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) the following types of equipment: Variable Frequency Drives.

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. Assure equipment is on approved list.

3.1.3 Review drawings, assure drawing schedules, and equipment details are correct.

3.1.4 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).

3.1.4.1 In most cases, Start-up should be scheduled a month in advance.

3.1.4.2 If exact date is known, Service should be notified with estimated time frame.

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

3.1.4.4 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 PM 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 Materials 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.

4 Procedures

4.1 General: Service Technician is responsible for filling out start-up sheet FN 8.029.1 for Variable Frequency Drives. 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 – Operational 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, 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)

5.3 Fill in filter and belt information.

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 and verify that it matches the design criteria.

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.

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 Procedure SOP 4.001 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 Unit is in a well ventilated area or cabinet. Check Operation and Maintenance literature and mechanical drawing details: proper ventilation is important to insure Variable Frequency Drive operation.

7.4 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.

7.5 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.

7.6 Separate metal conduits for routing input power, output power and control circuits are used. Check Operation and Maintenance literature and mechanical drawing details: proper wire routing is important to insure Variable Frequency Drive operation.

7.7 The 3-phase source power is within the correct voltage and frequency tolerances. Check Operation and Maintenance literature.

7.8 Input, output and control wiring are connected. Check Operation and Maintenance literature.

7.9 Motor leads are connected to motor terminals.

7.10 A molded case circuit breaker between the power source and the inverter is installed. Check Operation and Maintenance literature and mechanical drawing details: local code may require more or less protection.

7.11 Short circuits or inadvertent grounds are not found. Test with a reliable meter for these before powering up the Variable Frequency Drive.

7.12 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, wire nuts, spade connectors, and crimps as well.

7.13 Heatsink is free of duct and debris. Check Operation and Maintenance literature.

7.14 Variable Frequency Drive has bypass.

8 Operational Inspection

8.1 Use Operation and Maintenance literature and follow start-up procedures the form FN 8.029.1 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 Test the drive with motor disconnected from the Variable Frequency Drive.

8.3 Output voltage is equal to the input voltage.

8.4 Test the drive with motor connected to Variable Frequency Drive.

8.5 Motor is running in the direction indicated by the rotation direction indicator on the unit LCD display. Check Operation and Maintenance literature.

8.6 Test bypass – Motor is running in the same direct as in Step 8.5. Check Operation and Maintenance literature.

8.7 Record operating parameters. Check Operation and Maintenance literature.

Document Approval

Service Manager — Date: 5-18-99

Service Supervisor — Date: 5/19/99

Quality Assurance Manager — Date: 5-28-99