SPROUTS FARMERS MARKET

REFRIGERATION INSTALLATION

SPECIFICATIONS

Revision #3 (1-8-2015)

REFRIGERATION INSTALLATION SPECIFICATIONS

I General Notes

Sprouts strongly suggest all Contractors that are submitting proposals visit and inspect an open and operating Sprouts store within the region for the project you are submitting a proposal. Check with the Sprouts Project Manager as to which location to visit and inspect. All refrigeration contractors that are invited to submit proposals are professional and reputable contractors. Sprouts expect that the proposals submitted are totally inclusive of what it takes to install the refrigeration, EMS, and cases for this project. During the proposal process, please call with any questions or clarifications prior to submitting your proposals.

Generally underground will begin 2 weeks after start of construction for Ground Up projects and immediately for T.I. projects. Typically there is 3 to 4 weeks to install overhead and hang coils in walk-ins. The racks will arrive 1 to 2 weeks before the cases. When the cases arrive there is usually 2 weeks until start up. This is typical but may not hold true for all stores. The Refrigeration Contractor is to inspect all customer supplied refrigeration equipment, cases, and components. Any damage is to be noted on the Bill of Lading and communicated to the Refrigeration Equipment Manufacturer. Within five (5) days of receiving loose parts, the Refrigeration Contractor is to contact the Refrigeration Equipment Manufacturer if any parts are missing. The Refrigeration Contractor is also to inspect cases as they arrive to ensure that all parts & components are on site and then send a list of items needed to the Refrigeration Equipment Manufacturer. The Refrigeration Case Manufacturer will also inspect the cases & components when they arrive on site. Sprouts expects the Refrigeration Contractor to closely coordinate and communicate at all times with the General Contractor throughout the entire project. The refrigeration installation will be inspected and a punch list produced by a 3rd party contractor. . Sprouts requires these punch list items to be completed within two weeks after receipt.

These General Conditions, together with the attached specifications and all drawings referred to by the specifications, are intended to illustrate the complete work required under this Contract.

Neither the Refrigeration Contractor nor Sprouts shall be responsible for oral instructions. All addenda, corrections or letters issued during the time of bidding shall take precedence over the specifications as written.

Section 1. Scope of Work

The intent of the drawings and specifications is to provide a complete refrigeration system installation. The Contractor shall provide all labor, material, supervision, tools, and perform all work necessary to accomplish this end.

All Contractor supplied materials and devices shall be new unless specified by Sprouts. Materials not specified by name or make shall be subject to approval by Sprouts management.

The transportation, unloading, storing, erection or installation, testing and making operable all parts of the Project shall be included under this Contract, at times appropriate thereto.

A. The work shall include, but is not necessarily limited to the following:

1. Refrigeration piping, hangers/support & insulation:: Refrigeration Contractor to supply.
2. Condensing units – systems: Furnished by Sprouts.
3. Remote condensers and controls. Furnished by Sprouts.
4. Charging and lubricating systems: Contractor to provide refrigerant. Refrigeration Equipment Manufacturer provides the oil.
5. Adjustments of controls.
6. Terminate wires to the T-stats and sensors, and ensure all alarms are functional.
7. Identification of systems including cases, branch line sets, & EPR valves.
8. For rooftop units, any heat reclaim piping to be in cooperation with the Mechanical Contractor Sprouts. For air handling units, the heat reclaim piping and coil installation, and start-up.
9. Installation of case shelving, and inserts. Make adjustments such as height, relocation of bolts for shelves, etc,
10. Installation & start-up of refrigerated ice machines and all other self-contained cases as shown in plans. Make adjustments as required.

11. Install EPR‟s, EEPR‟s and solenoid valve controls, etc., for walk-ins and cases.
12. All other installation material, together with all labor and permits as required to do a complete installation and perform the services outlined in this specification as detailed on the drawings.
13. As-built drawings showing any approved deviations from the Contract Documents.
14. Warranty – Ninety (90) days unless otherwise specified.
15. Returning any defective parts/components.
16. Site Manager Setup/Updates (Refer to Appendix B). 17. RTU & S/C Equipment Verisae Paperwork/Refrigerant Charges to be turned into commissioning agent prior to turnover.
18. GreenChill Paperwork to be turned into commissioning agent prior to turnover.
19. Final EMS Programming for Refrigeration, HVAC, & Lighting.

Section 2. Examination of the Premises

a. The Refrigeration Contractor, before submitting a proposal for this work, shall examine the premises and all conditions thereon and/or therein. The Contractor‟s proposal shall take into consideration all such conditions as may affect the work under the Contract.

Section 3. Change in the Work

a. Sprouts may make additions, deletions or alterations in the work.

b. No changes shall be made or extra work done or paid for unless **authorized in writing** by Sprouts. Should any change decrease the amount of work, deduction shall be made accordingly in the amount to be paid.

Section 4. Manufacturer's Warranties and Instructions

a. No work shall be done by the Contractor, which will void a manufacturer‟s warranty.

b.Upon completion of the work, the Contractor shall deliver tothe store at least one copy of all installation and service instructions
supplied with the various pieces of equipment. Refrigeration Equipment Manufacturer is to send out (2) binders with installation and service instructions for the Refrigeration Contractor and General Contractor. The Refrigeration Contractor is to give (1) binder to the General Contractors

superintendent upon receiving. The Refrigeration Equipment Manufacturer will provide the Sprouts Project Manager with a thumb drive containing this information as well.

c. Any work furnished by the Contractor which does not comply with these specifications, or is defective in material or workmanship, will be rejected by written or verbal notice from SPROUTS Project Manager. The Contractor shall start to dismantle and remove such material or workmanship within twenty-four (24) hours of receiving the notice. Such work shall be remade or replaced in accordance with the plans and specifications.

d. If any public authority requires any work to be specially tested or approved, the Contractor shall give the proper authorities timely notice of its readiness for inspection. If any such work should be covered over without approval or consent, it must, if required, be uncovered for examination at the Contractor‟s expense.

Section 5. Labor and Materials

a. The Contractor shall provide all labor, transportation, materials, apparatus and tools necessary to complete everything described, shown or reasonably implied on the drawings or in these specifications.

Section 6. Supervision

a. The Contractor shall, through competent agents, give proper Supervision of the work.

b. Contractor shall furnish the services of an experienced Superintendent who shall constantly be in charge of the Refrigeration Systems, together with all necessary mechanics and laborers required to properly unload, transfer, erect, connect, adjust, start, operate, and test systems.

c. Any careless or incompetent worker as judged by Sprouts Project Manager shall be removed by the Refrigeration Contractor when he is notified to do so by SPROUTS Project Manager.

d. For the actual fabrication, installation, and testing of work under these specifications, uses only thoroughly trained and experienced workers completely familiar with the items required and with the manufacturers‟ recommendations as to their use. In the acceptance or rejection of the finished installation, no allowance will be made for lack of skill on the part of workers.

Section 7. Cleaning Up

a. The Contractor shall at all times maintain the Project in an orderly, workman like condition, reasonably clean and free of accumulations of dirt and debris. If the Contractor fails to maintain the Project, the Owner shall have the right to engage others to do so at the Contractor‟s expense.

b.The Project shall, in general, be turned over to the Owner in a thoroughly clean and workmanlike condition, ready for the Owner‟s use in every respect.

Section 8. Intent of Drawing

a. The drawings indicate in diagrammatic form the arrangements desired for principal apparatus, piping, ducts etc., and shall be followed as closely as possible. Use judgment in carrying on the work to secure the best possible headroom and space conditions throughout, to secure a neat arrangement of piping, duct work and equipment, to overcome local difficulties and interferences to structural conditions wherever encountered.

b. Any work installed to the contrary, in the opinion of Sprouts Project Manager, shall be relocated and reinstalled at the expense of the Contractor, and at no additional cost to SPROUTS.

Section 9. Cooperation with Others

a. The Contractor shall schedule their work in such a manner that progress will Harmonize with all trades, and so that all work may proceed as expeditiously as Possible.

b. The Contractor shall plan his bid, considering all other trades, to make sure each and every item has been covered. No extras will be allowed for any controversies arising between trades.

c. The Contractor will furnish motors and electrical equipment suitable for Electric service and voltages as installed.

Section 10. Opening through Walls, Roof, and Floors

a. Opening will be provided by others. Contractor shall refer to refrigeration drawings & coordinate with G.C.

Section 11. Bird Screen

a. All openings through roof occurring in any portion of this contract work shall be provided with bird screen (maximum ¼" screen). Bird Screens must also be installed between the back of the refrigeration cases and the wall. General Contractor is to provide and install the bird screen on all cases backed up to walls except on cases that are part of the return air plenum.

Section 12. Patching and Repairing

a. Contractor shall be responsible for all patching and repairing relating to work performed, including any fire stops at penetration through fire rated walls, ceilings or floors.

Section 13. Equipment Exposed to Weather

a. All equipment exposed to weather shall be protected in a manner recommended by the manufacturer and subject to approval of SPROUTS Project Manager, whether indicated on Plans or not.

. b. Where possible, weatherproofing shall be by manufacturer, otherwise by Contractor.

Section 14. Accessibility of Equipment

a. All valves, motors, controls, and other devices or components requiring service, maintenance, and/or adjustment shall be placed in fully accessible position and locations. Provide access doors where required in ductwork of construction, whether specifically detailed or not, to render all such items accessible. Refer to plans for installation location of EPR/EEPR valves & shut-off valves.

b. Components requiring access for service, inspection, etc., shall have hinged access openings provided with clamp latches. The use of screws in lieu of hinges or latches will NOT be permitted.

Section 15. Wiring Diagrams and Equipment Changes

a. Contractor shall pay for any extra charges arising from changes in the control system when the approved Shop Drawing of the Control System is different from that shown on Drawings. Control system shall be taken to include all wiring including power, conduit, switches, relays, starters, etc., required for the operation or control of any or all parts of the HVAC and Refrigeration Systems.

b. Contractor shall also pay extra charges for changes in structure, equipment, location, and/or service connections (including plumbing) when caused by installing equipment other than specified or in a manner different from that shown on Drawings.

c. Approval by SPROUTS Project Manager of Shop Drawings shall not relieve the Contractor from bearing cost of changes.

d. Contractor to have qualified men on the job within 24 hours of being notified. After more than 48 hours of not responding, SPROUTS reserves the right to reassign the contract to a different company.

e. Failure to stay within the General Contractor‟s Construction Schedule will dictate a re-evaluation of the refrigeration contractor being considered for future store bid lists.

Section 16. Display Cases

a. Refrigerated and non-refrigerated display cases will be set and trimmed in accordance with the manufacturer‟s instructions or representative.
All cases shall be received at the job site by the refrigeration contractor. If freight damage occurs, it must be so noted on the "Bill of Lading", and the Sprouts Construction Department immediately notified. No repairs are to be made until authorized to do so by the manufacturer.
Cases will be located as per the refrigeration drawings, <u>not</u> the architectural drawings.

b. Metal shims (only) will be used to level cases.
Case cleaning by this contractor shall include removing all foreign material from cases and vacuuming of drain pan to remove loose material, screws, nuts, labels, stickers, etc.

c. The electrical contractor to provide and install all conduits and pull all high voltage wire. However, it shall be the responsibility of the refrigeration contractor to pull all low voltage wire & EEPR wiring and make all final low voltage connections on product refrigeration equipment including the environmental panel, AI panel, light panel, HVAC panel and alarm panel. E.C. to terminate all high voltage wiring.

d. Refrigeration line set case penetrations shall be no larger than necessary and will be located in the space designated by the case manufacturer.

e. It shall ,be the responsibility of the refrigeration contractor to ensure that floor sinks at cases are half in and half out, and that the floor sink grate can be easily removed. Refrigeration contractor to coordinate with plumbing contractor for proper location of floor sinks.

f. Case closure panels shall be stainless steel, provided and installed by General Contractor as directed by Sprouts Construction Department. General Contractor also to provide insulated panels at rear load dairy case close-offs. Closure panels will include ALL refrigeration case closures, plenum walls, and openings on top of refrigerated cases.

g. Service cases must be sealed on inside & outside and 3-Deck Deli cases must be sealed on the outside joints by Refrigeration Contractor. Caulking must be around entire service cases. Silicone caulking used must color match area being sealed. No clear caulking to be used.

h. Install clear acrylic (Plexiglas) divider between like temperatures on separate circuits and insulate partitions on all mixed temperature applications. Dividers and partitions are supplied by the case manufacturer.

j. Refrigeration Contractor to provide and install butyl tape to seal both sides of cases at joints.

Section 17. Walk-In Boxes

a. The evaporator coils will be furnished by the Owner and shall be installed from hangers furnished by this Contractor. Use 3/8" threaded steel rod to support suspended cooling coils. Coils installed in the walk-in coolers/freezers, support coils above ceiling panel with Unistrut. All cooler penetrations are to be sealed both inside and out with foam and silicone sealant by R.C.

b. The Fixture Electrician shall install the Refrigeration Equipment Manufacturer supplied micro switch on all walk-in boxes at the top of the door. Micro switch and evaporator coil fans for the freezer boxes shall be wired in back to the rack control. This is to shut off coil fans and pump down the system/circuit with the EEPR within the EMS software when freezer door is opened. No liquid line solenoids are to be used.

Section 18. Drains

a. All case drains are to be installed by the Refrigeration Contractor.

Cases will be furnished with a trap, either built-in or supplied loose by the equipment manufacturer, for connection to case drains.

b. All case drains will be run to the nearest floor drain with schedule 40 PVC tubing unless other material is required by code. Cleanout unions shall be provided in the most accessible location for cleaning. Drains to be run full size whenever possible. Drain lines to be cleaned and cemented. For threaded fittings, use Teflon tape or pipe dope. If drain lines are ran in return air, Type M hard copper must be used.

c. Case line-ups will utilize a maximum of three cases per floor drain Each case to drain independently all the way to the drain hub. Maximum drain runs of 15‟.

d. Walk-in cooler drain. Drain will be installed by refrigeration contractor.
Drain lines in walk-in coolers must be Type M hard copper. Drain lines and traps will be required from coils in all walk-in coolers to condensate drain outside cooler (per code).

e. Drain lines in walk-in freezers and meat cooler must be Type M hard copper. Drain should slope not less than 15 degrees. Drain line shall be wrapped with heat tape and insulated inside of freezer. Meat Cooler drain must be wrapped with heat tape and insulated also.

f. Type M hard copper drain lines will be required for coils in all refrigerated prep areas. No drain lines shall be smaller than the coil drain and connection. A copper union shall be installed at the bottom of the pan to allow removal of the drain line. Drain lines shall not inhibit the removal of the drain pan. Provide and install union fitting within 11 inches of the drain pain.

g. Heat tape and insulation will be installed and supplied by refrigeration contractor.

h. Seal all wall penetrations with expanding foam and silicone caulk, inside and out.

i. All walk-in coil drain lines “P” traps shall be outside the walk-in boxes.

j. Each walk-in box to drain independently. Do not combine drains from multiple walk-ins.

Section 19. Piping

a. All piping shall conform to these notes. Anything not covered by these notes must conform to ASHRAE standards.

b. Piping shall be ACR, hard drawn, Type L with factory sealed ends and sized in accordance with refrigeration schedule and loop piping diagrams.
Piping shall be run overhead, as low as possible (above lights & on top of walk-ins. All other lines shall be underground to avoid drops in the sales area. No exposed refrigeration lines on walls or below ceiling where visible from sales floor.

c. Underground piping shall be insulated, installed in PVC and buried directly in trench provided by the General Contractor Trenching and backfilling shall be done by General Contractor. Underground refrigeration lines must be pressurized with 300 psi of dry nitrogen or pressure required by code, whichever is greater, it must sit for a 24 hour period and must not drop more than +/-1 psi when check with the same gauge. Once this process has been verified by Sprouts Project manager or the General Contractor, the refrigeration line can then be buried. Bottom of trench at most distant point from risers shall be a minimum of eighteen inches (18") below finish floor and graded one inch (1") per twenty feet (20') toward refrigeration rack. Insulated pipe shall then be laid in six inch (6") bed of sand, and backfilled with no less than eight inches (8") of washed sand. General Contractor to provide sand and complete backfill.

d. Compaction shall be obtained with engineered fill and testing in accordance with General Contractor specifications and soils report. Excess dirt shall be removed from the site by the General Contractor.

e. Overhead Suction lines shall be insulated with ¾" Arma-flex and liquid lines shall be insulated with ½" Arma-flex or as noted on plans for high humidity areas, slipped over pipe prior to brazing and sealed at joints. All 90's are to be mitered (Refer to Section 20, Item I). Piping buried underground shall be insulated with 1" Arma-flex or equal insulation on both suction and liquid. Pipe shall be installed in a 6" PVC on all underground refrigeration pipes and foam the ends.

f. Piping shall be installed per construction drawing. Locate stub ups per construction print and verify with Construction Department prior to floor being poured. Install stub-up four foot above slab grade and protect with 6" PVC sleeve. Paint PVC pipe with brite flourescent colored paint such as Safety Orange Cut PVC to floor grade when fixture is installed.

g. P" traps shall be installed on all vertical suction risers over 3'. For risers over 20', install second trap at top of case. Traps shall be one (1) piece, not fabricated from ells, and shall be the same size as the horizontal. "P" traps shall also be provided at the vertical riser in the suction line from each cooler and freezer blower coil. Inverted "P" traps are to be used when branch lines are connected into main suction line runs.

h. Piping shall be arranged so as not to obstruct easy access to valves, evaporators, coils, compressors, condensers, motor and electrical gear or controls and shall have a minimum seven foot (7') high head clearance.

i. Overhead piping must be installed in Snap „N Shield pipe hanger made by Cooper B-Line. They must be black in color.
Note: Attachment to 2x4 rafters is not allowed. Supported at a maximum of eight foot (8') intervals, however no sagging of piping is allowed. Provide sway bracing (lateral & end-to-end) to prevent swing per local code requirements.
j. Hyra-Zorb brand clamps or equal with black inserts will be used on <u>all</u> discharge and liquid drain lines including lines to and from the heat reclaim coil and condenser, and a minimum of two (2) clamps once the liquid lines leave the racks. These clamps shall also be installed in all other locations where vibration exists.

k. Tubing from one system shall not run through a case or box connected to another system.

l. Where branch, coil or case suction lines enter the main suction line, they shall enter at the top. Piping shall be arranged so that refrigerant or oil cannot drain into the coil.

m. All welded joints in copper to copper shall be made with silfos with fifteen percent (15%) silver. All joints made copper to brass or steel will be made with Easy Flow with forty-five percent (45%) silver or equal.

n. All entry holes (by any trade) for piping to equipment room, display cases or walk-in boxes shall be sealed with insta-foam froth pack or approved equal. Company making entry hole is responsible for sealing same, refrigeration contractor to ensure this is done. Foam is not to be cut back. Foam is to be redone if the initial application excess interferes with either airflow or case parts. Perma-gum is not acceptable. Penetrations into equipment room where required by code shall be sealed with fireproof caulking. This includes electrical conduit, sprinkler piping and refrigeration piping. The work is to be done with the highest degree of craftsmanship by individual trades

o. All fittings to be long radius, wrought copper manufactured by Mueller Brass.

p. No 45 degree fittings will be allowed.

q. All joining of copper tubing shall be with fittings manufactured for the application.
r. Tubing and fittings to be sweat joined shall be cleaned to bright metal before brazing.

s. No flare fitting shall be permitted where it is possible to make sweat joints.

t. Dry nitrogen shall be bled through lines while brazing. Extreme care shall be taken to keep the entire system clean and dry during installation. Construction Department retains the right to cut three (3) welded joints from the system for examination. These joints to be replaced by the Contractor at no expense to SPROUTS. Before making final connection, and prior to charging the system, nitrogen shall be blown through piping to remove loose brazing alloy and dirt.

u. All unistrut clamps to be secured with commercial grade nylon stop nuts.

v. Refrigerant piping & valves on top of walk-ins shall be identified with legible, permanent marking showing what system it serves.

w. System isolation valves on suction & liquid lines shall be installed throughout, including condenser inlet and outlet, for proper pump-down and shut-down procedures. Isolation valves provided by Refrigeration Equipment Manufacturer.

x. Appropriate and sufficient expansion loops shall be constructed on all heat reclaim lines to air handlers, and hot water reclaim tank.

y. Liquid line take-offs in cases or boxes shall be taken from the bottom half of the branch liquid line.

Section 20. Insulation

a. All liquid and suction lines shall be insulated continuous from the cabinet of the display case, cooler or freezer coil to the service valve at the compressor.

b. All sub cooled liquid lines shall be insulated with ½" Arma-flex and all suction lines shall be insulated with ¾" Arma-flex or as noted on plans for high humidity areas.

c. Insulation shall be Armstrong closed cell Arma-flex or approved equal. All suction & liquid lines located outdoors shall have aluminum wrapped insulation.

d. All joints to be sealed with #520 Arma-flex glue or equal.

f. Discharge lines shall be insulated to OSHA standards with fiberglass insulation one-half (1/2") thick with properly-fitting elbows. Arma-flex will not be accepted on discharge lines. Provided the discharge lines are a minimum of fifteen inches (15") from the walkway, the insulation may be omitted. In all stores,provide a

sign in a prominent location in the machine room which says “Caution-Hot Pipes”. This sign is to be acceptable to OSHA in size and design.

g. Any piece of equipment or part thereof that is within fifteen inches (15”) from any walkway and reaches temperatures hot enough to burn human tissue on momentary contact must also be covered. Use sheet fiberglass insulation of proper design to be permanent, neat and effective.

h. All insulation in overhead shall run continuous through hangers and shall have metal or rigid plastic sleeves where clamped, except discharge and drain lines. Insulation shall be cut at Hydra-Zorb clamps on discharge, drain and liquid lines.All suction accumulators, or their equivalent, shall be insulated with ¾” sheet Arma-flex.

i. Insulation is to be installed in accordance with manufacturer‟s specifications. All 90 degree ells will be covered by making two 22.5 degree mitered cuts and glued. All suction p-traps will be mitered with 22.5 degree mitered cuts and glued also. Any 3/8” piping can use 45 degree mitered cuts.

Section 21. Equipment setting

a. Compressor racks shall be mounted on vibration isolation pads furnished with the rack. Isolation units shall be lagged to floor and sealed against water intrusion with non-hardening silicone seal. Seismic restraints, when required by local codes, shall be provided and installed and lagged to the floor/I-beam and sealed against water intrusion with non-hardening silicone seal. Contractors to refer to Refrigeration and Structural plans for seismic restraint details and responsibilities.

b. If mounted on roof, condenser shall be securely fastened to roof members provided by the General Contractor. If air cooled condensers, clearance from structure must be a minimum of (24”) twenty-four inches to bottom of condenser.

c. All equipment and panels should be mounted in location shown on drawings.

Section 22. Installation Requirements

a. Installation work performed on behalf of Sprouts Farmers Market, work not included in the scope of work and considered “extra”, will not be invoiced to Sprouts without proper authorization prior to the work being done. Labor rate and material mark-up shall be the same as construction rates, as provided as part of the Contractor‟s bid proposal.

b. Installation work performed on behalf of equipment manufactures, suppliers, or representatives will be invoiced directly to the requesting party and a copy of each

invoice forwarded to Sprouts Construction Department. Labor rate and material mark up shall be the same as Sprouts rates.

c. Contractor shall provide an experienced service technician familiar with the equipment installed by the Contractor and its operation and adjustment from 5:00 AM to 5:00 PM on opening day.

d. Each field installed component part of every system shall be clearly identified with the corresponding system number. (No Dyno tape) Use Brother p-Touch, or equal, labels in a contrasting color.). Cases to be labeled with system number using engraved hard plastic, 1" by 2", with 3/4" white lettering. Rivet label on each case in upper LH corner. Temporary tags may be used until permanent tags are available.

e. Furnish the following, 24" x 36" drawings in picture frame with clear plexi-glass mounted on or near each parallel refrigeration rack. For outdoor parallel racks, 11" x 17" laminated drawings are to be attached to the inside of the rack panel. Coordinate with the Sprouts project manager for specific location.

1. As Built Floor Plan Drawing
2. With fixture, rack, and panel locations
3. System Numbers
4. Temperature Probe locations
5. EPR, EEPR, & Solenoid valve locations
6. Any special control locations
7. Showing underground piping/trenches
8. Initial defrost schedule of all systems
9. Engineering Refrigeration Schedule

Note: It is mandatory for the refrigeration contractor to provide the engineer of record with marked up drawings indicating any deviations from the plans.

f. The Refrigeration Equipment Manufacturer shall supply a sheet metal pocket for the service log book near the parallel refrigeration rack (coordinate with Sprouts project manager for specific location). The Service Log Book will be initiated at start-up and used for each service call, in or out of warranty. The refrigeration contractor shall promptly forward to Sprouts copies of all service calls, in or out of warranty.

Section 23. Temperature Performance

A. It is the responsibility of the installer to ensure systems are installed in accordance with the manufacturer‟s installation instructions. The discharge air temperatures are to be setup per the refrigeration schedule

and then optimized by the commissioning agent. All critical temperature refrigerated storage and merchandising equipment used for potentially hazardous food must maintain Food Code temperatures (currently at 41°F) or below at all times (including defrost), and be NSF-7 approved for supermarket operation. Bulk produce (one touch) not applicable. This means all food locations, including above or below lamps, ballast and anti-condensate heaters.

Section 24. Test and Inspection

a. Underground piping shall be pressurized under the GREENCHILL best practices guideline for ensuring Leak-tight installations of Commercial Refrigeration Equipment. This will require 300 psi of nitrogen pressure or pressure required by code, whichever is greater, and must stand unaltered, for a 24 hour period with no more than a +/- 1 pound pressure change using the same gauge. THIS GUIDELINE MUST FOLLOWED NO EXCEPTIONS! The guidelines are available on the GREENCHILL website at http://www.epa.gov/ozone/partnerships/greenchill/downloads/LeakGuidelines.pdf

b. The Refrigeration Contractor shall check the SPROUTS Project Manager‟s site schedule and be available for a job walk within two (2) weeks after the installation of major refrigeration equipment.

c. Prior to charging systems with refrigerant, the Contractor shall meet Sprouts Project Manager and walk the job for preliminary approval. Contractor shall have inspection covers and case bottom pans open for visual inspection, as well as kick plates for drain inspection. The insides of the cases shall be cleaned by the Contractor prior to this time.

d. The Contractor is required to clean all new cases. This includes removing all foreign material from cases and vacuuming of drain pan to remove loose material, screws, nuts, etc.

e. Evacuate the system following the GREENCHILL best Practice Guidelines ensuring Leak-Tight Installations of Commercial Refrigeration Equipment standards, while still following all requirements of the EPA, SCAQMD, and any other agency or municipality that has enforcement responsibilities for this project. The guidelines are available on the GREENCHILL website at. http://www.epa.gov/ozone/partnerships/greenchill/downloads/LeakGuidelines.pdf

f. The Contractor shall schedule the Final Inspection with project manager once all systems are on line and operating normally.

Section 25. Start-up

a. For all vacuum and refrigerant charging. The refrigeration contractor must follow the GREENCHILL Best Practices Guidelines for Ensuring Leak-Tight installations of Refrigeration Equipment. THE GUIDELINES MUST BE FOLLOWED FOR THE STORE TO QUALIFY FOR THE GREENCHILL CERTIFICATION. The guidelines are available on the GREENCHILL website at.
http://www.epa.gov/ozone/partnerships/greenchill/downloads/LeakGuidelines.pdf

b. Contractor to check all motors, bearings, fans, and blowers for lubrication and mounting prior to starting.

c. Check for proper installation of fan blades on all fan motors-cases, coolers, condensers.

d. Contractor to check and tighten all electrical lugs including compressor electrical boxes prior to start-up.

e. Check for proper direction of rotation of all fans and all three-phase motors.

f. Check oil level on all compressors. Oil added shall be as specified by manufacturer from sealed containers.

g. Contractor is responsible for adjusting superheat of all expansion valves and verifying the presence of proper valves after 48 hours of operation. Before attempting to adjust valves, make sure the case is within 10F degrees of its expected operating temperature. Sprouts is requiring contractor to set all superheat during start-up no exceptions. Each case temperature must be within 2F degrees of each other on each system. A representative for Sprouts will be allowed to check up to 10 expansion valves for proper superheat. Contractor is to set superheats after cases are stocked. Start-up technician to coordinate with Sprouts PM and stocker.

h. After the expansion valves have been adjusted, check suction temperature eight inches from the compressor suction service valve for proper temperature. The superheated gas at the compressor should be a maximum 20Fdegrees, above saturated suction temperatures of the compressors for low temperature units. For medium temperature units, a maximum 20F degrees,

i. Contractor is responsible for verifying the presence of the EMS temperature probes in the discharge honeycomb of a case in each subsystem.

j. Contractor is responsible for cleaning TXV strainers after twelve (12) hours of operation.

k. Change all suction filters, liquid driers, and oil filters after seventy-two (72) hours running. Remove suction filters (30) days after the store opening and leave in compressor rack area for commissioning agent to inspect.

l. After seventy-two (72) hours and ninety (90) days of running, acid test the oil in all systems. Provide a copy of test results to Sprouts Facility Manager.

m. After start-up and operation has been stabilized, thoroughly leak test system with an electronic leak detector and replace all liquid line driers upon repair of all refrigerant leaks.

n. The Refrigeration Contractor along with the Mechanical Contractor shall start up the A/C compressors and air handler including heat reclaim if applicable. HVAC package units are the responsibility of the Mechanical Contractor. The Refrigeration Contractor is to provide EMS control of all RTU‟s.

o. The Contractor is responsible for programming the EMS computer systems for proper operation in every respect per SPROUTS specifications.

p. Defrost and Temperature Control Specification
The Contractor shall supply all defrost and temperature control components as indicated on refrigeration schedule. The length and number of defrost cycles shall be in accordance with case and coil manufacturer‟s recommendations. All defrosts shall be staggered to avoid demand peak.

q. During start-up of equipment, the Refrigeration Contractor shall tighten all electrical connections and check all defrost fan, light, and compressor circuits for amperage draw. Remedy if not within design parameters.

r. Finals
Provide installation and service manuals for refrigerated cases and other equipment in binder form (1 copy) given to the store manager. Contractor must complete Refrigeration log book, start-up records, and GreenChill paperwork and turn in to commissioning agent.. They must provide Store Manager with current defrost schedule and update the Site Manager floor plan The Refrigeration Contractor must also provide basic Site Manager training to the Store Manager.

s. Each component of a system shall be identified with the corresponding system number..

t. The Refrigeration Contractor is to provide the Refrigeration Equipment Manufacturer with complete marked up As Built refrigeration plans by the turnover date. In addition, the Refrigeration Contractor is to furnish the following As Builts, to be mounted near mechanical equipment (reproduced in such a manner as to not fade with time or light):
1. Floor Plan Drawing
2. With fixture, rack, and panel locations
3. System Numbers
4. Temperature Probe locations
5. EPR, EEPR, & Solenoid valve locations
6. Any special control locations
7. Showing actual underground piping/trenches as installed
8. Initial defrost schedule of all systems
9. Engineering Refrigeration Schedule

u. For Hussmann Protocol systems, Hill Phoenix Enviro Pac Distributed systems, and Kysor Warren Distributed systems Refer to the "Start-up" section in the installation and service manual for proper procedures.

v. For Hussmann Protocol systems, and Hill Phoenix Enviro Pac Distributed systems. Charging of refrigerant for start up shall maintain a minimum of 15% in receiver, while all systems and compressors are on ,and no systems in defrost. If the system has heat reclaim the receiver shall maintain 30% receiver with heat reclaim OFF. Receiver level shall maintain no lower that 15% receiver level with heat reclaim ON. CONTRACTOR MUST DOCUMENT FULL CHARGE ON REFRIGERATION RACK. If the system requires more than 15% or 30% then the receiver level must be charged to satisfy all system temperatures. If the rack has low ambient valves it will require an additional charge to maintain the receiver level in low ambient conditions.

w. After cases, coolers and freezers have a normal operating load, the Contractor shall setup for logging in the controls system.

Section 26. Warranties

a. Sprouts Project Manager or a representative of Sprouts will perform a walk through after start up with a representative of the installing refrigeration contractor to create a punch list of case installation and refrigeration system installation. Punch list will be provided to installing refrigeration contractor within 15 days of walk. Refrigeration contractor will have 15 days to complete all items noted on the punch list. Once the refrigeration contractor has completed all punch list items notification must be made to Sprouts Project Manager to schedule a second walk through to ensure all punch list items have been

completed. The refrigeration, mechanical, electrical contractor, and the Commissioning agent must be present at the second walk through to address any unfinished work. Once Sprouts Project Manager has agreed that all punch list items have been completed the 10% retainer will be released. If he punch list items are not complete on the second visit then Sprouts will contract out the work and assume the 10% retainer.

b. 365 day walk through to be scheduled by Sprouts Project Manager.

c. Warranty period will be begin on the day of grand opening of the store and be effective for 365 days. This warranty shall include any hidden defects in material, workmanship and/or any malfunctioning equipment that requires service. This is to include power outage service calls. This warranty will be enforced unless specified in construction bid.

Section 27. Notes for Proposal Forms

1. Due to the various Lease Agreements between the Landlord and Sprouts the break out of cost associated with the installation of the Refrigeration Equipment, Cases and HVAC equipment the proposal process is broken out in five (5) categories. We ask that the Refrigeration Contractors do their best in determining the cost of all material and labor associated with each of these individual tasks. Not all line items on these proposal forms may be relevant to each proposal. Please fill in the line items that are associated only with that particular portion of the job. Following are how the Proposals must be submitted.

A) **Refrigeration Equipment Install Proposal Form:** The cost associated on this proposal is for the materials and labor for installing the rack in association with the refrigeration system, all piping, material and labor.

B) HVAC Equipment Install Proposal Form: The cost associated on this proposal is for the materials and labor for installing the rack in association with the HVAC system, all piping, material and labor (only applicable on stores with a built up system with an A/C rack)

C) EMS Refrigeration Install Proposal Form: The cost associated on this proposal is for the materials and labor for installing the EMS in association with the refrigeration system.

D) EMS HVAC Install Proposal Form: The cost associated on this proposal is for the materials and labor for installing the EMS in association with the HVAC system.

E) Refrigerated Cases Install Proposal Form: The cost associated on this proposal is for the materials and labor for installing and setting of the refrigerated cases.

Section 28. Insurance Requirements

The Refrigeration Contractor awarded the Project must have the required insurance coverage as described below. Sprouts must be listed as "Additionally Insured". Contractor request for payment will not be processed until the required insurance coverage and documents are received by Sprouts. Insurance coverage must be in place prior to Contractor performing any work on this project and not expire until 15 days after Sprouts has opened for business.

Contractor Insurance Requirements

A. Commercial General Liability - Occurrence Form

General Aggregate Limit applies per project per form CG2503 or Equivalent

Limits

- $1,000,000 each occurrence
- $1,000,000 Personal and Advertising Injury
- $2,000,000 General Aggregate
- $2,000,000 Products and Completed Operations Aggregate
- Including Broad Form Contractual Liability
- Including Explosion, Collapse and Underground Hazard
- Jobsite Pollution
- Additional Insured, per CG2010 11/85 or Equivalent (to include Completed Operations) in favor of Sprouts Farmers Market and any other Designated Party of Sprouts Farmers Market, LLC on a Primary and Non-Contributory Basis. Endorsement must be attached.
- Waiver of Subrogation in favor of Sprouts Farmers Market and any other Designated Party of Sprouts

Farmers Market, LLC

B. Automobile Liability - Owned, Nonowned and Hired Automobile

Limits

- $1,000,000 Combined Single Limit
- Broadened Pollution - When hauling Hydrocarbons or Hazardous Materials as cargo
- Additional Insured Endorsement in favor of Sprouts Farmers Market and any other Designated Party of Sprouts Farmers Market, LLC

C. Umbrella Liability

- Limits
- $3,000,000 per Occurrence
- $3,000,000 Aggregate

D. Workers" Compensation

Limits

- Statutory Limits Box checked
- Employers Liability $1,000,000 / $1,000,000 / $1,000,000

- Waiver of Subrogation included

Sprouts and the Landlord need to be named as additionally insured.
Sprouts Framers Market shall be the certificate holder.

Sample Certificate Only

ACORD™ CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

PRODUCER	THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.	
HRH of Colorado 720 S. Colorado Blvd., N. PH P.O. Box 469025 Denver, CO 80246	INSURERS AFFORDING COVERAGE	NAIC #
INSURED Subcontractor Company Subcontractor Address City, State, ZIP	INSURER A: Name of Company	
	INSURER B: Name of Company	
	INSURER C: Name of Company	
	INSURER D: Name of Company	
	INSURER E: Name of Company	

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	ADD'L INSRD	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
A	X	GENERAL LIABILITY	Policy #	01/01/06	01/01/07	EACH OCCURRENCE	$1,000,000
	X	[ ] COMMERCIAL GENERAL LIABILITY				DAMAGE TO RENTED PREMISES (Ea occurrence)	$50,000
		[ ] CLAIMS MADE [X] OCCUR				MED EXP (Any one person)	$5,000
	X	[ ] Jobsite				PERSONAL & ADV INJURY	$1,000,000
		[ ] Pollution				GENERAL AGGREGATE	$2,000,000
		GEN'L AGGREGATE LIMIT APPLIES PER:				PRODUCTS - COMP/OP AGG	$2,000,000
		[ ] POLICY [X] PRO-JECT [ ] LOC					
B	X	AUTOMOBILE LIABILITY	Policy #	01/01/06	01/01/07	COMBINED SINGLE LIMIT (Ea accident)	$1,000,000
		[X] ANY AUTO				BODILY INJURY (Per person)	$
		[X] ALL OWNED AUTOS					
		[ ] SCHEDULED AUTOS				BODILY INJURY (Per accident)	$
		[X] HIRED AUTOS					
		[X] NON-OWNED AUTOS				PROPERTY DAMAGE (Per accident)	$
		[X] Broadened					
		[ ] Pollution					
		GARAGE LIABILITY				AUTO ONLY - EA ACCIDENT	$
		[ ] ANY AUTO				OTHER THAN AUTO ONLY: EA ACC	$
						AGG	$
C		EXCESS/UMBRELLA LIABILITY	Policy #	01/01/06	01/01/07	EACH OCCURRENCE	$1,000,000
		[X] OCCUR [ ] CLAIMS MADE				AGGREGATE	$1,000,000
							$
		[ ] DEDUCTIBLE					$
		[ ] RETENTION $					$
D		WORKERS COMPENSATION AND EMPLOYERS' LIABILITY	Policy #			[X] WC STATU-TORY LIMITS [ ] OTH-ER	
		ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED?				E.L. EACH ACCIDENT	$100,000
		If yes, describe under SPECIAL PROVISIONS below				E.L. DISEASE - EA EMPLOYEE	$100,000
						E.L. DISEASE - POLICY LIMIT	$500,000
E		OTHER Professional Liability				If Required by Contract	

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES / EXCLUSIONS ADDED BY ENDORSEMENT / SPECIAL PROVISIONS

Project Description:
Project Number:

The following are Additional Insureds as respects General Liability only
(See Attached Descriptions)

CERTIFICATE HOLDER	CANCELLATION
Sample Company Sample Company Address City, State, ZIP	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL 30* DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES. AUTHORIZED REPRESENTATIVE

Section 29. Refrigeration Controls Installation Guide

The following information is intended to be a guide for programming, installing, wiring, and setting up the refrigeration control system in the Sprouts stores, for the latest and more detailed instruction on controllers, please refer to Sprouts Templates and Detail Drawings, and the OEM‟s manuals.

A. Refrigeration Equipment Manufacturer Requirements

1. Initial programming to include: A program for each controller is supplied with general set-points,input and output assignments, pressure control settings, defrost and sensor control settings per Sprouts set point guidelines. Condenser programming to be setup for TD Control Strategy.

2. Mounting and terminating all rack inputs which will include discharge and suction pressure, liquid temperatures, liquid level and rack alarm

3. The refrigeration controllers, and associated boards, will be mounted by the Refrigeration Equipment Manufacturer

4. The Refrigeration Equipment Manufacturer will be responsible for factory installation of the rack controls.

B. Contractor Requirements

1. The Refrigeration controllers are networked together to the building HVAC controller at the Power wall, the network switch will be located at the Power wall. The alarm annunciator will be the HVAC controller.

C. Installation

1. All low voltage wiring shall be in metal conduit where subject to mechanical damage and at levels below 10ft or located on any part of the sales floor area. Conceal raceways except within mechanical, electrical, or service rooms. Maintain minimum clearance of eight inches between raceway and high-temperature equipment. Seal top ends of vertical raceways.

2. Low-voltage wiring shall meet NEC Class 2 requirements. Sub-fuse low-voltage power circuits as required to meet Class 2 current limit. NEC Class 2 (current-limited) wires not in raceway but in concealed and accessible locations such as return air plenums shall be UL listed for the intended application.

3. Install Class 1 and Class 2 wiring in separate raceways. Boxes and panels containing high-voltage wiring and equipment shall not be used for low-voltage wiring except for the purpose of interfacing the two through relays and transformers.

4. Run exposed Class 2 wiring parallel to a surface and tie neatly at 10 ft intervals. Use structural members to support or anchor plenum cables. Do not use ductwork, electrical raceways, piping or ceiling suspension systems to support or anchor cables.

5. Include one pull string in each raceway 1 inch or larger

6. No changes to the scope of work shall be permitted without the permission of the Sprouts project manager.

7. Secure raceways, and conduits, with clamps fastened to structure and spaced according to code requirements. Raceways and pull boxes shall not be hung on or according to code requirements. Raceways and pull boxes shall not be hung on or attached to ductwork, electrical raceway, piping, or ceiling suspension systems.

D. Programming

1. Point Naming: Name points as shown on the equipment points list. Must include name, system number, board and point. If sensor control or Combiner must have name and board and point

2. Provide system programming necessary for system operation under Sprouts Set point Guidelines (See Appendix A)

3. Refrigeration Contractor must work with Sprouts IT department. The Refrigeration Contractor is to pull cable between the alarm RO point and the burglar alarm panel and ensure that the alarm company lands cable in the burglar panel. The Refrigeration Contractor is to work with the alarm company to ensure that Guardian can receive refrigeration failure signal prior to product being loaded in cases or walk-in boxes.

4. Refrigeration Contractor must commission all VSD drives on condenser and air handlers. All VSD programming and control programming must be complete and to Sprouts Specifications.

5. Refrigeration Contractor must install Site Manager and a Site Manager Floor Plan indicating if the cases are in alarm, defrost, or running at designed temperature on store managers PC. Lighting overrides must also be provided on the SiteManager Floor Plan. Contractor must provide a training session with the store manager on the operation of the system. (See Appendix B).

F. Communication Wiring

1. Each run of communication wiring shall be a continuous length without splices. If splices are found contractor will be required to repull cable.

2. Label all communication wiring to indicate origination and destination.

3. Install communication wiring in separate raceways and enclosures from other class 2 wiring. Do not exceed maximum cable length, specified by Energy management manufacturer specifications.

4. Communication wiring shall be class 2 low-voltage wiring.

G. Wiring and Hardware Identification

1. Label all wiring and cabling, with system number or termination number at each end of wiring.

2. Label each control component with permanent labels.

3. Label all room, offices, and sales floor temperature sensors.

4. Label all hardware cabinets and enclosesures that contain EMS devices.

H. Control system Testing.

1. Calibrate all devices that require precise reading. Example all pressure transducers, humidity sensors, and light level sensors.

2. Verify that all control wiring is properly connected, verify that are terminations are tight.

3. Verify that all output devices such as relay point, solenoid valves, and electronic stepper valves are functioning properly.

4. Check each alarm with an appropriate signal at a value that will trip the alarm. The alarm buzzer must be activated at the front of the store and the alarm company must be notified that they have received a signal.

5. Verify that system operates according to sequences of operation. Simulate and observe each operational mode by overriding and changing inputs and schedules.

I. Temperature Sensors

1. All cables must be labeled with system number and type (temperature or termination sensor).

2. Refrigeration Equipment Manufacturer must provide detailed board and point sheet located in the Analog Input panels. Any changes made by the contractor must be clearly documented.

3. Install all sensors according to manufacturer‟s recommendations.

4. Mount outdoor air temperature sensors on roof, facing north with light level sensor to RTU. The sun shield must be installed over the temperature sensor. This is the outdoor temperature sensor for the HVAC controller not the air-cooled Condensers.

5. Walk-in box sensors will be mounted in the return air of one of the coils. Locate sensor at height of bottom of the evaporator, centered between the evaporator and the wall, no more than one foot from the evaporator. Use CPC walk-in box sensor, J box should be located on top of walk-in box.

6. All cables going to fixture must be installed in conduit not strapped under the case with wire ties.

7. Cable that is not on the sales floor must be bundled together and strapped every three feet. The cable bundle must be strapped to the ceiling truss or girder, not to refrigeration lines, plumbing lines, or sprinkler pipes.

8. All sales floor cable must be concealed in conduit. Underground conduit will be provided and installed by General Contractor‟s electrician.

9. Cables must be a continuous run with no splices. NO EXCEPTIONS!

10. From AI panel a single pair cable shall be pulled for each temperature sensor to cases and walk-ins. All refrigerated cases and walk-in boxes will require a temperature sensor. Muti-conductor wire will not be accepted.

J. Defrost Terminations

1. Run defrost termination for systems as specified on the refrigeration drawing and point sheet. A single cable shall be pulled for each system and walk-in from A/I panel to fixture.

2. Terminate Klixon, t-stat, or pipe mounted temperature probe from case to defrost panel. All stats to be wired in series no voltage to be used.

3. Medium temperature MD meat & fish cases will require defrost termination by temperature.

K. Door Switches

1. Door switches should be magnet break type, no moving parts. Door switches will be provided by the Refrigeration Equipment Manufacturer and installed on all walk-in boxes. Micro switch and evaporator coil fans for the freezer boxes shall be wired in back to the rack control. This is to shut off coil fans and pump down the system/circuit with the EEPR within the EMS software when freezer door is opened. No liquid line solenoids are to be used.

3. A single pair cable shall be pulled for each walk-in, from box to A/I panel non-voltage.

L. Variable Speed Drives

1. Sprouts shall provide all VSDs/ VSD enclosures and bypass assemblies, sensors, IO boards, transformers and necessary refrigeration controllers.

2. Installation contractor shall supply all conduits, unistrut, fasteners, line voltage conductors and connections, control wiring and CAT5 network communication cables as indicated on plans.

5. Where controls and control system elements are permanently installed, installation must be made in a manner that does not obstruct refrigeration maintenance and service activities. Also VSDs and bypass panels shall be mounted so that access doors can be opened at least 90 degrees.

6. Line Voltage conductor must be run in metallic conduit. Line and load side of wiring must be in separate conduit. Conduit provided by Electrical Contractor.

7. No low voltage cables shall be run in same conduit as line voltage.

8. Low voltage communication wiring shall be run with no splices.

M. Air Cooled Condenser Fan VSD TD controls installation

1. For air-cooled rooftop condensers that are 2 Fans long or longer condenser fan #1 shall always be the fan closest to the refrigeration manifold. Fan #2 shall be the fan immediately adjacent to fan #1. Fan shall be identified 3 through 4,5,6, etc. Continuing this odd/ even pattern. Fan 2 shall be identified as the first fan on the right manifold side. Fans shall be identified 3 through 6 continuing this odd/even pattern. Note fans will only cycle in bypass. If the condensers is running in normal VSD operations all fans will ramp at the same time. Refer to Sprouts template sheets for programming and setup. (See Appendix C)

2. Air-cooled fan rooftop condensers that are 1 fan wide by 4 fans long or longer, condenser fan #1 shall always be the fan closet to the refrigeration manifold. Fans shall be identified 2, 3, 4, etc. moving away from the manifold.

3. Make wire connections at VSD so that the incoming line feeds from the load side of the condenser disconnect, provides incoming line power to the VSD, and VSD line output power conductors are connected to the air cooled condenser fan motor distribution block. The CPC relay output will close the fan contactors the contactor will be equipped with auxiliary contacts that will connect to the forward run on the VSD. Wiring must be routed inside watertight conduits. Motor disconnect to be on the line side of the drive.

4. Refer to NEC and local electrical codes and regulations for the correct size of conductors. In some cases a larger conductor size may be required to avoid excessive voltage drop. Also follow VSD manufacture specifications.

5. All network wiring running to CPC boards located in the condenser control panel must be in separate conduit.

6. Install a temperature sensor on each air cooled condenser being fitted with a VSD in a protected location on the air cooled condenser. Sensor provided by Refrigeration Equipment Manufacturer. Sensor shall be mounted to the close to the refrigeration manifold. The sensor shall be out of direct sunlight,in free air circulation and some distance from source of warm air, so that it always maintains an accurate ambient air temperature. Do not locate sensor near equipment room makeup or exhaust openings, vent stacks for heating appliances, and HVAC exhaust duct opening. See image below:

7. Install a temperature sensor on each dropleg pipe at condenser outlet, cover sensor with weather-tight Arma-flex .. Dropleg sensor supplied by Refrigeration Equipment Manufacturer.

8. Install a 500 psi pressure transducer on condenser drop legs or return legs this will be the control transducer for the TD strategy. Transducer must be installed upstream of any head pressure control valves. Transducer supplied by Refrigeration Equipment Manufacturer.

9. Follow Sprouts Setpoint Guideline template for proper setting.

10. For 540 RPM motors, program as staged pairs per Sprouts setpoint in template guide.

11. If refrigeration rack is equipped with low ambient valves. Set the inlet pressure regulator on the dropleg to 65F degree condensing temperature.

N. VSD on Evaporative Condensers

1. Provide and install line voltage wiring and connections between the VSD and condenser enclosure as required by the NEC and VSD manufacturer‟s guideline. The VSD must be connected to the building electrical system ground.

2. Make wire connections at VSD so that the incoming line feeds from the load side of the disconnect provides incoming line power to the VSD, and VSD line output power conductor are connected to the fan motor contactor. The fan motor contactor will close when relay output is energized, the contactor will require

auxiliary contactor that will connect to the forward run on VSD. Motor disconnect to be on the line side of the drive.

3. All control cable must be wired separately from high voltage wires and must be in conduit.

4. Install one ambient temperature sensor on building. Sensor must be shielded from the sun. Install one humidity sensor. Both sensors should be facing north away from condenser exhaust. It should be located a distance from any potential source of warm air. Locations near equipment room exhaust opening, vent stacks for heating appliances, and HVAC exhaust duct should be avoided.

5. Install a temperature sensor on each dropleg and wrap with weather tightArma-flex. Dropleg temp sensor supplied by the Refrigeration Equipment Manufacturer.

6. Install a 500 psi pressure transducer on condenser drop legs or return legs this will be the control transducer for the TD strategy. Transducer supplied by the Refrigeration Equipment Manufacturer.

7. Follow Sprouts template for Evaporative condenser programming.

8. Commission VSD for proper operation in bypass and back to VSD. Verify all parameter are programmed correctly. Commissioning agents will test for proper operation.

O. EMS/ Building Controls

1. Program all air handler and rooftop unit to Sprouts Setpoint Guidelines. The network switch must be located at the powerwall.

4. Refrigeration Contractor must design a map of all RTU communication wires and mount on wall near building controller.

5. The EMS contractor must work with the mechanical contractor on installation of CPC controls on all roof top or remote fan coil units. The Mechanical contractor will start up all roof top units or remote fan coil units and install a temporary thermostat in the return air of the unit. When the unit is determined fully operational by mechanical contractor the refrigeration EMS contractor will then take full control of the unit and install all CPC components.

P. Lighting

1. The following lights will be controlled. Sales lights, case, canopy, signage, inside perimeter, security, parking lot and wall pack lights. See Appendix A for parameters.

2. The inside 2/3 lights and 1/3 lights will be controlled by indoor light level sensor. Lighting control should be staged so that 2/3 lights is first setting and 1/3 lights is second setting. Follow Sprouts setpoint guidelines for proper times. Note indoor light level sensor will vary on each store. The foot candle should be at 90 with the lights OFF. Make adjustments on controller to obtain this setting.

3. An outdoor photocell shall be installed for the outdoor lights. The photocell must be positioned to the north so that sunlight cannot shine directly into the photocell. It must be installed in a position on the roof that places it at a height which allows it see the horizon (actual light) as opposed to the parapet wall (reflected light).

4. All lights must be set up to fail ON in the event of a board failure.

5. All lighting must be installed with a override buttons that will be controlled by the CPC controller via a digital input (DI). Override buttons must also be on SiteManager Floor Plan.

Sign and Return these pages with your Proposal.

Company Name:
Signature:_____ Name:_____
Date:_____

APPENDIX A
Setpoint Guidelines

Floating suction	set all Rack setpoints per RS schedule. Set rack float **7psi** above suction set point and if needed no more than **2 psi** below RS schedule set point						
Condenser Control	Use TD control/ Control type will be Temperature Evap Towers will use Wet Bulb Calc. with OAT and Humidity Sensor						
	Min Speed	Max speed	TD	Thottle Range Temperture		PID out	PID
VFD AIR COOLED	10% / 6HZ	100%	Calculate	10		0	end of thott
VFD EVAP	25% / 15HZ	100%	Calculate	10		0	ling Range

Lighting 1/3	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**	
ON	4:00	4:00	4:00	4:00	4:00	4:00	4:00	On Light Level
OFF	23:30	23:30	23:30	23:30	23:30	23:30	23:30	
Lighting 2/3								
ON	6:45	6:45	6:45	6:45	6:45	6:45	6:45	On Light Level
OFF	22:15	22:15	22:15	22:15	22:15	22:15	22:15	
Skylights	During daylight hours 2/3 sales lights is controlled by light level senser cut in= 700 cut out= 1200							
Case Lights	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**	
ON	6:45	6:45	6:45	6:45	6:45	6:45	6:45	
OFF	22:15	22:15	22:15	22:15	22:15	22:15	22:15	
Perimeter								
ON	6:45	6:45	6:45	6:45	6:45	6:46	6:45	
OFF	22:15	22:15	22:15	22:15	22:15	22:15	22:15	
Outside Lts	**Light Level**	**ON**	**OFF**	**ON**	**OFF**			
Cut IN	20FTC	16:30	22:15	6:45	8:30			
Cut Out	30FTC	Everyday						

HVAC	Occupied			Unoccupied			Occupied Schedule	
Summer	First stage	Second stage	Third stage	First stage	Second stage	Third stage	On	Off
Cooling	73			75			6:00	22:00
Cool TR	2			2			Everyday	MIN
ON Delay	10			10			**AHU VFD**	50%
OFF Delay	5			5				MAX
Heating	70			70			**AHU VFD**	100%
Heat TR	3			3			**Summer Winter SP**	
ON Delay	10			10			By Temperature	
OFF Delay	5			5			Summer Tmp Tggr 85F	
VFD	65%	85%	100%	65%	85%	100%		
VFD 2 Stg	75%	100%		75%	100%		**CO2 Settings**	
Fan Mode Cooling		Continuous			Auto		Cut in	Cut out
Fan Mode Heating		Continuous			Auto		1000 PPM	800 PPM
Dehumidifying Setpoint			50%			50%		
Dehumidifying Fan Setback						20%		
Dehumidifying Minimun Space Temperature						70F		

APPENDIX A

Dehumidifying Minimun Supply and cooling supply Temperature	40F

HVAC	Occupied			Unoccupied			Occupied Schedule	
Winter	First stage	Second stage	Third stage	First stage	Second stage	Third stage	On	Off
Cooling	75			78			6:00	22:00
Cool TR	2			2			Everyday	MIN
ON Delay	10			10			**AHU VFD**	50%
OFF Delay	5			5				MAX
Heating	70			68			**AHU VFD**	100%
Heat TR	3			3			**Summer Winter SP**	
ON Delay	10			10			By Temperature	
OFF Delay	5			5			Summer Tmp Tggr 85F	
VFD	65%	85%	100%	65%	85%	100%		
VFD 2 Stg	75%	100%		75%	100%			
Fan Mode Cooling		Continuous			Auto			
Fan Mode Heating		Continuous			Auto			
Dehumidifying Setpoint			50%			50%		
Dehumidifying Fan Setback						20%		
Dehumidifying Minimun Space Temperature						70F		
Dehumidifying Minimun Supply and cooling supply Temperature						40F		

APPENDIX B

Site Manager Workflow

Requirements of the Refrigeration Contractor for Site Manager to work when IT has established connection for the store

(1) Refrigeration Contractor to verify all Probe location between programming and Hill Phoenix Drawings Sheet R1 match

(2) Refrigeration contractor will need to enter the store IP address into both controllers, RX300 on the rack and the BX300 on the power wall

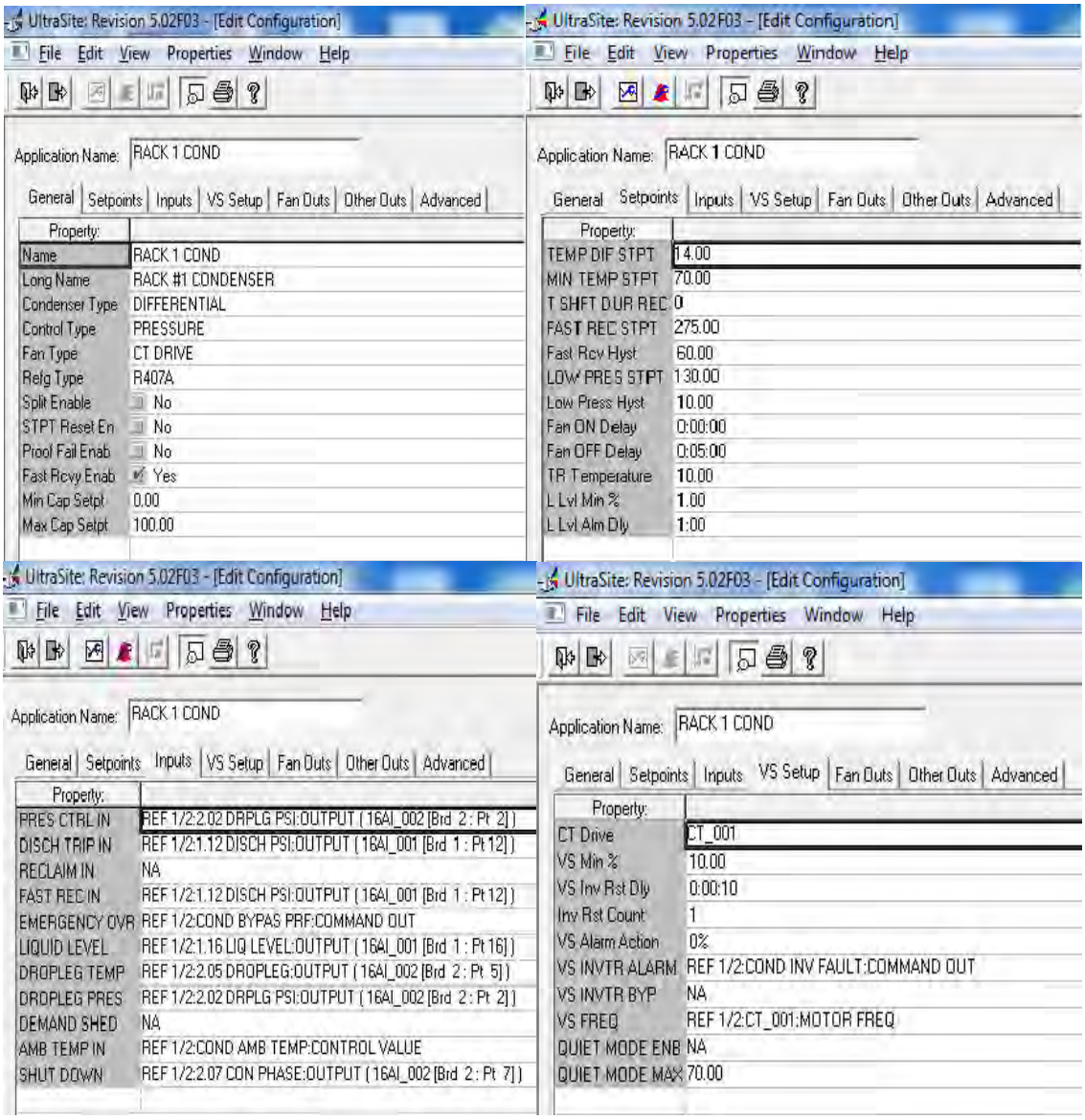
(3) Refrigeration contractor to contact Sprouts to test connection once IT has established the connection

(4) Once test is complete refrigeration contractor is to use the manager computer and connect to HTTP;//sproutssm.ectsolutions.net/emerson/ login to the IP address and the Site Manager will begin to read the system

For Hussmann Projects we will need to contact them and request the E2 RX controller set-point files and the Specific floor plan they list all the sensor probes, we can use the fixture floor plan from the Architect to establish the store floor plan.

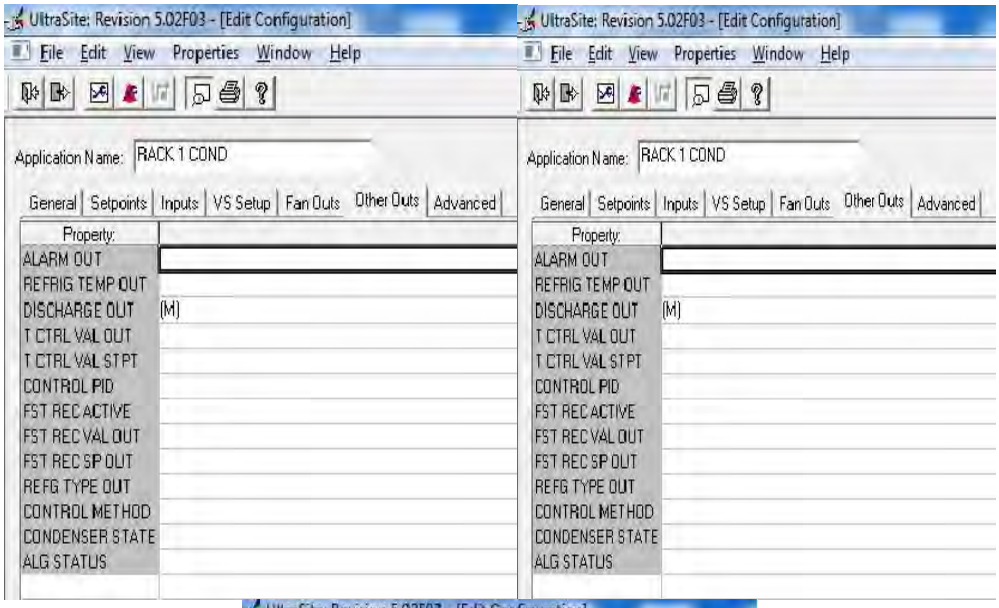
APPENDIX C

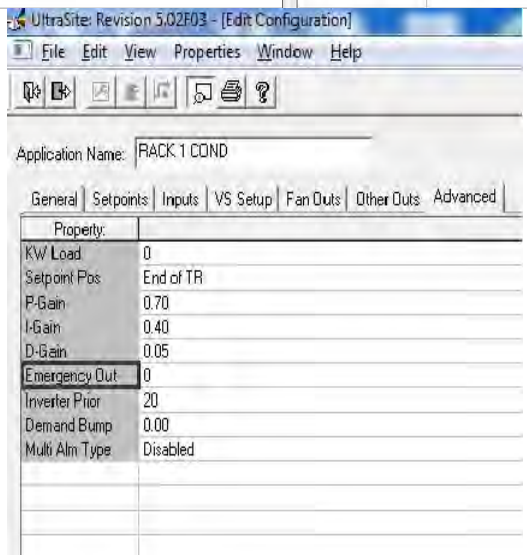
Condenser Task: 1 Thru 7



APPENDIX C

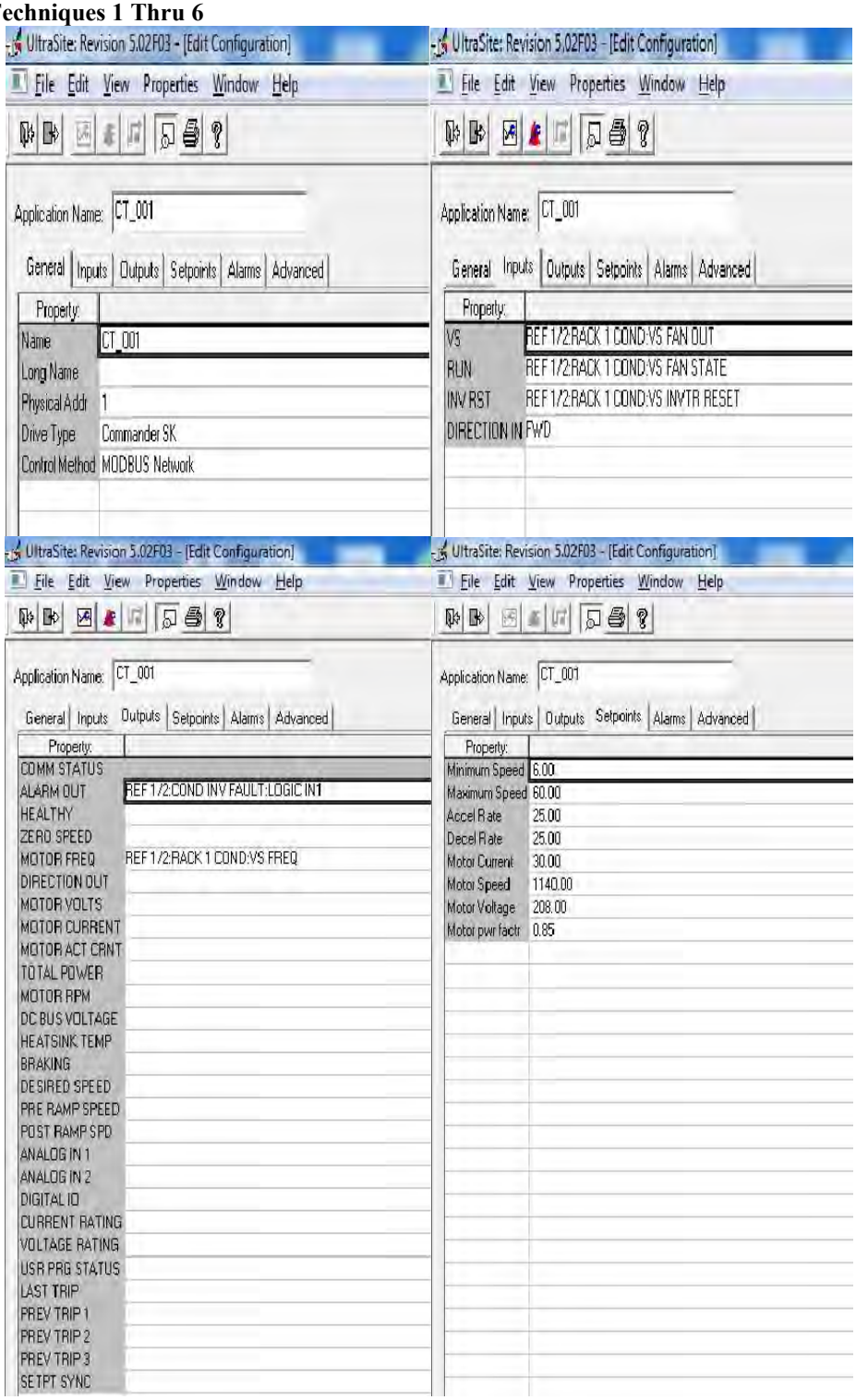
Condenser Task: Continued





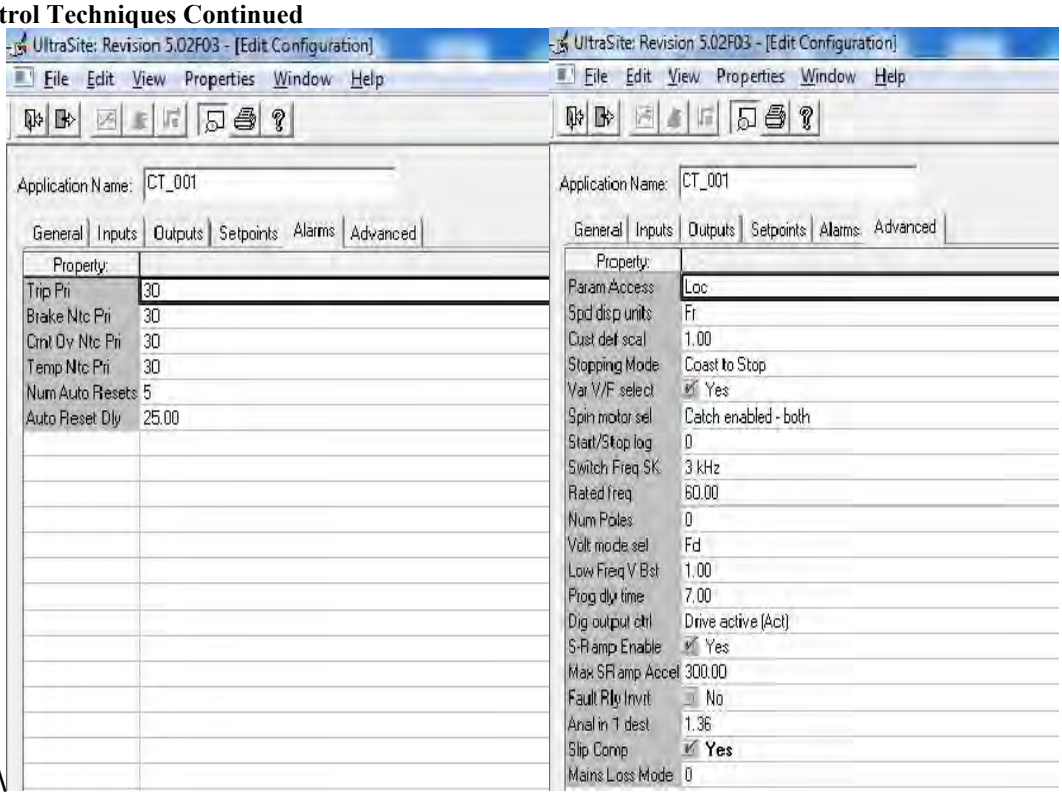
APPENDIX C

Control Techniques 1 Thru 6



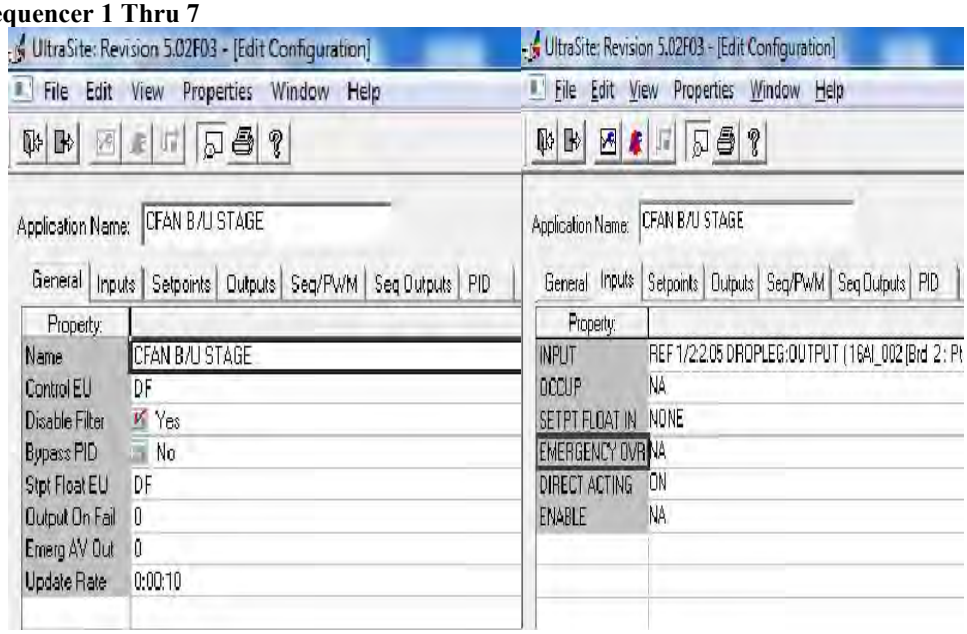
APPENDIX C

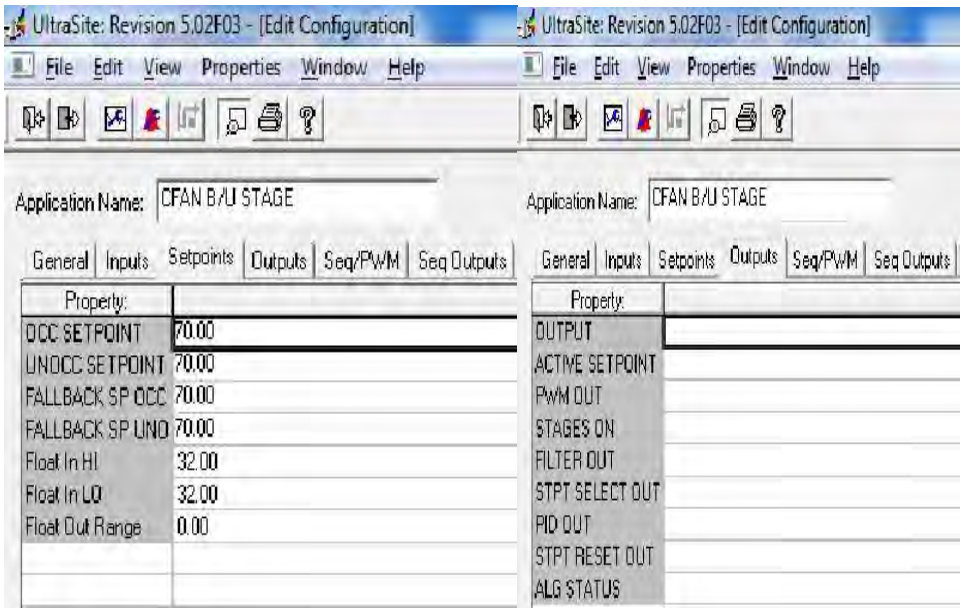
Control Techniques Continued



APPENDIX C

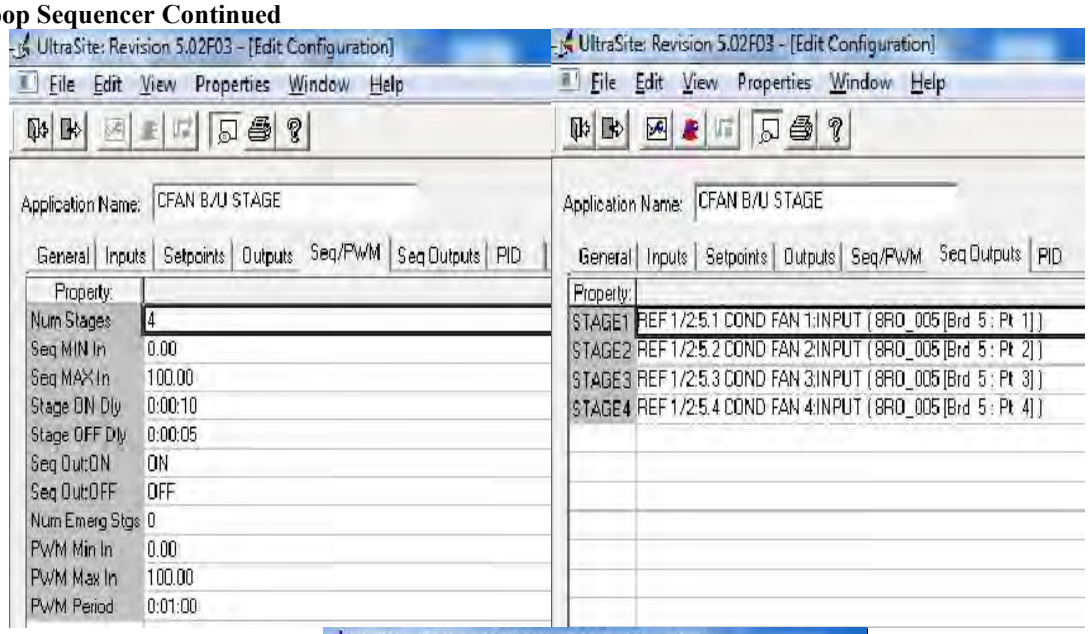
Loop Sequencer 1 Thru 7





APPENDIX C

Loop Sequencer Continued



APPENDIX D

CPC COMPUTER PROCESS CONTROLS | technical bulletin | EMERSON Climate Technologies

Control Techniques Variable-Speed Drive (VSD) Interface

Overview

The E2 RX, BX, and CX series of controllers features integration with several models of variable-speed drives (VSDs) manufactured by Control Techniques, a division of Emerson Industrial Automation. The E2 communicates with the VSD via an RS485 MODBUS network, which allows easier wiring setup and more detailed status and fault information to be communicated to the E2 than traditional VSDs driven with I/O points.
All E2 control applications that can use VSDs — such as variable-speed condenser fans, AHU fans, and VS compressors — support selection of Control Techniques drives, making software setup quicker and easier.

Cautions, Warnings, and Notices

WARNING! If an E2 has Commander SK variable speed drives configured, do NOT remotely upgrade this unit to 2.64F01 and above if the current version is earlier than 2.64F01. The E2 will lose communication with Commander SK drives when upgraded. A technician must be on-site to clean out the Commander SK and reprogram (follow the instructions in this document to program).

WARNING! Inhibit or disable the VSD before making programming changes. Refer to the VSD's manufacturer's instructions for information on inhibiting the drive.

Compatible Drives and E2 Versions

The E2 controller's RS485 MODBUS interface communicates with the following Controller Techniques VSD models:

- Commander SK - Requires E2 version 2.64F01 or above
- Commander SE - Requires E2 version 2.40F01 or above
- Unidrive SP - Requires E2 version 2.40F01 or above

Before Beginning Setup

The networking and configuration instructions in this technical bulletin assume the Control Techniques VSDs are properly installed, tuned, and programmed by the installer. It is **critical** that the proper filters, wiring, shielding, and grounding are done to minimize the EMI generated by these drives. The following is a list of items that **must** be addressed to insure proper system operation. Refer to the drive manual on how to do the following:

1. Fitting the correct RFI filter(s) at the power input to the drive,

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Control Techniques VSD Interface to E2

2. Mounting the drive against the surface of the RFI filter correctly, removing all paint or non-conducting coatings so that the drive and the RFI filter make good direct electrical contact,
3. Ensuring the filter is connected to the drive using only the wires provided (with no extensions),
4. Using a shielded (screened) or steel wire armored cable to connect the drive to the motor, with the shield connected to the drive gland plate by a good high-frequency connection (using either the conductive cable glands or the SE11 optional cable screen clamp kit),
5. Grounding the shield of the motor cable to the ground terminal of the motor frame using a link that is as short as possible and not exceeding 50 mm (2 in) in length (a full 360° termination of the shield to the motor terminal housing, if metal, is beneficial),
6. Ensuring the cables carrying the AC supply and the ground to the filter are at least 100 mm (4 in) from the drive and motor cable,
7. Avoiding locating noise-sensitive circuits in a zone extending 0.3m (12 inches) all around the drive, and
8. Ensuring the motor cables do NOT run in parallel with control signal cables.

Proper setting of the drive setpoints themselves, outside of what is needed for the VSDs to communicate with E2s, is beyond the scope of this document. For information about CT drive setpoints and their functions, consult the Commander SK, Commander SE, or Unidrive SP instructions.

VSD Input Wiring

WARNING! Keep the VSD disabled by leaving the ENABLE and FWD/RUN signals OPEN until the drive is ready for use.

If the VSD's drive speed will be controlled by a 0-10VDC analog output board point from a MultiFlex or 4AO board controlled by the E2, the point must be connected to the drive's speed input terminals. Commonly, the FWD/RUN and ENABLE inputs on the VSD are also be connected to relays on a MultiFlex board so the E2 may control the run and enable signals.

Figure 1 on page 3 shows wiring for the Commander SK for both 0-10VDC and MODBUS drive control. For analog control, use Belden 8761 or equivalent cable to connect the analog point to the T1 and T2 terminals on the Commander SK, and connect a relay point on a MultiFlex or 8RO board to terminals B2 and B5 to control the FWD/RUN signal.

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Control Techniques VSD Interface to E2

For both MODBUS and 0-10VDC, connect B2 and B4 terminals to a relay on a MultiFlex or 8RO board to control the ENABLE signal, or simply jumper B2 and B4 to enable the drive.

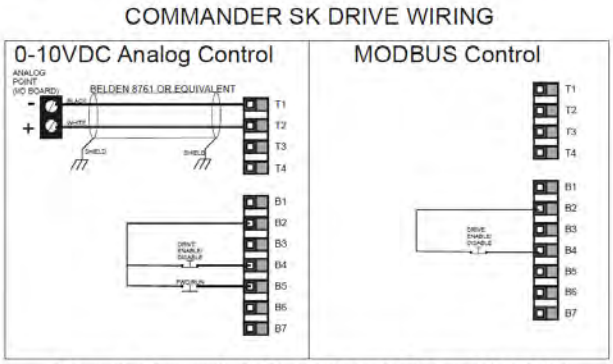

Figure 1 - Commander SK Drive Wiring (Analog and MODBUS)

For wiring information for Commander SE and Unidrive SP models of VSD, refer to the VSD documentation.

MODBUS Networking

Control Techniques drives connect to an E2 using an RS485 network. Multiple VSDs must be interconnected in a daisy-chain without branches or star configurations, as shown in *Figure 2*. Use only Belden 8761 shielded two-wire cable or equivalent.

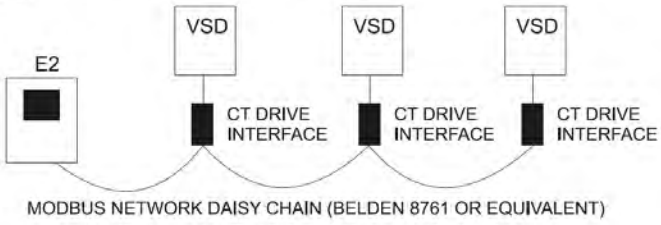

Figure 2 - MODBUS Daisy Chain for CT VSD Drives

Warning! Consult the Control Techniques technical manual for your drive(s) for proper wiring, grounding, and noise prevention. Failure to do so may result in excessive noise disrupting RS485 communication.

Warning! Use only Belden 8761 or equivalent for networking the VSDs. CAT5 cabling and other cable that typically uses RJ45 connectors like the one on the VSD are not rated for use with VSDs.

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Control Techniques VSD Interface to E2

Connection to E2

The E2 supports MODBUS on any of its RS485 serial ports. These include:

- *COM2* - The RS485 serial port onboard the E2 Power Interface Board (PIB). All E2 models have a COM2 port, which is typically used by the CPC I/O Network but may also be designated as a MODBUS port.
- *COM4* - The RS485 serial port on the RS485 COM Card (*P/N 637-4890*), a peripheral board that must be purchased separately.
- *COM6* - The RS485 serial port on the E2 Modem/Expansion COM Card (*P/Ns 637-4871, 637-4872, and 637-4873)*, a peripheral board that must be purchased separately. MODBUS must be connected to the RS485 port as labeled in *Figure 3*.

The connectors for the COM2, COM4, and COM6 ports are shown in *Figure 3*. Note that the COM port assigned for use as MODBUS may not be used to communicate with CPC I/O boards or any other type of serial device - only MODBUS devices may be connected to the port.

E2 PIB COM PORT ASSOCIATIONS

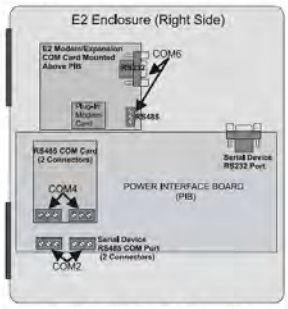

Figure 3 - E2 PIB COM Port Locations

Connection to VSDs and the CT Drive Interface

CPC requires that all MODBUS network connections to Control Techniques VSDs use a CT Drive Interface (P/N 535-2725). This assembly, which plugs into the RJ45 MODBUS jack on the VSD, provides the noise filtering circuitry recommended by Control Techniques, and it also provides a screw terminal connector for easier daisy chaining to the MODBUS network.

1. Using the shielded Ethernet cable included in the CT Drive Interface Kit, connect the CT Drive Interface box to the RJ45 jack on the VSD. Do not use any other Ethernet cable except the cable supplied in the CT Drive Interface kit.
2. Connect the MODBUS network cable to the RS485 network connector on the CT Drive Interface. Wire all 485+ terminals on the E2 and CT Drive Interfaces to the same wire color, and wire all 485- terminals to the other wire color. All bare shield wires should be connected to the 0V terminals. The 0V terminal must also be connected to earth ground with a 14AWG wire no longer than 6 inches. You may use the earth ground connection on the motor drive. Refer to *Figure 4*.
3. Terminate the two devices at the endpoints of the MODBUS daisy chain. For the E2, the termination jumpers will be next to the COM port connector. For the VSDs, use the termination jumpers on the CT Drive Interface. Set the jumpers of the end devices to the TERMINATED positions and all other devices to the UNTERMINATED position. Refer to *Figure 4*.

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Control Techniques VSD Interface to E2

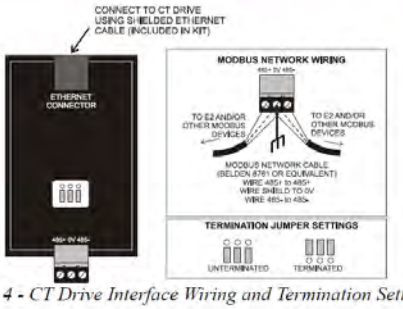

Figure 4 - CT Drive Interface Wiring and Termination Settings

Manually Configuring the VSDs to Enable MODBUS Communication

By default, a Control Techniques VSD is not configured with the right parameter settings to communicate via MODBUS. Before connecting to an E2, you must use the CT drive's own keypad interface to change serial networking parameter values. The list below shows the ID number of each parameter that must be changed for each model type. Refer to the drive manufacturer's instructions for more information about using the CT drive keypad interface.

Commander SE:

- 41 - SERIAL MODE: Change to "rtU"
- 42 - BAUD RATE: Recommended value is "19.2" for 19200 baud.
- 43 - SERIAL ADDRESS: Choose a unique MODBUS address number from 1 to 127. The SE drive displays MODBUS addresses with a decimal point (i.e. 10 is displayed as "1.0", and 2 is displayed as "0.2"). Ignore the decimal point.

Commander SK:

For the Commander SK, follow the steps below in order:

1. Inhibit or disable the drive.
2. Set access to Level 3 (set parameter 10 to "L3").
3. Reset the drive to USA defaults (set parameter 29 to "USA").
4. Set the Drive Config (parameter 5) to "Pr.".
5. Set access to Level 3 (set parameter 10 to "L3").
6. Set the SERIAL COMMS BAUD RATE (parameter 43) to "19.2" (19200 baud).
7. Set the SERIAL COMMS ADDRESS (parameter 44) to a unique MODBUS address number from 1 to 127.
8. **Do not set any other parameters. Exit to save changes.**

Unidrive SP:

- 35 - SERIAL MODE: Change to "rtU"
- 36 - SERIAL COMMUNICATION BAUD RATE: Recommended value is "19.2" for 19200 baud.

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- 37 - SERIAL COMMUNICATIONS ADDRESS: Choose a unique MODBUS address number from 1 to 127.

Sharing the MODBUS Network with Other MODBUS Devices

Control Techniques VSDs may share the same network segment as other MODBUS devices communicating with the E2, provided:

- Each device, regardless of type, has a unique MODBUS address from 1 to 127. In other words, if there are two VSDs and five Control Link Case Displays (CL-CDs) on the MODBUS network, do not number the VSDs 1-2 and the Control Link Case Displays 1-5. You must either number the VSDs 1-2 and the CL-CDs 3-7, or the CL-CDs 1-5 and the VSDs 6-7.
- Each device uses the same baud rate and parity type.
- The number of total devices does not exceed 127.

Adding Control Techniques VSD Drives

Once the Control Techniques VSDs are networked properly, assign the E2 COM port to which the VSDs are connected as a MODBUS port, and specify the number of drives on the network.

1. Log in to the E2 controller with a username/password that has Level 4 (Administrator) access.
2. Press Menu 7 3 1 (GENERAL CONTROLLER INFORMATION).
3. Port assignments are made in the "Serial" tab of the General Controller Information setup screens. Press Ctrl + # 3 to navigate to the Serial Configuration screen.
4. In the COM Connection field that corresponds to the COM port number to which the VSDs are connected, press F4 - LOOK UP and select "MODBUS."
5. After selecting "MODBUS," four fields will appear below the COM Connection field. These fields define the format of the messages coming from the VSDs and must be set to the following values:

- *Baud Rate* - To match the baud rate settings specified in the VSDs, set the baud rate to 19200.
- Data Size - 8
- *Parity* - None
- *Stop Bits* - All CT VSD drives use 2 stop bits, but since all other MODBUS-enabled Emerson Climate Technologies devices use 1 stop bit, the E2 has been programmed to automatically use 2 stop bits in messaging to CT VSD devices only. Therefore it is recommended you leave the Stop Bits field set to 1.

6. When you have finished entering the MODBUS settings, press ESC to save changes and return to the System Information menu.
7. Press Menu & 7 $ 7 @ 2 (CONNECTED I/O BOARDS AND CONTROLLERS).
8. In the Connected I/O screen, locate the field in the ECT Devices box labeled "CT Drive." Enter the total number of VSDs on the network in this field.
9. Press ESC to save changes and return to the Network Setup menu.

Commissioning the VSD

Once you have set the COM port for MODBUS and added a number of CT drives, the next step in VSD setup is to edit the application parameters in the E2 to set drive type, address, and control type:

1. Press Menu % 5 - Configured Applications
2. Use the arrow keys to highlight "CT Drive" in the Configured Apps menu. Press Enter.

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Control Techniques VSD Interface to E2

3. If multiple CT drives are set up, highlight the name of the drive you wish to set up and press Enter.
4. The CT Drive Status screen should be visible. From this screen, press F5 to access the CT Drive setup screens. The first setup screen shown will be "General."

Screen 1: General

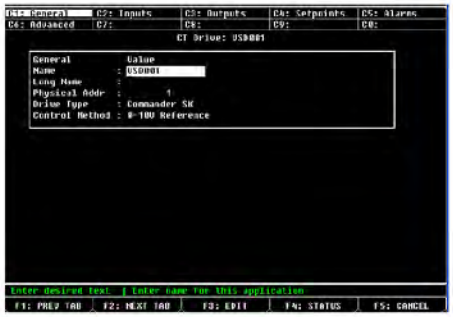

Figure 5 - CT Screen 1: General

5. Enter a name for the VSD in the "Name" field.
6. Enter the MODBUS address for this drive in the "Physical Addr" field.
7. Choose the VSD model type (Commander SK, Commander SE, or Unidrive SP) in the Drive Type field.
8. In the Control Method field, select "0-10V Reference" if controlling drive speed from an analog point, or "MODBUS Network" if the E2 will control drive speed directly through the MODBUS interface.
9. Press F10 to save these changes and exit.
10. Remain on the CT Drive Status screen. You should see live values appearing in the "Current Conditions" status fields (such as Hz/RPM) as the E2 makes connections between the CT Drive application inputs and outputs and the VSD's inputs and outputs. Remain on this status screen until the Setpt Status field shows either "In Sync" or "Sync/Error." (Note: the screen may show Sync/Error even when no error is occurring - this is normal. Ignore this parameter until the drive is fully configured. See "Configuration and Synchronizing Configuration Between the E2 and Control Techniques VSDs" on page 9.)

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11. When the Setpt Status field shows "In Sync" or "Sync/Error," press F5 to return to the CT Drive setup screens. Complete the drive programming by setting the necessary setpoints in the Setpoints, Alarms, and Advanced tabs.

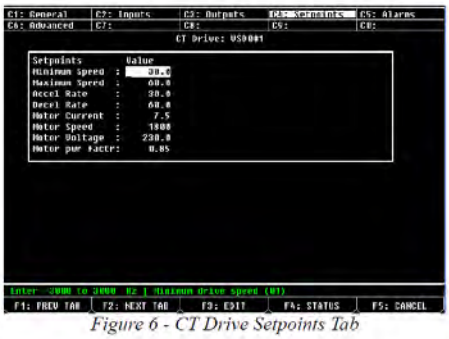

Figure 6 - CT Drive Setpoints Tab

When finished programming, press to save changes and exit. On the CT Drive status screen, you should see the Setpt Status field change to the value "In Sync." The final step in CT Drive setup is to associate the VSD with the application that will be commanding it.

VSD Association With E2 Control Applications

Most E2 control applications that can use variable-speed drives may be associated with Control Techniques VSDs. They are:

- Suction Group and Enhanced Suction Group (for controlling variable-speed compressors)
- Condenser (for controlling variable-speed fans)
- AHU (for controlling variable-speed blowers)

To associate an application with a CT VSD, navigate to the application's setup screens, locate the field that determines device type or fan type, and set that field to "CT Drive."

Condenser & AHU

1. Press Menu 5 - Configured Applications.
2. Highlight either "Condenser" or "AHU" in the Configured Apps menu, and press Enter.
3. If more than one application, highlight the name of the application you wish to set up in the Summary Screen and press Enter.
4. From the status screen, press F5 to access the application setup screens.
5. Locate the "Fan Type" field on screen C1: General. Highlight this field, press F4, and select "CT Drive" as the fan type.
6. Navigate to the screen where the advanced VS setup parameters are (screen C4: VS Setup for Condensers, screen C8: Adv Fan for AHU).
7. Locate the field named "CT Drive." Highlight this field, press F4, and select the name of the CT Drive application you wish to assign to this application.

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8. Press [Menu] to save changes and exit.

Suction Group & Enhanced Suction Group

1. Press [Menu] [%5] - Configured Applications.
2. Highlight either "Suction Group" or "Enhanced Suction Group" in the Configured Apps menu, and press [Enter].
3. If more than one application, highlight the name of the application you wish to set up in the Summary Screen and press [Enter].
4. From the status screen, press [F5] to access the application setup screens.
5. In Screen 1: General, if you have not set up the total number of compressor stages in the rack, enter the correct number in the "Num of Stages" field. This will cause the "C6: Comp Setup" tab to be visible.
6. Press [Ctrl]+[^6] to navigate to the Comp Outs screen.
7. For stage #1 in the Comp Outs screen, highlight the "TYPE" field and set this field to "CTdr" (CT Drive). This assigns stage 1 of the rack to be a VS compressor driven by a CT VSD.
8. Press [Ctrl]+[*8] to navigate to the VS screen.
9. Locate the field named "CT Drive." Highlight this field, press [F4], and select the name of the CT Drive application you wish to assign to this application.
10. Press [Menu] to save changes and exit.

When a CT Drive application is associated with a control application, the E2 automatically connects all of the necessary inputs and outputs of the CT Drive to the inputs and outputs of the control application that are responsible for: controlling the drive's forward/run (RUN) and variable speed percentage (VS); resetting the inverter (INV RST); reading the motor frequency (MOTOR FREQ); and reading the inverter's alarm output state (ALARM OUT).

Configuration and Synchronizing Configuration Between the E2 and Control Techniques VSDs

The setpoints that determine how the VSD operates are kept and saved in the VSD's own memory. When the VSD is connected to an E2, the E2 becomes the "master" of the VSD's setpoints. This means:

- All permanent changes to CT Drive setpoints must be made through the E2's CT Drive application. Changes made through the E2 are saved to the VSD as permanent.
- All changes made from the VSD's front panel are temporary and will eventually be overwritten by the configuration in the CT Drive application. The E2 checks once daily for out-of-synch conditions between the setpoints in the CT Drive application and the VSD, and all setpoints that are different from the values stored in the CT Drive application will be overwritten.

Read Setpoints On Startup

If the VSD is a Commander SE or Unidrive SP, or if you are using a Commander SK drive and the E2 version is before version E2 2.64F01, when the E2 makes the connection between a VSD and a CT Drive application for the first time, the setpoints are read from the VSD and saved to the E2's application configuration. When this occurs, the configurations between the E2 and VSD are considered "synchronized."After the initial read from the

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Control Techniques VSD Interface to E2

VSD occurs, as long as the VSD is associated with a CT Drive application in the E2, the E2 will be considered the primary device when keeping the setpoints synchronized between the E2 and VSD.

When using a Commander SK drive with E2 version 2.64F01 or above, E2 will not read setpoints when first connected. Drive parameters will need to be programmed from the E2.

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Installation Instructions: Lennox IMC Interface to E2 BX Building Controller

Overview

All E2 Building Controller (BX) versions 2.21F01 and above have the capability to communicate with Lennox IMC control boards version M1-4 or higher (mounted in Lennox L-series and S-series rooftop HVAC units). The E2 BX may directly communicate with up to 31 IMC controllers on the IMC's S-Bus network using a special E2 RS485 plug-in network card on the E2 power interface board. The interface allows remote viewing of IMC status information (such as temperature values and the ON/OFF states of fans and stages), set point changes, pass-through of IMC-generated alarms to the E2 Alarm Log, and remote reset of the IMC board. The Lennox IMC E2 interface is a licensed feature in E2. Licenses are purchased from CPC based on the number of boards the E2 unit will communicate with, and are enabled in the E2 by entering a license key supplied by CPC.

Scope of this Document

This technical bulletin only covers installation and operation details of the **interface** between E2 and the Lennox IMC controller, and ***not the Lennox IMC controller itself***. Technical details concerning the installation, programming, and troubleshooting of the IMC are covered in Lennox's own IMC documentation. To request information or receive technical support related to the operation of the Lennox rooftop HVAC units and the IMC itself, contact your local Lennox service representative or call Lennox directly at 1 (800)-953-6669.

Wiring

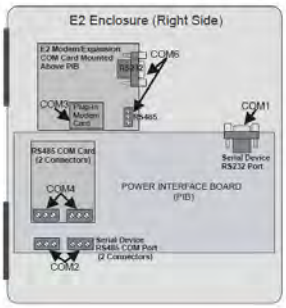
NOTE: The wiring section of this manual covers only the connection of the Lennox IMC S-Bus network to the E2. Refer to your Lennox IMC documentation for all other information, including cable types, IMC hardware diagrams, etc.

The E2 RS485 Card (E2 version 2.21 only)

Before proceeding, check the firmware revision of your E2 unit by pressing Alt+V from the E2 front panel. If the version is 2.21F01, the Lennox IMC S-Bus network connection must be made using an E2 RS485 card. If 2.30 or higher, skip these instructions and refer to "The E2 COM Ports (E2 version 2.30 or higher)" on page 3.

In order for an E2 BX version 2.21F01 to communicate with Lennox IMCs, an E2 RS485 card (*CPC P/N **637-4890***) must be installed in the controller. If ordered along with new E2 units, the E2 RS485 card will come pre-installed; otherwise, the card must be ordered and installed by the customer or OEM. The board plugs into the E2 Power Interface Board (PIB), located inside the enclosure on the rear mounting plate. ***Power down the E2 unit before installing the E2 RS485 card.*** Locate the 5x2 connector slot on the left side of the PIB, and

E2 PIB COM PORT ASSOCIATIONS



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plug the E2 RS485 card into this slot. The mounting holes at the bottom of the card should align with the plastic stand-offs protruding through the PIB. Use the supplied mounting screws to secure the card against the PIB.

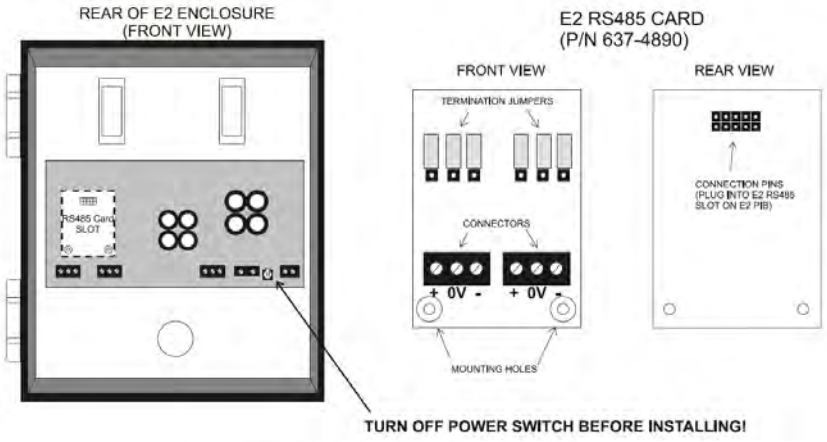

Figure 1 - NCI 485 Card - Mounting Location and Installation

Connect the Lennox IMC S-Bus network cable to one of the connectors on the E2 RS485 card. The E2 should be at the end of the S-Bus daisy chain. The polarity of the E2 RS485 network ports is opposite that of the Lennox IMC controllers; you must connect the wire used to interconnect the negative "-" terminals of the IMC to the positive "+" terminal on the E2, and the "+" terminals on the IMCs to the negative "-" terminal on the E2 (see *Figure 2*).

Connect the shield wire of the network cable to the 0V terminal on the E2 RS485 connector.

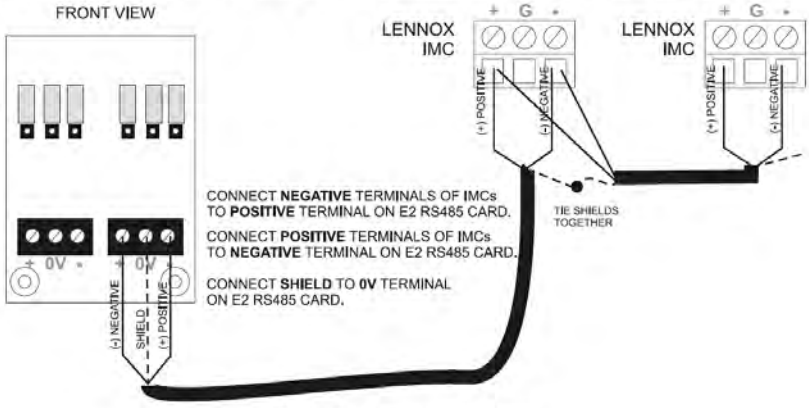

Figure 2 - S-Bus Network Wiring

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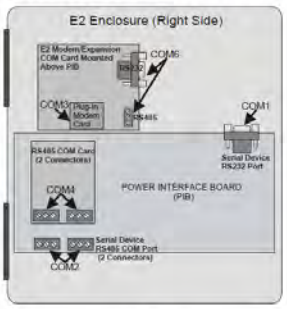
Installation Instructions: Lennox IMC Interface to E2 BX Building Controller

The E2 COM Ports (E2 version 2.30 or higher)

In E2 firmware versions 2.30 or higher, the Lennox IMC S-Bus Network can be assigned to any RS485 I/O port on the E2 that is not being used by other I/O devices. This means the Lennox network may be connected to the I/O network connectors on the E2 Power Interface Board (COM2), the RS485 Card that plugs into the Power Interface Board (COM4), or the RS485 port on the Modem/COM Port Expansion Card (COM6).

E2 PIB COM PORT ASSOCIATIONS



COM2

To connect to COM2, wire the network cabe to one of the two network connectors. The wire connected to the positive terminals on the IMCs must be connected to the NEGATIVE (-) terminal on the COM2 connector. The negative terminals on the IMC must be connected to the POSITIVE (+) terminals on the COM2 connector. Connect the shield wire to the 0V terminal. Set the three termination jumpers to the terminated (UP) position.

Note that if COM2 is being used as the Lennox IMC port, no other I/O device types can be connected to the COM2 terminals. MultiFlex I/O boards, Control Link MODBUS devices, and other types of devices will not work if connected to this port.

COM4

If you will be connecting the Lennox IMC S-Bus network to COM4, refer to "The E2 RS485 Card (E2 version 2.21 only)" on page 1 for installation and wiring information.

COM6

The E2 Modem/COM Expansion Card has a single three-terminal connector on it that may be used as a Lennox IMC S-Bus network port. The wire connected to the positive terminals on the IMCs must be connected to the NEGATIVE (-) terminal on the COM6 connector. The negative terminals on the IMC must be connected to the POSITIVE (+) terminals on the COM6 connector. Connect the shield wire to the 0V terminal. Set the three termination jumpers to the terminated (LEFT) position.

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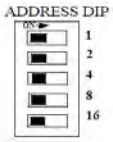
Installation Instructions: Lennox IMC Interface to E2 BX Building Controller

Set Up E2 COM Port (E2 ver. 2.30 and above only)

After connecting the Lennox IMC network cable to one of the E2 COM ports, you must assign the chosen port in the software. Log in to the E2 with level 4 access and press Alt+M (Serial Configuration). Highlight the COM port the Lennox network is connected to, press F4 - LOOK UP, and select "Lennox" from the Look-Up Table.

IMC Board Numbering



Verify that each IMC board on the network has a unique non-zero address setting on its address DIP switch. The address DIP switches are labeled 1,2,4,8, and 16; the address number is figured by adding together all switches in the ON position. The E2 assumes all IMCs are numbered sequentially; therefore, if you have 7 Lennox IMCs on the network, they must be numbered #1 through #7.

Termination Jumpers

The Lennox S-Bus network requires no termination. Leave the three termination jumpers above the E2 RS485 port set to the UP position.

Setting Up Licensing In the E2

The interface to Lennox IMC units is not a standard feature in the E2 BX building controller. To enable connectivity, a license key must be purchased from CPC to unlock a maximum number of Lennox IMC instances for the BX-300. When the license key is entered, the Lennox IMC interface will be enabled after rebooting the E2.

Obtaining a License Key

To receive a license key for Lennox IMC, contact your CPC sales representative or call customer service at (800) 829-2724. To order a license key, you must provide the following information:

- The MAC address of the E2 BX unit. A MAC address is a twelve-character identifier unique to each E2 unit manufactured. You can read the MAC address from the front panel of the E2 by pressing the ALT+T hotkey

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combination. New E2 units will also have a sticker with the MAC address printed on it — this will be located on the bottom right corner of the processor board.

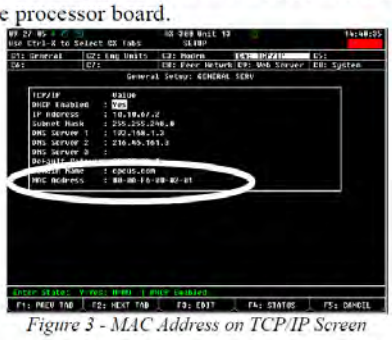

Figure 3 - MAC Address on TCP/IP Screen

- The number of Lennox IMCs the E2 BX will be communicating with. Licensing fees for the Lennox IMC interface are based on the number of IMCs enabled.

When a license order is fulfilled, you will be given a sixteen-character license key. You must enter this key on the E2 License Manager screen.

Entering the License Key

Log into the E2 controller with level 4 access, and press Menu 4 7 1 9 to navigate to the License Report screen.

Figure 4 - License Report Screen

From this screen, you can see all the different application types that are licensed in the box. Most of the licenses here are defaults that are enabled for all BX model types. Application types that require licensing and that have already been licensed will be shown in this list along with the license key that enabled it.

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Installation Instructions: Lennox IMC Interface to E2 BX Building Controller

In new BX units that have no Lennox IMCs licensed in them, Lennox IMC will not appear in the Feature list until the correct license key is entered. To enter the license key from this screen, press F1 and enter the license key. If entered correctly, the message "Feature Activated" will be shown (*Figure 5*).

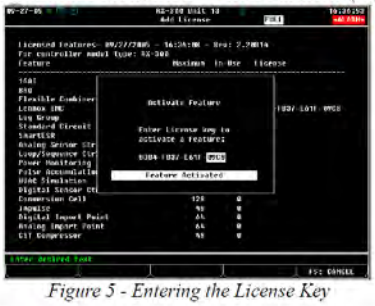

Figure 5 - Entering the License Key

When activated, press Esc to return to the License Report screen. You should be able to see the newly added Lennox IMC instances. The amount shown in the Maximum field should be equal to the number of purchased licenses.

Adding and Configuring Controllers

After licensing is properly set up for Lennox IMCs, they must be added to E2 the same way boards and unit controllers are added: from the Connected I/O screen. Press Menu 7 7 2 to access the Connected I/O screen, and enter the number of Lennox IMCs on the network in the Lennox IMC field. (*Figure 6*).

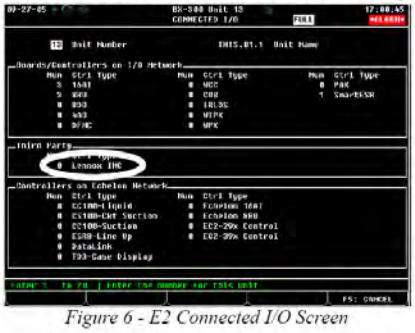

Figure 6 - E2 Connected I/O Screen

Once you enter the number of Lennox IMCs, the E2 will attempt to make connection with IMCs over the S-Bus network. You can check the status of the Lennox IMC connections from the E2 Online Status screen (Menu 7 7 1). This screen will list all the Lennox IMCs you added, starting with board address #1 (displayed in the column labeled "Node") and continuing in sequence. If one or more IMCs are reporting Unknown, check network wiring and refer to your Lennox IMC documentation for network troubleshooting instructions.

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Installation Instructions: Lennox IMC Interface to E2 BX Building Controller

If the Status of the Lennox IMCs reads "No Port," it means no COM port in E2 has been designated as the Lennox COM port. Refer to "Set Up E2 COM Port (E2 ver. 2.30 and above only)" on page 4.

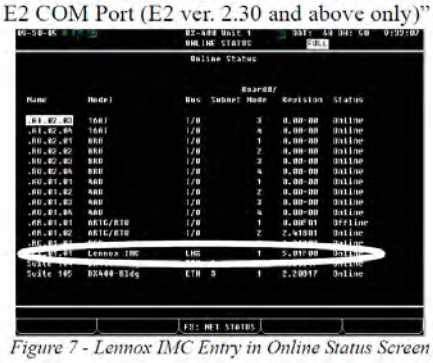

Figure 7 - Lennox IMC Entry in Online Status Screen

Associating a Lennox IMC with a Zone

If desired, a Lennox IMC can be associated with an E2 HVAC Zone application. Association with an HVAC Zone allows an IMC to work in conjunction with other IMCs (as well as CPC controllers and applications such as MultiFlex RCBs, RTUs, and AHU applications) to maintain temperature in a large area.
Associating a Lennox IMC with a Zone automatically ties certain I/O points of the Lennox IMC application with the HVAC Zone application. Specifically:

- The Space Temperature output is tied to one of the HVAC Zone's Zone Temp inputs, so that the zone can combine all associated controllers' space temperature values into a single zone temp.
- All occupied and unoccupied heating, cooling, and dehumidification setpoint inputs for the Lennox IMC are tied to the HVAC Zone (i.e. the Lennox IMC will use the HVAC Zone's temperature and dehumidification setpoints).
- The Zone RH Input for the Lennox IMC is tied to the Zone Humidity Output (in E2 version 2.21 and above).
- The occupancy status input for the Lennox IMC is tied to the occupancy status output of the HVAC Zone (i.e. the Lennox IMC will follow the same occupancy schedule as the HVAC Zone).

Configuring the Lennox IMC to Work with E2

Once the Lennox IMC is on-line and (if desired) associated with an HVAC Zone application, you must change two ECTO parameters in each Lennox IMC to make the IMC work properly with E2. Refer to the IMC documentation for instructions on how to change ECTO parameters.

1. **Parameter 6.01 - System_Mode:** This parameter determines what backup temperature sensor will be used for control if the local "space" temperature sensor fails. Set this parameter to "3". This will instruct the IMC to use the return air sensor as a backup.
2. **Parameter 5.24 - Min_Damper_Pos:** This parameter determines the economization damper's minimum position. By default, this is set to "101" which relinquishes control of the minimum damper position to the potentiometer on the IMC board. E2 passes down the minimum damper position to the IMC programmatically. Set this field to "0" to allow E2 to set the IMC's minimum damper position.
3. **Parameter 6.15 - Zone_Sensor_Auto-Changeover_Deadband_Minimum:** This parameter sets a minimum amount of degrees that the active cool setpoint and the active heat setpoint must be different from each

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other. In other words, if the cool setpoint is 68 degrees and this parameter is set to "3," the heat setpoint must be equal to or greater than 71 degrees. The value of this parameter is important. E2 does not read the value of ECTO 6.15, and if a user changing setpoints from the E2 chooses a heat setpoint that differs from the cool setpoint by less than the number of degrees specified in ECTO 6.15, **the IMC will reject the E2's setpoint changes and use its backup heat/cool setpoints.**

Before entering heat/cool setpoints in the E2, check the value of ECTO 6.15 and verify the difference between the heat and cool setpoints you are using is equal to or greater than 6.15. If not, change the value of 6.15 or enter different setpoints.

Viewing Status and Configuration

You can view the status of a Lennox IMC from the E2 front panel by pressing Menu 5 to access the Configured Applications list, then choosing "200. Lennox IMC". If you have more than once Lennox IMC, a Summary Screen will be shown listing all Lennox IMCs and their current zone temperatures, modes of operation, fan and occupancy states, and error status. Using the up and down arrow keys, highlight the Lennox IMC you wish to view, and press Enter.

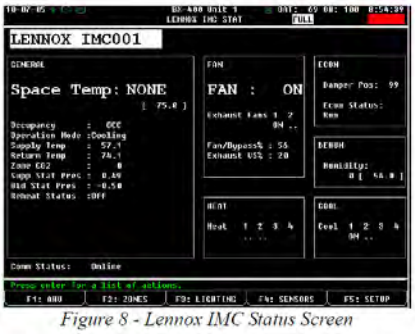

Figure 8 - Lennox IMC Status Screen

The status screen shows specific details regarding all sensors and devices on the Lennox rooftop unit, including temperatures, fan states, heating and cooling stage states, fan speeds, and economization damper settings. You may perform other actions from the Lennox IMC status screen to obtain even more information about various inputs and outputs.

NOTE: The Lennox IMC does not allow output overrides (such as heats and cools) to be made from the E2.

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Viewing Logs and Graphs

If an input or output is being logged by the E2, you may view a tabular log or graph of the logged data by highlighting the property you wish to view and pressing Enter. If a log exists, there will be options in the Actions Menu for "Graph" and "Log" (see *Figure 9*). Select one of these to view a graph or log of the data.

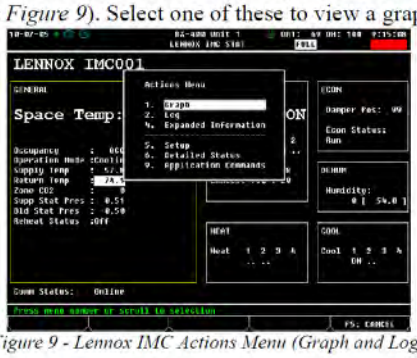

Figure 9 - Lennox IMC Actions Menu (Graph and Log)

Resetting the IMC Controller and Clearing the IMC Diagnostic Buffer

You may reset the IMC controller or clear the IMC's diagnostic buffer from the Lennox IMC Status screen by pressing Enter to view the Actions Menu and selecting "9. Application Commands." From this menu, you can choose option 1 to reset the IMC controller or 2 to clear the IMC's diagnostic buffer (*Figure 10*).

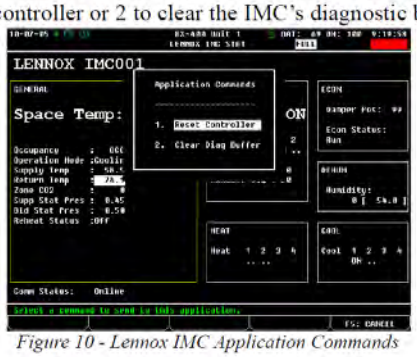

Figure 10 - Lennox IMC Application Commands

The ***Reset Controller*** option reboots the IMC and clears all lockout conditions. The ***Clear Diag Buffer*** causes all alarms in the IMC's alarm buffer to return to normal. This does NOT reset or clear the alarms in the E2's Advisory Log (this must be done in the E2 Advisory Log screen).

Using E2 Sensor Inputs with Lennox IMC Boards (v. 5.02 or Higher)

If the Lennox IMC board is version 5.02 or higher, you may choose to send input values from the E2 up to the IMC(s) for zone temperature, CO2 (IAQ), and/or indoor humidity. You may wish to do this if you are using a combination of multiple temperature sensors to determine zone temperature, or if you wish to use one CO2 and indoor humidity sensor for multiple IMCs.
To make an IMC use E2's sensor values:

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4. Press Menu 5 to access the Configured Applications list.
5. Choose "200. Lennox IMC", and (if multiple IMCs are used) highlight the IMC you wish to configure and press Enter.
6. From the IMC Status Screen, press F5 (SETUP) and then press F2 (NEXT TAB) to move over to the Inputs tab of the Lennox IMC setup screens (*Figure 11*).

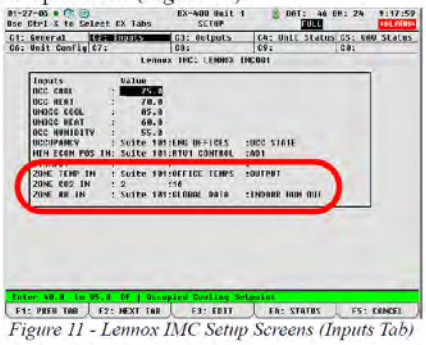

Figure 11 - Lennox IMC Setup Screens (Inputs Tab)

7. If the Lennox IMC board is version 5.02 or greater, three input definitions (ZONE TEMP IN, ZONE CO2 IN, and ZONE RH IN) will appear at the bottom of this screen. Use these input definitions to define the sources for the zone temperature, CO2 sensor, and relative humidity sensor to be used by the IMC. You may define them using:

- An output from another E2 application. Enter the controller, application name, and output to be used in the Controller, Application, and Output fields respectively, or
- An input board point directly (with the cursor highlighting a field in the input definition, press F3 , 1 , 1 to change to a Board/Point style input definition, and then enter the board and point number of the sensor to be used.
- If an input type will use a local IMC input and not an input from E2, leave its input definition blank.

8. Finally, the IMC must be programmed to accept remote values for its inputs. ECTO parameter 5.27 allows you to specify whether you are using a remote source for zone temperature, IAQ (a.k.a. CO2 level sensor), and indoor RH. Choose the value that enables the remote inputs you are using. Refer to the Lennox IMC documentation for specific information on how to do this.

Alarms

Error codes generated by the Lennox IMC are sent to the E2 and recorded in the Alarm Log ( ). Lennox IMC alarm messages will include the IMC error code number it corresponds to. Table 1 shows a list of Lennox IMC error codes and their alarm messages.

For further information about error codes and their meaning, consult the Lennox IMC documentation or contact Lennox directly.

WARNING: Lennox IMC error codes are subject to change without notice and may vary depending on IMC firmware version.

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Installation Instructions: Lennox IMC Interface to E2 BX Building Controller

Error Code	Alarm Message	E2 Advisory Type	E2 Advisory Priority	Description
1	1 Power loss for two cycles	NOTICE	50	Low or no power for two consecutive cycles.
2	2 ECTO Access Error	ALARM	30	May indicate a problem with the ECTO memory chip and parameters may not be changeable.
4	4 A17 Input - smoke alarm	ALARM	30	Smoke detected.
5	5 S52 No blower after demand	ALARM	30	No airflow detected 16 seconds after blower turned ON.
6	6 S27 Dirty filter	ALARM	30	Indicates a dirty filter.
10	10 24V loss TB35-1 A55 P111-11	FAIL	20	24V power is lost at TB35-1 on A55 (M1) board. P111 pin 11.
11	11 24V loss TB34-1 A55 P113-1	FAIL	20	24V power is lost at TB34-1 on A55 (M1) board.113 pin 1.
12	12 S4 High Pressure 1 open	ALARM	30	S4 (High Press. 1) is open. Note: on Heat Pump 088S units, S4 or S5 (comp. discharge temp) is open.
13	13 S4 High Pressure 1 open 3time	ALARM	30	S4 (High Press. 1) opened 3 (default) times during demand. The number of times is defined in ECTO 1.12 or 4.14. Note: on Heat Pump 088S units, S4 or S5 (comp. discharge temp) has opened 3 (default) times.
14	14 S7 High Press 2 open	ALARM	30	S7 (High Press. 2) is open.
15	15 S7 High Press 2 open 3time	ALARM	30	S7 (High Press. 2) opened 3 (default) times during demand.
16	16 S28 High Press 3 open	ALARM	30	S28 (High Press. 3) is open.
17	17 S28 High Press 3 open 3time	ALARM	30	S28 (High Press. 3) opened 3 (default) times during demand.
18	18 S96 High Press 4 open	ALARM	30	S96 (High Press. 4) is open.
19	19 S96 High Press 4 open 3time	ALARM	30	S96 (High Press. 4) opened 3 (default) times during demand.
20	20 A42 Input open A55 P110-9	ALARM	30	A42 input is open on A55 (M1) board P110 pin 9.
21	21 A42 Input open 3 times	ALARM	30	A42 input has opened 3 (default) times.
22	22 S87 Low Pressure 1 open	ALARM	30	S87 (Low Press. 1) is open.
23	23 S87 Low Press 1 open 3 time	ALARM	30	S87 (Low Press. 1) opened 3 (default) times during demand. The number of times is defined in ECTO 1.13 or 4.15.
24	24 S87 Low Pressure 2 open	ALARM	30	S88 (Low Press. 2) is open.
25	25 S88 Low Press 2 open 3 time	ALARM	30	S88 (Low Press. 2) opened 3 (default) times during demand. The number of times is defined in ECTO 1.13 or 4.15.
26	26 S87 Low Pressure 3 open	ALARM	30	S98 (Low Press. 3) is open.
27	27 S98 Low Press 3 open 3 time	ALARM	30	S98 (Low Press. 3) opened 3 (default) times during demand. The number of times is defined in ECTO 1.13 or 4.15.
28	28 S87 Low Pressure 4 open	ALARM	30	S97 (Low Press. 4) is open.
29	29 S97 Low Press 4 open 3 time	ALARM	30	S97 (Low Press. 4) opened 3 (default) times during demand.
32	32 S49 Frzstat 1 open	ALARM	30	S49 Freezestat 1 is open.
33	33 S49 Frzstat 1 open 3 time	ALARM	30	S49 Freezestat 1 has opened 3 (default) times during a demand. The number of times is defined by ECTO 4.04.
34	34 S50 Frzstat 2 open	ALARM	30	S50 Freezestat 2 is open.
35	35 S50 Frzstat 2 open 3 time	ALARM	30	S50 Freezestat 2 has opened 3 (default) times during a demand.
36	36 S53 Frzstat 3 open	ALARM	30	S53 Freezestat 3 is open.

Table 1: - IMC Error Codes and E2 Alarm Messages

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Installation Instructions: Lennox IMC Interface to E2 BX Building Controller

Error Code	Alarm Message	E2 Advisory Type	E2 Advisory Priority	Description
37	37 S53 Frzstat 3 open 3 time	ALARM	30	S53 Freezestat 3 has opened 3 (default) times during a demand.
38	38 S95 Frzstat 4 open	ALARM	30	S95 Freezestat 4 is open.
39	39 S95 Frzstat 4 open 3 time	ALARM	30	S95 Freezestat 4 has opened 3 (default) times during a demand. The number of times is defined by ECTO 4.04.
40	40 Return Air above heat limit	ALARM	30	Return air temperature (RT 16) exceeded heating limit.
41	41 Return Air below cool limit	ALARM	30	Return air temperature (RT 16) exceeded cooling limit.
44	44 GasValve 1 energized/no dmd	FAIL	20	Gas valve 1 is energized but no demand. (GV1).
45	45 GasValve 2 energized/no dmd	FAIL	20	Gas valve 2 is energized but no demand. (GV2).
46	46 No 24VAC on A60 board K9-5	FAIL	20	Second heat section off.
47	47 No relay power A58 TB35-1	FAIL	20	Second heat section off.
48	48 No relay power A61 TB34-1	FAIL	20	Second compressor off.
49	49 No relay power A59 TB35-1	FAIL	20	Third and fourth compressor off.
50	50 Pri heat limit open	ALARM	30	Gas unit: S10, S130, or S131 (Primary Heat Limit) is open. Other Units: Jumper is open. A55 P111 pin 1 & 2.
51	51 Pri heat limit open 3 times	ALARM	30	Gas unit: S10, S130, or S131 (Primary Heat Limit) has opened 3 (default) times during a demand. Other Units: Jumper is open. A55 P111 pin 1 & 2. First heat section is OFF.
52	52 Sec heat limit open	ALARM	30	Gas unit: S21 (Secondary Heat Limit 1) is open. Other units: Jumper is open. A55 P111 pin 1 and 2.
53	53 Sec heat limit open 3 times	ALARM	30	Gas unit: S21 (Secondary Heat Limit 1) has opened 3 (default) times during a demand. Other units: Jumper is open. A55 P111 pin 1 & 2. First heat section is OFF.
54	54 S47 or S15 open	ALARM	30	Gas unit: S47 (Roll Out) is open. Other units: S15 (El. Heat Limit) is open. First heat section is OFF.
55	55 S47 or S15 open during dmd	ALARM	30	Gas unit: S47 (Roll Out) opened 1 (default) time during demand. Other units; S15 (El. Heat Limit) has opened 1 (default) time during a demand. First heat section is OFF.
56	56 S18 or S63 open	ALARM	30	Gas unit: S18 (Combustion Air Proof Switch 1) is open. Other units: S63 (El. Heat Limit) is open. First heat section is OFF.
57	57 S18 or S63 open 3 times	ALARM	30	Gas unit: S18 (Combustion Air Proof Switch 1) has opened 3 (default) times during a demand. Other units: S63 (El. Heat Limit) has opened 3 (default) times during a demand.
58	58 GV1 not energized.	ALARM	30	Gas valve 1 not energized two minutes after thermostat demand. (GV1)
59	59 GV1 not energized 3 times	ALARM	30	Gas valve 1 not energized 3 (default) times (2 minutes after a demand) (GV1)
60	60 S99 open	ALARM	30	S99 (Primary Heat Limit 2) is open. Second heat section OFF.
61	61 S99 open 3 times	ALARM	30	S99 (Primary Heat Limit 2) has opened 3 (default) times during a demand. Second heat section OFF.
62	62 S100 open	ALARM	30	S100 (Secondary Heat Limit 2) is open. Second heat section OFF.
63	63 S100 open 3 times	ALARM	30	S100 (Secondary Heat Limit 2) has opened 3 (default) times since during a demand. Second heat section OFF.
64	64 S69 open	ALARM	30	S69 (Roll Out Switch 2) is open. Second heat section OFF.
65	65 S69 open 3 times	ALARM	30	S69 (Roll Out Switch 2) has opened 3 (default) times since during a demand. Second heat section OFF.

Table 1: - IMC Error Codes and E2 Alarm Messages

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Installation Instructions: Lennox IMC Interface to E2 BX Building Controller

Error Code	Alarm Message	E2 Advisory Type	E2 Advisory Priority	Description
66	66 S45 open	ALARM	30	S45 (Combustion Air Proof Switch 2) is open. Second heat section OFF.
67	67 S45 open 3 times	ALARM	30	S45 (Combustion Air Proof Switch 2) has opened 3 (default) times since during a demand. Second heat section OFF.
68	68 GV2 not energized	ALARM	30	Gas valve 2 not energized two minutes after demand (GV3).
69	69 GV2 not energized 3 times	ALARM	30	Gas valve 2 not energized 3 (default) times (2 minutes after demand) (GV3).
74	74 Zone sensor (A2) problem	FAIL	20	IMC's zone temp sensor is bad or disconnected.
75	75 OAT (RT17) sensor problem	FAIL	20	Outdoor air temp sensor is bad or disconnected. IMC defaults to a high outdoor temperature operation.
76	76 RH (A91) sensor problem	FAIL	20	RH sensor is bad or disconnected. No reheat.
77	77 Supply (RT6) sensor problem	FAIL	20	Supply temp sensor is bad or disconnected. No free cooling. Economizer damper will close. All economizer modes. No FAC or FAH.
78	78 Return(RT16) sensor problem	FAIL	20	Return temp sensor is bad or disconnected. No free cooling if economizer is in TMP (temperature) mode, dampers will be closed.
79	79 Comm error-lock out	FAIL	20	Major comm error between the main IMC board and add-on boards. Alarm can be caused by multiple GP1 (A133) boards set to the same mode. This alarm has nothing to do with communication between E2 and the IMC. When this alarm occurs, the main board will reset communications with the add-on boards.
80	80 Comm error-reset	ALARM	30	A communication problem between the main board and add-on board has occurred. Alarm can also be caused by multiple GP1 (A133) boards set to the same mode. When this alarm occurs, the main board will reset communications with the add-on boards.
81	81 IMC config error	ALARM	30	IMC config error.
82	82 Reset or power outage	NOTICE	50	Main board reset or power outage has occurred.
83	83 IMC config error	FAIL	20	Check UNIT DIP switch setting and add-on board types.
84	84 Comm error-addon board	FAIL	20	Add-on board did not respond or is not recognized when polled by main control during system power-up.
86	86 Tstat-heat and cool demands	FAIL	20	Thermostat conflict - simultaneous heat and cool demands.
87	87 UNIT dip switch changed	NOTICE	50	The UNIT (equipment type) DIP switch has changed while unit is energized. Check UNIT DIP switch setting and reset control.
88	88 ECTO chip problem	ALARM	30	This may indicate a problem with the ECTO chip. Control will operate on factory ECTO default settings.
89	89 No address set on SW3	ALARM	30	No address is set on unit address DIP switch SW3.
90	90 Ram error. System reset	NOTICE	50	A RAM error caused a system reset.
91	91 Outdoor enthalpy (A7) open	FAIL	20	Outdoor enthalpy sensor is bad or disconnected.
92	92 Indoor enthalpy (A62) open	FAIL	20	Indoor enthalpy sensor is bad or disconnected.
93	93 System mode changed	ALARM	30	The control has changed the system mode because of an error with the controlling sensor or because of a loss of communication.

Table 1: - IMC Error Codes and E2 Alarm Messages

APPENDIX D

technical bulletin

Installation Instructions: Lennox IMC Interface to E2 BX Building Controller

Error Code	Alarm Message	E2 Advisory Type	E2 Advisory Priority	Description
94	94 Setpoint out of range	NOTICE	50	The zone sensor setpoint is invalid. IMC will revert to default 65°F (18°C) heating and 80°F (27°C) cooling set-points.
95	95 ECTO changed by pushbutton	NOTICE	50	Indicates someone made an ECTO change.
96	96 4 Stg failure A138	FAIL	20	Four stage interface failure A138.
97	97 Config error for 4 Stg A138	ALARM	30	Four stage interface failure A138.
98	98 ECTO chip write error	ALARM	30	ECTO memory chip write error. ECTO settings may not be saved.
100	100 VAV,CAV,etc. config error	ALARM	30	VAV,CAV w/bypass damper, or exhaust fan configuration error.
101	101 MGV config error	ALARM	30	MGV configuration error.
102	102 GP config error	ALARM	30	GP configuration error.
103	103 General config error	ALARM	30	General configuration error.
105	105 Economizer config error	ALARM	30	Economizer configuration error.
106	106 Building APS A34 problem	FAIL	20	Building air pressure sensor is OPEN or SHORT.
107	107 Duct pres A30 problem	FAIL	20	Duct air pressure sensor is either OPEN or SHORT.
109	109 Error 107 or 108 3 times	FAIL	20	Supply duct pressure errors 107 and 108 have occurred enough times to require unit lock-out.
127	127 Error buffer overflow	NOTICE	50	The number of errors that occurred has exceeded the IMC alarm buffer, meaning some alarms have not been stored.

Table 1: - IMC Error Codes and E2 Alarm Messages