MIDSTATES
REFRIGERATION
SUPPLY

MRS Modular Refrigeration Systems

R-454C Low-Charge Refrigeration Solutions

midstatesrefrigsupply.com

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About Mid States Refrigeration Supply

With over 30 years of experience in the refrigeration industry, Mid States Refrigeration Supply has built a reputation for reliability, expertise, and exceptional customer service.

As a trusted partner to contractors, technicians, and businesses across the region, we offer an extensive inventory of industrial
refrigeration and HVAC supplies, parts, and equipment to keep your operations running smoothly. Our knowledgeable team brings decades of hands-on industry experience to every interaction, ensuring you get the right products and solutions — when you need them most.

At Mid States Refrigeration Supply, we're more than a supplier; we're a partner you can count on.

Built for Industry.
Engineered to Perform.

R-454C Low-Charge Refrigeration Solutions

Mid-States Refrigeration Supply (MRS) provides modular industrial refrigeration systems utilizing R-454C refrigerant, engineered for reliability, efficiency, and simplified installation for modern cold storage and food processing facilities.

These systems integrate industrial screw compressors, advanced PLC automation, and high-efficiency condenser technology to deliver dependable refrigeration performance across freezer and cooler applications.

MRS refrigeration modules are designed for outdoor installation and provide a compact refrigeration plant solution suitable for distribution centers, food plants, and refrigerated warehouses.

Typical Applications

- Cold Storage Warehouses
- Refrigerated Distribution Centers
- Food Processing Facilities
- Blast Freezing Operations
- Multi-Temperature Refrigeration Plants

System Design Conditions

Refrigerant: R-454C

Evaporation Temperatures

Freezer (Low Temp): -20°F SST
Cooler (Medium Temp): +20°F SST

Ambient Operating Range

-20°F to 95°F

DX evaporators with electric defrost are typically used with these systems.

Modular Refrigeration System Architecture

Typical system flow:

Compressor ⇢ Oil Management ⇢ Condenser ⇢ Receiver ⇢ Expansion ⇢ Evaporators ⇢ Return Suction ⇢ Compressor

Integrated components include:

- Frascold semi-hermetic screw compressors
- Oil separation and oil management systems
- Liquid receiver and refrigerant circuit components
- Expansion control systems
- PLC automation and monitoring

Structural Construction

Base / Frame

- Heavy-duty carbon steel frame
- Integrated condenser stand
- Insulated embossed aluminum enclosure panels
- Service man door
- Interior lighting
- Equipment heaters and ventilation
- Refrigerant leak detection system

This enclosure protects refrigeration equipment while allowing safe service access.

Refrigerant Circuit

Integrated refrigeration components include:

- Oil separator with heating, cooling, filtration, and level control
- Suction accumulator
- Economizer (low temperature systems)
- Liquid line solenoid valves
- Filter-drier and moisture indicator
- Dual pressure relief valves with manual switchover
- Pressure transmitters and RTDs
- Low pressure safety (manual reset)
- High pressure safety (manual reset)
- Service access ports on high and low sides

These components ensure safe and reliable system operation.

Compressor Technology

MRS refrigeration systems utilize Frascold semi-hermetic screw compressors designed for industrial refrigeration duty.

Low Temperature Compressors

Frascold FVR-L Series

Medium Temperature Compressors

Frascold FVR-H Series

Compressor Capacity Control

- Variable Frequency Drive (VFD)
- Compressor staging
- Slide valve modulation
- Modulating hot gas bypass

This multi-layer control strategy allows the refrigeration system to respond efficiently to changing loads while maintaining stable suction conditions.

Condensing Options

Air-Cooled Condensers

Standard systems utilize a dry air-cooled condenser mounted on the refrigeration skid.

Features include:

- Aluminum fin / copper tube heat exchanger
- EC propeller fan motors
- Common condenser serving LT and MT circuits
- Designed for 95°F ambient temperature

Low ambient controls allow system operation down to -20°F outdoor temperature.

Adiabatic Condensing Option

Adiabatic condensers provide a hybrid approach between dry air-cooled and evaporative condensing systems.

Operating Concept

- Air-cooled operation during moderate weather
- Water-assisted cooling during high ambient temperatures
- Evaporative media reduces entering air temperature

Advantages

- Lower compressor power consumption during peak temperatures
- Improved system efficiency during summer conditions
- Reduced water consumption compared to evaporative condensers
- Ideal for facilities with high ambient temperatures but limited water availability

Evaporator Integration

Evaporator coils and fans are typically supplied separately and integrated with the refrigeration system.

Typical configurations include:

- DX evaporators
- Electric defrost evaporators
- EC fan evaporators

These evaporators serve freezer rooms, cooler rooms, and blast freezer environments.

Advanced Evaporator Controls

EC Fan Motor Control

Electronically Commutated fan motors provide efficient airflow control.

Features:

- Variable fan speed modulation
- Reduced electrical consumption
- Lower heat load in refrigerated spaces
- Quiet operation
- Soft-start motor operation

Defrost Control Options

Electric Defrost

- Simple and reliable defrost method
- Ideal for medium temperature cooler applications

Hot Gas Defrost

- Fast defrost cycles
- Reduced electrical energy consumption
- Ideal for freezer evaporators

Demand Defrost

- Defrost cycles initiated only when required
- Reduced energy consumption
- Improved product temperature stability

Integrated Evaporator Management

The PLC system coordinates evaporator operation with the refrigeration plant.

Control capabilities include:

- EC fan speed control
- Defrost scheduling and sequencing
- Temperature monitoring and alarms
- System optimization across multiple evaporators

Electrical System

Electrical design includes:

- 460V / 3 Phase / 60Hz power supply
- 115V control voltage
- NEMA 4 electrical enclosures
- Through-the-door disconnect
- Motor and safety controls
- Evaporator fan contactors
- Alarm beacon
- Emergency stop
- IEC finger-safe components
- 5kA SCCR rating

PLC Automation & Monitoring

Each system includes an industrial PLC platform.

Control System

- Allen-Bradley CompactLogix PLC
- Ethernet/IP communications
- 10" Maple Systems HMI touchscreen

Monitoring Functions

- Compressor suction pressure and temperature
- Superheat and refrigerant conditions
- Compressor discharge pressure
- Liquid refrigerant temperature and subcooling
- Compressor status and runtime tracking

Operators receive full visibility into refrigeration system performance.

Partner with Us for a Smarter Refrigeration Solution

At MRS, we combine engineering expertise, industry-leading components, and a customer-first approach to deliver a refrigeration system that truly fits your needs—not just what fits in a catalog.

Let's Build Your Custom System Today!

Refrigeration System Selection Charts

The following systems represent standard configurations available for R-454C modular refrigeration plants.

Low Temperature Freezer Systems (-20°F SST)

Model	Capacity (Ton)	Compressors (LT / MT)	Total Compressor Power (BHP)	Heat of Rejection (kBTU/hr)
LTA-60T(-20F)-R454C-DX	60	2 / 0	216	1155
LTA-90T(-20F)-R454C-DX	90	2 / 0	326	1740
LTA-120T(-20F)-R454C-DX	120	2 / 0	442	2304
LTA-180T(-20F)-D-R454C-DX	180	4 / 0	653	3482
LTA-240T(-20F)-D-R454C-DX	240	4 / 0	883	4610

Medium Temperature Cooler Systems (+20°F SST)

Model	Capacity (Ton)	Compressors (LT / MT)	Total Compressor Power (BHP)	Heat of Rejection (kBTU/hr)
LTA-60T(20F)-R454C-DX	60	0	123	1035
LTA-90T(20F)-R454C-DX	90	0	175	1526
LTA-120T(20F)-R454C-DX	120	0	239	2045
LTA-180T(20F)-R454C-DX	180	0	350	3058
LTA-240T(20F)-R454C-DX	240	0	465	4080

Condenser Fans	Condenser Fan Power (HP)	COP	Estimated Evap Fans	Total FLA (Amps)
5 Flat	22	1.19	6	382
8 Flat	35	1.17	9	566
10 Flat	44	1.17	12	715
14 V-Coil	44	1.22	18	1100
18 V-Coil	57	1.20	24	1391

Condenser Fans	Condenser Fan Power (HP)	COP	Estimated Evap Fans	Total FLA (Amps)
5 Flat	22	1.95	6	248
8 Flat	35	2.02	9	376
10 Flat	44	2.00	12	422
12 V-Coil	53	2.11	18	628
16 V-Coil	51	2.19	24	777

Dual Temperature Refrigeration Systems

Model	Capacity (LT / MT Tons)	Compressors (LT / MT)	Total Compressor Power (BHP)	Heat of Rejection (kBTU/hr)
LTA-60T(-20F)/ 60T(20F)-R454C-DX	60	2 / 2	301	2189
LTA-90T(-20F)/ 90T(20F)-R454C-DX	90	2 / 2	501	3266
LTA-120T(-20F)/ 60T(20F)-R454C-DX	120	2 / 2	564	3339

Optional Heat Recovery

A heat recovery circuit may be integrated into freezer systems.

System performance:

- 65 GPM flow rate
- 40% propylene glycol solution
- Heating capacity ~300,000 BTU/hr
- 70°F ⇢ 80°F fluid temperature rise

Recovered compressor heat can be used for facility heating or process loads.

Typical Project Timeline

Engineering drawings issued: **4–6 weeks after order**

Equipment shipment: **22–26 weeks after drawing approval**

Manufactured in Willoughby, Ohio, USA.

Condenser Fans	Condenser Fan Power (HP)	COP	Estimated Evap Fans	Total FLA (Amps)
10 Flat	44	1.48	12	604
14 V-Coil	44	1.56	18	910
14 V-Coil	44	1.39	18	936

MID-STATES REFRIGERATION SUPPLY
Industrial Refrigeration Systems & Natural Refrigerant Solutions

Providing engineered refrigeration systems:

- Cold Storage Facilities
- Food Processing Plants
- Blast Freezer Operations
- Distribution Warehouses
- Industrial Refrigeration Plants

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