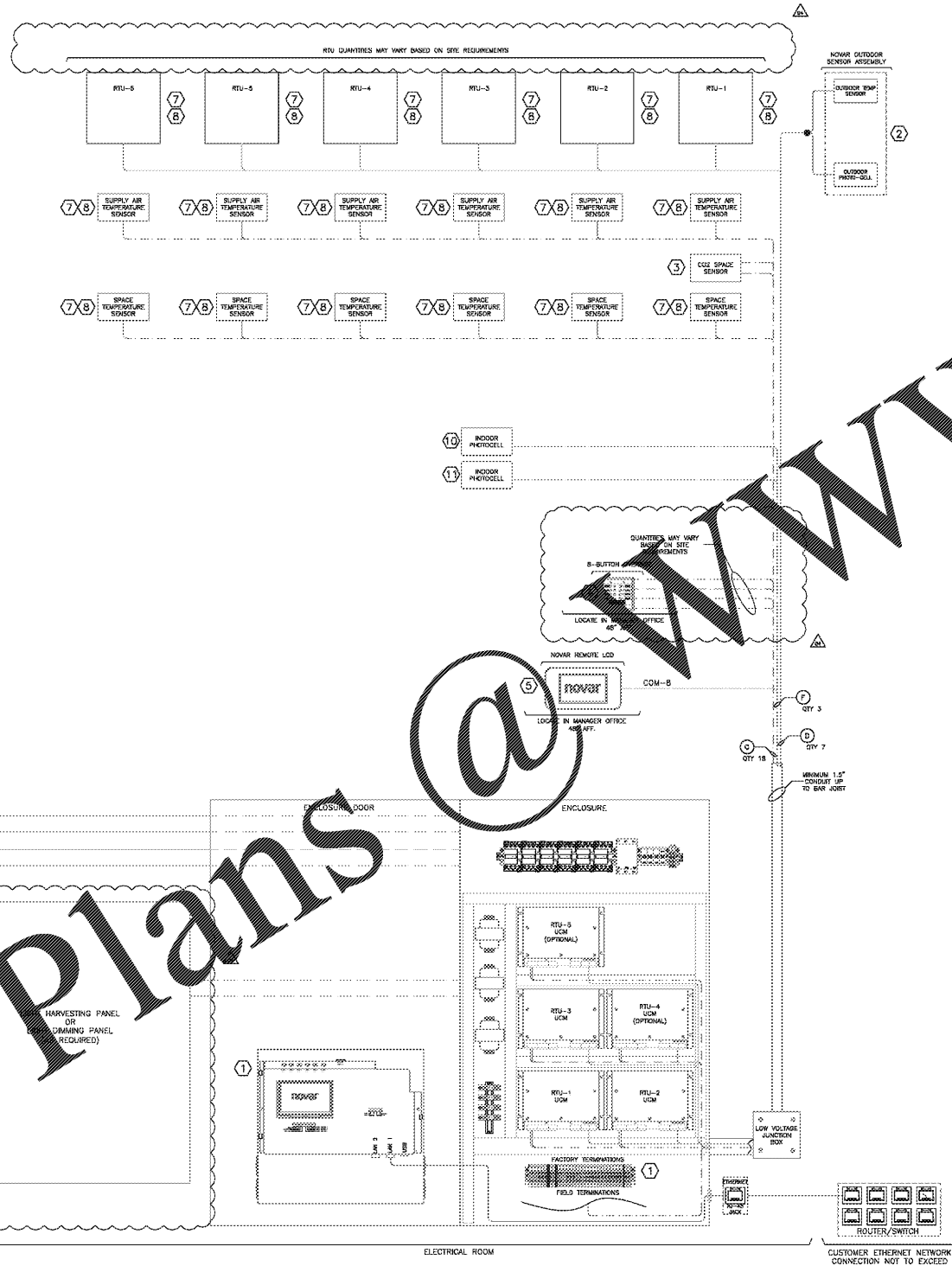


UPDATED 06/29/16



Novar - ENERGY MANAGEMENT SYSTEM (EMS) Installation Scope of Work

I. GENERAL CONTRACTOR'S RESPONSIBILITIES:

- Read Dollar Tree Documentation Package (this document) and distribute to mechanical and electrical contractors.
- Arrange for the electrical and mechanical contractors to be present during the entire remote commissioning for a two-hour period, via telephone, for a complete commissioning of the EMS as deemed by Novar Systems Commissioning Agent.
- Remote EMS commissioning shall be scheduled 24 hours prior to requested commissioning date. Contact Novar Programming:
  - Ops.Checkout@novar.com
- Confirm that the mechanical and electrical contractors have completed the Novar Survey form, FAX Survey form (pages 1 and 2 above):
  - Dollar Tree Survey Form Fax: 216-682-6772
  - Richard Doncaster, Novar PM: 216-682-1321; richard.doncaster@novar.com

If contacts above cannot be reached, please call Novar at:  
 i. Novar General Number: 216-682-1600

II. ELECTRICAL CONTRACTOR'S RESPONSIBILITIES:

- Provide labor and installation material, as required, for a complete and operational Novar EMS for this Dollar Tree Stores location.
- Receive and store all Novar material in a safe and secure place until the EMS installation has been completed.
- The following equipment will be supplied by Novar, and installed by the Electrical Contractor:
  - 1 Outdoor Light and Temperature Sensor Assembly (OSA)
  - 1 Integrated Controller/ Contactor Panel (RCP Panel)
  - 1 Manager Timed Override Panel or Remote LCD
  - 1 Seven Foot Ethernet Patch Cable (CAT5)
- Review the entire set of site plans, perform a job site survey and inventory the Novar equipment to ensure the proper equipment has been ordered and received for a complete and operational Novar EMS.
- If any material is missing or additional equipment (e.g. lighting) is required, immediately call Novar PM to request an order.
- Electrical Contractor shall verify number of rooftop units and number of control lighting circuits against the design and report any discrepancies that cannot be resolved in the field to the Novar Project Manager.
- All EMS cables are to be installed per National and Local codes. It is the Electrical Contractor's responsibility to determine if national and local codes permit class cables to be installed exposed within the building structure. A full conduit system is required.
- EIMT connectors and splice boxes are to be installed at the top of every conduit to protect EMS cables from abrasion. All cables are to be clearly and distinctly labeled at both ends.
- Perform all work in accordance with national, state, or local codes for this project.
- Coordinate the EMS installation with the Mechanical Contractor to avoid any interference that may delay program testing and commissioning.
- Furnish and install all required conduits, conduits, trays, fittings, straps, hangers and wiring for a complete and operational EMS as required.
- Coordinate with the Mechanical Contractor for locations when running communication and sensor wires. Ethernet cable run from the Integrated controller/contactor panel to the HUB under Cash Register #1. Contractor will terminate both ends of the Ethernet cable for proper wiring, plug one end of the Ethernet cable into the HUB and terminate the other end of the Ethernet Cable into the NOVAR XCM20R sensitive controller LAN1 (RJ45) jack.
  - Label: DO NOT TURN OFF / RCP EMS
  - Confirm wiring is completed as per Documentation Package before applying power. Improper wiring will cause damage to equipment.
- Furnish and install a 3-pole, 20 amp breaker/disconnect at the main distribution panel (MDP) for phase loss monitor power.
  - Label: DO NOT TURN OFF / PHASE FAILURE
- Confirm wiring is completed as per Documentation Package before applying power. Improper wiring will cause damage to equipment.
- Mount the Remote Override Panel (RCP) or Remote LCD in Manager's Office Area, see EMS drawings for details.
- Connect the Ethernet patch cord provided from the XCM20R Controller to the RJ-45 Ethernet jack. If the Ethernet jack is not yet in place, connect one end of the patch cord to the XCM20R System Controller, coil and tape the other end of the cord to the conduit for future connection.
- Mount the integrated controller/contactor panel adjacent to the electrical panels. Install the lighting circuit home runs from the fixtures straight to the load side of the contractors. Install the circuits from the line side of the contractors to each breaker as follows:
 

Lighting load	RCP Contactor(s)	Where ckt's identified on DT construction dwgs
Employee	C1A/C1B	Electrical Panel Schedule (E3)
Customer	C2A/C2B	Electrical Panel Schedule (E3)
Exterior/Signs	C3	Electrical Panel Schedule (E3)
Fire Sales	C4 (As Required)	Electrical Panel Schedule (E3)
- Lighting load
 LHP Contactor(s) | Where ckt's identified on DT construction dwgs || Light Harvesting | C1 (As Required) | Lighting Plan (E2) |
- Mount the Outdoor Sensor Assembly (OSA) on the roof top unit that resides closest to the XCM20R System Controller. Mount the device on a 1" rigid riser and 'L&B' to back of Assembly, 3 feet above the roof top unit, facing north, away from the combustion heat blower and condenser fan.
- When applicable, install indoor light sensor as directed per EM-4.
- Amended stores only: provide credit back to Dollar Tree Stores Inc. for any equipment that has been omitted from the original bid as a result of the EMS installation, i.e.: time clocks, contactors, switches, etc.
- Upon completion of the installation, the Electrical Contractor will fill in the information below, coordinate with Mechanical Contractor to be present and contact Novar to schedule a remote checkout at Ops.Checkout@novar.com. If both Electrical Contractor and Mechanical Contractor are not present, the checkout can not be scheduled.
- Provide a technician for an approximate 2-hour remote telephone checkout with Novar.
- Coordinate with the Mechanical Contractor to verify HVAC control during the Novar remote telephone checkout.
- If extra equipment exists after installation, the Electrical Contractor will inform Novar personnel at checkout to arrange for RMA # to return the material.

III. NOVAR RESPONSIBILITIES:

- If any end unit (e.g. lighting, roof top unit, supply air fan) cannot be operated for mechanical or electrical reasons, Novar will verify the proper operation of the control devices (e.g. contactors, discrete I/O) leading up to the unit.
- Timed operation of lighting loads - employee, customer, exterior signage, and security.
- Outside light level control of lighting loads - exterior signage and security.
- Operation of HVAC unit heating stages, as indoor environment allows.
- Operation of HVAC cooling stages, as indoor and outdoor environments allow.
- Verification of HVAC unit sensor readings - space and supply temperatures.
- Timed override operation of lighting loads.
- Operation of phase loss monitor HVAC load lockout.
- CO2 level on Sales Floor:
  - The following services will be supplied by Novar:
    - Equipment shipping to the job
    - Pre-programming and downloading of Novar equipment.
    - Telephone technical support at (216) 682-1600.
    - Remote system checkout with installing contractor.

IV. MECHANICAL CONTRACTOR'S RESPONSIBILITIES:

- Provide labor and installation material, as required, for a complete and operational Novar EMS for this Dollar Tree Stores tenant space.
- Mechanical Contractor shall verify number and type of rooftop units against the design and report discrepancies that cannot be resolved in the field to the Novar Project Manager (216) 682-1321 for RMA # to return the material.
- The following equipment will be supplied by Novar and installed by the Mechanical Contractor:
  - Remote Display Temperature Sensors (As Required)
  - Remote Space Temperature Sensors (As Required)
    - Please refer to Down Roof Installation Instructions for correct placement of Remote Space Temperature Sensors.
    - CO2 Sensor
- Amended stores only: provide credit back to Dollar Tree Stores Inc. for any equipment and/or labor that has been omitted from the original bid as a result of the installation, i.e.: contactors, relays, thermostats, etc.
- Perform all work in accordance with all national, state, or local codes for this project. Coordinate the EMS installation with Electrical Contractor to avoid any interference that may delay program testing and commissioning.
- Install the Remote Override Panel (RCP) or Remote LCD in Manager's Office Area, see EMS drawings for details.
  - Terminal R, G, Y1, Y2, W1, and W2 for control of fan, cooling and heating.
- Secure the communications cables to the UCM Controller as shown.
- Provide 24VAC power to the UCM controller from the roof top unit transformer. Power to the controller must be off while terminations are made.
- Mount the remote supply duct temperature sensor of each roof top unit. The remote supply duct temperature sensor should be mounted no closer than six feet from the roof top unit penetration measured along the duct. Install and secure the supply duct temperature sensor wire (18/2 Shielded, MC Supplied) to the UCM Controller location and terminate, as shown.
- Provide a technician for an approximate 2-hour remote telephone checkout with Novar.
- If extra equipment exists after installation (e.g. sensors), inform the Novar personnel at checkout to arrange for RMA # to return the material.
- Coordinate with the Electrical Contractor to verify proper HVAC control during the Novar remote telephone checkout. Provide Electrical Contractor with roof plan layout showing location of RTUs on the roof.
- Mount the CO2 sensor per Dollar Tree Stores location criteria, i.e. one sensor in Sales Floor area. Install and terminate sensor's signal wires and power wires as shown on EM-2. DO NOT CALIBRATE CO2 SENSOR! FIELD CALIBRATION WILL CAUSE SENSOR FAILURE.
- Install and terminate DCV wires to economizer section of RTUs as shown on EM-3. If RTUs do not have economizer section, DCV wires do not need to be installed, but CO2 sensor should still be installed in space.
- Set address and configuration DIP switches on the UCM Controller, as shown on the face of the controller.

**EMS REMOTE TESTING CHECKLIST**

- PERMANENT POWER APPLIED TO BUILDING.
- ALL INTERIOR LIGHTING AND LIGHTING CONTACTORS WIRED AND OPERATIONAL.
- 120 VAC CONTROL CIRCUIT INSTALLED AND WIRED TO EMS-I/FP.
- 240/480 VAC 3 PHASE CIRCUIT INSTALLED AND WIRED TO EMS PHASE LOSS RELAY.
- ALL EMS CABLE AND WIRING INSTALLED AND TERMINATED AS PER THE DRAWINGS AND MANUFACTURERS INSTRUCTIONS.
- ALL EMS COMPONENTS INSTALLED AND OPERATIONAL AS PER DRAWINGS AND MANUFACTURERS INSTRUCTIONS.
- NATURAL GAS UTILITY SERVICE APPLIED TO BUILDING (IF APPLICABLE).
- HIGH-SPEED INTERNET/INTRANET SERVICE APPLIED TO BUILDING.
- RJ-45 ETHERNET CABLEING INSTALLED AND OPERATIONAL FOR REMOTE COMMUNICATIONS.
- ALL HVAC COMPLETE AND OPERATIONAL.
- ELECTRICAL CONTRACTOR HAS QUALIFIED TECHNICIAN SCHEDULED FOR REMOTE SYSTEM TESTING.
- MECHANICAL CONTRACTOR HAS QUALIFIED TECHNICIAN SCHEDULED FOR REMOTE SYSTEM TESTING.

Revision	10/15/15	Added RCP, LHP remote
Revision	01/29/16	Change C4 contact
Revision	05/09/16	Override Button 3
Revision	08/29/16	Added Fire Sales A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, AA, AB, AC, AD, AE, AF, AG, AH, AI, AJ, AK, AL, AM, AN, AO, AP, AQ, AR, AS, AT, AU, AV, AW, AX, AY, AZ, BA, BB, BC, BD, BE, BF, BG, BH, BI, BJ, BK, BL, BM, BN, BO, BP, BQ, BR, BS, BT, BU, BV, BW, BX, BY, BZ, CA, CB, CC, CD, CE, CF, CG, CH, CI, CJ, CK, CL, CM, CN, CO, CP, CQ, CR, CS, CT, CU, CV, CW, CX, CY, CZ, DA, DB, DC, DD, DE, DF, DG, DH, DI, DJ, DK, DL, DM, DN, DO, DP, DQ, DR, DS, DT, DU, DV, DW, DX, DY, DZ, EA, EB, EC, ED, EE, EF, EG, EH, EI, EJ, EK, EL, EM, EN, EO, EP, EQ, ER, ES, ET, EU, EV, EW, EX, EY, EZ, FA, FB, FC, FD, FE, FF, FG, FH, FI, FJ, FK, FL, FM, FN, FO, FP, FQ, FR, FS, FT, FU, FV, FW, FX, FY, FZ, GA, GB, GC, GD, GE, GF, GG, GH, GI, GJ, GK, GL, GM, GN, GO, GP, GQ, GR, GS, GT, GU, GV, GW, GX, GY, GZ, HA, HB, HC, HD, HE, HF, HG, HH, HI, HJ, HK, HL, HM, HN, HO, HP, HQ, HR, HS, HT, HU, HV, HW, HX, HY, HZ, IA, IB, IC, ID, IE, IF, IG, IH, II, IJ, IK, IL, IM, IN, IO, IP, IQ, IR, IS, IT, IU, IV, IW, IX, IY, IZ, JA, JB, JC, JD, JE, JF, JG, JH, JI, JJ, JK, JL, JM, JN, JO, JP, JQ, JR, JS, JT, JU, JV, JW, JX, JY, JZ, KA, KB, KC, KD, KE, KF, KG, KH, KI, KJ, KK, KL, KM, KN, KO, KP, KQ, KR, KS, KT, KU, KV, KW, KX, KY, KZ, LA, LB, LC, LD, LE, LF, LG, LH, LI, LJ, LK, LL, LM, LN, LO, LP, LQ, LR, LS, LT, LU, LV, LW, LX, LY, LZ, MA, MB, MC, MD, ME, MF, MG, MH, MI, MJ, MK, ML, MM, MN, MO, MP, MQ, MR, MS, MT, MU, MV, MW, MX, MY, MZ, NA, NB, NC, ND, NE, NF, NG, NH, NI, NJ, NK, NL, NM, NN, NO, NP, NQ, NR, NS, NT, NU, NV, NW, NX, NY, NZ, OA, OB, OC, OD, OE, OF, OG, OH, OI, OJ, OK, OL, OM, ON, OO, OP, OQ, OR, OS, OT, OU, OV, OW, OX, OY, OZ, PA, PB, PC, PD, PE, PF, PG, PH, PI, PJ, PK, PL, PM, PN, PO, PP, PQ, PR, PS, PT, PU, PV, PW, PX, PY, PZ, QA, QB, QC, QD, QE, QF, QG, QH, QI, QJ, QK, QL, QM, QN, QO, QP, QQ, QR, QS, QT, QU, QV, QW, QX, QY, QZ, RA, RB, RC, RD, RE, RF, RG, RH, RI, RJ, RK, RL, RM, RN, RO, RP, RQ, RR, RS, RT, RU, RV, RW, RX, RY, RZ, SA, SB, SC, SD, SE, SF, SG, SH, SI, SJ, SK, SL, SM, SN, SO, SP, SQ, SR, SS, ST, SU, SV, SW, SX, SY, SZ, TA, TB, TC, TD, TE, TF, TG, TH, TI, TJ, TK, TL, TM, TN, TO, TP, TQ, TR, TS, TT, TU, TV, TW, TX, TY, TZ, UA, UB, UC, UD, UE, UF, UG, UH, UI, UJ, UK, UL, UM, UN, UO, UP, UQ, UR, US, UT, UU, UV, UW, UX, UY, UZ, VA, VB, VC, VD, VE, VF, VG, VH, VI, VJ, VK, VL, VM, VN, VO, VP, VQ, VR, VS, VT, VU, VV, VW, VX, VY, VZ, WA, WB, WC, WD, WE, WF, WG, WH, WI, WJ, WK, WL, WM, WN, WO, WP, WQ, WR, WS, WT, WU, WV, WW, WX, WY, WZ, XA, XB, XC, XD, XE, XF, XG, XH, XI, XJ, XK, XL, XM, XN, XO, XP, XQ, XR, XS, XT, XU, XV, XW, XX, XY, XZ, YA, YB, YC, YD, YE, YF, YG, YH, YI, YJ, YK, YL, YM, YN, YO, YP, YQ, YR, YS, YT, YU, YV, YW, YX, YY, YZ, ZA, ZB, ZC, ZD, ZE, ZF, ZG, ZH, ZI, ZJ, ZK, ZL, ZM, ZN, ZO, ZP, ZQ, ZR, ZS, ZT, ZU, ZV, ZW, ZX, ZY, ZZ

**LEGEND**

- NOTE-THIS SHEET
- DETAIL NUMBER
- DETAIL: DEVICE ID NUMBER OVER DEVICE CATEGORY NUMBER
- WIRE ID
- DESIGNATED WIRE SPLICE
- SECURED SPARE CONDUCTOR FOR FUTURE USE

**WIRE/CABLE TYPES**

ALL TYPES MAY NOT APPLY.

- 22/2 AWG SHIELDED GROUND \* BELDEN 8761
- 22/3 AWG SHIELDED GROUND \* WINDY CITY 004330
- 18/2 AWG SHIELDED GROUND \* HONEYWELL 3320 10 D1
- 18/8 AWG STRANDED CABLE PLENUM RATED
- LINE VOLTAGE WIRING IN CONDUIT
- 20/2 AWG SHIELDED AND 18/2 AWG \* BELDEN 9155
- 12 TO 18 AWG STRANDED WIRE \* THRL

\* OR EQUIVALENT.

LOW VOLTAGE CABLING REQUIREMENTS:

- WIRE SPLICES ARE UNACCEPTABLE.
- THE COMMUNICATIONS BUSSES WILL BE TERMINATED AT THE CONTROLLER.
- INSTALLED NEATLY AND CONCEALED WITHIN THE BUILDING STRUCTURE.
- SLEEVED IN CONDUIT UP TO COILING OR BAR JOIST.

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**DOLLAR TREE**  
 Energy Management Plan

Application Eng: R. James  
 Project/Program Mgr: CR / GN  
 Date: 11/13/2014  
 Issue No: U-  
 Single Line Diagram  
 Scale: N.T.S.      Dep. No: EM-1

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ENERGY MANAGEMENT SYSTEM SINGLE LINE DIAGRAM.