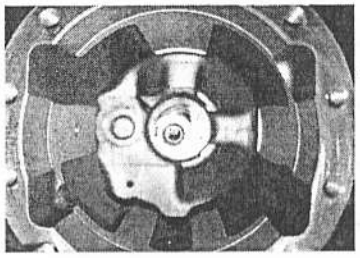
- Heart of RTAA/RTWA
- 99.5% Reliability

HELIROTOR™ COMPRESSORS
General Purpose



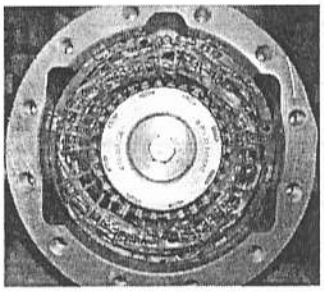
- RTAA/RTWA/RTUA
  - 70 - 125 Ton
  - 35, 40 Ton
  - 50, 60 Ton
  - Variable & Step Unloading
  - Gas Cooled Motor

HELIROTOR™ COMPRESSORS
General Purpose



- Motor Housing
  - Male Rotor Shaft
  - Female Rotor
    - Bore/Bearing

HELIROTOR™ COMPRESSORS
General Purpose



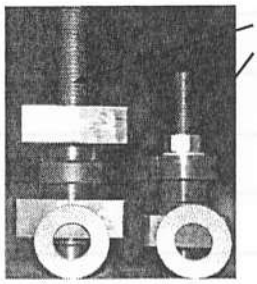
- Motor Construction
  - 3 Phase 2 Pole
  - X-Line
  - Y Delta
  - Rotor Bolt And Keyed
- Motor Protection
  - 3 Winding Stats
  - Open At 221° F

MOTOR TERMINAL BOARD
General Purpose

Six Lead Motor
Winding Stat Wires
Two Piece Insulators
- Can Be Repaired

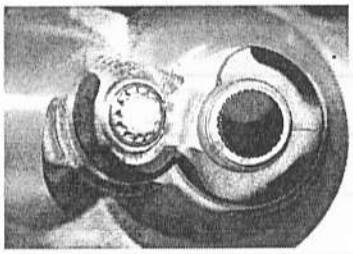
Inspect Periodically

MOTOR TERMINALS



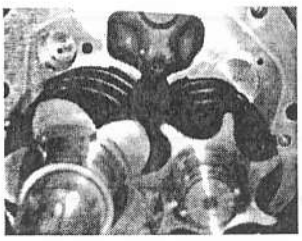
- Intermediate
- General Purpose (Old Style)
  - O-Ring Compression
  - Leak Check

HELIROTOR™ COMPRESSORS
General Purpose



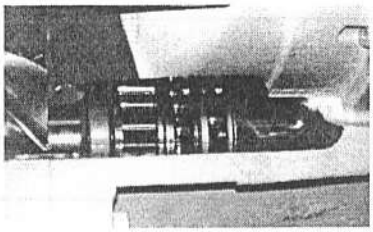
- Rotor Housing
  - Bore
  - Bearings

HELIROTOR™ COMPRESSORS
General Purpose



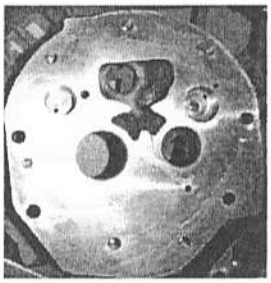
- Bearing Head

HELIROTOR™ COMPRESSORS
General Purpose



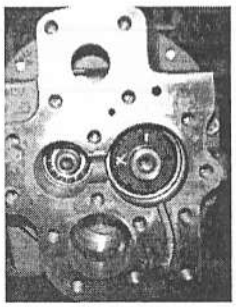
- Discharge End
- Low Friction
- Roller Bearings For Radial Thrust
- Ball Bearings For Axial Thrust

HELIROTOR™ COMPRESSORS
General Purpose



- Bearing Head
- Discharge Port
- Unloaders Housings

HELIROTOR™ COMPRESSORS
General Purpose



- Bearing Head
  - Bearing Locks
  - Oil Filter Housing
  - Discharge Service Valve

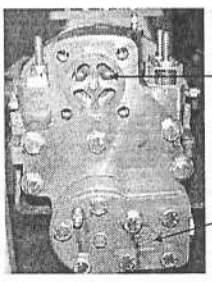
HELIROTOR™ COMPRESSORS
General Purpose

- Bearing Locks
  - Allows Proper Adjustment of Rotor to Housing Clearances
  - Locks Bearings In Place

HELIROTOR™ COMPRESSORS
General Purpose

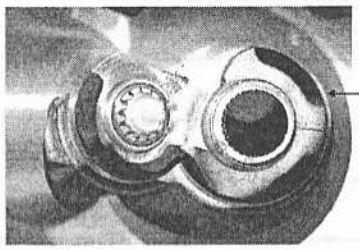
- Bearing Head End Plate
- Oil Filter

HELIROTOR™ COMPRESSORS
General Purpose



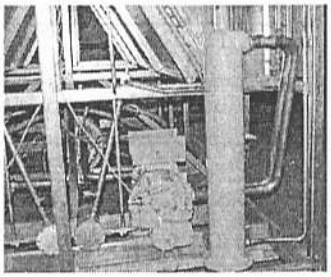
- Discharge Check Valve
  - Pressure Operated
  - Prevents Backwards Free Wheeling
  - Prevents Slugging
- Oil Filter Housing Cover

HELIROTOR™ COMPRESSORS
General Purpose



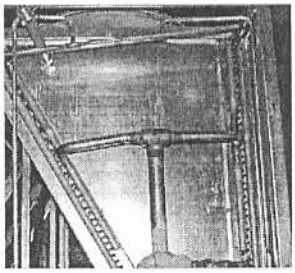
- Housing Casting Variation For Different Compressor Tonnages

RTAA OIL DISTRIBUTION SYSTEM
70 - 125



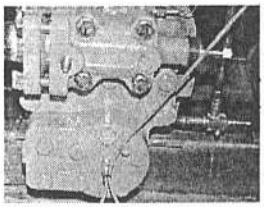
- Cylinder Oil Separator
  - Oil Pick Up Tube

RTAA
OIL DISTRIBUTION SYSTEM
70 - 125



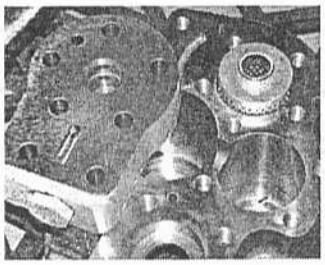
- Oil Cooler Circuit

RTAA OIL DISTRIBUTION SYSTEM
70 - 125



- Oil Entering Housing
- Oil Shutoff Valve

COMPRESSOR OIL DISTRIBUTION
General Purpose

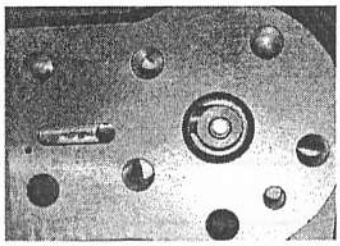


- Oil Filter
  - Housing
- Housing Cover
  - Master Oil Valve

COMPRESSOR OIL DISTRIBUTION
General Purpose

- Oil Filter
  - Changeout Procedure

COMPRESSOR OIL DISTRIBUTION
General Purpose

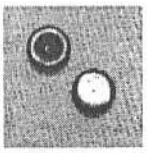


- Master Oil Valve Chamber
- Discharge Pressure Actuation Gas Passage
- Schrader Bore

COMPRESSOR OIL DISTRIBUTION
General Purpose

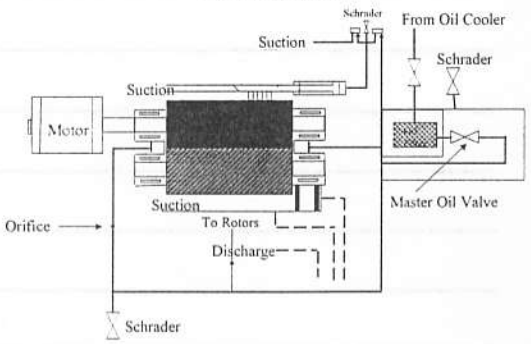
- Master Oil Valve
  - Discharge Pressure Actuated
  - One Way Valve

COMPRESSOR OIL DISTRIBUTION
General Purpose

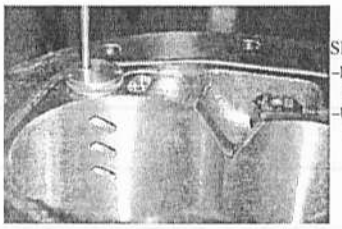


- Oil Orifices
  - Injection Ports
  - Load/Unload Solenoids

COMPRESSOR OIL DISTRIBUTION
General Purpose

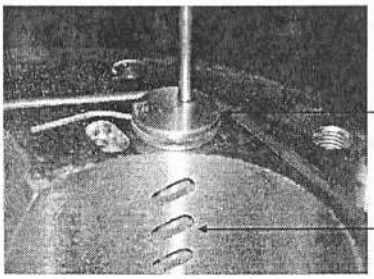


HELIROTOR™ COMPRESSORS
General Purpose

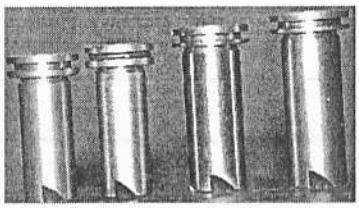


SLIDE VALVE
- Hydraulically Controlled
- Unload Down to 25%

HELIROTOR™ COMPRESSORS
General Purpose



HELIROTOR™ COMPRESSORS
General Purpose
Slide Valves

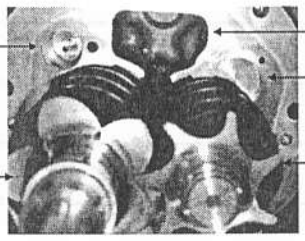


35 Ton 40 Ton 50 Ton 60 Ton

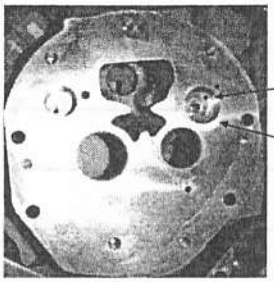
HELIROTOR™ COMPRESSORS
General Purpose

- Female Unloader
  - Step
  - Ist to Load
  - Last to Unload

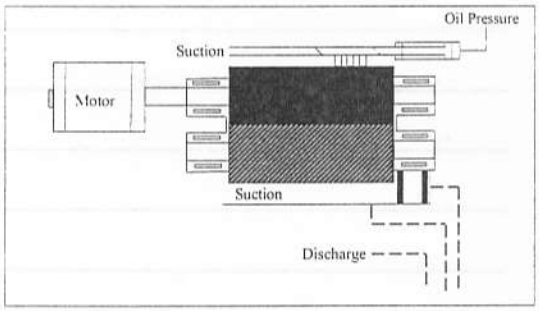
HELIROTOR™ COMPRESSORS
General Purpose



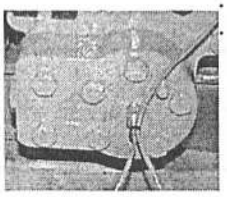
HELIROTOR™ COMPRESSORS
General Purpose



HELIROTOR™ COMPRESSORS
General Purpose
Unloader Operation



COMPRESSOR OIL DISTRIBUTION
General Purpose



- High Oil Temp Protection
- Oil Flow Protection
  - Oil Temperature Sensor
  - Compares Oil Temp to Condensing Temp
  - CMR if 4*F Below Condensing for 30"

CONDENSER FAN MOTOR
130 - 400

- 3 Phase
- Direct Drive
- Vertical Discharge
- 1.5 Horse Power
- 1140 Revolutions Per Minute
- Fan Control =
  - Cond. PSIG - Evap. PSIG
  - Cond. Temp

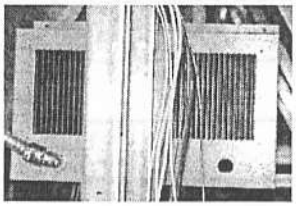
CONDENSER FAN MOTORS

- New Design
  - Longer Housing
  - Doubled Dipped Windings
  - Coastal Applications Failures

Saturated Condenser Temperature Sensor

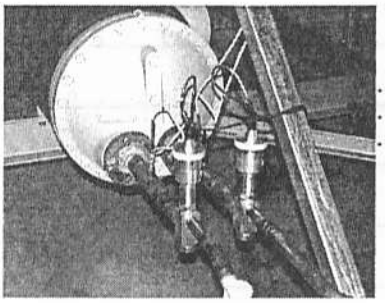
- Ref. RTAA-SB-12

Variable Frequency Drive



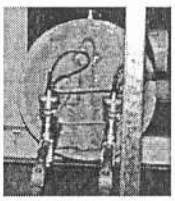
- Standard on 70-125 Units
- 1st Fan in each Circuit
- Non Programmable
  - Enable/Disable in Menu
  - Disabled-fan off always
- 20 - 60 HZ

ELECTRONIC EXPANSION VALVE



- Fast Response
- Stable Operation
- Eliminates Hunting

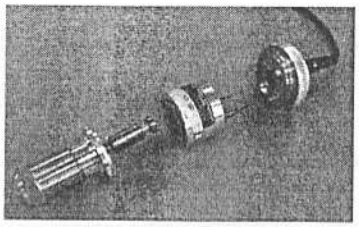
SPORLAN VALVES



- Two Models
  - SEO 70
  - SEO 100
- Driven By A Step Motor
- 24 Volt 3 Phase
- .25" Valve Stroke
- 1 Valve Per Compressor

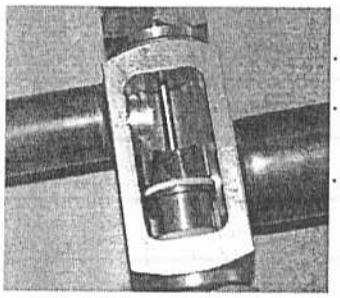
Note

SPORLAN EXV



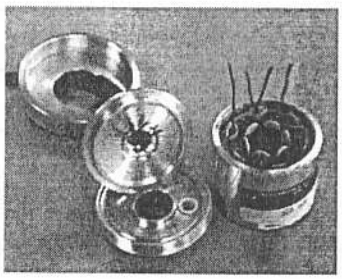
- Field Repairable
- Periodically Leak Check

SPORLAN EXV



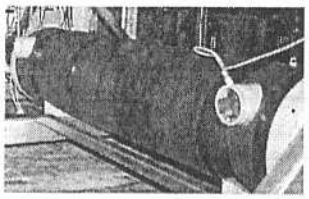
- Same As Standard Valves
- Valve Shape Provides Linear Flow
  - 1/2 Open = 1/2 Flow
- This Part Fully Repairable

SPORLAN EXV MOTOR



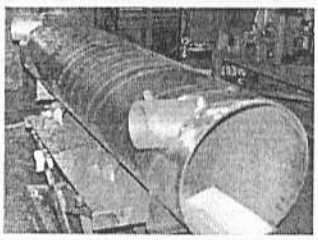
- Four Wires
- Epoxy Sealed Motor Windings
- Motor Assembly Can Be Replaced

EVAPORATOR

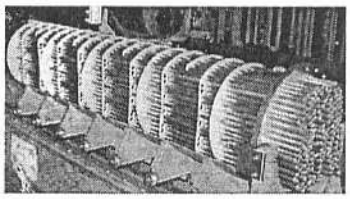


- Tube In Shell Design
- Internally Enhanced Tubing
- Freeze Protected Down to -20 F

EVAPORATOR
Raw Shell

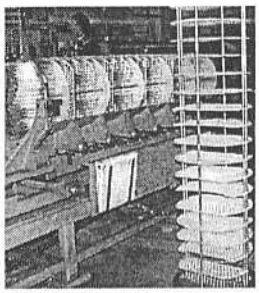


EVAPORATOR
Tube Bundle

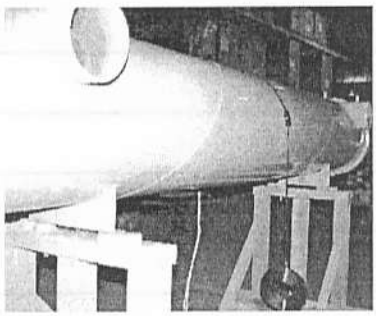


- Water Flow Characteristics
- Water Flow Calculations

EVAPORATOR
Tube Sheets



EVAPORATOR
Shell Heater



IF EVAPORATOR CLEANING IS REQUIRED

- Water System Is Closed Loop
- First Attempt to Dislodge Material by Back Flushing the System
- If Unsuccessful, Chemically Clean the Evaporator
- Keep All Strainers Clean

CAUTION:

- Do Not Use an Acid Type Cleaning Agent that Will
  Damage Steel, Galvanized Steel, Polypropylene, or
  Internal Copper Components

WATER SYSTEM FLOW RATES

- Below Minimum Values
  - Laminar/Lazy Flow
  - Loss of Heat Transfer
  - Loss of EXV Control
  - Nuisance Low Temp Cutouts
- Above Maximum Values
  - Tube Erosion
  - Damage to Tube Supports and Baffles

WATER SYSTEM PRESSURE DROP

- Use Field Installed Pressure Taps
- Use the Same Gauge
- Do Not Include Valves, Strainers or Fittings
- Refer to Pressure Drop Chart to Determine Water Flow

RTAA ICE MAKING

- Must Be Enabled in Menu
- Customer Installed Contact Initiates Ice Making Mode
- Unit Runs Fully Loaded
- Terminated When Contacts Open or Setpoint is Satisfied