

SM AH Series Heat pump

Greensource

SM024 | SM036 | SM048 | SM060 | SM070



BOSCH

Installation, Operation and Maintenance Manual

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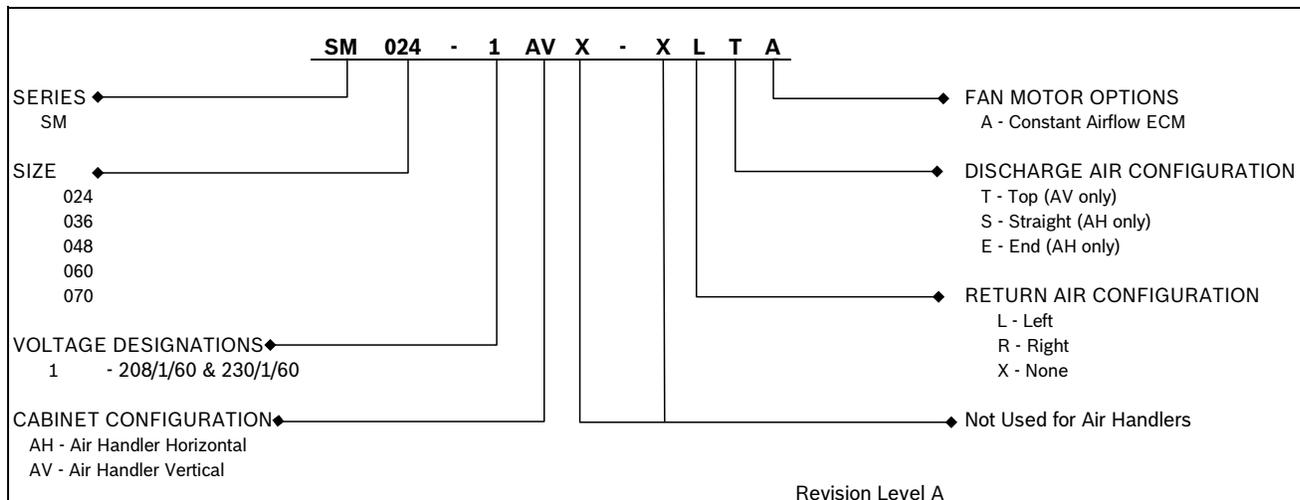
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Figure 1: CS/AH Pairings

UNIT MODEL	Paired Air Handler					
	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
SM024-1CSC	SM024-1AVX	SM024-1AHX	DX025-1VTX	DX025-1CCX	DX025-1UCX	DX035-1VTX
SM036-1CSC	SM036-1AVX	SM036-1AHX	DX035-1VTX	DX035-1CCX	DX035-1UCX	DX049-1VTX
SM048-1CSC	SM048-1AVX	SM048-1AHX	DX049-1VTX	DX049-1CCX	DX049-1UCX	
SM060-1CSC	SM060-1AVX	SM060-1AHX	DX061-1VTX	DX061-1CCX	DX061-1UCX	DX071-1VTX
SM070-1CSC	SM070-1AVX	SM070-1AHX	DX071-1VTX	DX071-1CCX	DX071-1UCX	

LEGEND:
AVX BOSCH box style Vertical Air Handler
AHX BOSCH box style Horizontal Air Handler
CCX Cased coil
UCX Uncased coil
VTX BOSCH unitary style air handler

AH MODEL NOMENCLATURE



KEY TO SYMBOLS

Warnings



Warnings in this document are identified by a warning triangle printed against a grey background. Keywords at the start of the warning indicate the type and seriousness of the ensuing risk if measures to prevent the risk are not taken.

The following keywords are defined and can be used in this document:

- **NOTE** indicates a situation that could result in damage to property or equipment.
- **CAUTION** indicates a situation that could result in minor to medium injury.
- **WARNING** indicates a situation that could result in severe injury or death.
- **DANGER** indicates a situation that will result in severe injury or death.

Important Information



This symbol indicates important information where there is no risk to property or people.

SAFETY WARNINGS



Installation and servicing of this equipment can be hazardous due to system pressure and electrical components. Only trained and qualified personnel should install, repair, or service the equipment.



Before performing service or maintenance operations on the system, turn off main power to the unit. Electrical shock could cause personal injury or death.



When working on equipment, always observe precautions described in the literature, tags, and labels attached to the unit. Follow all safety codes. Wear safety glasses and work gloves. Use a quenching cloth for brazing, and place a fire extinguisher close to the work area.



All refrigerant discharged from this unit must be recovered WITHOUT EXCEPTION. Technicians must follow industry accepted guidelines and all local, state, and federal statutes for the recovery and disposal of refrigerants. If a compressor is removed from this unit, refrigerant circuit oil will remain in the compressor. To avoid leakage of compressor oil, refrigerant lines of the compressor must be sealed after it is removed.

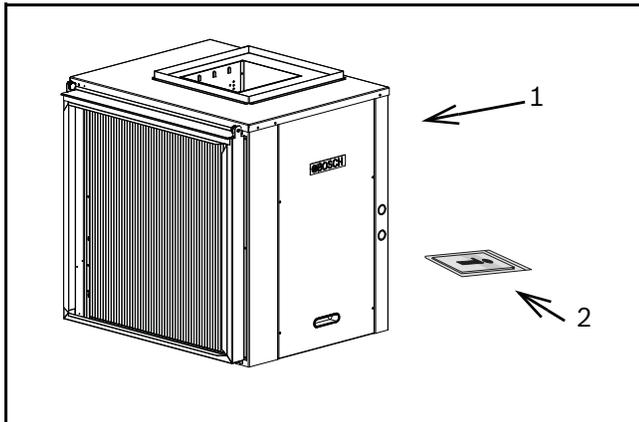


To avoid equipment damage, DO NOT use these units as a source of heating or cooling during the construction process. Doing so may affect the unit's warranty. The mechanical components and filters will quickly become clogged with construction dirt and debris, which may cause system damage.

INITIAL INSPECTION

Be certain to inspect all cartons or crates on each unit as received at the job site before signing the freight bill. Verify that all items have been received and that there are no visible damages; note any shortages or damages on all copies of the freight bill. In the event of damage or shortage, remember that the purchaser is responsible for filing the necessary claims with the carrier. Concealed damages not discovered until after removing the units from the packaging must be reported to the carrier within 24 hours of receipt.

SM AH STANDARD PACKAGE



[1] SM Series Water-to-Air Heat Pump: Air Handler
[2] Installation and Operation Manual

GENERAL DESCRIPTION

These Split System Heat Pumps provide the best combination of performance and efficiency available. Safety devices are built into each unit to provide the maximum system protection possible when properly installed and maintained.

The SM Split Water-to-Air Heat Pumps are Underwriters Laboratories (UL) and (cUL) listed for safety. All SM Water-to-Air Heat Pumps conform to UL1995 standard and are certified to CAN/CSA C22.1 No 236 by Intertek-ETL

MOVING AND STORAGE

If the equipment is not needed for immediate installation upon its arrival at the job site, it should be left in its shipping carton and stored in a clean, dry area. Units must only be stored or moved in the normal upright position as indicated by the "UP" arrows on each carton at all times. If unit stacking is required, stack units as follows: Vertical units no more than two high. Horizontal units no more than three high.

SAFETY CONSIDERATIONS

Installation and servicing of this equipment can be hazardous due to system pressure and electrical components. Only trained and qualified personnel should install, repair, or service the equipment. Untrained personnel can perform basic functions of maintenance such as cleaning coils and replacing filters.

When working on equipment, always observe precautions described in the literature, tags, and labels attached to the unit. Follow all safety codes. Wear safety glasses and work gloves. Use a quenching cloth for brazing, and place a fire extinguisher close to the work area.

The air handler blower should only be operated when a duct is installed and secured to heat pump duct collar in order to avoid possible injury.

LOCATION

To maximize system performance, efficiency and reliability, and to minimize installation costs, it is always best to keep the refrigerant lines as short as possible. Every effort should be made to locate the air handler and the condensing section as close as possible to each other.

Air Handler

Locate the air handler unit in an indoor area that allows easy removal of the filter and access panels, and has enough room for service personnel to perform maintenance or repair. Provide sufficient room to make electrical and duct connections. If the unit is located in a confined space such as a closet, provisions must be made for return air to freely enter the space. On horizontal units, allow adequate room below the unit for a condensate drain trap.



The air handler units are not approved for outdoor installation; therefore, they must be installed inside the structure being conditioned. Do not locate in areas that are subject to freezing.

Condensing Section

Locate the condensing section in an area that provides sufficient room to make water and electrical connections, and allows easy removal of the access panels, for service personnel to perform maintenance or repair.

Consult the condensing section of this manual for more information, or your CS factory's tech support.

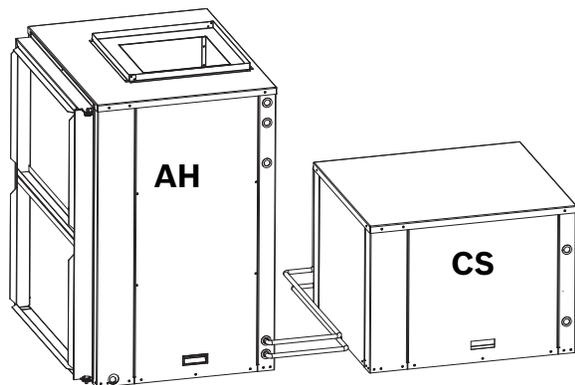


Figure # 2

INSTALLATION



Remove all shipping blocks under blower housing.

The installer should comply with all local codes and regulations which govern the installation of this type of equipment. Local codes and regulations take precedent over any recommendations contained in these instructions. In lieu of local codes, the equipment should be installed in accordance with the recommendations made by the National electric code, and in accordance with the recommendations made by the National Board of Fire Underwriters. All local seismic codes for seismic restraint of equipment, piping, and duct work shall be strictly adhered to.

Condensing Section

Locate the condensing section in an area that provides sufficient space to make water and electrical connections, allowing easy removal of the access panels. A 36" clearance in front of the unit is recommended. This will ensure proper work space for service personnel to perform maintenance or repair.

If the condensing section is installed in a location where ambient temperatures can fall below freezing, some form of freeze protection should be employed such as anti-freeze. Where the use of anti-freeze is not possible for example in a ground water application the fluid circulating pump should

operate continuously to prevent possible condenser freeze-up and to optimize overall system performance. Consult the factory in these instances for guidance.



Water freezes at 32°F. Frozen water coils are not covered under the limited product warranty. It is the installer's responsibility to insure that the condensing section is installed in a location or has the proper controls to prevent rupturing the water coil due to freezing conditions.



Do not remove the protective caps or plugs from the service valves until the refrigerant lines are run and ready for final connection.

Mounting Vertical Air Handler Units

Vertical units should be mounted level on a vibration absorbing pad slightly larger than the base to minimize vibration transmission to the building structure. (See Figure #3)

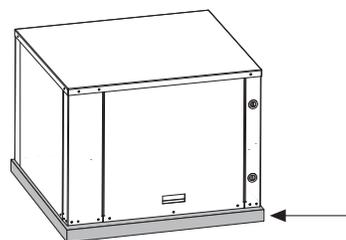


Figure # 3

Mounting Horizontal Air Handler Units

While horizontal units may be installed on any level surface strong enough to hold their weight, they are typically suspended above a ceiling by threaded rods. The rods are usually attached to the unit corners by hanger bracket kit. The rods must be securely anchored to the ceiling. Refer to the hanging bracket assembly and installation instructions for details. All units require four mounting brackets at the corners. Horizontal units installed above the ceiling must conform to all local codes. An auxiliary drain pan if required by code, should be at least four inches larger than the bottom of the heat pump. Plumbing connected to the heat pump must not come in direct contact with joists, trusses, walls, etc.

Some applications require an attic floor installation of the horizontal air handler unit. In this case the unit should be set in a full size secondary drain pan on top of a vibration absorbing mesh.

The secondary drain pan prevents possible condensate overflow or water leakage damage to the ceiling. The secondary drain pan is usually placed on a plywood base isolated from the ceiling joists by additional layers of vibration absorbing mesh. In both cases, a 3/4" drain connected to this secondary pan should be run to an eave at a location that will be noticeable. If the unit is located in a crawl space, the bottom of the unit must be at least 4" above grade to prevent flooding of the electrical parts due to heavy rains.

HANGING BRACKET KIT

Installation instructions

All horizontal air handler units come with Hanging Bracket Kit facilitate suspended unit mounting using threaded rod. Hanging brackets are to be installed as shown in Figure#4.

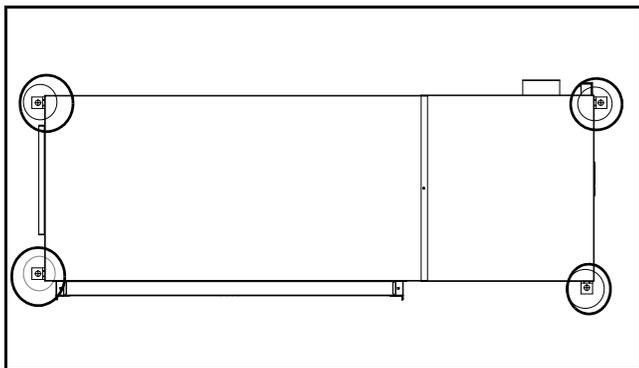


Figure # 4

This Kit includes the following:

- (5) Brackets
- (5) Rubber Vibration isolators
- (8) Screws #10x1/2
- (10) Bolts 1/4-28x12" Hex Bolt (not used for these models)

The following are needed and are to be field provided:

- Threaded rod (3/8" max dia)
- Hex Nuts
- Washers (1-3/4" min O.D.)

1. Remove and discard factory provided screws from locations where hanging brackets will be installed shown in Figure# 5.

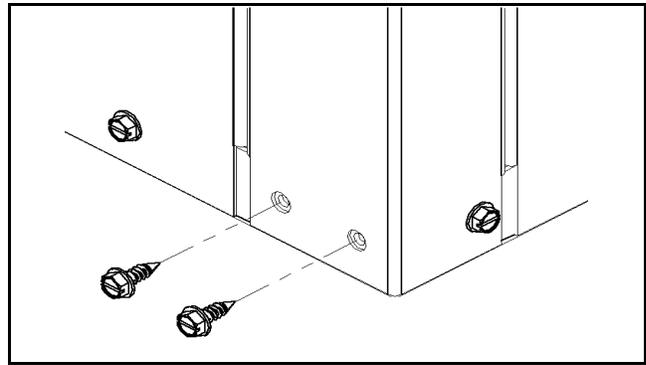


Figure # 5

2. Mount 4 Brackets to unit corner post using the bolts provided in the kit as shown on Figure#6.

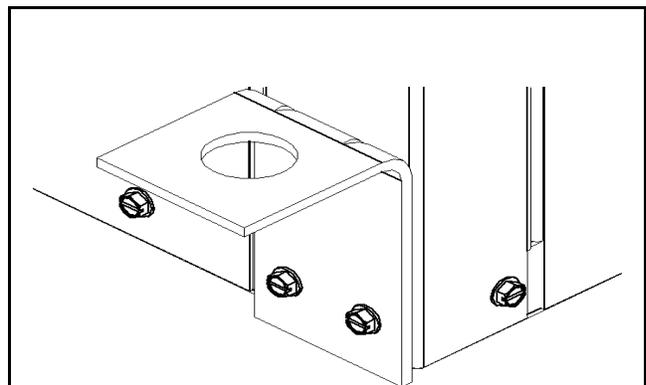
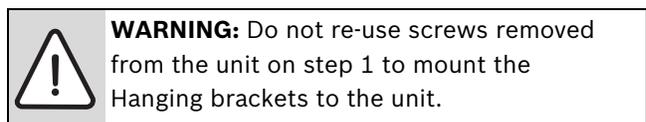
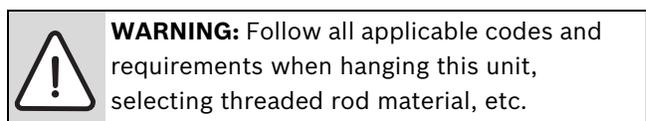
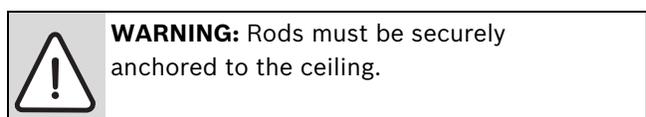


Figure # 6



3. Install rubber grommet onto the Brackets as shown in Figure#7.

4. Hang the unit and assemble the field provided threaded rod, nuts and washers on to the brackets as shown in Figure#7



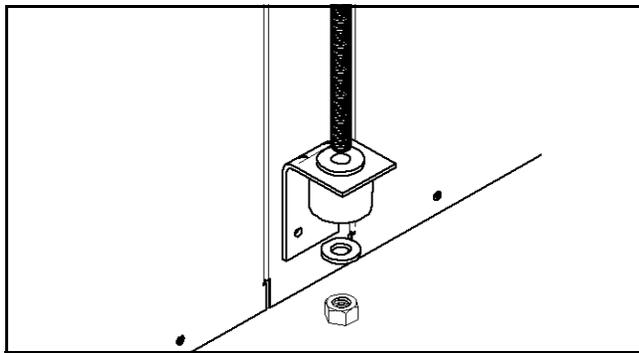


Figure # 7



NOTE: Plumbing connected to the heat pump must not come in direct contact with joists, trusses, walls, etc.

CONDENSATE DRAIN



If equipped with float style condensate overflow switch, final adjustment must be made in the field.



Make sure that the unused drain pan opening is plugged prior to operating the air handler.

The air handler should be pitched approximately 1/4" towards the drain in both directions, to facilitate condensate removal. A drain line must be connected to the air handler and pitched away from the unit a minimum of 1/8" per foot to allow the condensate to flow away from the unit. This connection must be in conformance with local plumbing codes. A trap must be installed in the condensate line to insure free condensate flow. (Units are not internally trapped). A vertical air vent is sometimes required to avoid air pockets. (See Figure #8).

The length of the trap depends on the amount of positive or negative pressure on the drain pan. A second trap must not be included.

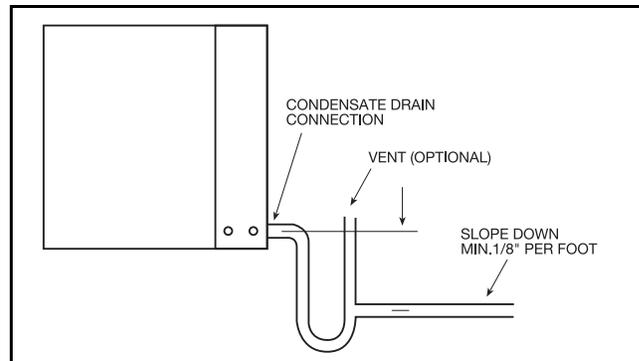


Figure # 8

The condensing unit should be pitched approximately 1/4" towards the drain in both directions, to facilitate condensate removal. (See Figure #6)

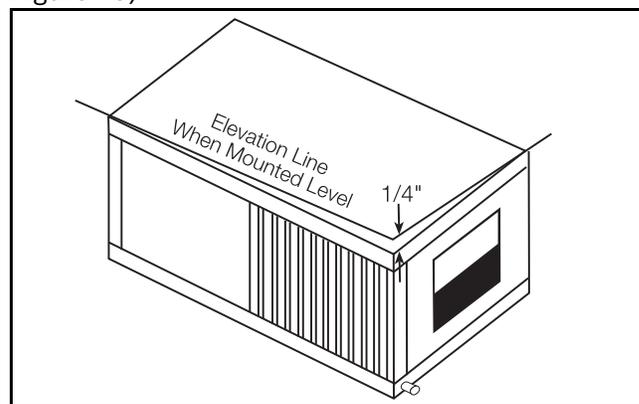


Figure # 9

DUCT SYSTEM

A supply air outlet collar and return air duct flange are provided on all units to facilitate duct connections. Refer to the FHP individual data specification sheet for physical dimensions of the collar and flange.

A flexible connector is recommended for supply and return air duct connections on metal duct systems. All metal ducting should be insulated with a minimum of one inch duct insulation to avoid heat loss or gain and prevent condensate forming during the cooling operation. Application of the unit to uninsulated duct work is not recommended as the unit's performance will be adversely affected.

Do not connect discharge ducts directly to the blower outlet. The factory provided air filter must be removed when using a filter back return air grill. The factory filter should be left in place on a free return system.

If the unit will be installed in a new installation which includes new duct work, the installation should be designed using current ASHRAE procedures for duct sizing. If the unit is to be connected to existing ductwork, a check should be made to assure that the duct system has the capacity to handle the air required for the unit application. If the duct system is too small, larger ductwork should be installed. Check for existing leaks and repair as necessary to ensure an air tight seal within the duct.

The duct system and all diffusers should be sized to handle the designed air flow quietly. To maximize sound attenuation of the unit blower, the supply and return air plenums should be insulated. There should be no direct straight air path thru the return air grille into the heat pump. The return air inlet to the heat pump must have at least one 90 degree turn away from the space return air grille. If air noise or excessive air flow are a problem, the blower speed can be changed to a lower speed to reduce air flow. (Refer to ECM motor interface board section in this manual and Figure #8)

ELECTRICAL



Always disconnect power to the unit before servicing to prevent injury or death due to electrical shock or contact with moving parts.

All field wiring must comply with local and national fire, safety and electrical codes. Power to the unit must be within the operating voltage range indicated on the unit's nameplate.



Operating the unit with improper line voltage or with excessive phase imbalance is hazardous to the unit and constitutes abuse and is not covered under warranty.

Properly sized fuses or HACR circuit breakers must be installed for branch circuit protection. See equipment rating plates for maximum size.

Both the air handler and condensing units are provided with a concentric knock-out in the front right corner post for attaching common trade sizes of conduit. Route power supply wiring through this opening. Flexible wiring and conduit should be used to isolate vibration and noise from the building structure. Be certain to connect the ground lead to the ground lug in each of the control boxes. Connect the power leads as indicated on the unit wiring diagrams.

Electric Heater Package Option

Factory installed internal electric heater packages are available for all unit sizes, in certain configurations; not available in straight-through configuration for supply air in horizontal models. Two circuit breakers are required when heater packages are utilized. The circuit breakers for the heater package provide power for the heater elements, the blower motor and the control circuit for the unit. The circuit breaker for the unit provides power for the compressor. This allows the electric heaters to continue to operate along with the blower motor in the case of unit compressor and/or compressor power supply failure. See HK Series Heater Kit Instructions for field installation. Each SM Series model has a number of heater sizes available. Refer to Figure #9 for heater package compatibility with specific SM Series units, models nomenclature and electrical data.

Low Voltage Control Wiring

The SM series units incorporate the ECM variable speed fan motor and control interface board. The thermostat should be connected to the air handlers and then from the air handler to the condensing section. The low voltage power supply is located in the air handler.

In this application utilize a 9 conductor cable from the thermostat to the air handler and 7 conductor cable from the air handler to the condensing section.

Each model has a number of heater sizes available. Refer to Figure#12 for heater package compatibility with specific units, model nomenclature and electrical data

Figure 10:
Figure 11: Motor Profile Air Flow Table CFM - Two Stage Units

Model	Fan Only	Y1 COOL/ HEAT	Y2 COOL/ HEAT	AUX HEAT	EMERG HEAT	PLUS ADJ	MINUS ADJ	TAP COOL/ HEAT/DELAY
SM024	450	500	800	800	800	900	700	A
SM036	700	1050	1225	1225	1225	1400	1050	A
SM048	900	925	1500	1500	1500	1700	1275	B
SM060	1200	1500	2000	2000	2000	2300	1700	A
SM070	1600	1600	2200	2200	2200	2300	1900	A

Figure 12: Heater Package Compatibility

Model	Heater Model	KW	Heater Amps		Circuit	MCA		Max. Fuse		AWG Min.
			208V	240V		208V	240V	208V	240V	
SM024 thru 070	HK050-1XS	4.8	17.3	20.0	L1/L2	27.1	30.4	30	30	8
SM024 thru 070	HK100-1XS	9.6	34.7	40.0	L1/L2	48.8	55.4	50	60	6
SM036 thru 070	HK100-1XM	9.6	34.7	40.0	L1/L2	49.5	56.3	50	60	6
SM048 thru 070	HK150-1XM HK150-1XM	14.4 14.4	52.0	60.0	L1/L2 L3/L4	49.5 21.7	56.3 25.0	60 25	60 25	6 10
			34.7	40.0						
			17.3	20.0						
SM048 thru 070	HK200-1XM HK200-1XM	19.2 19.2	69.3	80.0	L1/L2 L3/L4	49.5 43.4	56.3 50.0	50 45	60 50	6 6
			34.7	40.0						
			34.7	40.0						

All heaters rated single phase 60 Hz, and include unit fan load. All fuses type "D" time delay or HACR type breaker or HRC FORM 1. Wire size based on 60 deg. C copper conductors.



Units supplied with internal electric heat require two (2) separate power supplies: one for the unit compressor and one for the electric heater elements, blower motor and control circuit. Refer to Figure #9 for wiring instructions, minimum circuit ampacities and maximum fuse/breaker sizing.

wire must be 8-conductor, 18-AWG wire. Strip the wires back 1/4-inch (longer strip lengths may cause shorts) and insert the thermostat wires into the connector as shown. Tighten the screws to ensure secure connections. The thermostat has the same type connectors, requiring the same wiring. See instructions in the thermostat for detailed installation and operation information.

Electronic Thermostat Installation

Position the thermostat subbase against the wall so that it is level and the thermostat wires protrude through the middle of the subbase. Mark the position of the subbase mounting holes and drill holes with a 3/16-inch bit. Install supplied anchors and secure base to the wall. Thermostat



When using a 2-cool, 3-heat thermostat both the W1 & W2 on the Heat Pump and W2 & EM on the thermostat must be connected together via a jumper. (See Figure#13)

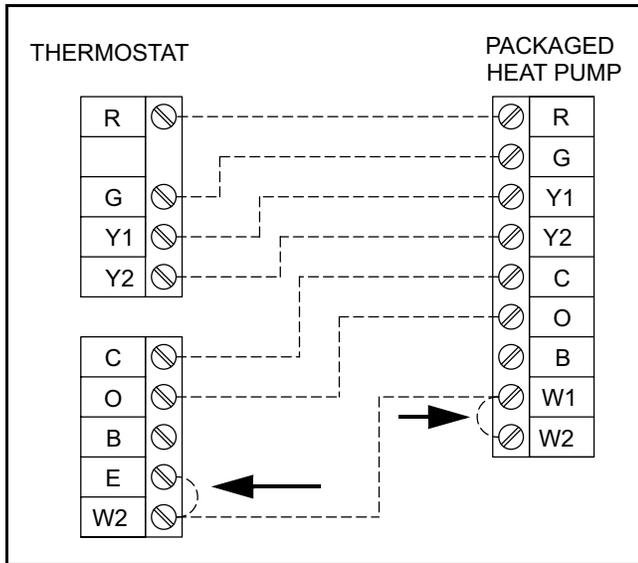


Figure # 13



Packaged heat pumps are equipped with detachable Thermostat connectors. These connectors are located in different locations based on the blower motor that is installed in the unit.

For the EON motor, the three detachable thermostat connectors are located on the ECM Interface board. See Wiring Harness Drawing.



Harness wiring can be loose, based on the options installed for the unit. See the Wiring Harness Drawing notes for further details.

Connection point logic is as follows:

Figure 14: Low Voltage Connection Points				
Function	From Thermostat	To Air Handler	From Air Handler	To Condensing Section
24 HVAC Common	C	C	C	C
24 VAC Hot	R	R	R	R
Fan Operation	G	G		
Reversing Valve (3)	O	O	O	O
1st Stage Compressor Operation	Y1	Y1	Y1	Y1
2nd Stage Compressor Operation	Y2	Y2	Y2	Y2

Condensate Sensor (1)			CS	CS
Alarm Output (From UPM) (2)	L	Splice		ALR
Auxilliary Electric Heat (4)	W/W1/W2	W1		
Emergency Heat (4)	E	EM/W2		

1. For the condensate overflow sensor, connect 'CS' at the condensing section to 'CS' at the air handler. Be sure to ground power supply.
2. If service LED is utilized connect 'ALR' terminal on the UPM board to 'L' on the thermostat sub base. The wiring may be spliced in the air handling unit. The ALR output is always dry contact between the OUT and COM Terminals. See Thermostat connections section of this manual for additional information.
3. 'O' – reversing valve is energized in the cooling mode. Fail safe is to heating.
4. Utilized when electric strip heater package present.

ECM Interface Board

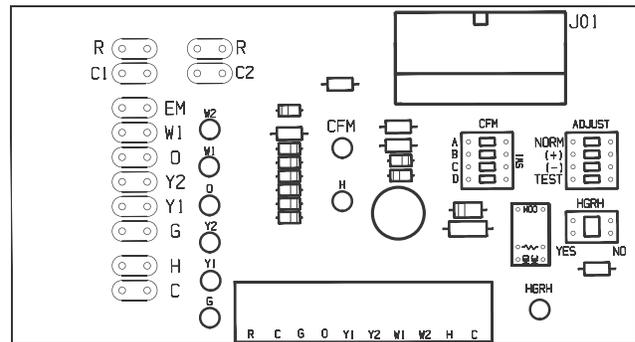


Figure # 15

THERMOSTAT CONNECTIONS

Thermostat wiring is connected to the 10 pin screw type terminal block on the lower center portion of the ECM Interface Board. In addition to providing a connecting point for thermostat wiring, the interface board also translates thermostat inputs into control commands for the variable speed programmable ECM DC fan motor and displays an LED indication of operating status.

The thermostat connections and their functions are as follows:

Y2	Second Stage Compressor Operation
Y1	First Stage Compressor Operation
G	Fan
O	Reversing Valve (energized in cooling)
W1	Auxiliary Electric Heat (runs in conjunction with compressor)
EM/W2	Emergency Heat (electric heat only)
NC	Transformer 24 VAC Common (extra connection)
C1	Transformer 24 VAC Common (primary connection)
R	Transformer 24 VAC Hot
HUM	Dehumidification Mode

If the unit is being connected to a thermostat with a malfunction light, this connection is made at the unit alarm output.



If the thermostat is provided with a malfunction light powered off of the common (C) side of the transformer, a jumper between “R” and “COM” terminal of “ALR” contacts must be made.



If the thermostat is provided with a malfunction light powered off of the hot (R) side of the transformer, then the thermostat malfunction light connection should be connected directly to the (ALR) contact on the unit’s UPM board.

To the left of the thermostat connection block are a row of 2 red and 4 green LED’s. These LED’s indicate the operating status of the unit. They are labeled as follows:

EM	RED	Emergency Heat On
W1	RED	Auxiliary Heat On
O	GREEN	Reversing Valve Energized, unit is in cooling mode
Y2	GREEN	Second Stage Compressor On
Y1	GREEN	First Stage Compressor On
G	GREEN	Fan On

Just above the connector block is a single red LED labeled CFM that will blink intermittently when the unit is running and may flicker when the unit is off. This LED indicates the air delivery of the blower at any given time. Each blink of the LED represent 100 CFM of air delivery so if the LED blinks 12 times, pauses, blinks 12 times, etc. the blower is delivering 1200 CFM. Refer to Figure #10 for factory programmed air delivery settings for the SM Series.

Just above and to the right of the thermostat connection block are four sets of jumper pins labeled ADJ, DELAY, HEAT and COOL. The ADJ set of pins are labeled NORM, (+), (-) and TEST. AP units will all be set on the NORM position from the factory, however, airflow can be increased (+) or decreased (-) by 15% from the pre-programmed setting by relocating the jumper in this section. The TEST position is used to verify proper motor operation. If a motor problem is suspected, move the ADJ jumper to the TEST position and energize G on the thermostat connection block. If the motor ramps up to 100% power, then the motor itself is functioning normally. Always remember to replace the jumper to NORM, (+) or (-) after testing and reset the unit thermostat to restore normal operation.



Do not set the ADJ jumper to the (-) setting when electric heaters are installed. Doing so may cause the heaters to cycle on their thermal overload switches, potentially shortening the life of the switches.

The other three sets of jumper pins are used to select the proper program in the ECM motor for the unit. Refer to Figure #7 for the proper jumper placement.

To the left of the red and green status LED’s is a row of 1/4” male quick connects. These are used to pass thermostat inputs on to the rest of the control circuit. Remember to always turn off unit power at the circuit breaker before attaching or disconnecting any wiring from these connections to avoid accidental short circuits that can damage unit control components.

SEQUENCE OF OPERATION

Cooling Mode

See Typical Wiring Diagram at the end of the manual. Energizing the “O” terminal energizes the unit reversing valve in the cooling mode. The fan motor starts when the “G” terminal is energized. When the thermostat calls for cooling (Y), the loop pump or solenoid valve if present is energized and compressor will start.

Once the thermostat is satisfied, the compressor shuts down accordingly and the fan ramps down to either fan only mode or off over a span of 30 seconds (ECM Motors).

Note that a fault condition initiating a lockout will de-energize the compressor.

Heating Mode

Heating operates in the same manner as cooling, but with the reversing valve de-energized. The compressor will run until the desired setpoint temperature on the thermostat is achieved.

Once the thermostat is satisfied, the compressor shuts down and the fan ramps down in either fan only mode or turns off over a span of 30 seconds. Auxiliary electric heating coils are not available on the EP product line.

REFRIGERANT LINES

The installation of the copper refrigerant tubing must be done with care to obtain reliable, trouble-free operation. This installation should only be performed by qualified refrigeration service and installation personnel.

Refrigerant lines generally can and should be routed and supported so as to prevent the transmission of vibrations into the building structure. Experience and good design practice dictate 75 feet as the maximum practical length for interconnecting refrigerant lines in split system heat pumps without special considerations. Beyond 75 feet, system losses become substantial and the total refrigerant charge required can compromise the reliability and design life of the equipment.

Refrigerant lines should be sized in accordance with Figure #13 in the following instructions. Copper tubing should be clean and free of moisture and dirt or debris. The suction and liquid lines MUST be insulated with at least 3/8" wall, closed-cell foam rubber insulation or the equivalent.

Some points to consider are:

- Pressure drop (friction losses) in refrigerant suction lines reduces system capacity and increases power consumption by as much as 2% or more, depending on the line length, number of bends, etc. Pressure drop in liquid lines affects system performance to a lesser degree, provided that a solid column of liquid (no flash gas) is being delivered to the refrigerant metering device, and that the liquid pressure at the refrigerant metering device is sufficient to produce the required refrigerant flow.
- Oil is continually being circulated with the refrigerant so, oil return to the compressor is always a consideration in line sizing. Suction lines on split system heat pumps are also hot gas lines in the heating mode, but are treated as suction lines for sizing purposes. If the recommended suction lines sizes are used, there should be no problem with oil return.
- Vertical lines should be kept to a minimum. Vertical liquid lines will have a vertical liquid lift in either heating or cooling, and the weight of the liquid head is added to the friction loss to arrive at the total line pressure drop.
- Wherever possible, the air handler should be installed at a higher elevation than the condensing section to aid with oil return to the compressor.

Linear vs Equivalent Line Length

Linear Line Length - is the actual measured length of the line including bends. This is used to calculate the additional refrigerant charge that must be added to the system. (See Figure #14 and examples)

Equivalent Line Length - is the combination of the actual length of all the straight runs and the equivalent length of all the bends valves and fittings in a particular line. The equivalent length of a bend, valve or fitting is equal to the length of a straight tube of the same diameter having the same pressure drop as the particular valve or fitting. The ASHRAE Fundamentals Handbook provides tables for determining the equivalent length of various bends, valves and fittings.

Connecting Refrigerant Lines

- Use only ACR grade copper tubing and keep ends sealed until joints are made.
- For best performance, select routing of refrigerant lines for minimum distance and fewest number of bends.
- Size lines in accordance with Figure #14.

- Cut crimped ends off the air handler suction and liquid lines. Connect and braze lines to the air handler.



The air handler is factory supplied with a holding charge of dry nitrogen.

- Connect and braze lines to service valves on the condensing section.



WARNING: Always wrap the body of the service valve with a wet towel or apply some other form of heatsink prior to brazing and direct flame away from the valve body. Failure to do so will result in damage to the valve. Valve body temperature must remain below 250°F to protect the internal rubber "O" rings and seals.

Figure 16: Valve Sizing Chart

Unit Size	Line Type	Valve Conn. Size	Allen Wrench size
SM024/036	Suction	3/4	5/16
SM048/060/070	Suction	7/8	5/16
All Valves	Liquid	3/8	3/16

Pressurize the refrigerant line set and air handler to 150lbs with dry nitrogen through the ports provided on the self service valves. Check line set and unit connections for leaks.

Once system integrity is verified, evacuate line set and air handler with a good vacuum pump to 500 microns and hold for half hour.



Pump down must never be used with heat pumps.

SYSTEM CHECKOUT

After completing the installation, and before energizing the unit, the following system checks should be made:

- Verify that the supply voltage to the heat pump is in accordance with the nameplate ratings.
- Make sure that all electrical connections are tight and secure.
- Check the electrical fusing and wiring for the correct size.

- Verify that the low voltage wiring between the thermostat and the unit is correct.
- Verify that the water piping is complete and correct.
- Check that the water flow is correct, and adjust if necessary.
- Check the blower for free rotation, and that it is secured to the shaft.
- Verify that vibration isolation has been provided.
- Unit is serviceable. Be certain that all access panels are secured in place.

UNIT START-UP

1. Set the thermostat to the highest setting.
2. Set the thermostat system switch to "COOL", and the fan switch to the "AUTO" position. The reversing valve solenoid should energize. The compressor and fan should not run.
3. Reduce the thermostat setting approximately 5 degrees below the room temperature.
4. Verify the heat pump is operating in the cooling mode.
5. Turn the thermostat system switch to the "OFF" position. The unit should stop running and the reversing valve should deenergize.
6. Leave the unit off for approximately (5) minutes to allow for system equalization.
7. Turn the thermostat to the lowest setting. Set the thermostat switch to "HEAT".
8. Increase the thermostat setting approximately 5 degrees above the room temperature.
9. Verify the heat pump is operating in the heating mode.
10. Set the thermostat to maintain the desired space temperature.
11. Check for vibrations, leaks, etc...

INITIAL START-UP

1. Make sure all valves in heat recovery water piping system are open. NEVER OPERATE HR PUMP DRY.
2. Turn on the heat pump. The HR pump should not run if the compressor is not running.
3. turn the HR switch to the "ON" position. The pump will operate if entering water temperature to HR is below 120° F.
4. The temperature difference between the water entering and leaving the heat recovery should be 5° to 15° F.

UNIT CHECKOUT SHEET

Customer Data

Customer Name _____ Date _____

Address _____

Phone _____

Unit Number _____

Unit Nameplate Data

Unit Make _____

Model Number _____

Serial Number _____

Refrigerant Charge (oz) _____

Compressor: RLA _____ LRA _____

Blower Motor: FLA (or NPA) _____ HP _____

Maximum Fuse Size (Amps) _____

Maximum Circuit Ampacity _____

Operating Conditions

	Cooling Mode	Heating Mode
Entering / Leaving Air Temp	_____ / _____	_____ / _____
Entering Air Measured at:	_____	_____
Leaving Air Measured at:	_____	_____
Entering / Leaving Fluid Temp	_____ / _____	_____ / _____
Fluid Flow (gpm)	_____	_____
Compressor Volts / Amps	_____ / _____	_____ / _____
Blower Motor Volts / Amps	_____ / _____	_____ / _____
Source Fluid Type	_____	_____
Fluid Flow (gpm)*	_____	_____
Fluid Side Pressure Drop*	_____	_____
Suction / Discharge Pressure (psig)*	_____ / _____	_____ / _____
Suction / Discharge Temp*	_____ / _____	_____ / _____
Suction Superheat*	_____	_____
Entering TXV / Cap Tube Temp*	_____	_____
Liquid Subcooling*	_____	_____

* Required for Troubleshooting ONLY

Auxiliary Heat

Unit Make _____

Model Number: _____

Serial Number _____

Max Fuse Size (Amps) _____

Volts / Amps _____

Entering Air Temperature _____

Leaving Air Temperature _____

Bosch Group
 555 NW 65th Court
 Fort Lauderdale, FL 33309
 Phone: (866) 642-3198
 Fax: (800) 776-5529



MAIL TO: Bosch.Fhp.TechSupport@us.bosch.com
 or scan the QR code and attach picture of this form with
 the information requested.

TROUBLESHOOTING

Unit Troubleshooting		
Problem	Possible Cause	Checks and Correction
ENTIRE UNIT DOES NOT RUN	Power Supply Off	Apply power, close disconnect
	Blown Fuse	Replace fuse or reset circuit breaker. Check for correct fuses
	Voltage Supply Low	If voltage is below minimum voltage specified on unit data plate, contact local power company.
	Thermostat	Set the fan to "ON", the fan should run. Set thermostat to "COOL" and lowest temperature setting, the unit should run in the cooling mode (reversing valve energized). Set unit to "HEAT" and the highest temperature setting, the unit should run in the heating mode. If neither the blower or compressor run in all three cases, the thermostat could be miswired or faulty. To ensure miswired or faulty thermostat verify 24 volts is available on the condensing section low voltage terminal strip between "R" and "C", "Y" and "C", and "O" and "C". If the blower does not operate, verify 24 volts between terminals "G" and "C" in the air handler. Replace the thermostat if defective.
UNIT OFF ON HIGH PRESSURE CONTROL	Discharge pressure too high	In "COOLING" mode: Lack of or inadequate water flow. Entering water temperature is too warm. Scaled or plugged condenser. In "HEATING" mode: Lack of or inadequate air flow. Blower inoperative, clogged filter or restrictions in duct work
	Refrigerant charge	The unit is overcharged with refrigerant. Reclaim refrigerant, evacuate and recharge with factor recommended charge.
	High pressure	Check for defective or improperly calibrated high pressure switch.
UNIT OFF ON LOW PRESSURE CONTROL	Suction pressure too low	In "COOLING" mode: Lack of or inadequate air flow. Entering air temperature is too cold. Blower inoperative, clogged filter or restrictions in duct work. In "HEATING" mode: Lack of or inadequate water flow. Entering water temperature is too cold. Scaled or plugged condenser.
	Refrigerant charge	The unit is low on refrigerant. Check for refrigerant leak, repair, evacuate and recharge with factory recommended charge.
	Low pressure switch	Check for defective or improperly calibrated low pressure switch.
UNIT SHORT CYCLES	Unit oversized	Recalculate heating and or cooling loads.
	Thermostat	Thermostat installed near a supply air grill; relocate thermostat. Readjust heat anticipator.
	Wiring and controls	Check for defective or improperly calibrated low pressure switch.

Unit Troubleshooting		
Problem	Possible Cause	Checks and Correction
INSUFFICIENT COOLING OR HEATING	Unit undersized	Recalculate heating and or cooling loads. If excessive, possibly adding insulation and shading will rectify the problem
	Loss of conditioned air by leakage	Check for leaks in duct work or introduction of ambient air through doors or windows
	Airflow	Lack of adequate air flow or improper distribution of air. Replace dirty filter
	Refrigerant charge	Low on refrigerant charge causing inefficient operation
	Compressor	Check for defective compressor. If discharge is too low and suction pressure is too high, compressor is not pumping properly. Replace compressor.
	Reversing Valve	Defective reversing valve creating bypass of refrigerant from discharge of suction side of compressor. Replace reversing valve
	Operating pressures	Compare unit operation pressures to the pressure/temperature chart for the unit.
	TXV	Check TXV for possible restriction or defect. Replace if necessary.
	Moisture, noncondensables	The refrigerant system may be contaminated with moisture or noncondensables. Reclaim refrigerant, replace filter dryer, evacuate the refrigerant system, and recharge with factory recommended charge.
BLOWER OPERATES BUT COMPRESSOR DOES NOT	Thermostat	Check setting, calibration, and wiring.
	Wiring	Check for loose or broken wires at compressor, capacitor, or contactor.
	Safety Controls	Check UPM board red default L.E.D. for Blink Code
	Compressor overload open	If the compressor is cool and the overload will not reset, replace compressor.
	Compressor motor grounded	Internal winding grounded to the compressor shell. Replace compressor. If compressor burnout, install suction filter dryer.
	Compressor windings open	After compressor has cooled, check continuity of the compressor windings. If the windings are open, replace the compressor.

WIRING DIAGRAMS

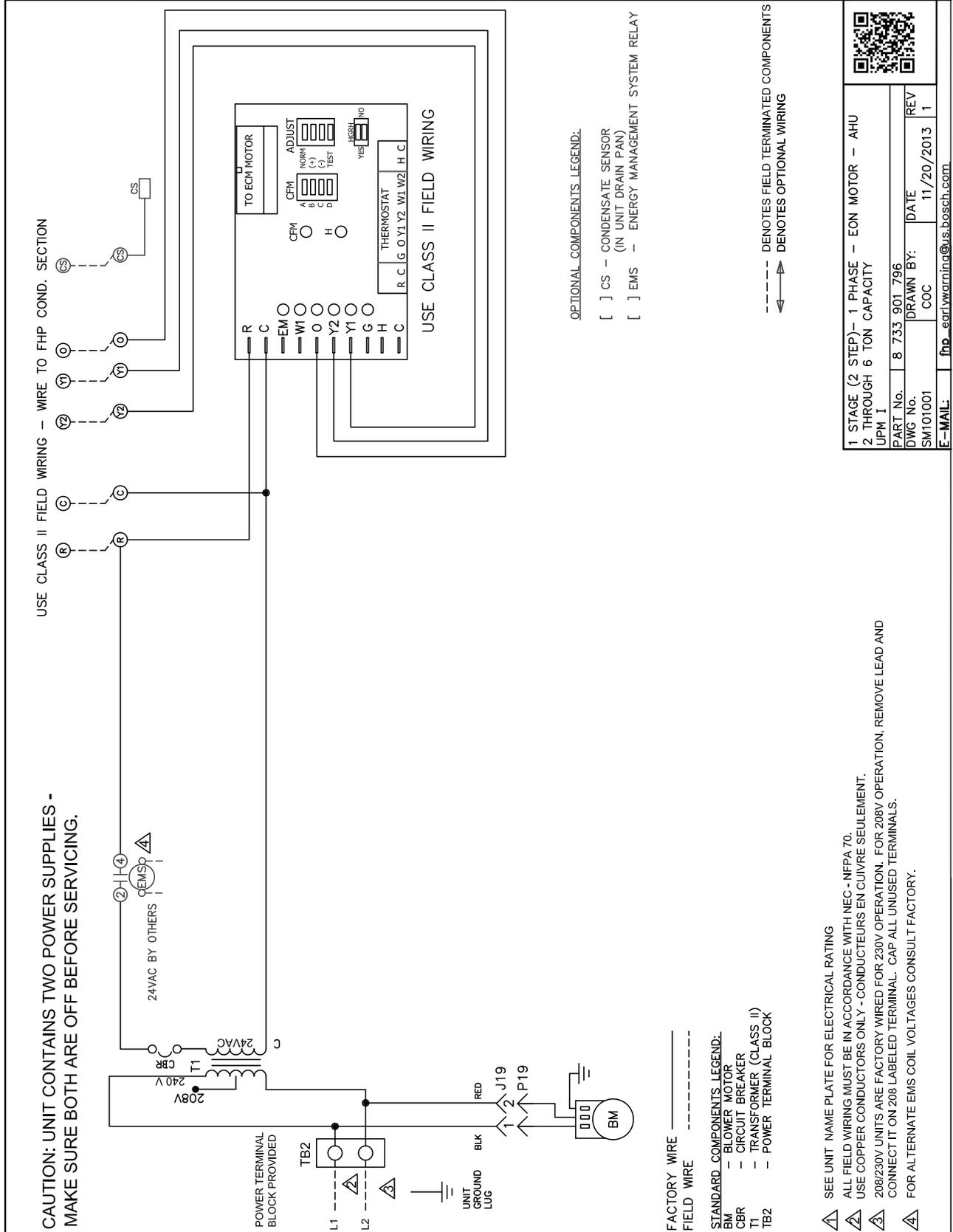


Figure # 17 SM - No Electric Heat Kit

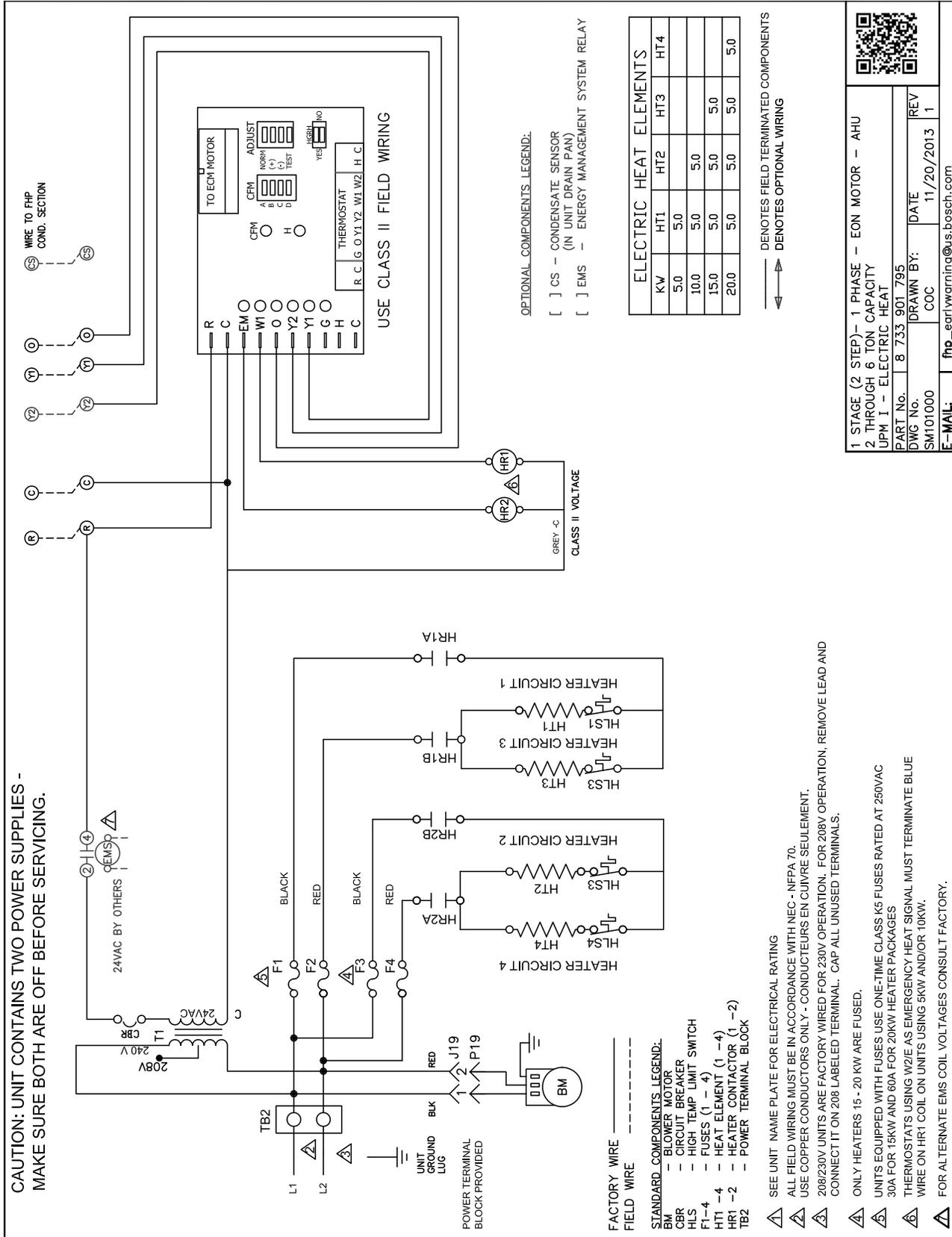
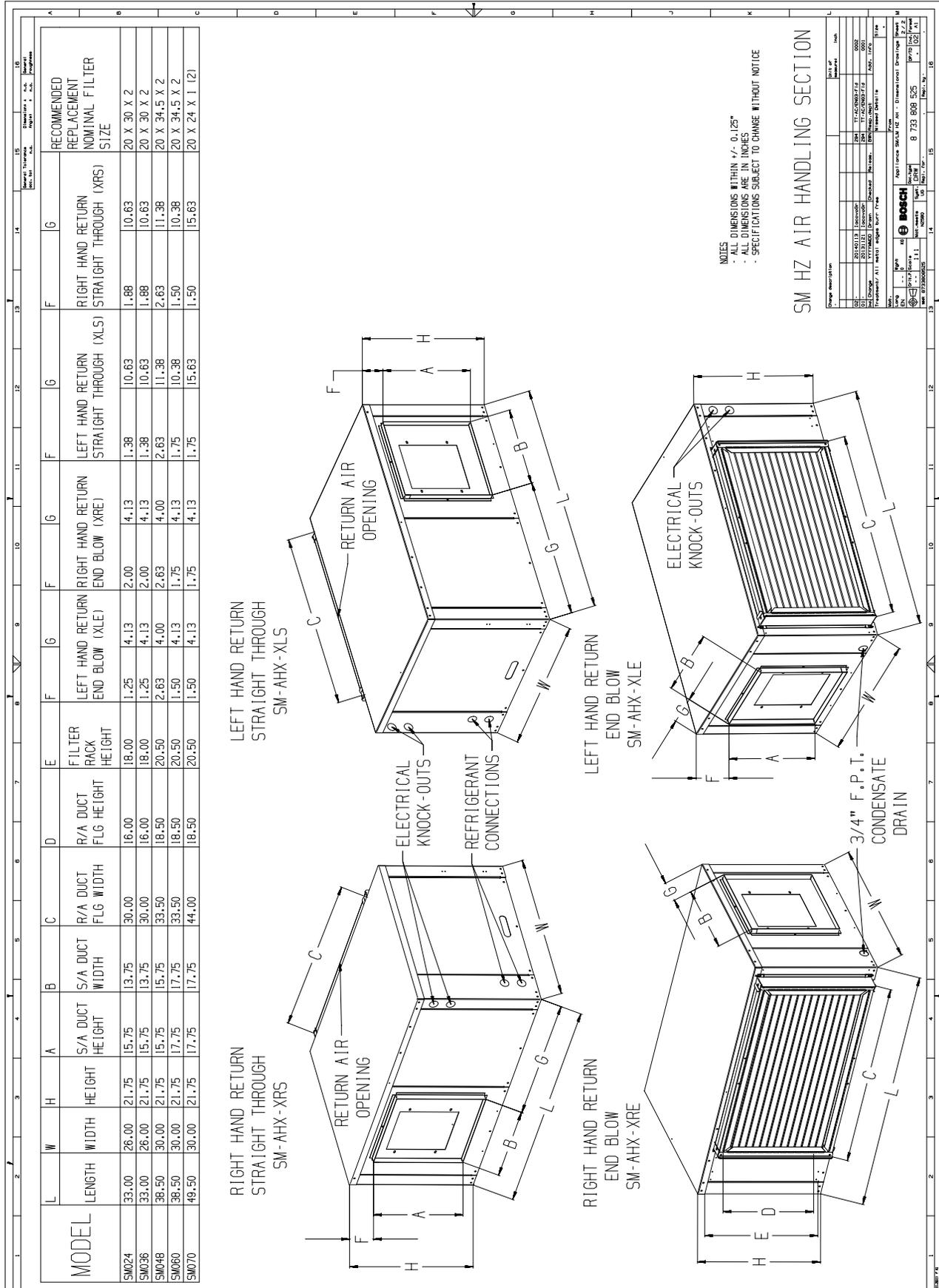


Figure # 18 SM- With Electric Heat Kit



SPARE PARTS LIST - AIR HANDLER

AIR HANDLER - PARTS LIST

Unit	Fan Blower Kit	Heater Collar Kit	EON Motor Kit	Tin Plated Air Coil Kit	Drain Pan Kit	Electrical Box Kit	Condensate Sensor Kit	TXV Kit	Filter Rack Kit	2" MERV13 Filter Kit	2" MERV8 Filter Kit	Electrical Post Kit	Regular Post Kit	Top Blower Panel Kit
SM024-1AVX-XLT	8733921325	8733921329	8733921333	8733922774	8733921344	8733921350	8733922780	8733921351	8733922800	8733922787	8733922793	8733922806	8733922816	8733922822
SM024-1AVX-XRT	8733921325	8733921329	8733921333	8733922774	8733921344	8733921350	8733922780	8733921351	8733922800	8733922787	8733922793	8733922806	8733922816	8733922822
SM024-1AHX-XLS	8733921325	8733921329	8733921333	8733922775	8733921345	8733921350	8733922780	8733921351	8733922801	8733922788	8733922794	8733922810	8733922820	NA
SM024-1AHX-XLE	8733921325	8733921329	8733921333	8733922775	8733921345	8733921350	8733922780	8733921351	8733922801	8733922788	8733922794	8733922810	8733922820	NA
SM024-1AHX-XRS	8733921325	8733921329	8733921333	8733922775	8733921345	8733921350	8733922780	8733921351	8733922801	8733922788	8733922794	8733922810	8733922820	NA
SM024-1AHX-XRE	8733921325	8733921329	8733921333	8733922775	8733921345	8733921350	8733922780	8733921351	8733922801	8733922788	8733922794	8733922810	8733922820	NA
SM036-1AVX-XLT	8733921325	8733921329	8733921334	8733922774	8733921344	8733921350	8733922780	8733921352	8733922800	8733922787	8733922793	8733922806	8733922816	8733922822
SM036-1AVX-XRT	8733921325	8733921329	8733921334	8733922774	8733921344	8733921350	8733922780	8733921352	8733922800	8733922787	8733922793	8733922806	8733922816	8733922822
SM036-1AHX-XLS	8733921325	8733921329	8733921334	8733922775	8733921345	8733921350	8733922780	8733921352	8733922801	8733922788	8733922794	8733922810	8733922820	NA
SM036-1AHX-XLE	8733921325	8733921329	8733921334	8733922775	8733921345	8733921350	8733922780	8733921352	8733922801	8733922788	8733922794	8733922810	8733922820	NA
SM036-1AHX-XRS	8733921325	8733921329	8733921334	8733922775	8733921345	8733921350	8733922780	8733921352	8733922801	8733922788	8733922794	8733922810	8733922820	NA
SM036-1AHX-XRE	8733921325	8733921329	8733921334	8733922775	8733921345	8733921350	8733922780	8733921352	8733922801	8733922788	8733922794	8733922810	8733922820	NA
SM048-1AVX-XLT	8733921326	8733921330	8733921335	8733922776	8733921346	8733921350	8733922780	8733921352	8733922802	8733922789	8733922795	8733922807	8733922817	8733922824
SM048-1AVX-XRT	8733921326	8733921330	8733921335	8733922776	8733921346	8733921350	8733922780	8733921352	8733922802	8733922789	8733922795	8733922807	8733922817	8733922824
SM048-1AHX-XLS	8733921326	8733921330	8733921335	8733922777	8733921347	8733921350	8733922780	8733921352	8733922803	8733922790	8733922796	8733922812	8733922821	NA
SM048-1AHX-XLE	8733921326	8733921330	8733921335	8733922777	8733921347	8733921350	8733922780	8733921352	8733922803	8733922790	8733922796	8733922812	8733922821	NA
SM048-1AHX-XRS	8733921326	8733921330	8733921335	8733922777	8733921347	8733921350	8733922780	8733921352	8733922803	8733922790	8733922796	8733922812	8733922821	NA
SM048-1AHX-XRE	8733921326	8733921330	8733921335	8733922777	8733921347	8733921350	8733922780	8733921352	8733922803	8733922790	8733922796	8733922812	8733922821	NA
SM060-1AVX-XLT	8733921327	8733921331	8733921336	8733922776	8733921346	8733921350	8733922780	8733921352	8733922802	8733922789	8733922795	8733922808	8733922818	8733922826
SM060-1AVX-XRT	8733921327	8733921331	8733921336	8733922776	8733921346	8733921350	8733922780	8733921352	8733922802	8733922789	8733922795	8733922808	8733922818	8733922826
SM060-1AHX-XLS	8733921327	8733921331	8733921336	8733922777	8733921347	8733921350	8733922780	8733921352	8733922803	8733922790	8733922796	8733922812	8733922821	NA
SM060-1AHX-XLE	8733921327	8733921331	8733921336	8733922777	8733921347	8733921350	8733922780	8733921352	8733922803	8733922790	8733922796	8733922812	8733922821	NA
SM060-1AHX-XRS	8733921327	8733921331	8733921336	8733922777	8733921347	8733921350	8733922780	8733921352	8733922803	8733922790	8733922796	8733922812	8733922821	NA
SM060-1AHX-XRE	8733921327	8733921331	8733921336	8733922777	8733921347	8733921350	8733922780	8733921352	8733922803	8733922790	8733922796	8733922812	8733922821	NA
SM070-1AVX-XLT	8733921328	8733921332	8733921337	8733922778	8733921348	8733921350	8733922780	8733921352	8733922804	8733922791	8733922797	8733922809	8733922819	8733922829
SM070-1AVX-XRT	8733921328	8733921332	8733921337	8733922778	8733921348	8733921350	8733922780	8733921352	8733922804	8733922791	8733922797	8733922809	8733922819	8733922829
SM070-1AHX-XLS	8733921328	8733921332	8733921337	8733922779	8733921349	8733921350	8733922780	8733921352	8733922805	8733922792	8733922798	8733922814	8733922821	NA
SM070-1AHX-XLE	8733921328	8733921332	8733921337	8733922779	8733921349	8733921350	8733922780	8733921352	8733922805	8733922792	8733922798	8733922814	8733922821	NA
SM070-1AHX-XRS	8733921328	8733921332	8733921337	8733922779	8733921349	8733921350	8733922780	8733921352	8733922805	8733922792	8733922798	8733922814	8733922821	NA
SM070-1AHX-XRE	8733921328	8733921332	8733921337	8733922779	8733921349	8733921350	8733922780	8733921352	8733922805	8733922792	8733922798	8733922814	8733922821	NA

NOTES



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