

Standard Operating Procedure Start-Up Procedure & Verification of Condensing Unit	SOP No. 8.031
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- 1 Purpose
 - 1.1 Provide a standard procedure for start-up and commissioning of HVAC equipment.
 - 1.2 Provide a standard procedure for coordinating selection, receiving, check out, and acceptance of new equipment.
- 2 Scope
 - 2.1 This procedure applies to (but is not limited to) Refrigeration Condensing Units.
- 3 Responsibility
 - 3.1 Project Managers have overall responsibility for new equipment from procurement to start-up. To assure optimum selection of equipment and smooth commissioning, the Project Manager is responsible for coordinating the following activities:
 - 3.1.1 Review of customer and specific job specifications.
 - 3.1.2 Review of equipment selected with Service prior to ordering.
 - 3.1.3 Assure equipment is on approved list.
 - 3.1.4 Review drawings, assure drawing schedules, and equipment details are correct.
 - 3.1.5 Coordinate delivery and commissions schedule with all team members including (but not limited to): Site Foremen, Balance and Service (start-up), Customer, General Contractor, and Safety (as needed).
 - 3.1.5.1 In most cases, Start-up should be scheduled a month in advance.
 - 3.1.5.2 If exact date is known, Service should be notified with estimated time frame.

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3.1.5.3 Communicate specific requirements to all team players in writing and verbally.

3.1.5.4 Provide appropriate job number to team members.

3.2 Therma Service/Start-up has responsibility for the following activities:

3.2.1 Therma will provide a qualified Service Mechanic to perform equipment start-up.

3.2.2 The start-up technician will perform the start-up tasks as specified in the commissioning Standard Operating Procedure for that equipment.

3.2.3 Service will provide estimated time required to Project Manager (PM) prior to start-up. Service will meet agreed upon schedules to assure customer satisfaction.

3.2.4 The start-up technician will fully complete a start-up sheet for each piece of equipment. A copy of this sheet will be provided to the Project Manager with the turnover documents: A second copy will be filed in Service by Customer Name and Address.

3.2.5 All time will be charged to the appropriate job number as specified by the Project Manager. If requested, Time and Material sheets shall be completed.

3.3 The Start-up/Commissioning Coordinator has responsibility for the following activities:

3.3.1 Provide a communication path between the Project Manager and the Field Foremen.

3.3.2 Schedule qualified personnel for start-up, balance, test, and room certification as required.

3.3.3 Coordinate punch-list completion with Project Managers.

3.3.4 Coordinate start-up, service, balance, and test report documentation.

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4 Procedures

- 4.1 General: Service Technician is responsible for filling out start-up sheet FN 8.031.1 for Condensing Units. A start-up sheet will be completed for each piece of equipment. Each sheet requires the following information:
 - 4.1.1 Job identification: The job name, job number, and job address are to be completed by the start-up/commissioning coordination. These will be provided to the service technician.
 - 4.1.2 Section 5 - Equipment Description.
 - 4.1.3 Section 6 - Equipment Pre-Installation Inspection.
 - 4.1.4 Section 7 - Equipment Installation Inspection.
 - 4.1.5 Section 8 - Operation and Inspection.
 - 4.1.6 Signature - As each section and page is completed, the Service Technician must print and sign his/her name and record the date. This document should also be signed off by an owner representative when required.

5 Equipment Description

- 5.1 This section should be completed by the Service Technician. Any design documentation specifying equipment should be recorded in this section. This includes: Specification number, Submittal number, Process and Instrumentation Diagram Number, and Drawing number. Also, record which area this equipment will be serving.
- 5.2 Fill In the "design" column, record the following information as specified on the design documents. Unit Tag number (per drawings) Manufacturer (per equipment schedule and/or approved submittals) Model number (per equipment schedule and approved submittals).

6 Equipment Pre-Installation Inspection

- 6.1 For each of the following items: Check Yes, No or N/A for not applicable. If No is checked, describe the difference in the comment section and notify the Project Manager immediately. Initial and date each item as it is checked.
- 6.2 Nameplate data matches vendor specifications. When the equipment is delivered, verify it matches specifications. Complete Section 5. In the "actual on site" column, record the actual data as shown on the equipment and verify that it matches the design criteria.

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- 6.3 All parts are received and verify the packing slip(s).
- 6.4 Inspect for visible signs of damage, leak, or defective parts. Note any discrepancies and notify the Project Manager.
- 6.5 Verify electrical service for correct voltage, current and thermal overload protection.
- 6.6 Operation and Maintenance (O&M) manual is available in the field.
- 6.7 Start-up technicians reviewed factory start up procedures in the Operation and Maintenance manual.

7 Installation Inspection

- 7.1 For each of the following items: Check Yes, No or N/A for not applicable. If No is checked, describe the difference in the comment section and notify the Project Manager immediately. Lock Out/Tag Out procedures should be observed before most of the following steps.
- 7.2 Unit is installed level. Check Operation and Maintenance literature some equipment needs to be level to 1/8" or better to allow proper drainage and or operation.
- 7.3 Tag number is attached to the unit. Tag should be attached to service disconnect or near unit identification plate, if mounted in a ceiling system tagging should reflect location above or below.
- 7.4 Service clearance is adequate for maintenance. Service clearance includes access to the equipment through the ceiling systems, over duct work etc. filter access for removal and replacement are essential.
- 7.5 Vibration isolators are installed and adjusted. Check Operation and Maintenance literature: internal and external isolation skids and springs need to be set properly. Isolators equipped with rubber damper washers on the seismic restraints these must be "just free" not compressed or removed. Isolation springs must not be used as leveling devices: leveling should be accomplished otherwise.
- 7.6 All compressor shipping braces and compressor rail isolator sleeves are removed. Check Operation and Maintenance literature: severe vibration will occur if compressor isolation is not set properly.
- 7.7 Compressor oil level is with in manufacturer's specification. Check Operation and Maintenance literature.

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- 7.8 Liquid line drier is installed. Drier is supported and is installed in proper flow arrangement.
- 7.9 Suction line(s) is properly sized and installed. Traps for oil, double suction risers, pitch for oil return to compressor, riser size reduction all may be necessary for conditions.
- 7.10 Liquid line(s) and hot gas bypass line(s) are sized and installed. Liquid line solenoid(s), hot gas bypass solenoid(s), line strainers all may be necessary for conditions.
- 7.11 Suction and hot gas lines are insulated. Rubber closed foam arma-flex or equivalent is acceptable. All joints, especially, on suction line insulation must be sealed. An alternative to arma-flex is fiberglass insulation. Fiberglass outside requires metal jacketing.
- 7.12 All condenser fan setscrews are tight.
- 7.13 Coils are clean and fins are straight.
- 7.14 Low ambient control is installed. Check Operation and Maintenance literature: if unit operates 24 hours a day this is necessary for colder outdoor air conditions, factory mounted or field mounted.
- 7.15 All bearings are lubricated.
- 7.16 Piping has undergone pressure test. Check Operation and Maintenance literature for manufacturers maximum pressure allowances. Pressure test is typically 150psi for 24 hours.
- 7.17 Piping is clamped and isolated. Refrigerant piping should be clamped with vibration isolating rubber or plastic insert clamps if not with insulation shields for fiberglass insulation.
- 7.18 Piping is labeled. Standard pipe labels of Freon or Refrigerant R22 etc are sufficient direction specific line identification may be required.
- 7.19 Crankcase heater is installed.
- 7.20 All electrical connections are secure. Check all terminals, with a reliable meter, from line to line and to ground before checking all electrical connections in all panels, motors, and devices. Check wire, nuts, spade connectors, and crimps as well.

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- 7.21 All access panels and covers are in place. Including: electrical, fan, filter, damper, return air, economizer section, supply air doors and covers.
- 7.22 Thermostat is installed. This maybe a separate controls system insure its connection to the Air Handler is correct and is applicable to Air Handler Operation and Maintenance literature.

8 Operational Inspection

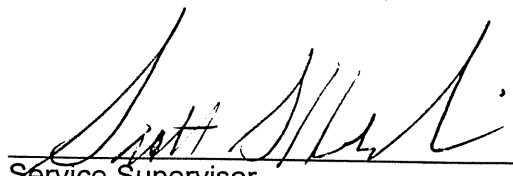
- 8.1 Use Operation and Maintenance literature and follow start up procedures the form FN 8.031.1 is a general out line and is to provide a quality assured start up when used in conjunction with the Operation and Maintenance literature. If there are any discrepancies notify the Project Manager immediately.
- 8.2 Unit vibration is acceptable. Check Operation and Maintenance literature for tolerances. Check for vibration at different fan speeds and volumes. Check unit, check around unit and below roof under unit.
- 8.3 Each fan rotation is correct.
- 8.4 Crankcase heaters are functional. Check Operation and Maintenance literature: verify voltage, wattage, amperage.
- 8.5 Cooling components perform per manufacturer's specifications. Check Operation and Maintenance literature: verify all safety controls, operating controls, and refrigeration performance.
- 8.6 Make sure thermostat is set. Operate (or have operated) temperature controls to ensure all functions and set points.
- 8.7 Record start up operating parameters in the Supplementary Form(s), FN 8.028.2 or FN 8.028.3. Use as many of the Supplementary Forms as necessary to complete Condensing Unit start-up form FN 8.031.

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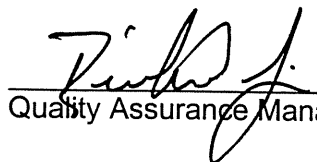
Document Approval


 Service Manager

5-18-99
 Date


 Service Supervisor

5/19/99
 Date


 Quality Assurance Manager

5-28-99
 Date

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