

*INSTALLATION AGREEMENT
FOR
CITY OF PATTERSON*

TERMS AND CONDITIONS

ATTACHMENTS:

- Attachment A – Scope of Work
- Attachment B – Lighting Systems
- Attachment C – Mechanical Systems
- Attachment D – Control Systems
- Attachment E – Electrical Systems
- Attachment F – Building Envelope Systems
- Attachment G – Renewable Energy Systems

ALLIANCE INSTALLATION AGREEMENT

This Installation Agreement (“Agreement”) dated ___ / ___ / ___ (“Effective Date”) is made by and between:

City of Patterson
 (“Purchaser”) with its principal place of business at
 1 Plaza, P.O. Box 667, Patterson, CA 95363

and

Alliance Building Solutions, LLC.
 (“ABS”) with its principal place of business at
 12520 High Bluff Drive, Ste 345, San Diego, CA 92130

Purchaser and ABS may be referred to hereinafter individually as a “Party” or collectively as the “Parties.” There are no other parties to this Agreement.

RECITALS

- A. ABS is a full-service energy service contractor with the qualifications and technical capabilities to provide the services described in this Agreement and desires to enter into this Agreement with Purchaser.
- B. Purchaser wishes to engage ABS, pursuant to the terms and conditions of this Agreement, to provide Purchaser with an Energy Efficiency and Renewable Energy Program.
- C. This Agreement constitutes an “energy service contract” within the meaning of Government Code Section 4217.10 et seq.
- D. Government Code Section 4217.10 et seq. (i) authorizes public agencies to enter into energy service contracts that satisfy the requirements of California Government Code Section 4217.12, (ii) allows public agencies to award such energy services contracts on the basis of the experience of the contractor, the type of technology employed by the contractor, the cost to the public agency, and any other relevant considerations, and (iii) expressly provides public agencies with the greatest possible flexibility in structuring such energy service contracts so that economic benefits may be maximized and financing and other costs associated with the design and construction of alternate energy projects may be minimized.
- E. The City Council for the City of Patterson has determined that the work to be provided by ABS under this Agreement satisfies the requirements of Government Code Section 4217.12 and has further determined, at a regularly scheduled public hearing of which public notice was given at least two weeks in advance, that the terms of this Agreement are in the best interests of the Purchaser.

NOW THEREFORE, in consideration of the foregoing and of the respective rights and obligations of the Parties set forth herein, the Parties agree as follows:

AGREEMENT

- 1. SCOPE OF WORK.** “ABS” shall provide “Purchaser” with and Energy Efficiency and Renewable Energy Program, as identified in the following Attachments and incorporated herein by reference (hereinafter referred to as the “Work”) at the total fixed price of **\$4,794,785** including required taxes, Bonds, and other costs necessary to fulfill ABS’s responsibilities under this Agreement (the “Contract Amount”).

“ABS” is responsible for the design, engineering, permits, fees, approvals, project management, installation, startup, training, checkout, warranty, and insurance specifically associated with the Work to be performed. “ABS” is not

responsible for any balancing, duct cleaning, equipment, systems, controls, comfort problems, etc. not specifically included in the Agreement. "ABS" will provide submittals and engineering drawings (if required), for "Purchaser's" technical review and written approval, prior to initiating construction. All construction and associated cleanup shall be performed and scheduled so as to minimize any disruption with any ongoing "Purchaser" activities. "ABS" requires all underground conduits between building to be clear of obstruction, of sufficient size to accommodate new wire and cable, and easily accessible. The "Purchaser" is responsible for Ethernet drops and WiFi access at each location for Energy Management Systems communication.

This agreement is based upon the use of straight time labor only unless stated otherwise in this agreement. "Purchaser" agrees to provide "ABS" with required field utilities (electricity, toilets, drinking water, etc.) without charge. "ABS" agrees to keep the jobsite clean of debris arising out of its own operations. "Purchaser" shall not back charge "ABS" for any cost or expenses without written consent from "ABS". Unless specifically noted in the statement of the scope of the work or services undertaken by "ABS" under this agreement, "ABS" obligations under this agreement expressly exclude any work or service of any nature associated or connected with the identification, abatement, cleanup, control, removal or disposal of environment hazards or dangerous substances, to include and not to be limited to asbestos, Polychlorinated biphenyls (PCBs), or mold discovered in or on the premises. Any language or provision of the agreement elsewhere contained which may authorize or empower the "Purchaser" to change, modify or alter the scope of work or services to be performed by "ABS" shall not operate to compel "ABS" to perform any work related to hazards without "ABS" express written consent.

2. **INVOICING AND PAYMENTS.** "ABS" will invoice the "Purchaser" for mobilization, predevelopment, engineering, bonding and insurance upon signing this Agreement for \$479,478 due within 15 days. "ABS" will submit a Schedule of Values ("SOV") for review and approval within 45 days of this Agreement signing for remaining scheduled payments. "Purchaser" agrees to pay "ABS" undisputed amounts invoiced 30 days after each invoice is received per agreed SOV. ABS's submission of an invoice shall constitute a representation to Purchaser that the Work has progressed to the point indicated and has been performed in accordance with this Agreement and the Standard of Care for ABS's Work. Waivers of lien will be furnished upon request, as the work progresses, to the extent payments are received. If undisputed "ABS" invoices are not paid within 30 days of its issuance, it is considered delinquent and "ABS" may add 1% interest per month, or the maximum amount permitted under applicable law, whichever is less, onto delinquent amounts.

The "Purchaser" shall retain an amount equal to 5% of each progress payment. All accrued retention shall be payable upon 50% of completion of work. The remainder of retention shall be payable upon completion of the work. For custom orders, "ABS" can bill the "Purchaser" up to 50% of the price of the order upon placing the order.

Pursuant to Public Contract Code Section 22300, at the request and expense of ABS, securities equivalent to the amount withheld pursuant to the paragraph above shall be deposited with Purchaser, State Treasurer or with a state or federally chartered bank in California as the escrow agent, who shall then pay the retainage to ABS. Upon satisfactory completion of the Work, the securities shall be returned to ABS. Alternatively ABS may request, pursuant to Public Contract Code Section 22300, and Purchaser shall make payment of retentions under the paragraph above directly to the escrow agent. ABS shall receive the interest earned on the investments upon the same terms provided for in Public Contract Code Section 22300 for securities deposited by ABS. Upon satisfactory completion of the Work, ABS shall receive from the escrow agent all securities, interest and payments received by the escrow agent from Purchaser. Either alternative may be exercised only if requested in writing by ABS within five (5) days after Purchaser's execution of this Agreement. ABS shall notify its Subcontractors in writing within fifteen (15) days of exercising this option. Securities eligible for investment under this Section shall include those listed in Government Code Section 16430 or bank or savings and loan certificates of deposit, interest-bearing demand deposit accounts, standby letters of credit, or any other security mutually agreed to by ABS and Purchaser. ABS shall be the beneficial owner of any securities substituted for monies withheld and shall receive any interest thereon.

3. **INDEPENDENT CONTRACT.** It is agreed between "Purchaser" and "ABS" that "ABS" shall perform the work as an independent contractor. "ABS" may use subcontractors to perform work hereunder, provided "ABS" shall fully pay said subcontractors and in all instances remain fully responsible for (a) the proper completion of this Agreement and (b)

supervising such subcontractor's work and for the quality of the work they produce. ABS shall ensure that each of the subcontractors holds all licenses legally required for the practice of its profession and in the classification(s) required for their respective work under this Agreement. ABS shall bind every subcontractor to the applicable terms of this Agreement. Nothing contained in this Agreement shall create any contractual relationship between any subcontractor and Purchaser nor shall the Agreement be construed to be for the benefit of any subcontractor.

ABS represents and warrants that neither it, nor any of its subcontractors, has been debarred by the California Labor Commissioner pursuant to Section 1777.1 of the California Labor Code or otherwise.

ABS represents and warrants that it is an equal opportunity employer and agrees that it shall not discriminate in violation of any applicable federal, state, or other law, rule or regulation, including, but not limited to, discrimination against any employee or applicant for employment on account of such person's race, religion, color, national origin, ancestry, sex, or age. ABS shall apply such policy of non-discrimination in connection with all activities related to ABS's employees and subcontractors, including with respect to initial employment, promotion, demotion, transfer, recruitment or recruitment advertising, and layoff or termination.

This contract is subject to prevailing wage law, including, but not limited to, California Labor Code Sections 1773.2 and 1775. ABS acknowledges that the Work will be subject to compliance monitoring and enforcement by the California Department of Industrial Relations ("DIR"). ABS shall be responsible for ensuring that it and all of its Subcontractors are currently and properly registered with the DIR. ABS and each of its subcontractors shall comply with all applicable provisions of the California Labor Code ("Labor Code") and the regulations promulgated thereunder (collectively, the "Labor Laws"), including, without limitation, any applicable Labor Laws requiring the payment of prevailing wages, submission of payroll records for inspection, posting of required notices at the Project Site, and cooperation with the DIR.

4. **MATERIALS.** All materials shall be new, in compliance with all applicable laws and codes, and shall be covered by a manufacturer's warranty, if appropriate. If the materials or equipment included in this Agreement become temporarily or permanently unavailable, then upon ABS's reasonable request (with appropriate supporting documentation), the Parties shall execute a Change Order reflecting such equitable changes to this Agreement as may be necessary or appropriate under the circumstances. In the case of permanent unavailability, "ABS" shall be excused from furnishing said materials or equipment and shall propose a reasonable substitute. No additional compensation shall be given to ABS for substitute materials or equipment beyond the Contract Amount. Final equipment selections shall be coordinated with Purchaser personnel and meet or exceed the performance than the equipment shown in the Attachments.
5. **COMPLETION.** The work specified in Section 1 shall be considered completed upon approval by the "Purchaser", provided that the "Purchaser's" approval shall not be unreasonably withheld.
6. **WARRANTY.** "ABS" warrants that the equipment manufactured by it shall be free from defects in material and workmanship arising from normal usage for a minimum period of one (1) year from delivery of said equipment. "ABS" warrants that for equipment furnished and/or installed by ABS but NOT manufactured by "ABS", "ABS" will extend the same warranty and terms and conditions, which "ABS" received from manufacturer of said equipment. Within the warranty period, for equipment installed by "ABS", if Purchaser provides written notice to "ABS" of any such defects within thirty (30) days after the appearance or discovery of such defect, "ABS" shall, at its option, repair or replace the defective equipment to "Purchaser". All transportation charges incurred in connection with the warranty for equipment not installed by "ABS" is included in the Contract Amount. These warranties do not extend to any equipment which has been repaired by others, abused, altered or misused, or which has not been properly and reasonably maintained. These warranties are in lieu of all other warranties, expressed or implied, including but not limited to those of merchantability and fitness for a specific purpose.

7. **LIABILITY.** Neither Party shall not be liable for any special, indirect, or consequential damages arising in any manner from the equipment or material furnished or the work performed pursuant to this Agreement.
8. **TAXES.** The price of this Agreement does include duties, sale, use, excise or other similar taxes required by federal, state or local laws in effect at the time of Agreement execution.
9. **DELAYS.** “ABS” shall not be liable for any delay in the performance of the work resulting from or attributed to a force majeure beyond “ABS” control, including but not limited to acts of God, riots, labor disputes, unknown conditions of the premises, acts or omissions of the “Purchaser”, or unforeseen delays caused by suppliers. In the event that ABS’s performance hereunder is impacted by such force majeure circumstances, then upon ABS’s reasonable request (with appropriate supporting documentation), the Parties shall execute a Change Order reflecting such equitable changes to this Agreement as may be necessary or appropriate under the circumstances.
10. **REBATES, UTILITY INCENTIVES, AND GRANTS.** Unless designated for public agencies, required by law to be awarded to a public agency, or otherwise stated in the project scope-of –work, or cash flow analysis, any and all rebates, incentives, grants that are earned through the course of this project from public or private utilities, municipalities, development districts or state funding are 100% the property of “ABS” or their designee. The paperwork, inspections and verification required to collect these monies are the sole responsibility of “ABS”. The Purchaser agrees to assist “ABS” where required by the jurisdiction in the form of data required for the application and authorizing signatures. In the event the Purchaser incurs expenses related to the processing of the applications, “ABS” shall reimburse these direct costs.
11. **CHANGE ORDER (Mid-Performance Amendments).** “ABS” and the “Purchaser” recognize that:
 - i. “Purchaser” may desire a mid-job change in the specifications or scope that would add time and cost to the specified work or inconvenience “ABS”.
 - ii. Other provisions of the Agreement may be difficult to carry out because of a force majeure. If these or other unforeseen events beyond the control of the Parties reasonably require adjustments to this Agreement, the Parties shall make a good faith attempt to agree on all necessary particulars. Such agreements shall be put in writing, signed by the Parties and added to this Agreement. Failure to reach agreement shall be deemed a dispute to be resolved as agreed in section 19 of this Agreement.
12. **TAX DEDUCTIONS.** Unless otherwise stated in the contract, all eligible tax deductions associated with the work, that “Purchaser” is not eligible for, are agreed to be 100% the property of “ABS” or their designee. The paperwork, inspections and verification required to collect these incentives are the sole responsibility of “ABS”. In the event the customer incurs expenses related to the processing of the applications, “ABS” shall reimburse these direct costs.
13. **COMPLIANCE WITH LAWS.** “ABS” shall comply with all applicable Federal, State and local laws and regulations. All licenses and permits required for the prosecution of the work shall be obtained and paid for by “ABS”. Each and every provision required by any Applicable Law to be included in this Agreement is hereby deemed to be so included, and this Agreement shall be construed and enforced as if all such provisions are so included.
14. **INSURANCE.** “ABS” will maintain comprehensive liability and other insurance in the amount not less than those set forth below.
 - a. General Liability Insurance. A policy of commercial general liability insurance, written on an “occurrence” basis, providing coverage with not less than \$1,000,000 per occurrence for bodily injury, personal injury & property damage and must include a separate endorsement naming the “Purchaser”, its elected officials, its officers, agents and employees as additional insurance (“General Liability Policy”). The General Liability Policy shall include coverage for the contractual liability assumed by the ABS pursuant to this Agreement.

- b. Vehicle Liability Insurance. A policy of business vehicle liability insurance, written on an “occurrence” basis, with a combined single limit of not less than \$1,000,000 per accident for bodily injury and property damage (“vehicle Liability Policy”). The vehicle Liability Policy shall include coverage for owned, hired, and non-owned automobiles.
- c. Worker’s Compensation Insurance. Worker’s compensation insurance as required by State law and employer’s liability insurance, written on an “occurrence” basis, with coverage in an amount not less than \$1,000,000. Notwithstanding the insurer rating standards set forth in this Agreement, coverage provided by the State Compensation Insurance Fund shall be deemed, with respect to the workers’ compensation insurance, to satisfy such insurer rating standards.
- d. Professional Liability Insurance. Professional liability insurance with coverage in an amount of not less than \$1,000,000 (Professional Liability Policy”), which the “Purchaser” acknowledges shall be written on a “claims made” basis. The Professional Liability Policy shall provide coverage for claims arising out of the performance of the Scope of Services pursuant to this Agreement. If an aggregate limit applies, such aggregate limit in the Professional Liability Policy shall not be less than \$2,000,000. Prior to commencing the Scope of Services, and, if applicable, upon replacing the original Professional Liability Policy, the ABS shall provide the Purchaser a copy of any and all applicable claims-reporting requirements. Notwithstanding anything to the contrary: (i) ABS shall have the Professional Liability Policy, as described herein, in full force and effect prior to commencing the Scope of Services; (ii) each renewal or replacement of the Professional Liability Policy shall have a retroactive date that is prior to the date the ABS commenced the Scope of Services; and (iii) as a condition to final payment to ABS pursuant to this Agreement. If the claims reporting period applicable to the scope of Services, as specified in or determined pursuant to the Professional Liability Policy for the Scope of Services, will Terminate prior to the end of the two-year period following final payment to ABS pursuant to this Agreement, then ABS, as its cost, shall obtain and provide satisfactory evidence to the Purchaser of: (i) an endorsement to extend the claims reporting period to include whatever will remain of such two-year period; or (ii) a supplemental extended reporting period (tail) applicable to the Professional Liability Policy as required to provide coverage until the end of such two-year period. Such tail coverage shall be required, for example; (i) if ABS intends to switch insurance carriers and the prospective new carrier will not agree to cover claims arising from the Scope of Services submitted at any time prior to the end of the two-year period following final payment to ABS pursuant to this Agreement; (ii) if ABSs business is to be wound-up or otherwise terminated, whether voluntarily or Involuntarily; or (iii) when necessary for any other reason to ensure that professional liability insurance applicable to the Scope of Services is in effect at all times required by this Agreement.
- e. Insurer Rating Standards. The insurance policies required pursuant to this section must be issued by one or more insurers that are (i) licensed to do business in the State of California and (ii) have an A.M. Best Company rating of not less than “A-” and a financial size category of not less than “VII.”
- f. Duration of Insurance. Except as provided in this Agreement with respect to insurance written on a “claims made” basis, the ABS shall maintain the insurance required pursuant to this Agreement in effect at least until the date that is one year following final payment to the ABS pursuant to this Agreement.
- g. Additional Insured’s. The “Purchaser”, its elected officials, officers, employees, and agents shall all be named as additional insured, to the extent of the ABSs’ acts and omissions in connection with this Agreement, on all insurance that the consultant is to have in effect pursuant to this agreement, excepting the workers’ compensation insurance and the Professional Liability Policy.
- h. Waiver of Subrogation. ABS hereby waives, on behalf of its insurers, any and all rights to subrogation that any such insurer may acquire by virtue of the payment of any loss. Each of the General Liability Policy and The Vehicle Liability Policy shall be endorsed with a cross-liability endorsement and a waiver of the insurer’s

rights of subrogation against the “Purchaser”. The policy of worker’s compensation insurance shall be endorsed with a waiver of the insurer’s rights of subrogation.

- i. ABS’s Insurance is Primary. To the extent permitted by law, insurance policies required by this Agreement to be maintained by the consultant shall be primary and non-contributing with respect to any insurance or self-insurance programs covering the “Purchaser” or “Purchaser’s” Council members thereof, or the “Purchaser’s” other officers, employees or agents. The General Liability Policy and the Vehicle Liability Policy shall be endorsed to provide that they are so primary and non-contributory.
 - j. Evidence of Coverage. Prior to commencing the Scope of Services, the ABS shall provide to the “Purchaser” or “Purchaser” such duly-authorized and executed certificates of insurance evidencing that the insurance policies to be maintained by the ABS pursuant to this Agreement are in effect (each a “certificate of Insurance”), together with a copy of each endorsement to such insurance as is required pursuant to this Agreement. The delivery of such Certificates of Insurance and endorsements shall be a condition precedent to ABS commencing any of the Scope of Services. As applicable, the Certificate of Insurance shall identify those who are additional insured’s in accordance with this Agreement. Not less than Thirty days prior to the expiration of any insurance policy that the ABS is required to maintain pursuant to this Agreement, the ABS shall provide updated Certificates of Insurance to the “Purchaser” evidencing the renewal of such policy.
 - k. Notice of Changes in Policies. Each certificate of Insurance and corresponding policy of insurance required pursuant to this Agreement shall expressly require, or be endorsed to require, that the insurer notify the “Purchaser” not less than thirty days prior to any cancellation, termination, reduction in coverage, or expiration without renewal of any such insurance policy, except for cancellation due to non-payment of premium, in which case the insurer shall provide such notice not less than ten days prior to cancellation. Language in any Certificate of Insurance or policy of insurance to the effect that the insurer shall “endeavor” to provide such notice shall not be acceptable.
 - l. Subcontractor Insurance. ABS shall require that each of its Subcontractors comply with substantially the same requirements as are set forth in this Insurance section, except to the extent Purchaser has approved any different standards or requirements applicable to any particular Subcontractor.
- 15. BONDING.** Bonds are subject to the procurement and installation portion of the contract. Payment and Performance Bonds, each for an amount equal to 100% of the Contract Amount, are required 10 days prior to start of procurement or installation. All M&V Agreements and Energy Savings Guarantees are specifically excluded.
- 16. INDEMNITY.** To the fullest extent permitted by law (including, without limitation, California Civil Code Sections 2782 and 2782.8), ABS shall defend, indemnify, hold harmless, and release Purchaser, and Purchaser’s elected and appointed councils, commissions, directors, officers, employees, agents, and representatives (“Purchaser’s Agents”) from and against any and all actions, claims, loss, cost, damage, injury (including, without limitation, disability, injury or death of an employee of ABS or its subcontractors), expense and liability of every kind, nature and description to the extent caused in whole or in part by ABS’s negligence or relate to acts or omissions of ABS, or any direct or indirect subcontractor, employee, contractor, representative or agent of ABS, or anyone that ABS controls (collectively “Liabilities”). Upon receiving notice of a claim, ABS shall assume the defense of the claim, action, or proceeding through the prompt payment of all attorneys’ fees and costs, incurred in good faith and in the exercise of reasonable discretion, of Purchaser’s counsel in defending such an action. Purchaser shall have the absolute and sole authority to control the litigation and make litigation decisions, including, but not limited to, selecting counsel to defend Purchaser and settlement or other disposition of the matter. Such obligations to defend, hold harmless and indemnify Purchaser and Purchaser’s Agents shall not apply to the extent that such Liabilities are caused in whole or in part by the negligence, active negligence, or willful misconduct of Purchaser or Purchaser’s Agents, but shall apply to all other Liabilities. With respect to third party claims against ABS, ABS waives any and all rights of any type of express or implied indemnity against Purchaser and Purchaser’s Agents. This indemnification obligation is not limited in any way by any limitation on the amount or type of damages or compensation payable to or for ABS or its agents under workers’ compensation acts, disability benefits acts or other employee benefit acts.

Neither termination of this Agreement nor completion of the acts to be performed under this Agreement shall release ABS from its obligations to indemnify the Purchaser and Purchaser's Agents.

Submission of insurance Certificates or other proof of compliance with the insurance requirements in this Agreement does not relieve ABS from liability under this indemnification clause. The obligations of this indemnity shall apply whether or not such insurance policies shall have been determined to be applicable to any of such damages or claims for damages.

ABS shall require each of its Subcontractors to comply with the requirements of this section related to indemnifying, holding harmless, defending, and releasing Purchaser and Purchaser's agents.

- 17. NOTICES.** All notices or other communications required or permitted hereunder shall be in writing and shall be personally delivered or sent by registered or certified mail, postage prepaid, return receipt requested. Notice shall be deemed received upon the earlier of (i) if personally delivered, the date of delivery to the address of the person to receive such notice, (ii) if mailed, three (3) business days after the date of posting by the United States post office, postage prepaid, or (iii) if delivered by Federal Express or other overnight courier, the date delivered as shown on a receipt issued by the courier.

ABS: Alliance Building Solutions, LLC
12520 High Bluff Drive, Ste 345
San Diego, CA 92130

Purchaser: City of Patterson
1 Plaza
P.O. Box 667
Patterson, CA 95363
Attention: City Manager

Copy to: White Brenner LLP
1608 T Street
Sacramento, CA 95811
Phone: 916-468-0950
Attention: Nubia Goldstein

- 18. GOVERNING LAW.** This Agreement shall be governed by and construed in accordance with the laws of the State of California.

- 19. DISPUTES.** Written notice of any dispute must be provided to the other party, describing specific details of the dispute relating to changes in work or claim for additional compensation, within seven (7) days of the occurrence of the conditions. This notice must be provided via certified mail. For a reasonable period commencing on the day written notice of dispute was provided, but not to exceed thirty (30) days, the parties shall in good faith attempt to resolve the dispute. If the parties are unable to resolve the dispute during this period, the parties shall proceed to binding arbitration. The arbitrator shall be neutral and mutually acceptable; the arbitrator shall determine all rights and obligations under this agreement and the award of the arbitrator shall be final, binding and enforceable. Any award issued pursuant to this provision may be enforced in a court of competent jurisdiction, and each party hereby consents to that jurisdiction. Venue for all legal proceedings shall be in the Superior Court for the County of Stanislaus.

- 20. OCCUPATIONAL SAFETY AND HEALTH.** The parties hereto agree to notify each other immediately upon becoming aware of any alleged violation of, the Occupational Safety and Health Act (OSHA) relating in any way to the project or project site.

- 21. ENTIRE AGREEMENT.** This agreement, upon acceptance, shall constitute the entire agreement between the parties and supersedes any prior representations or understandings.
- 22. MODIFICATION OF AGREEMENT.** No change or modification of any of the terms and conditions stated herein shall be valid unless made in writing and executed by both Parties to this Agreement.
- 23. TERMINATION BY PURCHASER.** Purchaser may terminate this Agreement at any time for cause by written notice to ABS. If ABS breaches this Agreement, or is insolvent or has made a general assignment for the benefit of all creditors, or a receiver has been appointed on account of ABS's insolvency, and Purchaser has provided written notice to ABS detailing the alleged breach or issue of insolvency, and within thirty (30) days of ABS's receipt of such written notice ABS has neither cured the alleged breach nor diligently commenced to cure such breach, Purchaser may terminate this Agreement for cause effective immediately upon giving written notice to ABS. If the Purchaser is forced to take over the Work, it may prosecute the same to completion by contract or by any other method it may in good faith deem advisable, for the account and at the expense of ABS, and ABS and its sureties shall be liable to the Purchaser for any reasonable excess costs, including management, supervision, and design support incurred in good faith by the Purchaser. In such event, Purchaser may take possession of and utilize in completing the Work, ABS's materials whether stored at the project site or elsewhere, that the Purchaser paid for and are necessary for completion of the Work. ABS hereby assigns to Purchaser all of its interest in orders and/or contracts existing at the time of termination for default. The assignment of said orders and/or contracts shall be effective upon notice of acceptance by Purchaser in writing, and only as to those orders and/or contracts which Purchaser designates in writing. Nothing in this Agreement shall be deemed or construed as a waiver by ABS of any rights it may have with respect to a wrongful suspension or termination by the Purchaser.

Purchaser may terminate this Agreement at any time for convenience by written notice to ABS. Upon receipt of such notice, ABS shall, unless the notice directs otherwise, immediately discontinue its work and the placing of orders for materials, facilities and supplies in connection therewith, and shall, if requested, make every reasonable effort to procure cancellation of all existing orders or contracts upon terms reasonably satisfactory to Purchaser, or at the option of Purchaser, Purchaser shall have the right to assume those obligations directly, including all benefits to be derived there from. ABS hereby assigns to Purchaser all of its interest in said orders and/or contracts, and the assignment of said orders and/or contracts shall be effective upon notice of acceptance by Purchaser in writing, and only as to those orders and/or contracts which Purchaser designates in writing. Following receipt of notice of termination, ABS shall thereafter do only such work as may be necessary to preserve and protect portions of its work already in progress and to protect materials and equipment on or in transit to the Project. Notwithstanding anything to the contrary contained herein, ABS shall be entitled to recover restocking fees for material ordered but cancelled prior to installation.

If the Purchaser terminates the Agreement for cause and it is later determined that the for-cause termination was wrongful, such termination automatically shall be converted to and treated as a termination for convenience under this Section. In such event, ABS shall be entitled to receive only the amounts payable under the paragraph above for a termination for convenience, and ABS specifically waives any claim for any other amounts or damages, including any claim for consequential damages or lost profits except as allowed as compensation to ABS upon termination in the section below.

- 24. TERMINATION BY ABS.** If Purchaser fails to make any payment(s) to ABS as required in this Agreement or repeatedly or materially fails, refuses or neglects to fulfill any of its other obligations or responsibilities under this Agreement, ABS may, after delivery of written notice and providing Purchaser thirty (30) days to cure, suspend the Work or terminate this Agreement. If ABS suspends the Work pursuant to this Section, the Work schedule and any anticipated completion dates shall be adjusted accordingly. Nothing in this Agreement shall be deemed or construed as a waiver by Purchaser of any rights it may have with respect to a wrongful suspension or termination by ABS.

In the event of any termination by Purchaser for convenience or by cause or if ABS terminates the Agreement pursuant to the paragraph above, Purchaser shall compensate ABS:(i) for such portion of the Project as has been completed in

conformity with this Agreement prior to the effective date of termination; and (ii) for services in progress by ABS and any of its Subcontractors at such time. In the event of any termination by Purchaser for cause, ABS shall not be entitled to receive any further payment for unfinished work and shall be liable to Purchaser for actual losses reasonably incurred by Purchaser in good faith in completing the Work.

No termination shall release ABS of its obligations or warranties under this Agreement with respect to any Work performed prior to the date of termination. Except as otherwise provided in this Agreement, any termination shall relieve ABS of all remaining Work obligations under this Agreement as of the effective date of termination.

- 25. SEVERABILITY.** If one or more of the provisions of this agreement are held to be unenforceable under laws, such provision(s) shall be excluded from these terms and conditions and the remaining terms and conditions shall be interpreted as if such provisions were so excluded and shall be enforced in accordance to their terms and conditions.
- 26. WAIVER.** A waiver by a Party of any provision of this Agreement shall be binding only if the waiver is set forth in writing and has been duly approved and signed by the waiving Party. Unless so specified in the written waiver, a waiver by a Party of any provision of this Agreement shall not constitute a waiver of any other provision(s) herein, similar or not, and shall not be construed as a continuing waiver. Except as waived in accordance with this Section, a Party's failure to require performance of any requirement of this Agreement shall not, in any manner, affect the Party's right to enforce the same or any other provision of this Agreement at a later time.
- 27. COUNTERPARTS.** This agreement may be executed in multiple counterparts, each of which shall be deemed an original and all of which together shall constitute one and the same instrument. A signature on a copy of this agreement received by either party by facsimile or portable document format (PDF) is binding upon the other party as an original. The parties shall treat a photocopy of such facsimile as a duplicate original.
- 28. ASSIGNMENT.** Neither Party to this Agreement may assign any right or obligation pursuant to this Agreement without agreement in writing from the other Party. Any attempt or purported assignment of any right or obligation pursuant to this Agreement without the written agreement of the other Party shall be void and of no effect. Subject to the foregoing, this Agreement shall inure to the benefit of, and be binding on, the Parties' authorized successors and assigns.
- 29. THIRD PARTIES.** Except as otherwise expressly provided herein, the execution and delivery of this Agreement shall not be deemed to confer any rights upon, nor obligate any of the Parties, to any person or entity other than the Parties.
- 30. PROJECT RECORDS.** ABS shall keep and maintain all such books and records as are necessary for proper administration and performance of the Agreement and/or as are required by law and/or this Agreement to be maintained (to the extent exclusively related to the performance of the Agreement, "Project Records"), including, but not limited to, plans and specifications, Change Orders, submittals, cut-sheets, projected energy-savings calculations, requests for information, written notices, permits, testing and inspection reports, and safety records. Pursuant to Government Code Section 8546.7, the California State Auditor has the right, for a period of three years after final payment is made under this Agreement, to examine and audit this Agreement at the request of Purchaser or as part of any audit of Purchaser. To the extent required by Government Code Section 8546.7 during such three-year period, ABS shall allow the California State Auditor and Purchaser to examine and/or audit this Agreement and the relevant Project Records at ABS's offices during normal business hours and upon reasonable advanced notice.
- 31. OWNERSHIP AND USE.** Any and all conceptual, preliminary, working, and final documents (both originals and reproductions), presentations, computations, analyses, and other documents, in whatever format or storage medium, that have been obtained or prepared for Purchaser by ABS pursuant to this Agreement and that have been paid for by Purchaser in accordance with this Agreement (each a "Project Document") shall be deemed and construed to be and remain the property of Purchaser. Assuming Purchaser has paid in full for the Project Documents, Purchaser shall have the unconditional right to use the Project Documents, for their intended purposes and, at Purchaser's sole discretion,

for any other purpose, with no additional compensation due to ABS. Except as expressly agreed in writing, Purchaser shall not be required to employ ABS in connection with any future use of the Project Documents. However, notwithstanding anything to the contrary, Purchaser acknowledges and agrees that the Project Documents are prepared with the expectation and intent that the Project is to be performed and completed by or on behalf of ABS; in the event Purchaser terminates this Agreement, Purchaser acknowledges and agrees that the Project Documents are not intended to be, and shall not be, relied upon by Purchaser or any third party in performing or completing any aspect of the Project. Purchaser shall indemnify and hold ABS harmless for any liabilities caused by Purchaser's use of the Project Documents other than in connection with ABS's completion of the Project.

Nothing in this Agreement shall be deemed or construed to result in Purchaser acquiring any interest or rights in any intellectual property owned, possessed or developed by ABS or any third parties ("ABS Intellectual Property"), including without limitation any ABS Intellectual Property in or underlying the Project Documents. However, ABS hereby grants Purchaser a perpetual, paid-up, worldwide license to make use of ABS Intellectual Property to the extent that such ABS Intellectual Property is necessary for the proper use, operation and/or maintenance of the Project Documents and/or any other products, services or deliverables provided by ABS pursuant to this Agreement. ABS shall indemnify, defend and hold harmless Purchaser and Purchaser Agents for any infringement of third-party intellectual property rights caused by ABS or any of its Subcontractors in connection with this Agreement.

32. ACKNOWLEDGMENT. Both "ABS" and the "Purchaser" acknowledge having read this Agreement and all contract documents incorporated herein and have executed this Agreement on the date written above.

33. APPROVAL. Each party represents that the person that has executed this Agreement on its behalf is authorized to do so.

IN WITNESS WHEREOF, the parties have caused their duly authorized officers to execute this Agreement effective as of the date first above written.

City of Patterson

Alliance Building Solutions, LLC.

Signature

Signature

Title

Title

Date

Date


Attachment A: Scope of Work

City of Patterson


Energy Efficiency and Renewable Energy Project

Aquatic Center

Lighting Systems



-  Replace identified existing interior fluorescent and/or incandescent lighting systems with high efficiency light emitting diode (LED) systems. Installation includes disposal of existing lighting systems and installation of new equipment. Refer to the Lighting Systems Attachment for identified fixtures, specific quantities, and locations.

Control Systems


-  Install a new Building Automation System (BAS) from Pelican Controls (BASat) to control the single zone HVAC equipment. The new system will be a networked globally programmable web-based system with a single point of access to adjust equipment schedules and space temperature setpoints. Heating and cooling setpoints will be adjustable by the user within a preprogrammed amount during occupied times. The system will follow a revised, efficient sequence of operations to ensure optimal equipment performance, efficient energy use, and occupant comfort. Refer to the Control Systems Attachment for specific equipment information, locations, and schedule of operations.

City Hall


Lighting Systems

-  Replace identified existing interior fluorescent and/or incandescent lighting systems with high efficiency light emitting diode (LED) systems. Installation includes disposal of existing lighting systems and installation of new equipment. Refer to the Lighting Systems Attachment for identified fixtures, specific quantities, and locations.
-  Replace identified existing exterior high intensity discharge (HID) and/or fluorescent lighting systems with high efficiency light emitting diode (LED) systems. Installation includes disposal of existing lighting systems and installation of new equipment. Refer to the Lighting Systems Attachment for identified fixtures, specific quantities, and locations.


Mechanical Systems

-  Replace select HVAC units with new high efficiency units of similar size, type and capacity. Replacement will include demolition of existing equipment and turn-key installation of new equipment with start-up / testing of the new installation. Refer to the HVAC Systems Attachment for specific equipment information, locations, and capacities.


Control Systems

-  Install a new Building Automation System (BAS) from Pelican Controls (BASat) to control the single zone HVAC equipment. The new system will be a networked globally programmable web-based system with a single point of access to adjust equipment schedules and space temperature setpoints. Heating and cooling setpoints will be adjustable by the user within a preprogrammed amount during occupied times. The system will follow a revised, efficient sequence of operations to ensure optimal equipment performance, efficient energy use, and occupant comfort. Refer to the Control Systems Attachment for specific equipment information, locations, and schedule of operations.

Building Envelope Systems



-  Re-roof the existing roof at the City Hall. The current roof is inefficient, suffers from leaks and requires replacement. Installation will include cleaning and preparation of the existing roof, installation of new fully adhered TPO membrane / metal system, and all edging and flashing required to fully install the new roofing system. Refer to the Envelope Systems Attachment for specific areas and equipment information.

Renewable Energy Systems


-  Install a new rooftop mounted solar photovoltaic (PV) system. The system will be owned, operated, and maintained by the City. Refer to the Preliminary Solar Layouts Attachment for proposed system layouts. Final system layouts to be approved by the City after final design and coordination are complete. Refer to the Renewable Energy Systems Attachment for details on location, system size, and production.

Corporate Yard


Lighting Systems

-  Replace identified existing interior fluorescent and/or incandescent lighting systems with high efficiency light emitting diode (LED) systems. Installation includes disposal of existing lighting systems and installation of new equipment. Refer to the Lighting Systems Attachment for identified fixtures, specific quantities, and locations.
-  Replace identified existing exterior high intensity discharge (HID) and/or fluorescent lighting systems with high efficiency light emitting diode (LED) systems. Installation includes disposal of existing lighting systems and installation of new equipment. Refer to the Lighting Systems Attachment for identified fixtures, specific quantities, and locations.

Mechanical Systems


-  Replace select HVAC units with new high efficiency units of similar size, type and capacity. Replacement will include demolition of existing equipment and turn-key installation of new equipment with start-up / testing of the new installation. Refer to the HVAC Systems Attachment for specific equipment information, locations, and capacities.

Control Systems


-  Install a new Building Automation System (BAS) from Pelican Controls (BAStat) to control the single zone HVAC equipment. The new system will be a networked globally programmable web-based system with a single point of access to adjust equipment schedules and space temperature setpoints. Heating and cooling setpoints will be adjustable by the user within a preprogrammed amount during occupied times. The system will follow a revised, efficient sequence of operations to ensure optimal equipment performance, efficient energy use, and occupant comfort. Refer to the Control Systems Attachment for specific equipment information, locations, and schedule of operations.

Fire Station #1


Lighting Systems

-  Replace identified existing interior fluorescent and/or incandescent lighting systems with high efficiency light emitting diode (LED) systems. Installation includes disposal of existing lighting systems and installation of new equipment. Refer to the Lighting Systems Attachment for identified fixtures, specific quantities, and locations.

Mechanical Systems


-  Replace select HVAC units with new high efficiency units of similar size, type and capacity. Replacement will include demolition of existing equipment and turn-key installation of new equipment with start-up / testing of the new installation. Refer to the HVAC Systems Attachment for specific equipment information, locations, and capacities.

Control Systems


-  Install a new Building Automation System (BAS) from Pelican Controls (BAStat) to control the single zone HVAC equipment. The new system will be a networked globally programmable web-based system with a single point of access to adjust equipment schedules and space temperature setpoints. Heating and cooling setpoints will be

adjustable by the user within a preprogrammed amount during occupied times. The system will follow a revised, efficient sequence of operations to ensure optimal equipment performance, efficient energy use, and occupant comfort. Refer to the Control Systems Attachment for specific equipment information, locations, and schedule of operations.

Building Envelope Systems



-  Re-roof the existing roof at the Fire Station. The current roof is inefficient, suffers from leaks and requires replacement. Installation will include cleaning and preparation of the existing roof, installation of new fully adhered TPO membrane / metal system, and all edging and flashing required to fully install the new roofing system. Refer to the Envelope Systems Attachment for specific areas and equipment information.

Renewable Energy Systems


-  Install a new rooftop mounted solar photovoltaic (PV) system. The system will be owned, operated, and maintained by the City. Refer to the Preliminary Solar Layouts Attachment for proposed system layouts. Final system layouts to be approved by the City after final design and coordination are complete. Refer to the Renewable Energy Systems Attachment for details on location, system size, and production.

Fire Station #2


Lighting Systems

-  Replace identified existing interior fluorescent and/or incandescent lighting systems with high efficiency light emitting diode (LED) systems. Installation includes disposal of existing lighting systems and installation of new equipment. Refer to the Lighting Systems Attachment for identified fixtures, specific quantities, and locations.
-  Replace identified existing exterior high intensity discharge (HID) and/or fluorescent lighting systems with high efficiency light emitting diode (LED) systems. Installation includes disposal of existing lighting systems and installation of new equipment. Refer to the Lighting Systems Attachment for identified fixtures, specific quantities, and locations.


Mechanical Systems

-  Replace select HVAC units with new high efficiency units of similar size, type and capacity. Replacement will include demolition of existing equipment and turn-key installation of new equipment with start-up / testing of the new installation. Refer to the HVAC Systems Attachment for specific equipment information, locations, and capacities.

Control Systems


-  Install a new Building Automation System (BAS) from Pelican Controls (BASat) to control the single zone HVAC equipment. The new system will be a networked globally programmable web-based system with a single point of access to adjust equipment schedules and space temperature setpoints. Heating and cooling setpoints will be adjustable by the user within a preprogrammed amount during occupied times. The system will follow a revised, efficient sequence of operations to ensure optimal equipment performance, efficient energy use, and occupant comfort. Refer to the Control Systems Attachment for specific equipment information, locations, and schedule of operations.

Renewable Energy Systems


-  Install a new rooftop mounted solar photovoltaic (PV) system. The system will be owned, operated, and maintained by the City. Refer to the Preliminary Solar Layouts Attachment for proposed system layouts. Final system layouts to be approved by the City after final design and coordination are complete. Refer to the Renewable Energy Systems Attachment for details on location, system size, and production.

Old Corporate Yard

Lighting Systems


-  Replace identified existing interior fluorescent and/or incandescent lighting systems with high efficiency light emitting diode (LED) systems. Installation includes disposal of existing lighting systems and installation of new equipment. Refer to the Lighting Systems Attachment for identified fixtures, specific quantities, and locations.

Renewable Energy Systems


-  Install a new rooftop mounted solar photovoltaic (PV) system. The system will be owned, operated, and maintained by the City. Refer to the Preliminary Solar Layouts Attachment for proposed system layouts. Final system layouts to be approved by the City after final design and coordination are complete. Refer to the Renewable Energy Systems Attachment for details on location, system size, and production.

Senior Center


Lighting Systems

-  Replace identified existing interior fluorescent and/or incandescent lighting systems with high efficiency light emitting diode (LED) systems. Installation includes disposal

of existing lighting systems and installation of new equipment. Refer to the Lighting Systems Attachment for identified fixtures, specific quantities, and locations.


-  Replace identified existing exterior high intensity discharge (HID) and/or fluorescent lighting systems with high efficiency light emitting diode (LED) systems. Installation includes disposal of existing lighting systems and installation of new equipment. Refer to the Lighting Systems Attachment for identified fixtures, specific quantities, and locations.

Control Systems


-  Install a new Building Automation System (BAS) from Pelican Controls (BASat) to control the single zone HVAC equipment. The new system will be a networked globally programmable web-based system with a single point of access to adjust equipment schedules and space temperature setpoints. Heating and cooling setpoints will be adjustable by the user within a preprogrammed amount during occupied times. The system will follow a revised, efficient sequence of operations to ensure optimal equipment performance, efficient energy use, and occupant comfort. Refer to the Control Systems Attachment for specific equipment information, locations, and schedule of operations.

Wastewater Treatment Plant South


Lighting Systems

-  Replace identified existing interior fluorescent and/or incandescent lighting systems with high efficiency light emitting diode (LED) systems. Installation includes disposal of existing lighting systems and installation of new equipment. Refer to the Lighting Systems Attachment for identified fixtures, specific quantities, and locations.

Electrical Systems

-  Replace select existing dry-type electrical transformers with new ultra-efficient K-rated units of similar size and capacity. Replacement will include demolition of existing equipment and turn-key installation of new equipment with start-up and testing of the new installation. Refer to the Electrical Systems Attachment for specific equipment information and sizes.


Renewable Energy Systems

-  Repair the existing 584 kW ground mount solar photovoltaic (PV) system. The existing system is currently not working optimally. The inverters, broken panels and faulty wiring will be replaced and/or fixed to repower the system and bring it back to optimal

production. The system will be owned, operated, and maintained by the City. Refer to the Renewable Energy Systems Attachment for details on location, system size, and production.


Well 8

Renewable Energy Systems

-  Install a new ground mount solar photovoltaic (PV) system. The system will be owned, operated, and maintained by the City. Refer to the Preliminary Solar Layouts Attachment for proposed system layouts. Final system layouts to be approved by the City after final design and coordination are complete. Refer to the Renewable Energy Systems Attachment for details on location, system size, and production.


Well 9

Renewable Energy Systems

-  Install a new ground mount solar photovoltaic (PV) system. The system will be owned, operated, and maintained by the City. Refer to the Preliminary Solar Layouts Attachment for proposed system layouts. Final system layouts to be approved by the City after final design and coordination are complete. Refer to the Renewable Energy Systems Attachment for details on location, system size, and production.

Well 11

Renewable Energy Systems

-  Install a new ground mount solar photovoltaic (PV) system. The system will be owned, operated, and maintained by the City. Refer to the Preliminary Solar Layouts Attachment for proposed system layouts. Final system layouts to be approved by the City after final design and coordination are complete. Refer to the Renewable Energy Systems Attachment for details on location, system size, and production.

Scope of Work Inclusions and Exclusions:

1. Includes the recovery and disposal of removed units as per EPA guidelines.
2. Excludes temporary HVAC (cooling or heating) during construction.
3. Excludes air balancing of the existing ductwork.
4. Excludes identification and removal of any hazardous material (such as lead, mold and asbestos).
5. Excludes any specialty smoke detectors, fire alarm work or testing.
6. Excludes any existing electrical issues of power wiring.
7. Excludes any structural penetrations or reinforcement or engineering, except solar carports.
8. Excludes permit, plan check and utility fees.
9. Excludes concrete work of any kind, except solar carports.
10. Excludes modifications and upgrading of existing systems to current codes.
11. Excludes LEED Design, evaluation, calculations, or consulting on LEED documentation.
12. Excludes structural engineering, calculations, or modifications of any kind, except solar carports.
13. Assumes everything is up to code.
14. Excludes any unforeseen conditions.

Attachment B: Lighting Systems

City of Patterson

Detailed Interior Lighting Inventory - City of Patterson - Aquatic Center



City of Patterson: Aquatic Center: Interior Lighting															
General Information				Existing Fixture Data						Proposed Fixture Data					
#	EEM #	Site	Room/Area	Fixture Type	Lighting (Pre)	OCS (Y/N)	Pre-Watts	Pre # Fixt	Lamps per Fixture	Lighting (Post)	Recommended Make: Model #	Post-Watts	Post #	Total Post # Lamps	Total Post # Ballast
1	1	Aquatic Center	Courtyard	Pendant	CFM 32W 1L	N	36.8	3	1	(1) LED 8-Watt 2-pin Lamp Ballast Bypass	Keystone: KT-LED82P-H-840-D /G2	8	3	3	0
2	1	Aquatic Center	Men's RR	Vanity	F32T81L	N	31	6	1	(1) LED 12-Watt 4' Tube & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	12	6	6	6
3	1	Aquatic Center	Women's RR	Vanity	F32T81L	N	31	6	1	(1) LED 12-Watt 4' Tube & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	12	6	6	6
4	1	Aquatic Center	Concession Rm (1)	Recessed 2'x4' Troffer	F32T82L	N	59	2	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	2	4	2
5	1	Aquatic Center	Concession Rm	Pendant	F32T82L	N	59	1	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	1	2	1
6	1	Aquatic Center	Concession Rm (2)	Recessed 2'x4' Troffer	F32T82L	N	59	5	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	5	10	5
7	1	Aquatic Center	Men's RR	Surface Wrap 4'	F32T82L	N	59	5	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	5	10	5
8	1	Aquatic Center	Women's RR	Surface Wrap 4'	F32T82L	N	59	5	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	5	10	5
9	1	Aquatic Center	Pool Equipment Rm	Strip 4'	F32T82L	N	59	7	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	7	14	7
10	1	Aquatic Center	Janitor Closet	Strip 4'	F32T82L	N	59	2	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	2	4	2
11	1	Aquatic Center	Chlorine Rm	Strip 4'	F32T82L	N	59	1	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	1	2	1
12	1	Aquatic Center	Acid Rm	Strip 4'	F32T82L	N	59	1	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	1	2	1

Detailed Interior Lighting Inventory - City of Patterson - City Hall



City of Patterson: City Hall: Interior Lighting															
General Information				Existing Fixture Data					Proposed Fixture Data					Total Post # Lamps	Total Post # Ballast
#	EEM #	Site	Room/Area	Fixture Type	Lighting (Pre)	OCS (Y/N)	Pre-Watts	Pre # Fixt	Lamps per Fixture	Lighting (Post)	Recommended Make: Model #	Post-Watts	Post # Fixt	Total Post # Lamps	Total Post # Ballast
1	1	City Hall	Basement Hallway	Can Rec. 4"	CFL 13W 1L	N	13	2	1	(1) LED 5-Watt A Lamp	NaturaLED: LED5A19/45L/950	5	2	2	0
2	1	City Hall	1st Flr: Admin Dept.	Gimbal Can 6"	INC 50W BR10 1L	N	50	2	1	(1) LED 5-Watt A Lamp	NaturaLED: LED5A19/45L/950	5	2	2	0
3	1	City Hall	1st Flr: Council Chambers	Gimbal Can 6"	INC 75W 1L	N	75	3	1	(1) LED 12-Watt A Lamp	NaturaLED: LED12A19/110L/940	12	3	3	0
4	1	City Hall	1st Flr: Lobby	Gimbal Can 6"	Halogen 50W MR16	N	60	1	1	(1) LED 6-Watt MR16 Lamp	NaturaLED: LED6MR16/50L/FL/830	6	1	1	0
5	1	City Hall	1st Flr: Lobby	Can Rec. 4"	Halogen 50W MR16	N	60	6	1	(1) LED 6-Watt MR16 Lamp	NaturaLED: LED6MR16/50L/FL/830	6	6	6	0
6	1	City Hall	1st Flr: Lobby	Can Rec. 10"	CFM 32W 2L	N	73.6	2	2	LED 21-Watt 9.5" Downlight Retrofit	ESPEN: VEKR9.5D/8T/27W-10V	21	2	4	0
7	1	City Hall	Rear Entry Lobby	Can Rec. 10"	CFM 42W 1L	N	48.3	2	1	LED 17-Watt 9.5" Downlight Retrofit	ESPEN: VEKR9.5D/8T/27W-10V	17	2	2	0
8	1	City Hall	1st Flr: Hallway	Can Rec. 10"	CFM 42W 1L	N	48.3	2	1	LED 17-Watt 9.5" Downlight Retrofit	ESPEN: VEKR9.5D/8T/27W-10V	17	2	2	0
9	1	City Hall	1st Flr: Council Chambers	Can Rec. 10"	CFM 42W 1L	N	48.3	34	1	LED 17-Watt 9.5" Downlight Retrofit	ESPEN: VEKR9.5D/8T/27W-10V	17	34	34	0
10	1	City Hall	1st Flr: Lobby Entry	Sconce	CFT 24W 2L Long	N	55.2	2	2	(2) LED 10-Watt 12" PL-L Lamps Ballast Bypass	Keystone: KT-LED10PLL-12GC-840-D	20	2	4	0
11	1	City Hall	1st Flr: Lobby	Chandelier	CFT 24W 2L Long	N	55.2	1	2	(2) LED 10-Watt 12" PL-L Lamps Ballast Bypass	Keystone: KT-LED10PLL-12GC-840-D	20	1	2	0
12	1	City Hall	1st Flr: Lobby	Sconce	CFT 24W 2L Long	N	55.2	3	2	(2) LED 10-Watt 12" PL-L Lamps Ballast Bypass	Keystone: KT-LED10PLL-12GC-840-D	20	3	6	0
13	1	City Hall	1st Flr: Lobby	Chandelier	CFT 40W 2L Long	N	92	7	2	(2) LED 17-Watt 24" PL-L Lamps Ballast Bypass	Keystone: KT-LED17PLL-22GC-840-D/G2	34	7	14	0
14	1	City Hall	1st Flr: Stairwell	Wall Mount	F17T82L	N	33	1	2	(2) LED 10-Watt 2' Tubes & Driver	ESPEN: L24T8/840/10G-EB, VEL50BN-2C	20	1	2	1
15	1	City Hall	1st Flr: Hallway	Recessed 2'x2' Troffer	F17T83L	N	47	1	3	(3) LED 10-Watt 2' Tubes & Driver	ESPEN: L24T8/840/10G-EB, VEL100BN-4C	30	1	3	1
16	1	City Hall	1st Flr: Lobby	Recessed 2'x2' Troffer	F17T83L	N	47	1	3	(3) LED 10-Watt 2' Tubes & Driver	ESPEN: L24T8/840/10G-EB, VEL100BN-4C	30	1	3	1
17	1	City Hall	1st Flr: Admin Dept.	Recessed 2'x2' Troffer	F17T83L	N	47	2	3	(3) LED 10-Watt 2' Tubes & Driver	ESPEN: L24T8/840/10G-EB, VEL100BN-4C	30	2	6	2
18	1	City Hall	1st Flr: Men's RR	Vanity	F32T81L	N	31	3	1	(1) LED 12-Watt 4' Tube & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	12	3	3	3
19	1	City Hall	1st Flr: Women's RR	Vanity	F32T81L	N	31	3	1	(1) LED 12-Watt 4' Tube & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	12	3	3	3
20	1	City Hall	1st Flr: Restroom	Vanity	F32T81L	N	31	1	1	(1) LED 12-Watt 4' Tube & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	12	1	1	1
21	1	City Hall	Elevator Mech Rm	Surface Mount 4'	F32T82L	N	59	1	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	1	2	1
22	1	City Hall	Boiler Rm	Surface Mount 4'	F32T82L	N	59	1	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	1	2	1
23	1	City Hall	1st Flr: 115 Vault	Surface Mount 4'	F32T82L	N	59	2	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	2	4	2
24	1	City Hall	2nd Flr: Men's RR	Vanity	F32T82L	N	59	3	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	3	6	3
25	1	City Hall	2nd Flr: Women's RR	Vanity	F32T82L	N	59	3	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	3	6	3
26	1	City Hall	1st Flr: Admin Dept.	Fixture	F32T82L	N	59	4	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	4	8	4
27	1	City Hall	1st Flr: Conference Rm	Fixture	F32T82L	N	59	4	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	4	8	4
28	1	City Hall	1st Flr: Council Chambers	Recessed 2'x4' Troffer	F32T82L	N	59	4	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	4	8	4
29	1	City Hall	1st Flr: 107 Conference Rm	Recessed 2'x4' Troffer	F32T82L	N	59	4	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	4	8	4
30	1	City Hall	2nd Flr: Stairwell	Wall Mount	F32T82L	N	59	2	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	2	4	2
31	1	City Hall	2nd Flr: Rm 224	Recessed 2'x4' Troffer	F32T82L	N	59	2	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	2	4	2
32	1	City Hall	2nd Flr: Rm 226	Recessed 2'x4' Troffer	F32T82L	N	59	2	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	2	4	2
33	1	City Hall	2nd Flr: Rm 227	Recessed 2'x4' Troffer	F32T82L	N	59	4	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	4	8	4
34	1	City Hall	2nd Flr: Rm 223	Recessed 2'x4' Troffer	F32T82L	N	59	4	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	4	8	4
35	1	City Hall	2nd Flr: Rm 232	Recessed 2'x4' Troffer	F32T82L	N	59	4	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	4	8	4
36	1	City Hall	2nd Flr: Rm 231	Recessed 2'x4' Troffer	F32T82L	N	59	4	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	4	8	4
37	1	City Hall	2nd Flr: Rm 203	Recessed 2'x4' Troffer	F32T82L	N	59	3	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	3	6	3
38	1	City Hall	2nd Flr: Rm 222	Recessed 2'x4' Troffer	F32T82L	N	59	2	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	2	4	2
39	1	City Hall	2nd Flr: Office	Recessed 2'x4' Troffer	F32T82L	N	59	2	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	2	4	2
40	1	City Hall	1st Flr: Open Office	Recessed 2'x4' Troffer	F32T83L	N	89	10	3	(3) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	36	10	30	10

Detailed Interior Lighting Inventory - City of Patterson - City Hall



City of Patterson: City Hall: Interior Lighting															
General Information				Existing Fixture Data						Proposed Fixture Data					
#	EEM #	Site	Room/Area	Fixture Type	Lighting (Pre)	OCS (Y/N)	Pre-Watts	Pre # Fixt	Lamps per Fixture	Lighting (Post)	Recommended Make: Model #	Post-Watts	Post # Fixt	Total Post # Lamps	Total Post # Ballast
41	1	City Hall	1st Flr: IT	Recessed 2'x4' Troffer	F32T83L	N	89	2	3	(3) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	36	2	6	2
42	1	City Hall	1st Flr: Sup. Acct. Office	Recessed 2'x4' Troffer	F32T83L	N	89	2	3	(3) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	36	2	6	2
43	1	City Hall	1st Flr: Rev. Mgr. Office	Recessed 2'x4' Troffer	F32T83L	N	89	2	3	(3) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	36	2	6	2
44	1	City Hall	1st Flr: Payroll Office	Recessed 2'x4' Troffer	F32T83L	N	89	3	3	(3) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	36	3	9	3
45	1	City Hall	1st Flr: Front Office	Recessed 2'x4' Troffer	F32T83L	N	89	7	3	(3) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	36	7	21	7
46	1	City Hall	2nd Flr: Open Office	Recessed 2'x4' Troffer	F32T83L	N	89	6	3	(3) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	36	6	18	6
47	1	City Hall	2nd Flr: 214 Office	Recessed 2'x4' Troffer	F32T83L	N	89	2	3	(3) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	36	2	6	2
48	1	City Hall	2nd Flr: 213 Office	Recessed 2'x4' Troffer	F32T83L	N	89	2	3	(3) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	36	2	6	2
49	1	City Hall	2nd Flr: 212 Office	Recessed 2'x4' Troffer	F32T83L	N	89	2	3	(3) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	36	2	6	2
50	1	City Hall	2nd Flr: 211 Office	Recessed 2'x4' Troffer	F32T83L	N	89	5	3	(3) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	36	5	15	5
51	1	City Hall	2nd Flr: 210 Office	Recessed 2'x4' Troffer	F32T83L	N	89	4	3	(3) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	36	4	12	4
52	1	City Hall	2nd Flr: 209 Office	Recessed 2'x4' Troffer	F32T83L	N	89	6	3	(3) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	36	6	18	6
53	1	City Hall	2nd Flr: HR Office	Recessed 2'x4' Troffer	F32T83L	N	89	2	3	(3) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	36	2	6	2
54	1	City Hall	2nd Flr: HR Director	Recessed 2'x4' Troffer	F32T83L	N	89	4	3	(3) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	36	4	12	4
55	1	City Hall	2nd Flr: 229 Meeting Rm	Recessed 2'x4' Troffer	F32T83L	N	89	8	3	(3) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	36	8	24	8

Detailed Exterior Lighting Inventory - City of Patterson - City Hall



City of Patterson: City Hall: Exterior Lighting															
General Information				Existing Fixture Data						Proposed Fixture Data					
#	EEM #	Site	Area Served	Fixture Type	Lighting (Pre)	Control Type	Pre-Watts	Pre # Fixt	Lamps per Fixture	Lighting (Post)	Recommended Make: Model #	Post-Watts	Post # Fixt	Total Post # Lamps	Total Post # Ballast
56	2	City Hall	Exterior Area	Porch Light	CFT 13W 2L	-	31	12	2	(2) LED 5-Watt 2-pin Lamp Ballast Bypass	Keystone: KT-LED62P-O-840-D	10	12	24	0
57	2	City Hall	Exterior Area	Canopy Decorative	CFT 13W 2L	-	31	5	2	(2) LED 5-Watt 2-pin Lamp Ballast Bypass	Keystone: KT-LED62P-O-840-D	10	5	10	0
58	2	City Hall	Landscape	In-Ground Well Light	MH 70W	-	95	2	1	(1) LED 18-Watt Retrofit Lamp Ballast Bypass	Keystone: KT-LED18PSHID-E26-850-D /G4	18	2	2	0
59	2	City Hall	Flag Pole	Flood Threaded Knuckle	MH 100W	-	128	2	1	LED 21-Watt Bullet Flood	NaturalLED: LED-FXBFS20/40/840/BZ-KNC	21	2	2	0

Detailed Interior Lighting Inventory - City of Patterson - Corporate Yard



City of Patterson: Corporate Yard: Interior Lighting															
General Information				Existing Fixture Data						Proposed Fixture Data					
#	EEM #	Site	Room/Area	Fixture Type	Lighting (Pre)	OCS (Y/N)	Pre-Watts	Pre # Fixt	Lamps per Fixture	Lighting (Post)	Recommended Make: Model #	Post-Watts	Post #	Total Post # Lamps	Total Post # Ballast
1	1	Corporate Yard	Hallway	Can Rec. 6"	CFT 18W 1L	N	24	3	1	LED 6.5-Watt 6" Downlight Retrofit	ESPEN: VEKR6D/8T/13W-10V	6.5	3	3	0
2	1	Corporate Yard	Conference Rm	Can Rec. 6"	CFT 18W 1L	N	24	7	1	LED 6.5-Watt 6" Downlight Retrofit	ESPEN: VEKR6D/8T/13W-10V	6.5	7	7	0
3	1	Corporate Yard	Lobby / Entry	Can Rec. 6"	Halogen 75W 1L	N	75	2	1	LED 13-Watt 6" Downlight Retrofit	ESPEN: VEKR6D/8T/13W-10V	13	2	2	0
4	1	Corporate Yard	Hallway	Wall Wash	F32T81L	N	31	14	1	(1) LED 12-Watt 4' Tube & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	12	14	14	14
5	1	Corporate Yard	Mech / Elec Rm	Recessed	F32T82L	N	59	6	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	6	12	6
6	1	Corporate Yard	Admin Office	Pendant 4'	F32T82L	N	59	2	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	2	4	2
7	1	Corporate Yard	115 Public Works Office	Pendant 4'	F32T82L	N	59	2	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	2	4	2
8	1	Corporate Yard	116 Utility Rm	Surface Mount 4'	F32T82L	N	59	1	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	1	2	1
9	1	Corporate Yard	Restroom	Surface Mount 4'	F32T82L	Y	59	1	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	1	2	1
10	1	Corporate Yard	Men's RR	Vanity	F32T82L	N	59	2	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	2	4	2
11	1	Corporate Yard	Women's RR	Vanity	F32T82L	N	59	2	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	2	4	2
12	1	Corporate Yard	Lubricant Storage	Strip 4'	F32T82L	N	59	4	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	4	8	4
13	1	Corporate Yard	Parts Storage	Strip 4'	F32T82L	N	59	8	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	8	16	8
14	1	Corporate Yard	Exterior Work Bay 2	Strip 4'	F32T82L	N	59	24	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	24	48	24
15	1	Corporate Yard	Exterior Work Bay 3	Strip 4'	F32T82L	N	59	32	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	32	64	32
16	1	Corporate Yard	Exterior Work Bay 4	Strip 4'	F32T82L	N	59	36	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	36	72	36
17	1	Corporate Yard	Exterior Work Bay 6	Strip 4'	F32T82L	N	59	9	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	9	18	9
18	1	Corporate Yard	Lobby / Entry	Pendant 8'	F32T84L	N	112	1	4	(4) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	48	1	4	1
19	1	Corporate Yard	Admin Office	Pendant 8'	F32T84L	N	112	1	4	(4) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	48	1	4	1
20	1	Corporate Yard	Conference Rm	Pendant 8'	F32T84L	N	112	2	4	(4) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	48	2	8	2
21	1	Corporate Yard	107 Manager Office	Pendant 8'	F32T84L	Y	112	2	4	(4) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	48	2	8	2
22	1	Corporate Yard	108 Manager Office	Pendant 8'	F32T84L	Y	112	2	4	(4) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	48	2	8	2
23	1	Corporate Yard	109 Manager Office	Pendant 8'	F32T84L	Y	112	2	4	(4) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	48	2	8	2
24	1	Corporate Yard	110 Manager Office	Pendant 8'	F32T84L	Y	112	1	4	(4) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	48	1	4	1
25	1	Corporate Yard	111 Manager Office	Pendant 8'	F32T84L	Y	112	1	4	(4) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	48	1	4	1
26	1	Corporate Yard	112 Supervisor Office	Pendant 8'	F32T84L	Y	112	1	4	(4) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	48	1	4	1

Detailed Exterior Lighting Inventory - City of Patterson - Corporate Yard



City of Patterson: Corporate Yard: Exterior Lighting															
General Information				Existing Fixture Data						Proposed Fixture Data					
#	EEM #	Site	Area Served	Fixture Type	Lighting (Pre)	Control Type	Pre-Watts	Pre # Fixt	Lamps per Fixture	Lighting (Post)	Recommended Make: Model #	Post-Watts	Post # Fixt	Total Post # Lamps	Total Post # Ballast
27	2	Corporate Yard	Exterior Area	Jelly Jar	CFM 32W 1L	-	36.8	1	1	LED 10-Watt Mini Wallpack w/ Photocell	Aleo: WPM-20UX/CT	10	1	1	0
28	2	Corporate Yard	Exterior Area	Wall Mount 1'x1	MH 100W	-	128	4	1	LED 28-Watt Full-Cutoff Wallpack	NaturaLED: FXCWP60SW/CCT3/BZ	28	4	4	0

Detailed Interior Lighting Inventory - City of Patterson - Fire Station #1



City of Patterson: Fire Station #1: Interior Lighting															
General Information				Existing Fixture Data						Proposed Fixture Data					
#	EEM #	Site	Room/Area	Fixture Type	Lighting (Pre)	OCS (Y/N)	Pre-Watts	Pre # Fixt	Lamps per Fixture	Lighting (Post)	Recommended Make: Model #	Post-Watts	Post #	Total Post # Lamps	Total Post # Ballast
1	1	Fire Station #1	Main Office	Surface Mount 2'x4'	F32T82L	N	59	8	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	8	16	8
2	1	Fire Station #1	Office	Surface Mount 2'x4'	F32T82L	N	59	8	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	8	16	8
3	1	Fire Station #1	Break Rm	Strip 4'	F32T82L	N	59	2	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	2	4	2
4	1	Fire Station #1	Living Quarters	Surface Mount 2'x4'	F32T82L	N	59	5	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	5	10	5
5	1	Fire Station #1	Rm 1	Surface Wrap 4'	F32T82L	N	59	2	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	2	4	2
6	1	Fire Station #1	Rm 2	Surface Wrap 4'	F32T82L	N	59	2	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	2	4	2
7	1	Fire Station #1	Storage Bldg	Strip 4'	F32T82L	N	59	2	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	2	4	2
8	1	Fire Station #1	Storage Bldg Laundry	Pendant 4'	F32T82L	N	59	3	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	3	6	3

Detailed Interior Lighting Inventory - City of Patterson - Fire Station #2



City of Patterson: Fire Station #2: Interior Lighting																
General Information				Existing Fixture Data						Proposed Fixture Data						
#	EEM #	Site	Room/Area	Fixture Type	Lighting (Pre)	OCS (Y/N)	Pre-Watts	Pre # Fixt	Lamps per Fixture	Lighting (Post)	Recommended Make: Model #	Post-Watts	Post # Fixt	Total Post # Lamps	Total Post # Ballast	
1	1	Fire Station #2	Kitchen	Under Cabinet	CFL 13W 1L	N	13	3	1	(1) LED 5-Watt A Lamp	NaturaLED: LED5A19/45L/950	5	3	3	0	
2	1	Fire Station #2	Men's RR	Can Rec. 6"	CFL 13W 1L	N	13	1	1	LED 6.5-Watt 6" Downlight Retrofit	ESPEN: VEKR6D/8T/13W-10V	6.5	1	1	0	
3	1	Fire Station #2	Restroom (2)	Can Rec. 6"	CFL 13W 1L	N	13	1	1	LED 6.5-Watt 6" Downlight Retrofit	ESPEN: VEKR6D/8T/13W-10V	6.5	1	1	0	
4	1	Fire Station #2	Lobby	Can Rec. 6"	CFT 18W 2L	N	45	6	2	LED 13-Watt 6" Downlight Retrofit	ESPEN: VEKR6D/8T/13W-10V	13	6	12	0	
5	1	Fire Station #2	Kitchen	Can Rec. 6"	CFT 18W 2L	N	45	10	2	LED 13-Watt 6" Downlight Retrofit	ESPEN: VEKR6D/8T/13W-10V	13	10	20	0	
6	1	Fire Station #2	DHW Rm	Surface Mount	F17T81L	N	20	1	1	(1) LED 10-Watt 2' Tube & Driver	ESPEN: L24T8/840/10G-EB, VEL50BN-2C	10	1	1	1	
7	1	Fire Station #2	Hallway	Recessed 2'x2' Troffer	F17T82L	N	33	27	2	(2) LED 10-Watt 2' Tubes & Driver	ESPEN: L24T8/840/10G-EB, VEL50BN-2C	20	27	54	27	
8	1	Fire Station #2	Server Rm	Recessed 2'x2' Troffer	F17T82L	Y	33	2	2	(2) LED 10-Watt 2' Tubes & Driver	ESPEN: L24T8/840/10G-EB, VEL50BN-2C	20	2	4	2	
9	1	Fire Station #2	Kitchen	Recessed 2'x2' Troffer	F17T82L	N	33	4	2	(2) LED 10-Watt 2' Tubes & Driver	ESPEN: L24T8/840/10G-EB, VEL50BN-2C	20	4	8	4	
10	1	Fire Station #2	Copy Rm	Recessed 2'x2' Troffer	F17T82L	N	33	6	2	(2) LED 10-Watt 2' Tubes & Driver	ESPEN: L24T8/840/10G-EB, VEL50BN-2C	20	6	12	6	
11	1	Fire Station #2	Janitor Closet	Surface Mount	F32T81L	Y	31	1	1	(1) LED 12-Watt 4' Tube & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	12	1	1	1	
12	1	Fire Station #2	Equipment / Laundry	Surface Wrap 4'	F32T83L	N	89	6	3	(3) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	36	6	18	6	
13	1	Fire Station #2	Office	Fixture	F32T84L	N	112	2	4	(4) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	48	2	8	2	
14	1	Fire Station #2	Training Rm	Fixture	F32T84L	N	112	7	4	(4) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	48	7	28	7	

Detailed Exterior Lighting Inventory - City of Patterson - Fire Station #2



City of Patterson: Fire Station #2: Exterior Lighting															
General Information				Existing Fixture Data						Proposed Fixture Data					
#	EEM #	Building	Area Served	Fixture Type	Lighting (Pre)	Control Type	Pre-Watts	Pre # Fixt	Lamps per Fixture	Lighting (Post)	Recommended Make: Model #	Post-Watts	Post # Fixt	Total Post # Lamps	Total Post # Ballast
15	2	Fire Station #2	Exterior Area	Flood Threaded Knuckle	Ceramic MH 120W	-	136	3	1	LED 21-Watt Bullet Flood	NaturaLED: LED-FXBFS20/40/840/BZ-KNC	21	3	3	0
16	2	Fire Station #2	Exterior Area	Goose-Neck Spot	Halogen 75W 1L	-	75	10	1	(1) LED 8-Watt PAR20 Lamp	NaturaLED: LED8PAR20/50L/FL/950	8	10	10	0

Detailed Interior Lighting Inventory - City of Patterson - Hammon Senior Center



City of Patterson: Hammon Senior Center: Interior Lighting															
General Information				Existing Fixture Data						Proposed Fixture Data					
#	EEM #	Site	Room/Area	Fixture Type	Lighting (Pre)	OCS (Y/N)	Pre-Watts	Pre # Fixt	Lamps per Fixture	Lighting (Post)	Recommended Make: Model #	Post-Watts	Post # Fixt	Total Post # Lamps	Total Post # Ballast
1	1	Hammon Senior Center	Lobby	Can Rec. 6"	CFM 32W 1L	N	36.8	12	1	LED 13-Watt 6" Downlight Retrofit	ESPEN: VEKR6D/8T/13W-10V	13	12	12	0
2	1	Hammon Senior Center	Side Lobby (1)	Can Rec. 8"	CFM 32W 1L	N	36.8	20	1	LED 12-Watt 8" Downlight Retrofit	ESPEN: VEKR8D/8T/17W-10V	12	20	20	0
3	1	Hammon Senior Center	Side Lobby (2)	Can Rec. 8"	CFM 32W 1L	N	36.8	8	1	LED 12-Watt 8" Downlight Retrofit	ESPEN: VEKR8D/8T/17W-10V	12	8	8	0
4	1	Hammon Senior Center	Back Dining Rm	Can Rec. 8"	CFM 32W 1L	N	36.8	4	1	LED 12-Watt 8" Downlight Retrofit	ESPEN: VEKR8D/8T/17W-10V	12	4	4	0
5	1	Hammon Senior Center	Lobby	Chandelier	CFM 32W 6L	N	216	1	6	(6) LED 8-Watt 2-pin Lamp Ballast Bypass	Keystone: KT-LED82P-H-840-D /G2	48	1	6	0
6	1	Hammon Senior Center	Side Lobby	Chandelier	CFM 32W 6L	N	216	4	6	(6) LED 8-Watt 2-pin Lamp Ballast Bypass	Keystone: KT-LED82P-H-840-D /G2	48	4	24	0
7	1	Hammon Senior Center	Back Dining Rm	Chandelier	CFM 32W 6L	N	216	9	6	(6) LED 8-Watt 2-pin Lamp Ballast Bypass	Keystone: KT-LED82P-H-840-D /G2	48	9	54	0
8	1	Hammon Senior Center	Electric Rm	Strip 4'	F32T82L	N	59	2	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	2	4	2
9	1	Hammon Senior Center	Lobby Side Rm	Recessed 2'x4' Troffer	F32T82L	Y	59	2	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	2	4	2
10	1	Hammon Senior Center	Kitchen	Recessed 2'x4' Troffer	F32T82L	N	59	5	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	5	10	5
11	1	Hammon Senior Center	Rec. Dept. Portable 1	Recessed 2'x4' Troffer	F32T82L	N	59	10	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	10	20	10
12	1	Hammon Senior Center	Rec. Dept. Portable 2	Recessed 2'x4' Troffer	F32T82L	N	59	10	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	10	20	10
13	1	Hammon Senior Center	Rec. Dept. Portable 3	Recessed 2'x4' Troffer	F32T82L	N	59	11	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL50BN-2C	24	11	22	11
14	1	Hammon Senior Center	Restroom	Vanity	F28T51L	N	33	1	1	(1) LED 13-Watt 4' T5 Tube & Ballast	ESPEN: L48T5HE/850/13G-EB, VE228MVHRP	13	1	1	1
15	1	Hammon Senior Center	Men's RR	Vanity	F28T51L	N	33	4	1	(1) LED 13-Watt 4' T5 Tube & Ballast	ESPEN: L48T5HE/850/13G-EB, VE228MVHRP	13	4	4	4
16	1	Hammon Senior Center	Women's RR	Vanity	F28T51L	N	33	4	1	(1) LED 13-Watt 4' T5 Tube & Ballast	ESPEN: L48T5HE/850/13G-EB, VE228MVHRP	13	4	4	4
17	1	Hammon Senior Center	Office	Pendant	F28T52L	N	64	1	2	(2) LED 13-Watt 4' T5 Tubes & Ballast	ESPEN: L48T5HE/850/13G-EB, VE228MVHRP	26	1	2	1
18	1	Hammon Senior Center	Office	Pendant	F28T54L	N	128	2	4	(4) LED 13-Watt 4' T5 Tubes & Ballast	ESPEN: L48T5HE/850/13G-EB, VE228MVHRP	52	2	8	4
19	1	Hammon Senior Center	Meeting Rm	Pendant	F28T54L	N	128	2	4	(4) LED 13-Watt 4' T5 Tubes & Ballast	ESPEN: L48T5HE/850/13G-EB, VE228MVHRP	52	2	8	4
20	1	Hammon Senior Center	Act. Rm 1	Pendant	F28T510L	N	320	4	10	(10) LED 13-Watt 4' T5 Tubes & Ballast	ESPEN: L48T5HE/850/13G-EB, VE228MVHRP	130	4	40	12

Detailed Exterior Lighting Inventory - City of Patterson - Hammon Senior Center



City of Patterson: Hammon Senior Center: Exterior Lighting															
General Information				Existing Fixture Data						Proposed Fixture Data					
#	EEM #	Building	Area Served	Fixture Type	Lighting (Pre)	Control Type	Pre-Watts	Pre # Fixt	Lamps per Fixture	Lighting (Post)	Recommended Make: Model #	Post-Watts	Post # Fixt	Total Post # Lamps	Total Post # Ballast
21	2	Hammon Senior Center	Exterior Area	Wallpack Full Cut-Off	CFM 42W 1L	-	48.3	14	1	LED 15-Watt Full-Cutoff Mini Wallpack	NaturaLED: LED-FXSWP15/850/DB	15	14	14	0

Detailed Interior Lighting Inventory - City of Patterson - Old Corporate Yard



City of Patterson: Old Corporate Yard: Interior Lighting																
General Information				Existing Fixture Data						Proposed Fixture Data						
#	EEM #	Site	Room/Area	Fixture Type	Lighting (Pre)	OCS (Y/N)	Pre-Watts	Pre # Fixt	Lamps per Fixture	Lighting (Post)	Recommended Make: Model #	Post-Watts	Post # Fixt	Total Post # Lamps	Total Post # Ballast	
1	1	Old Corporate Yard	Maintenance Shop	Strip 4'	F32T84L	N	112	5	4	(4) LED 12-Watt 4' Tubes & Driver	ESPEN: L48T8/840/12P-EB, VEL100BN-4C	48	5	20	5	
2	1	Old Corporate Yard	Maintenance Shop	Strip 8'	F96T82L	N	109	4	2	(2) LED 24-Watt 8' Tubes & Ballast	ESPEN: L96T8/850/24G-EB, VE259MVHIP	48	4	8	4	
3	1	Old Corporate Yard	Maintenance Shop	Strip 8'	F96T122L	N	123	1	2	(2) LED 24-Watt 8' Tubes & Ballast	ESPEN: L96T8/850/24G-EB, VE259MVHIP	48	1	2	1	

Detailed Interior Lighting Inventory - City of Patterson - Waste Water Treatment Plant



City of Patterson: WWTP South: Interior Lighting															
General Information				Existing Fixture Data						Proposed Fixture Data					
#	EEM #	Site	Room/Area	Fixture Type	Lighting (Pre)	OCS (Y/N)	Pre-Watts	Pre # Fixt	Lamps per Fixture	Lighting (Post)	Recommended Make: Model #	Post-Watts	Post # Fixt	Total Post # Lamps	Total Post # Ballast
1	1	WWTP South	Office Portable RR	Surface Mount	CFL 23W 1L	N	23	1	1	(1) LED 9-Watt A Lamp	NaturaLED: LED9A19/EC/81L/940	9	1	1	0
2	1	WWTP South	Office Portable	Recessed 2'x4' Troffer	F32T82L	N	59	8	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEL: L48T8/840/12P-EB, VEL50BN-2C	24	8	16	8
3	1	WWTP South	Polymer Bldg	Pendant 4'	F32T82L	N	59	4	2	(2) LED 12-Watt 4' Tubes & Driver	ESPEL: L48T8/840/12P-EB, VEL50BN-2C	24	4	8	4
4	1	WWTP South	Maintenance Bldg	Pendant 8'	F32T84L	N	112	6	4	(4) LED 12-Watt 4' Tubes & Driver	ESPEL: L48T8/840/12P-EB, VEL100BN-4C	48	6	24	6
5	1	WWTP South	Electrical Bldg	Strip 4'	F32T84L	N	112	9	4	(4) LED 12-Watt 4' Tubes & Driver	ESPEL: L48T8/840/12P-EB, VEL100BN-4C	48	9	36	9



Project	
Notes	
Type	Date
Cat. No.	

WPM™ UX Series

Slim Mini LED Wall Pack Luminaire



DESCRIPTION

The Aleo WPM™ Series combines energy-efficiency, high performance, and rugged construction with a slim profile. Designed look to deliver enhanced performance to outdoor wall-mounted lighting applications. Rugged die-cast housing provides advanced thermal management for long life and weather-proof compartment to withstand challenging, outdoor environments.

APPLICATIONS

Outdoor wall-mount applications. Building facade. Retail, commercial, Industrial exteriors, School Campuses.

Specification Features



Construction

Rugged, die-cast housing with advanced thermal management system ensures reliability and durability. Weather-proof, gasketed compartment protects electronics against environmental elements. Dark Bronze finish. IP65 Wet Location Rated.

Optical System

High performance LED platforms delivers high efficiency and long life. Frosted prismatic glass lens designed for superior light distribution and uniformity. Type IV comes standard.

Certification

UL Listed. All components have safety certification.

Warranty

7-year Limited Warranty. See warranty documentation for more information.

Electrical

Luminaire utilizes high-efficacy LED packages maintained at cool temperatures for long life, high efficacy. Reliable driver features universal voltage (120-277V) for convenient installation.

Installation / Mounting

Designed to be wall-mounted. Luminaire to be mounted directly over standard 4" junction box (supplied by others) or surface mount and wiring connection through convenient 1/2" threaded conduit entry hub on wall pack sides.

Photocell

Comes Standard with built-in dusk-to-dawn photocell.

Field-Adjustable CCT / Wattage

Increased versatility and reduced inventory burden. Wattage and Color Temp. can be adjusted in the field by selecting (3) different wattages and (3) different CCTs via switch inside the housing.

WPM Series

10W / 15W / 20W

Rated Life 75,000 hours
Limited Warranty 7-years
Efficacy Up to 140 LPW



Quick Ship

WPM-20UX/CT
WPM-20UX/CT WH

Ordering Information

Example: WPM-20UX/CT

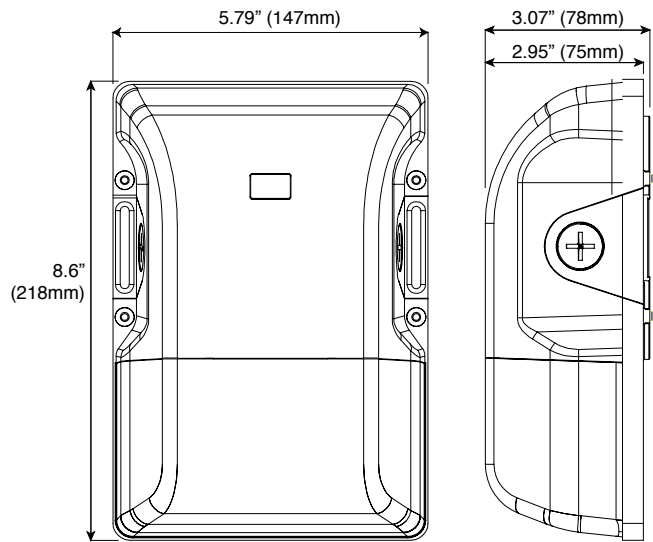
WPM	20	UX	CT	[Blank]	[Blank]
Series	Nominal Max Wattage	Lumen Package	Color Temp	Controls	Finish
WPM Slim Mini LED Wall Pack	20 10W/15W/20W	UX Field Adjustable Wattage	CT Field Adjustable 3000K 4000K 5000K	Blank Photocell (Built-in)	Blank Dark Bronze RAL#8019 WH White RAL#9003
Options					
Designation					
BAA Buy American Act Compliant			BABAA Build America, Buy America Act Compliant		

Specifications and Dimensions subject to change without notice.

Performance Summary

Input Voltage	120V-277V
Input Frequency	50/60 Hz
Rated Wattage	See Performance Table
Delivered Lumens	See Performance Table
Efficacy	140 LPW (typ.)
CRI	80+, R9 > 0
Available CCT ¹	3000K, 4000K, 5000K
Rated Life	75,000 hours
Power Factor	> 0.9
THD	< 20%
IP Rating	IP65
Photometric Distribution	Type IV
Operating Temp.	-40°C to 45°C

Product Dimensions



Performance Data

Catalog No.	Rated Wattage (W)	3000K		4000K		5000K	
		Delivered Lumens (lm)	Efficacy (lm/W)	Delivered Lumens (lm)	Efficacy (lm/W)	Delivered Lumens (lm)	Efficacy (lm/W)
WPM-20UX/CT	10	1,380	138	1,450	145	1,400	140
	15	2,055	134	2,160	144	2,085	139
	20	2,720	136	2,860	143	2,760	138



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Nano Plastic Linear T8 L24T8/8XX/12P-EB

Commercial Grade LED T8 Lamp



Descriptions:

The RetroFlex (Type A) LED lamps provide hassle-free installation with simple lamp-for-lamp replacements for your linear fluorescent T8 or T12 retrofit needs. NSF 2 rated nano plastic body prevents any breakage. Fully certified to replace original fluorescent lamps, these lamps provide the perfect, hassle-free solution for whatever the project requires. When being used with an instant start, programmed start, or emergency backup ballast, no fixture re-wiring is needed.



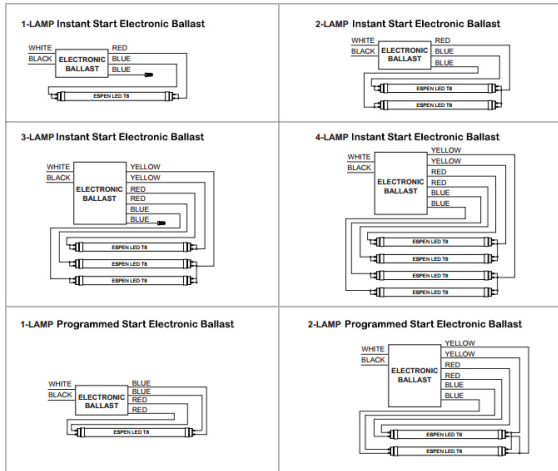
Features & Benefits:

- Shatterproof Nano Plastic Tube
- NSF2 Rated
- No rewiring needed
- Works with fluorescent electronic ballast (Instant Start, Programmed Start, and Dimming)*
- Long life
- High CRI
- Instant on, no delay
- Convenient and quick installation
- Utilizes existing instant start or rapid start sockets
- Compatible with controls and sensors
- Dimmable
- Works in cold temperature applications
- Suitable for damp locations
- Nano-Plastic tube for superior optical performance
- 5 Year Warranty

Specifications:

Ordering Code	Length (in)	Lamp Wattage	System Wattage	CCT (K)	Initial Lumens	CRI	Beam Angle	Lamp Efficacy	System Efficacy	Life (hr)
L24T8/830/12P-EB	24	9	12	3000K	1500	83	325	166	125	50000
L24T8/835/12P-EB	24	9	12	3500K	1500	83	325	166	125	50000
L24T8/840/12P-EB	24	9	12	4000K	1500	83	325	166	125	50000
L24T8/850/12P-EB	24	9	12	5000K	1500	83	325	166	125	50000

Wiring Diagram:



DLC Listing:

Ordering Code	DLC Product ID	DLC Product Model	DLC Version
L24T8/830/12P-EB	PL64Y897CKUW	L24T8/830/12P-EB	5
L24T8/835/12P-EB	PL661HGAXGNN	L24T8/835/12P-EB	5
L24T8/840/12P-EB	PL1MSMZRB0UP	L24T8/840/12P-EB	5
L24T8/850/12P-EB	PLOGTDXM83F4	L24T8/850/12P-EB	5

- Please refer to "Ballast Compatibility List" for compatible battery backup and/or emergency ballasts.
- Please refer to "Ballast Compatibility List" on Related Downloads.

Specification data is based on tests performed in a controlled environment and represents relative performance. Actual performance can vary depending on operating conditions. Application and performance data subject to change without notice. All specifications are nominal unless noted otherwise.

Linear T5HE/HO

L48T5HE/8XX/13P-EB

Commercial Grade LED T5 Lamp



Descriptions:

The RetroFlex (Type A) LED lamps provide hassle-free installation with simple lamp-for-lamp replacements for your linear fluorescent T5HE or T5HO retrofit needs. Fully certified to replace original fluorescent lamps, these lamps provide the perfect, hassle-free solution for whatever the project requires. When being used with an instant start, programmed start, or emergency backup ballast, no fixture re-wiring is needed.



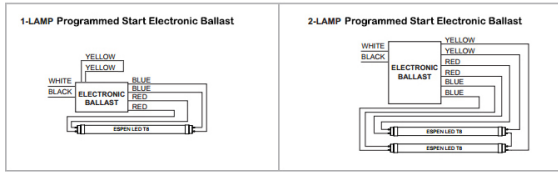
Features & Benefits:

- No rewiring needed
- Works with fluorescent electronic T5 ballast
- Long life
- High CRI
- Instant on, no delay
- Convenient and quick installation
- Utilizes existing T5 sockets
- Compatible with controls and sensors
- No Mercury, No UV
- Works in cold temperature applications
- Shatterproof Nano Plastic Tube
- Super Wide View Angle, 240
- 5 Year Warranty

Specifications:

Ordering Code	Length (in)	Lamp Wattage	System Wattage	CCT (K)	Initial Lumens	CRI	Beam Angle	Lamp Efficacy	System Efficacy	Life (hr)
L48T5HE/835/13P-EB	48 in	13W	16W	3500K	1600	83	240	123	100	50000
L48T5HE/840/13P-EB	48 in	13W	16W	4000K	1600	83	240	123	100	50000
L48T5HE/850/13P-EB	48 in	13W	16W	5000K	1600	83	240	123	100	50000

Wiring Diagram:



DLC Listing:

Ordering Code	DLC Product ID	DLC Product Model	DLC Version
L48T5HE/835/13P-EB	N/A	N/A	N/A
L48T5HE/840/13P-EB	N/A	N/A	N/A
L48T5HE/850/13P-EB	N/A	N/A	N/A

- Please refer to "Ballast Compatibility List" for compatible battery backup and/or emergency ballasts.
- Please refer to "Ballast Compatibility List" on Related Downloads.

Specification data is based on tests performed in a controlled environment and represents relative performance. Actual performance can vary depending on operating conditions. Application and performance data subject to change without notice. All specifications are nominal unless noted otherwise.

Nano Plastic Linear T8 L48T8/8XX/12P-EB

Commercial Grade LED T8 Lamp



Descriptions:

The RetroFlex (Type A) LED lamps provide hassle-free installation with simple lamp-for-lamp replacements for your linear fluorescent T8 or T12 retrofit needs. NSF 2 rated nano plastic body prevents any breakage. Fully certified to replace original fluorescent lamps, these lamps provide the perfect, hassle-free solution for whatever the project requires. When being used with an instant start, programmed start, or emergency backup ballast, no fixture re-wiring is needed.



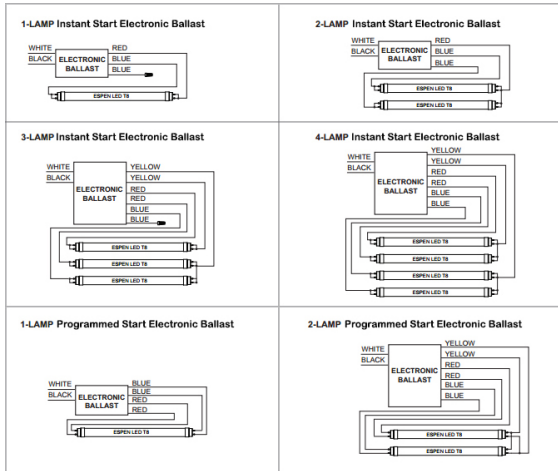
Features & Benefits:

- Shatterproof Nano Plastic Tube
- NSF2 Rated
- No rewiring needed
- Works with fluorescent electronic ballast (Instant Start, Programmed Start, and Dimming)*
- Long life
- High CRI
- Instant on, no delay
- Convenient and quick installation
- Utilizes existing instant start or rapid start sockets
- Compatible with controls and sensors
- Dimmable
- Works in cold temperature applications
- Suitable for damp locations
- Nano-Plastic tube for superior optical performance
- 5 Year Warranty

Specifications:

Ordering Code	Length (in)	Lamp Wattage	System Wattage	CCT (K)	Initial Lumens	CRI	Beam Angle	Lamp Efficacy	System Efficacy	Life (hr)
L48T8/830/12P-EB	48	12	14.5	3000K	1800	83	325	150	124	50000
L48T8/835/12P-EB	48	12	14.5	3500K	1800	83	325	150	124	50000
L48T8/840/12P-EB	48	12	14.5	4000K	1800	83	325	150	124	50000
L48T8/850/12P-EB	48	12	14.5	5000K	1800	83	325	150	124	50000

Wiring Diagram:



DLC Listing:

Ordering Code	DLC Product ID	DLC Product Model	DLC Version
L48T8/830/12P-EB	PACASTWU	L48T8/830/12P-EB	5
L48T8/835/12P-EB	P2KSU3AM	L48T8/835/12P-EB	5
L48T8/840/12P-EB	P8YY2WD5	L48T8/840/12P-EB	5
L48T8/850/12P-EB	PETR5AMS	L48T8/850/12P-EB	5

- Please refer to "Ballast Compatibility List" for compatible battery backup and/or emergency ballasts.
- Please refer to "Ballast Compatibility List" on Related Downloads.

Specification data is based on tests performed in a controlled environment and represents relative performance. Actual performance can vary depending on operating conditions. Application and performance data subject to change without notice. All specifications are nominal unless noted otherwise.

Commercial Recessed Downlight

Commercial Grade LED Retrofit Kit



Descriptions:

This advanced commercial recessed downlight retrofit kit easily converts fluorescent troffers to the most current LED technology. Its ultra high efficiency reduces energy costs. It is one of the LED retrofits that comes completely assembled as a lensed kit, requiring only one minute to install, reducing labor costs. The retrofit kit is also 0-10V Dimmable with 5 Year Warranty. Ideal applications include: office, retail, healthcare, education and hospitality interiors.

Features & Benefits:

- Commercial Downlight Retrofit or New Construction
- Universal Voltage 120-277V
- UL for Safety
- Three Adjustable Lumen Output
- Three Adjustable CCT Options (3000K, 3500K, 4000K)
- Driver Efficiency Greater than 85% at full power
- THD ≤ 20% at full power
- High CRI
- Long Life
- Convenient and quick installation
- 0-10V Dimmable
- 25 inch Flexible Conduit
- Auto Recovery Short Circuit Protection, Over Load Protection, Over Voltage Protection
- Ambient Operating Temperature: -30 ~ 40°C
- Works in cold temperature applications
- 5 Year Warranty
- Flicker-free, Meets IEEE 1798-2015

Specifications:

Ordering Code	Size	IC Rated	System Wattage	System Lumens	CCT (K)	System Efficacy	CRI	Input Voltage	Dimming	THD	Power Factor
VEKR6D/8T/13W-10V	6" Recess	Yes	6.5 / 9 / 13	790 / 1100 / 1560	3000K, 3500K, 4000K selectable	120	>80	120-277	0-10V	max. 20%	0.9

Specification data is based on tests performed in a controlled environment and represents relative performance. Actual performance can vary depending on operating conditions. Application and performance data subject to change without notice. All specifications are nominal unless noted otherwise.



Commercial Recessed Downlight

Commercial Grade LED Retrofit Kit



Descriptions:

This advanced commercial recessed downlight retrofit kit easily converts fluorescent troffers to the most current LED technology. Its ultra high efficiency reduces energy costs. It is one of the LED retrofits that comes completely assembled as a lensed kit, requiring only one minute to install, reducing labor costs. The retrofit kit is also 0-10V Dimmable with 5 Year Warranty. Ideal applications include: office, retail, healthcare, education and hospitality interiors.

Features & Benefits:

- Commercial Downlight Retrofit or New Construction
- Universal Voltage 120-277V
- UL for Safety
- Three Adjustable Lumen Output
- Three Adjustable CCT Options (3000K, 3500K, 4000K)
- Driver Efficiency Greater than 85% at full power
- THD ≤ 20% at full power
- High CRI
- Long Life
- Convenient and quick installation
- 0-10V Dimmable
- 25 inch Flexible Conduit
- Auto Recovery Short Circuit Protection, Over Load Protection, Over Voltage Protection
- Ambient Operating Temperature: -30 ~ 40°C
- Works in cold temperature applications
- 5 Year Warranty
- Flicker-free, Meets IEEE 1798-2015

Specifications:

Ordering Code	Size	IC Rated	System Wattage	System Lumens	CCT (K)	System Efficacy	CRI	Input Voltage	Dimming	THD	Power Factor
VEKR8D/8T/17W-10V	8" Recess	Yes	8.5 / 12 / 17	1030 / 1450 / 2040	3000K, 3500K, 4000K selectable	120	>80	120-277	0-10V	max. 20%	0.9

Specification data is based on tests performed in a controlled environment and represents relative performance. Actual performance can vary depending on operating conditions. Application and performance data subject to change without notice. All specifications are nominal unless noted otherwise.



Type A+B Hybrid Linear T8

L96T8/8XX/24G-AB

Commercial Grade LED T8 Lamp



Descriptions:

The ProLED Select T8 Linear Hybrid (Type A+B) lamps offer the most versatile installation solution for your linear fluorescent T8 or T12 retrofit needs. Fully certified as a UL 1598C retrofit kit in single end or double end ballast bypass scenarios (UL Type B) and UL listed for use with electronic T8 fluorescent ballasts (UL Type A), these lamps provide the perfect, hassle-free solution for whatever the project requires. When being used with an instant start, programmed start, or emergency backup ballast, no fixture re-wiring is needed. If the ballast fails in the future, simply re-wire the fixture with 120-277V line voltage using either single end or double end wiring. This CCT selectable hybrid comes in 2-foot, 3-foot, and 4-foot lengths, and offers users the ability to select between 3500K, 4000K, and 5000K kelvin temperatures by simply sliding the selector on the tube to the desired color.

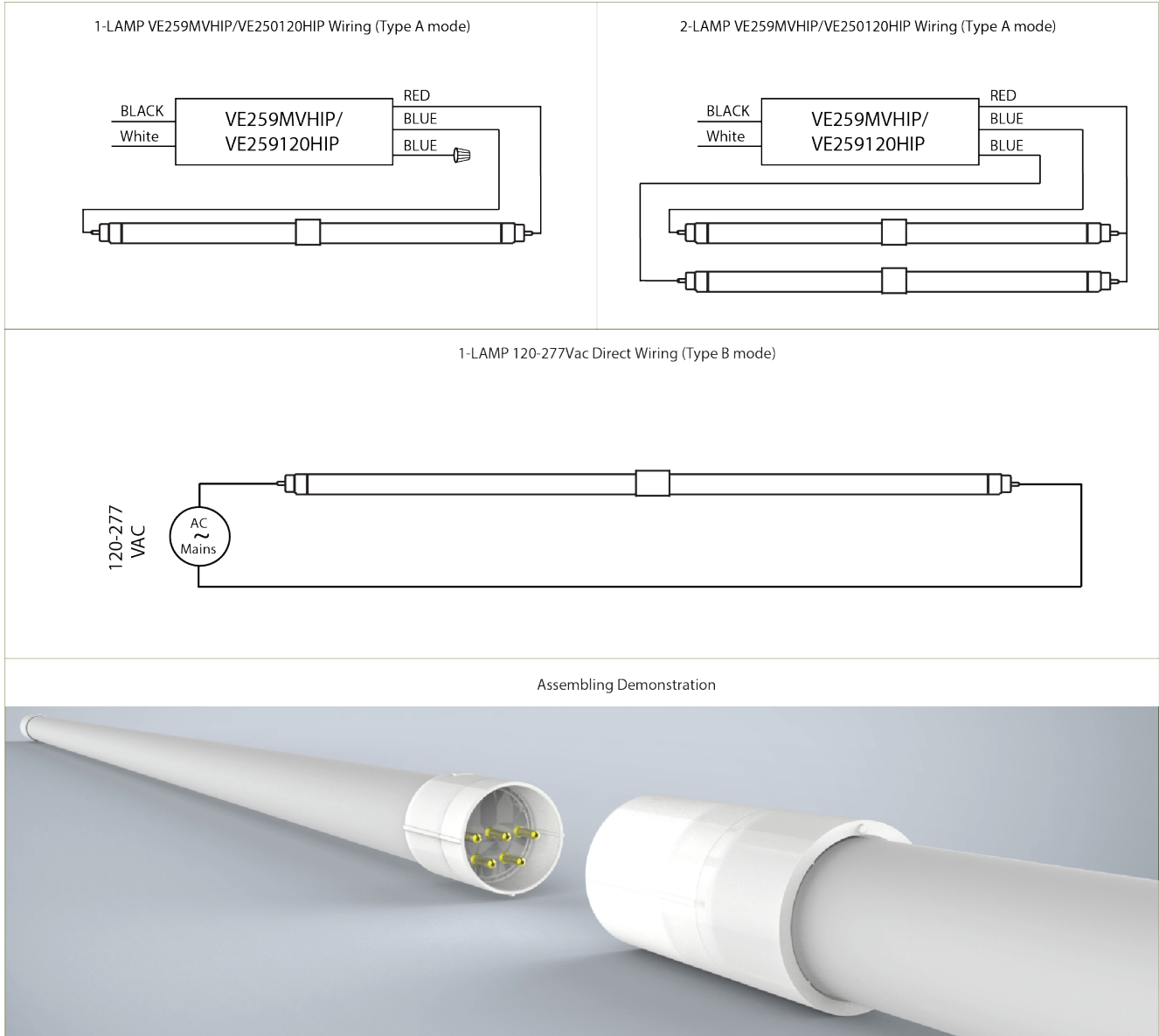
Features & Benefits:

- Type A mode: Compatible with electronic ballast VE259MVHIP and VE259120HIP
- Type B mode: Internal Driver (Direct 120-277VAC input)
- Accessory: Default Fa8 End Cap Adapter Converter, Mounting Clip
- Glass tube with ArmorCoat Shatterproof Coating
- ArmorCoat Shatterproof Coating
- Long life
- High CRI
- Instant on, no delay or warm up time
- Convenient and quick installation
- Works in cold temperature applications
- Compatible with controls and sensors
- Glass tube for superior optical performance
- Continuous Dimming to 10%
- 5 Year Warranty
- For 8', lamp consists of (2) 4ft sections

Specifications:

Ordering Code	Length (in)	Wattage Direct AC	Wattage With Ballast	Input Voltage	CCT (K)	Initial Lumens	CRI	Beam Angle	System Efficacy Direct AC	System Efficacy with Ballast
L96T8/830/24G-AB	96	24	27	120-277V	3000K	3500	83	325	145	130
L96T8/835/24G-AB	96	24	27	120-277V	3500K	3500	83	325	145	130
L96T8/840/24G-AB	96	24	27	120-277V	4000K	3500	83	325	145	130
L96T8/850/24G-AB	96	24	27	120-277V	5000K	3500	83	325	145	130

Wiring Diagram:



DLC Listing:

Ordering Code	DLC Product ID	DLC Product Model	DLC Version
L96T8/830/24G-AB	PLZ8LDRMERYI	L96T8/830/24G-AB	5
L96T8/835/24G-AB	PL8FG7WRZ09W	L96T8/835/24G-AB	5
L96T8/840/24G-AB	PLNKJ4MTNB89	L96T8/840/24G-AB	5
L96T8/850/24G-AB	PLBKMXLJOW9J	L96T8/850/24G-AB	5

Specification data is based on tests performed in a controlled environment and represents relative performance. Actual performance can vary depending on operating conditions. Application and performance data subject to change without notice. All specifications are nominal unless noted otherwise.

Commercial Recessed Downlight

Commercial Grade LED Retrofit Kit



Descriptions:

This advanced commercial recessed downlight retrofit kit easily converts fluorescent troffers to the most current LED technology. Its ultra high efficiency reduces energy costs. It is one of the LED retrofits that comes completely assembled as a lensed kit, requiring only one minute to install, reducing labor costs. The retrofit kit is also 0-10V Dimmable with 5 Year Warranty. Ideal applications include: office, retail, healthcare, education and hospitality interiors.

Features & Benefits:

- Commercial Downlight Retrofit or New Construction
- Universal Voltage 120-277V
- UL for Safety
- Three Adjustable Lumen Output
- Three Adjustable CCT Options (3000K, 3500K, 4000K)
- Driver Efficiency Greater than 85% at full power
- THD ≤ 20% at full power
- High CRI
- Long Life
- Convenient and quick installation
- 0-10V Dimmable
- 25 inch Flexible Conduit
- Auto Recovery Short Circuit Protection, Over Load Protection, Over Voltage Protection
- Ambient Operating Temperature: -30 ~ 40°C
- Works in cold temperature applications
- 5 Year Warranty
- Flicker-free, Meets IEEE 1798-2015

Specifications:

Ordering Code	Size	IC Rated	System Wattage	System Lumens	CCT (K)	System Efficacy	CRI	Input Voltage	Dimming	THD	Power Factor
VEKR9.5D/8T/27W-10V	9" Recess	Yes	17 / 21 / 27	2070 / 2500 / 3240	3000K, 3500K, 4000K selectable	120	>80	120-277	0-10V	max. 20%	0.9

Specification data is based on tests performed in a controlled environment and represents relative performance. Actual performance can vary depending on operating conditions. Application and performance data subject to change without notice. All specifications are nominal unless noted otherwise.





KT-LED62P-O-8XX-D

2-PIN LED CFL REPLACEMENT LAMP

REV1

DESCRIPTION

5W 2-Pin LED Omnidirectional Lamp | 2700–5000K | GX23 Base |
Type B Line Voltage Compatible



RoHS
Compliant



5 YEAR
WARRANTY

LAMP TYPE: LED CFL Replacement

BULB TYPE: 2-Pin LED

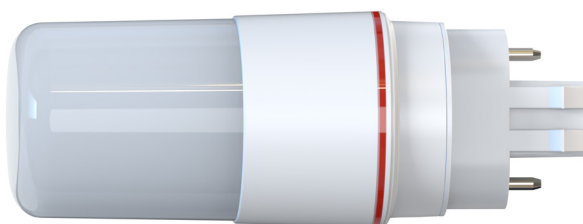
BASE TYPE: GX23

WATTAGE: 5W

COLOR TEMPERATURE: 2700–5000K

COLOR RENDERING INDEX (CRI): > 80

WARRANTY: 5 Years



PRODUCT FEATURES

• Replaces 13W GX23 CFL lamps

- Approximately 50% more energy efficient vs legacy CFL lamps
- Up to 5x longer life vs traditional lamps
- Frosted diffuser that eliminates pixilation and glare
- Environmentally friendly. No mercury used
- Instant startup

- UL Classified Retrofit Kit
- Suitable for use in damp locations
- Non dimmable
- 50,000 hour lifetime
- Operating temperature: -20°C/-4°F to 45°C/113°F
- Compliant with FCC Part 15 Class B

PERFORMANCE SPECIFICATIONS

Catalog Number	Wattage	CCT	Lumens	Efficacy	Input Voltage	CRI	Base Type	Beam Angle	Related Life
KT-LED62P-O-827-D	5W	2700K	580	116 lm/W	120–277V	> 80	GX23	260°	50,000 hrs
KT-LED62P-O-830-D		3000K	610	122 lm/W					
KT-LED62P-O-835-D		3500K	630	126 lm/W					
KT-LED62P-O-840-D		4000K	650	130 lm/W					
KT-LED62P-O-850-D		5000K	650	130 lm/W					

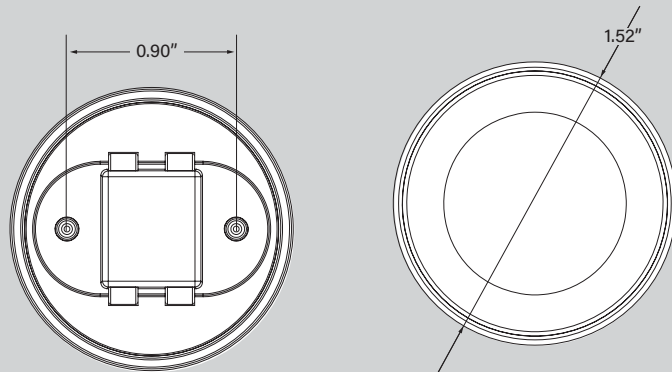
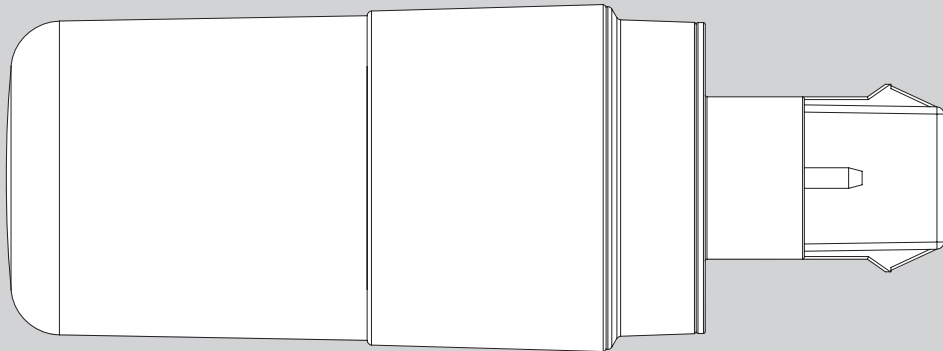
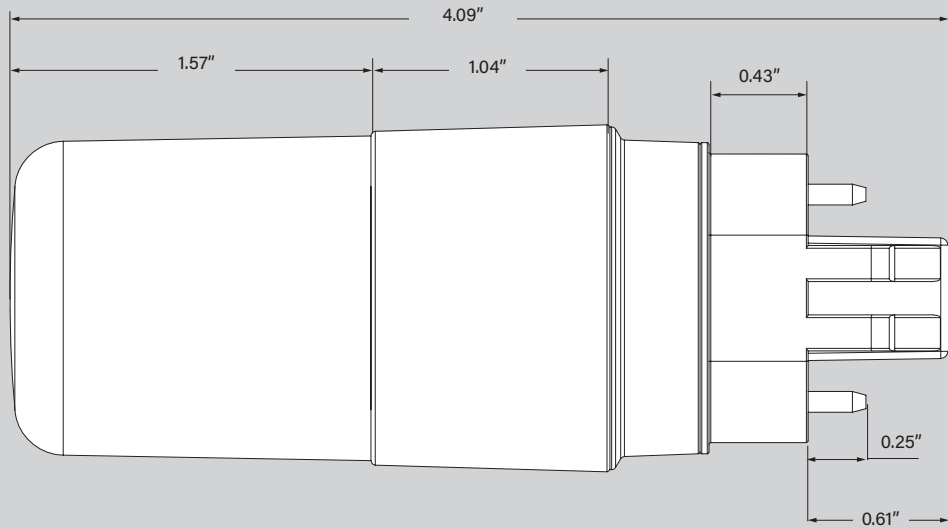


KT-LED62P-O-8XX-D

2-PIN LED CFL REPLACEMENT LAMP

REV1

PHYSICAL SPECIFICATIONS





KT-LED62P-O-8XX-D

2-PIN LED CFL REPLACEMENT LAMP

REV1

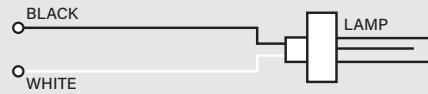
WIRING DIAGRAMS

BYPASS MAGNETIC BALLAST WITH 1 LAMP (GX23 SOCKET)

BEFORE

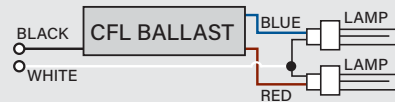


AFTER

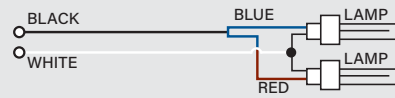


BYPASS MAGNETIC BALLAST WITH 2 LAMPS (GX23 SOCKET)

BEFORE



AFTER



ORDERING INFORMATION

ORDER CODE	UPC	EASY CODE
KT-LED62P-O-827-D	843654126944	JUB-44
KT-LED62P-O-830-D	843654126951	HGN-74
KT-LED62P-O-835-D	843654126968	WLK-19
KT-LED62P-O-840-D	843654126975	BYX-38
KT-LED62P-O-850-D	843654126982	HXE-05

CATALOG NUMBER BREAKDOWN

KT-LED62P-O-8XX-D

1 2 3 4 5 6 7 8

- | | |
|---|---|
| <ul style="list-style-type: none"> 1 Keystone Technologies 2 LED Lamp 3 Wattage 4 Lamp Type | <ul style="list-style-type: none"> 5 Omnidirectional Orientation 6 80 CRI 7 CCT 8 Direct Drive Series |
|---|---|



KT-LED82P-V-8XX-D / G2

2-PIN LED CFL REPLACEMENT LAMP

DESCRIPTION

8W 2-Pin LED Lamp | 3500K - 5000K | G24d Base |
Type B Line Voltage Compatible



5 YEAR
WARRANTY

LAMP TYPE: LED CFL Replacement
BULB TYPE: 2-Pin LED
BASE TYPE: G24d
WATTAGE: 8W
COLOR TEMPERATURE: 3500K - 5000K
COLOR RENDERING INDEX (CRI): > 80
WARRANTY: 5 Years



PRODUCT FEATURES

- Replaces 13W, 18W, and 26W legacy lamps with G24q, GX24q, G24d, and GX24d bases
- G24d 2-pin bases can be used in G24Q 4-pin applications for ballast bypass
- Approximately 50% more energy efficient vs legacy CFL lamps
- Up to 5x longer life vs traditional lamps
- Frosted diffuser that eliminates pixilation and glare
- Environmentally friendly. No mercury used
- Instant startup
- UL Classified Retrofit Kit
- Suitable for use in damp locations
- Not for use in enclosed luminaires
- Non dimmable
- 50,000 hour lifetime
- Operating temperature: -20°C/-4°F to 45°C/113°F
- Compliant with FCC Part 15 Class B
- Minimum compartment dimensions: 6.31" D x 9.06" H

*G24q-5/6/7 and Gx24q-5/6/7 not compatible

PERFORMANCE SPECIFICATIONS

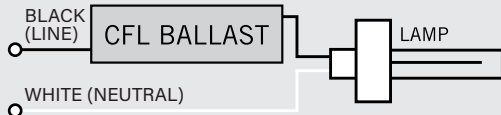
Catalog Number	Wattage	CCT	Lumens	Efficacy	Input Voltage	CRI	Base Type	Beam Angle	Related Life
KT-LED82P-V-835-D /G2	8W	3500K	1000	125 lm/W	120-277V	> 80	G24d	> 110°	50,000 hrs
KT-LED82P-V-840-D /G2		4000K	1050	131 lm/W					
KT-LED82P-V-850-D /G2		5000K	1050	131 lm/W					

KT-LED82P-V-8XX-D / G2
2-PIN LED CFL REPLACEMENT LAMP

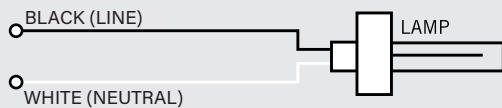
WIRING DIAGRAM

BYPASS MAGNETIC BALLAST WITH 1 LAMP

BEFORE

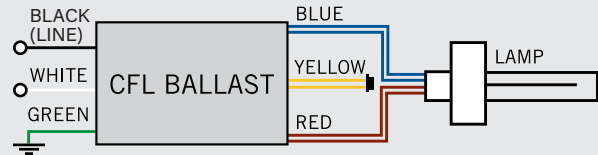


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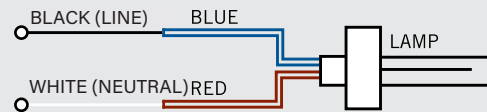


BYPASS ELECTRONIC BALLAST WITH 1 LAMP

BEFORE

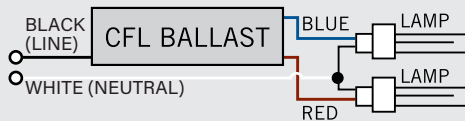


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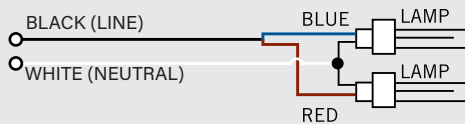


BYPASS MAGNETIC BALLAST WITH 2 LAMPS

BEFORE

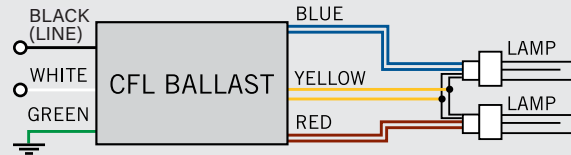


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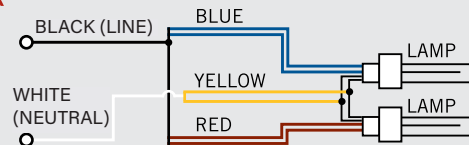


BYPASS ELECTRONIC BALLAST WITH 2 LAMPS

BEFORE



AFTER

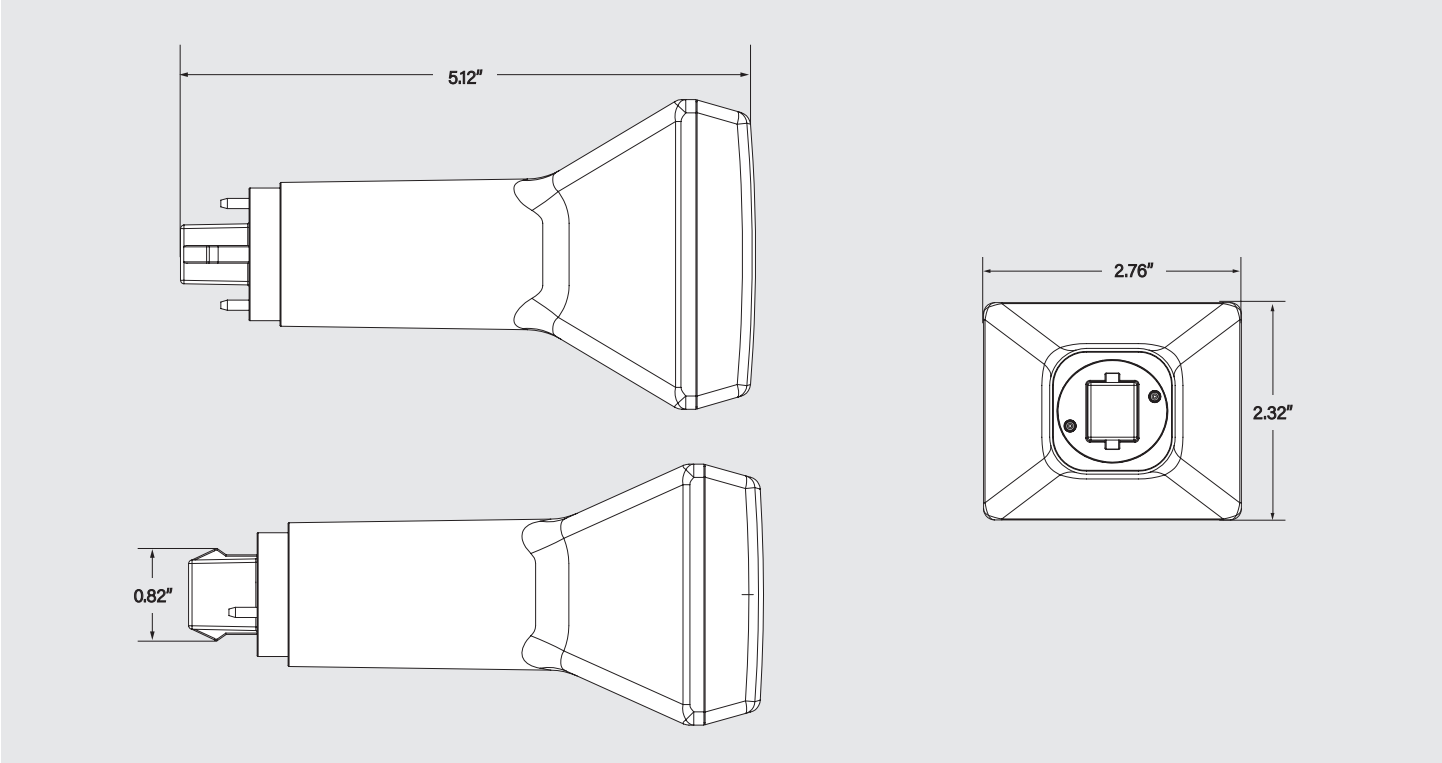




KT-LED82P-V-8XX-D / G2

2-PIN LED CFL REPLACEMENT LAMP

PHYSICAL SPECIFICATIONS



ORDERING INFORMATION

ORDER CODE	UPC	EASY CODE
KT-LED82P-V-835-D /G2	843654159126	AOZ-45
KT-LED82P-V-840-D /G2	843654159133	LMA-10
KT-LED82P-V-850-D /G2	843654159140	XMM-77

CATALOG NUMBER BREAKDOWN

KT-LED82P-V-8XX-D / G2

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

- 1** Keystone Technologies
- 2** LED Lamp
- 3** Wattage
- 4** Lamp Type
- 5** Vertical Orientation
- 6** 80 CRI
- 7** CCT
- 8** Direct Drive
- 9** Second Generation



KT-LED82P-H-8XX-D / G2

2-PIN LED CFL REPLACEMENT LAMP

DESCRIPTION

8W 2-Pin LED Lamp | 2700K - 5000K | G24d Base |
Type B Line Voltage Compatible



LAMP TYPE: LED CFL Replacement

BULB TYPE: 2-Pin LED

BASE TYPE: G24d

WATTAGE: 8W

COLOR TEMPERATURE: 2700K - 5000K

COLOR RENDERING INDEX (CRI): > 80

WARRANTY: 5 Years



PRODUCT FEATURES

- Replaces 13W, 18W, and 26W legacy lamps with G24q, GX24q, G24d, and GX24d bases
- G24d 2-pin bases can be used in G24Q 4-pin applications for ballast bypass
- Approximately 50% more energy efficient vs legacy CFL lamps
- Up to 5x longer life vs traditional lamps
- Frosted diffuser that eliminates pixilation and glare
- Environmentally friendly. No mercury used
- Instant startup
- UL Classified Retrofit Kit

*G24q-5/6/7 and GX24q-5/6/7 not compatible

- Suitable for use in damp locations
- Not for use in enclosed luminaires
- Non dimmable
- Rotatable 270°
- 50,000 hour lifetime
- Operating temperature: -20°C/-4°F to 45°C/113°F
- Compliant with FCC Part 15 Class B
- Minimum compartment dimensions: 6.12" D x 4.75" H

PERFORMANCE SPECIFICATIONS

Catalog Number	Wattage	CCT	Lumens	Efficacy	Input Voltage	CRI	Base Type	Beam Angle	Related Life
KT-LED82P-H-827-D /G2	8W	2700K	900	112 lm/W	120-277V	> 80	G24d	> 110°	50,000 hrs
KT-LED82P-H-830-D /G2		3000K	950	118 lm/W					
KT-LED82P-H-835-D /G2		3500K	1000	125 lm/W					
KT-LED82P-H-840-D /G2		4000K	1050	131 lm/W					
KT-LED82P-H-850-D /G2		5000K	1050	131 lm/W					



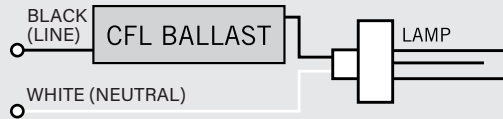
KT-LED82P-H-8XX-D / G2

2-PIN LED CFL REPLACEMENT LAMP

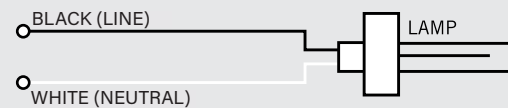
WIRING DIAGRAMS

BYPASS MAGNETIC BALLAST WITH 1 LAMP

BEFORE

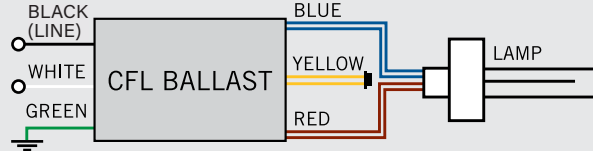


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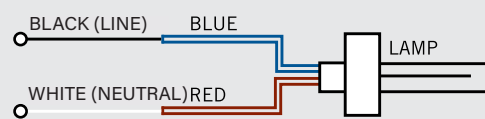


BYPASS ELECTRONIC BALLAST WITH 1 LAMP

BEFORE

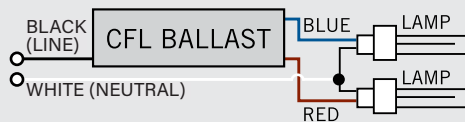


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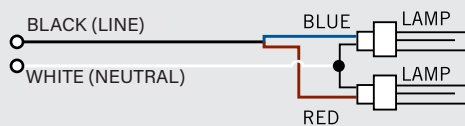


BYPASS MAGNETIC BALLAST WITH 2 LAMPS

BEFORE

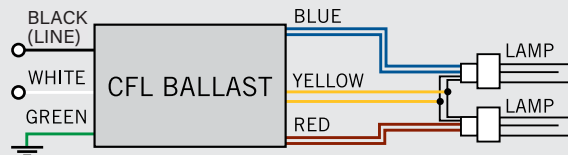


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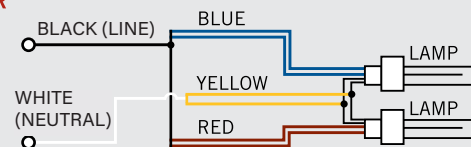


BYPASS ELECTRONIC BALLAST WITH 2 LAMPS

BEFORE



AFTER

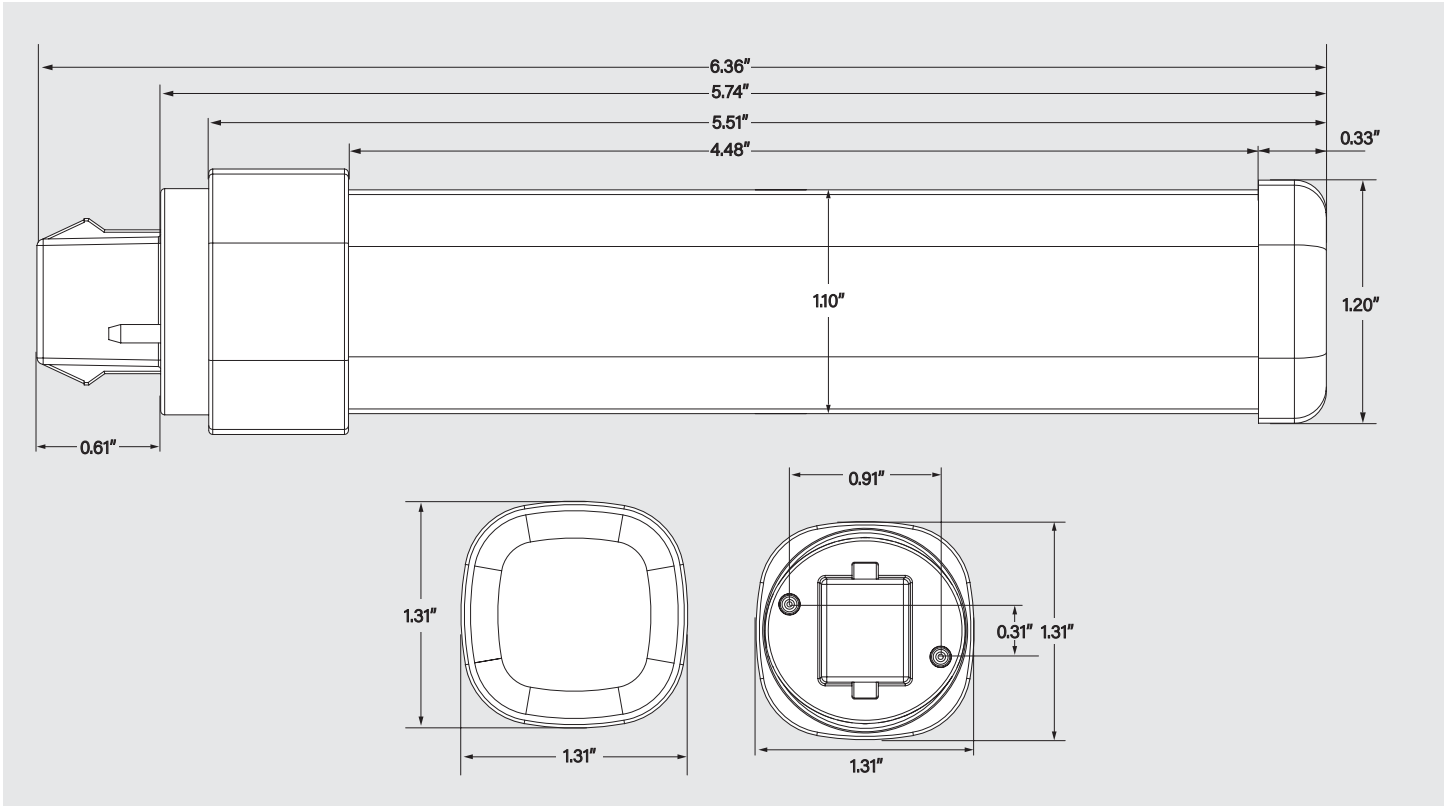




KT-LED82P-H-8XX-D /G2

2-PIN LED CFL REPLACEMENT LAMP

PHYSICAL SPECIFICATIONS



ORDERING INFORMATION

ORDER CODE	UPC	EASY CODE
KT-LED82P-H-827-D /G2	843654159072	FGG-69
KT-LED82P-H-830-D /G2	843654159089	CLH-33
KT-LED82P-H-835-D /G2	843654159096	FIY-22
KT-LED82P-H-840-D /G2	843654159102	EDK-39
KT-LED82P-H-850-D /G2	843654159119	CUO-61

CATALOG NUMBER BREAKDOWN

KT-LED82P-H-8XX-D /G2

1 2 3 4 5 6 7 8 9

- 1 Keystone Technologies
- 2 LED Lamp
- 3 Wattage
- 4 Lamp Type
- 5 Horizontal Orientation
- 6 80 CRI
- 7 CCT
- 8 Direct Drive
- 9 Second Generation



KT-LED82P-O-8XX-D

2-PIN LED CFL REPLACEMENT LAMP

REV1

DESCRIPTION

7W 2-Pin LED Omnidirectional Lamp | 2700–5000K | G24d Base |
Type B Line Voltage Compatible

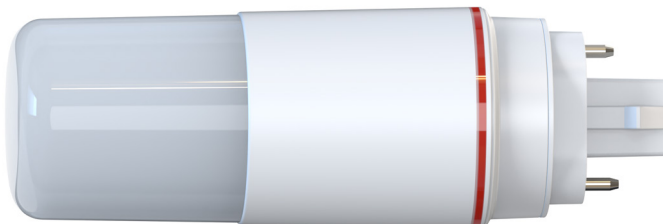


RoHS
Compliant



5 YEAR
WARRANTY

LAMP TYPE: LED CFL Replacement
BULB TYPE: 2-Pin LED
BASE TYPE: G24d
WATTAGE: 7W
COLOR TEMPERATURE: 2700–5000K
COLOR RENDERING INDEX (CRI): > 80
WARRANTY: 5 Years



PRODUCT FEATURES

- Replaces 13W, 18W, and 26W legacy lamps with G24q, GX24q, G24d, and GX24d bases
- G24d 2-pin bases can be used in G24Q 4-pin applications for ballast bypass
- Approximately 50% more energy efficient vs legacy CFL lamps
- Up to 5x longer life vs traditional lamps
- Frosted diffuser that eliminates pixilation and glare
- Environmentally friendly. No mercury used
- Instant startup
- UL Classified Retrofit Kit
- Suitable for use in damp locations
- Not for use in enclosed luminaires
- Non dimmable
- 50,000 hour lifetime
- Operating temperature: -20°C/-4°F to 45°C/113°F
- Compliant with FCC Part 15 Class B

*G24q-5/6/7 and GX24q-5/6/7 not compatible

PERFORMANCE SPECIFICATIONS

Catalog Number	Wattage	CCT	Lumens	Efficacy	Input Voltage	CRI	Base Type	Beam Angle	Related Life
KT-LED82P-O-827-D	7W	2700K	800	114 lm/W	120–277V	> 80	G24d	260°	50,000 hrs
KT-LED82P-O-830-D		3000K	840	120 lm/W					
KT-LED82P-O-835-D		3500K	870	124 lm/W					
KT-LED82P-O-840-D		4000K	910	130 lm/W					
KT-LED82P-O-850-D		5000K	910	130 lm/W					

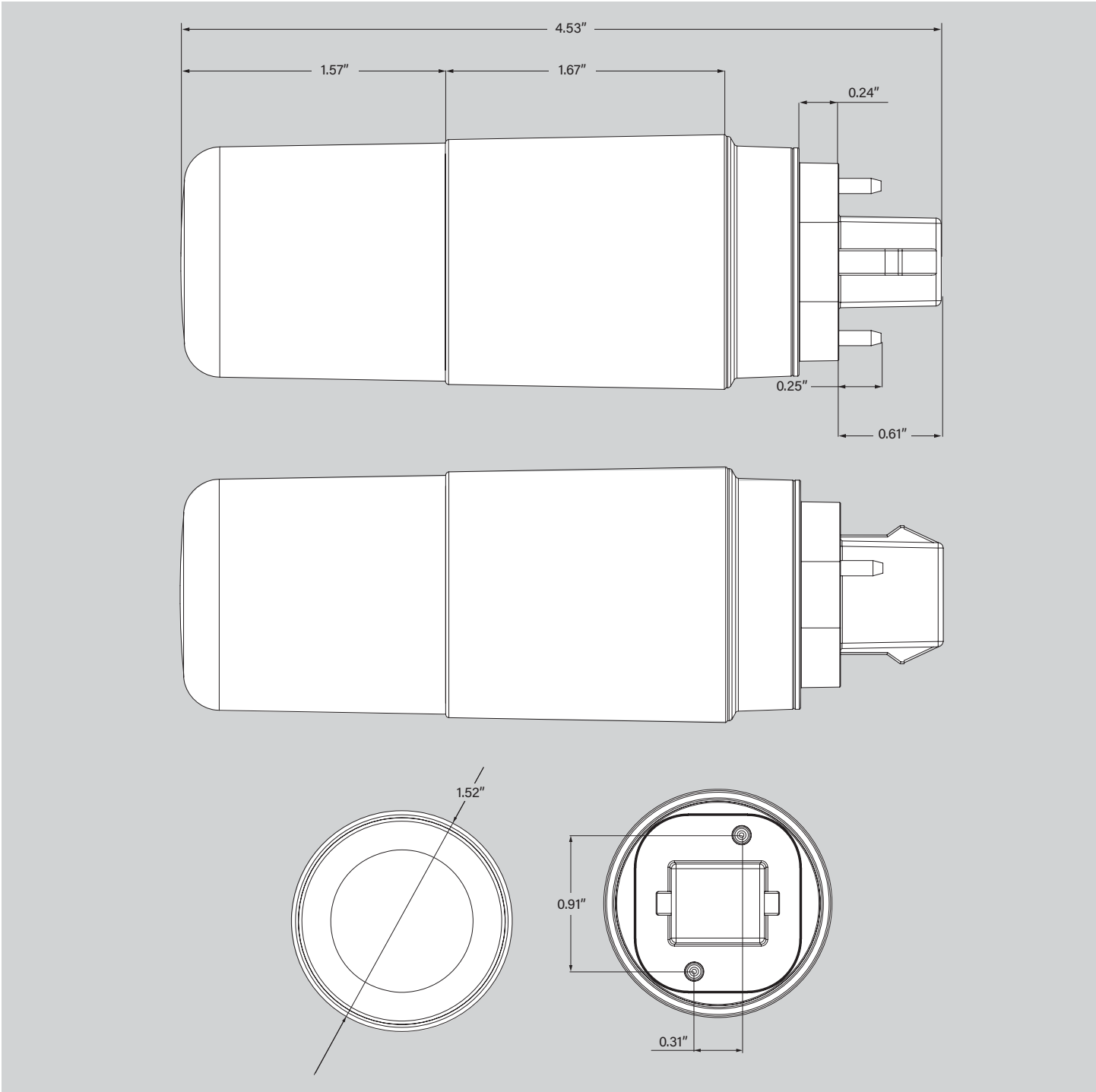


KT-LED82P-O-8XX-D

2-PIN LED CFL REPLACEMENT LAMP

REV1

PHYSICAL SPECIFICATIONS



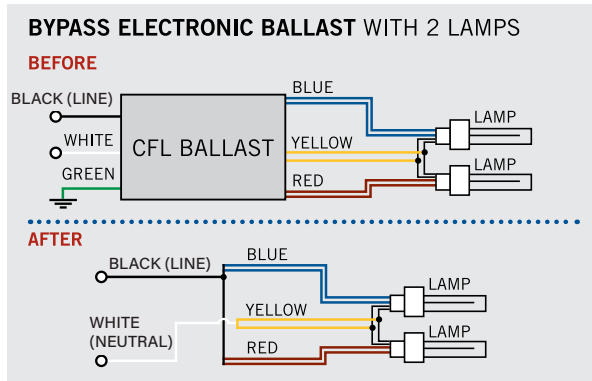
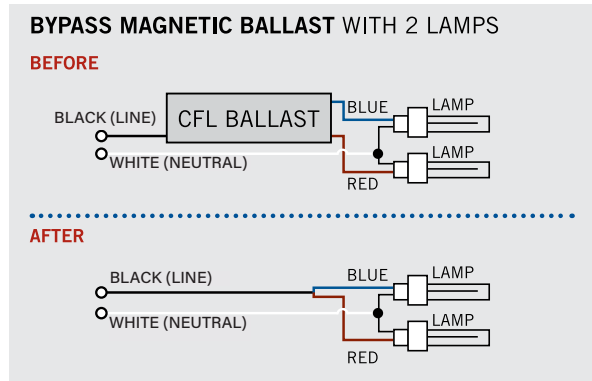
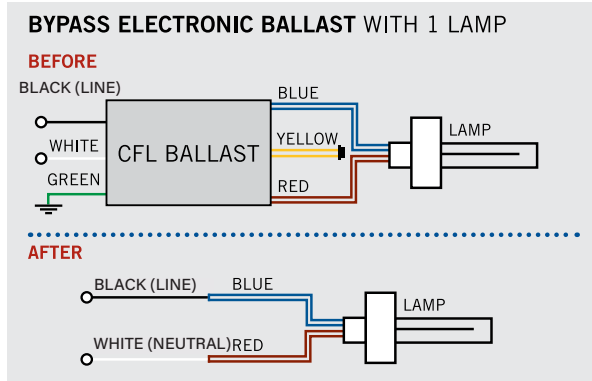
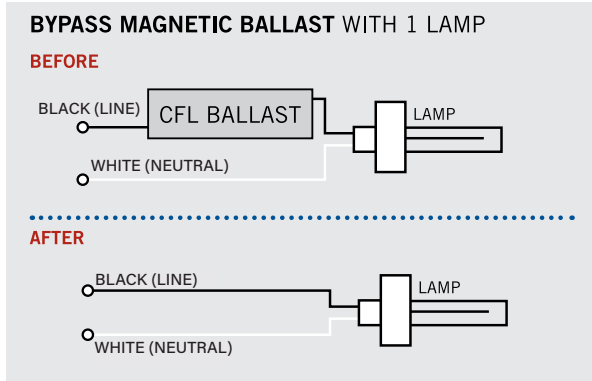


KT-LED82P-O-8XX-D

2-PIN LED CFL REPLACEMENT LAMP

REV1

WIRING DIAGRAMS



ORDERING INFORMATION

ORDER CODE	UPC	EASY CODE
KT-LED82P-O-827-D	843654126890	GJI-26
KT-LED82P-O-830-D	843654126906	EMQ-20
KT-LED82P-O-835-D	843654126913	NOP-94
KT-LED82P-O-840-D	843654126920	KZU-89
KT-LED82P-O-850-D	843654126937	CRO-51

CATALOG NUMBER BREAKDOWN

KT-LED82P-O-8XX-D

- | | |
|--------------------------------|--------------------------------------|
| 1 Keystone Technologies | 5 Omnidirectional Orientation |
| 2 LED Lamp | 6 80 CRI |
| 3 Wattage | 7 CCT |
| 4 Lamp Type | 8 Direct Drive Series |



KT-LED10PLL-12GC-8XX-D

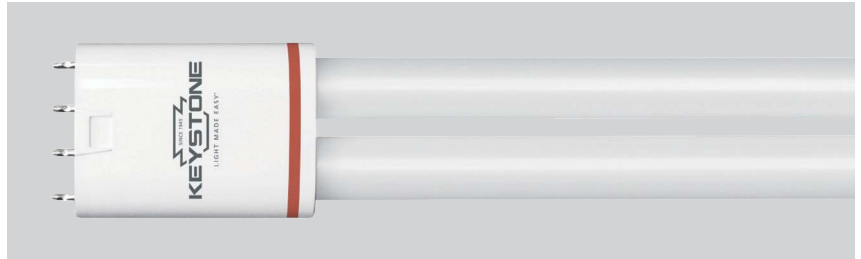
PLL LED LAMP

DESCRIPTION

10W PLL LED | 3000-5000K | >80 CRI | High-Efficiency



LAMP TYPE: PLL
BASE TYPE: 2G11
WATTAGE: 10W
COLOR TEMPERATURE: 3000-5000K
COLOR RENDERING INDEX (CRI): >80
WARRANTY: 5 Years



PRODUCT FEATURES

- Replacement for conventional fluorescent lamp
- UL Classified
- 50,000+ hour lifetime
- Approximately 50% more energy efficient than standard FT40/2G11 lamps
- Environmentally friendly: No mercury used
- Integral driver (isolated) eliminates the need for an external ballast or driver
- Instant startup
- Not dimmable
- Frosted lens eliminates pixelation
- Operating temperature: -20°C/-4°F to 45°C/113°F
- 100+ Lumens per Watt (bare lamp efficacy)
- Suitable for dry and damp locations
- NSF Listed: NSF/ANSI Standard 2 - Food Equipment
- Suitable for use in fully enclosed fixture. Minimum lamp compartment dimensions: 44cm x 14cm x 10cm

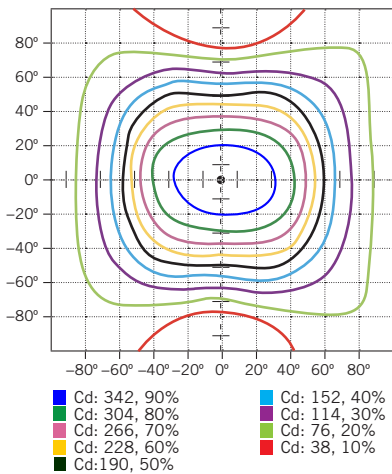
OPERATING SPECIFICATIONS

ELECTRICAL AND PERFORMANCE CHARACTERISTICS

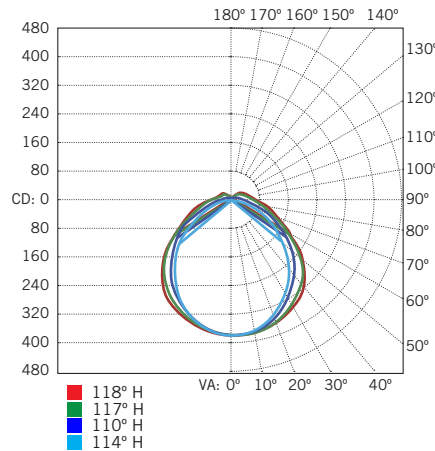
Catalog Number	Input Voltage	CRI	Wattage	Nominal Lumens	Color Temp.	Beam Angle	Efficacy	Power Factor	Max. THD
KT-LED10PLL-12GC-830-D	120-277V	>80	10W	1200	3000K	160°	120 lm/W	>0.9	20%
KT-LED10PLL-12GC-835-D	120-277V	>80	10W	1200	3500K	160°	120 lm/W	>0.9	20%
KT-LED10PLL-12GC-840-D	120-277V	>80	10W	1250	4000K	160°	125 lm/W	>0.9	20%
KT-LED10PLL-12GC-850-D	120-277V	>80	10W	1250	5000K	160°	125 lm/W	>0.9	20%

PHOTOMETRIC SPECIFICATIONS

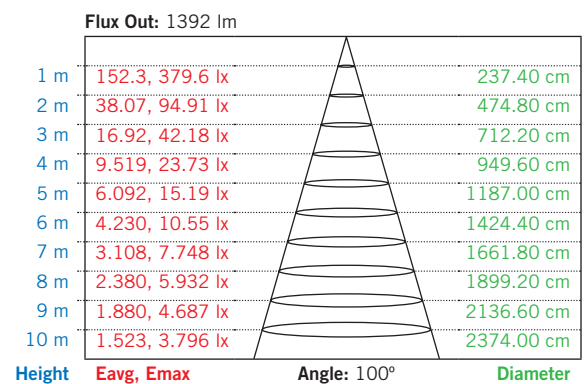
ISOCANDELA PLOT



POLAR CANDELA DISTRIBUTION



LUX DISTANCE CURVE

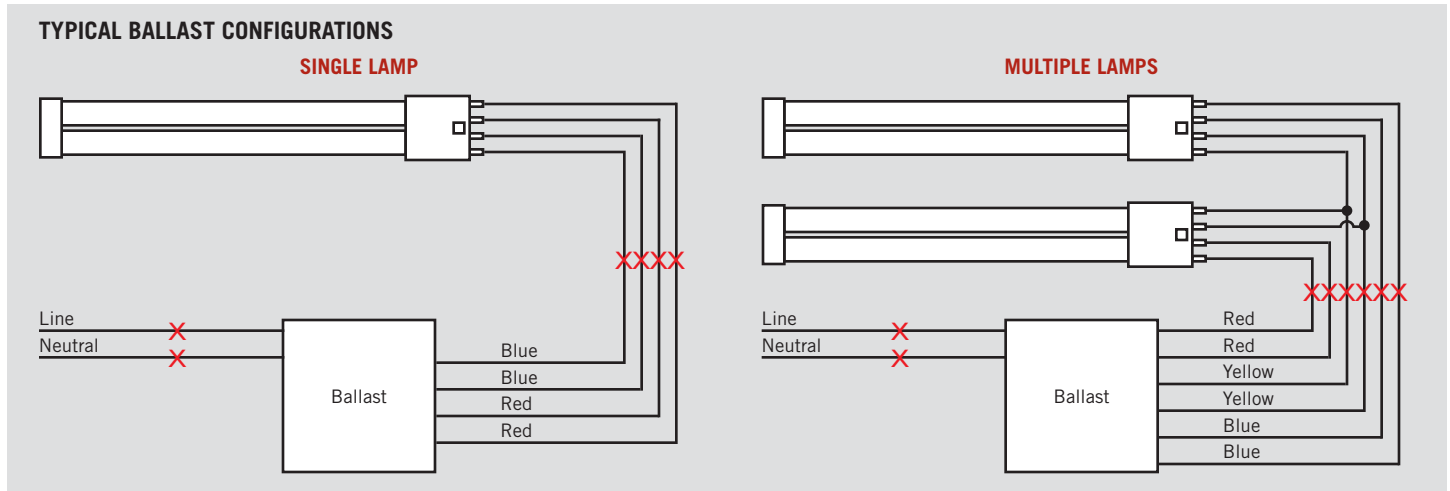


NOTE: Charts are represented by 5000K

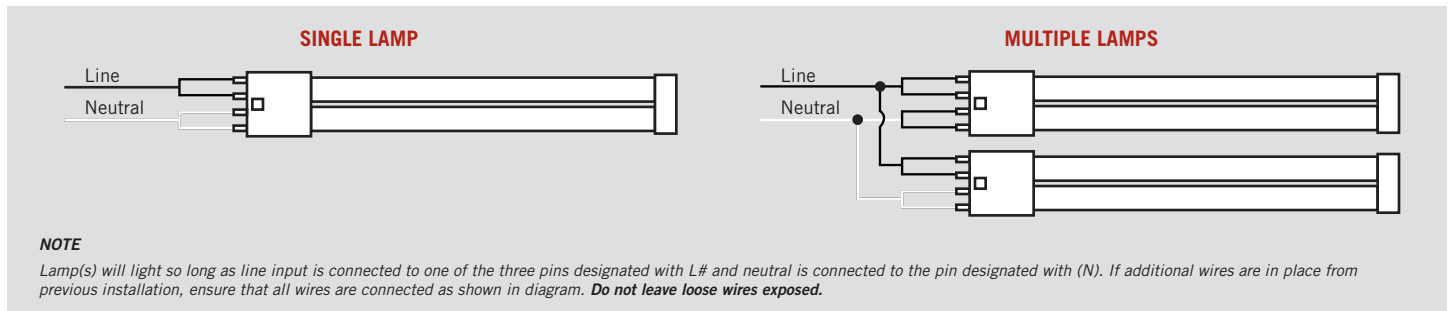
KT-LED10PLL-12GC-8XX-D
PLL LED LAMP

WIRING DIAGRAMS

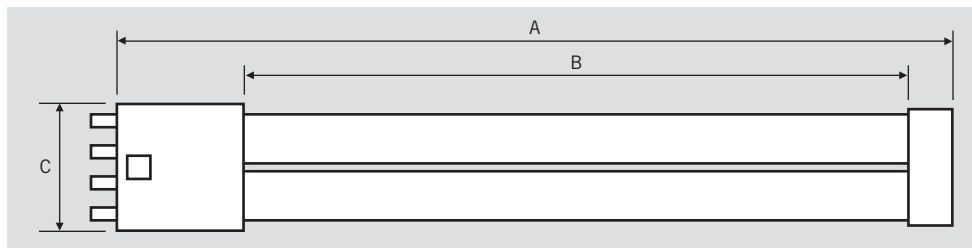
1. Cut all existing connections to ballast as shown below and remove ballast.



2. Re-wire fixture as shown below.



PHYSICAL CHARACTERISTICS



LAMP DIMENSIONS

A (Body Length)	12.2"
B (Illuminated Length)	9.3"
C (Width)	1.7"

BASE TYPE: 2G11



KT-LED10PLL-12GC-8XX-D

PLL LED LAMP

ORDERING INFORMATION

ORDER CODE	PACK QTY.	EASY CODE	UPC
KT-LED10PLL-12GC-830-D	24	HHU-66	843654131184
KT-LED10PLL-12GC-835-D	24	CGN-57	843654131191
KT-LED10PLL-12GC-840-D	24	JLG-84	843654131207
KT-LED10PLL-12GC-850-D	24	IBZ-37	843654131214

CATALOG NUMBER BREAKDOWN

KT-LED10PLL-12GC-8XX-D

1 2 3 4 5 6 7 8 9

- 1 Keystone Technologies
- 2 LED Lamp
- 3 Wattage
- 4 Lamp Type
- 5 Nominal Length (Inches)
- 6 Glass
- 7 800 Series
- 8 Color Temperature
- 9 Direct-Drive Series



KT-LED17PLL-22GC-8XX-D /G2

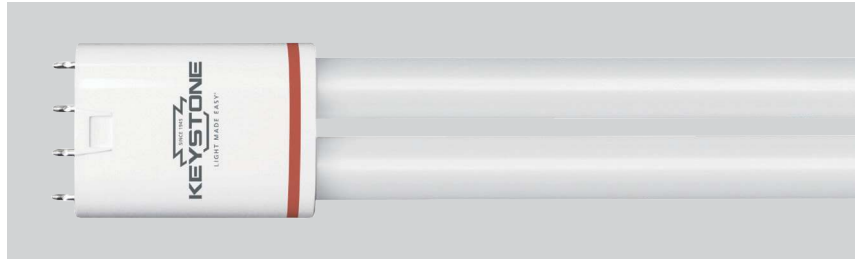
PLL LED LAMP

DESCRIPTION

17W PLL LED | 3000-5000K | >80 CRI | High-Efficiency



LAMP TYPE: PLL
BASE TYPE: 2G11
WATTAGE: 17W
COLOR TEMPERATURE: 3000-5000K
COLOR RENDERING INDEX (CRI): >80
WARRANTY: 5 Years



PRODUCT FEATURES

- Replacement for conventional fluorescent lamp
- UL Classified
- 50,000+ hour lifetime
- Approximately 50% more energy efficient than standard FT40/2G11 lamps
- Environmentally friendly: No mercury used
- Integral driver (isolated) eliminates the need for an external ballast or driver
- Instant startup
- Not dimmable
- Frosted lens eliminates pixelation
- Operating temperature: -20°C/-4°F to 45°C/113°F
- 100+ Lumens per Watt (bare lamp efficacy)
- Suitable for dry and damp locations
- NSF Listed: NSF/ANSI Standard 2 - Food Equipment
- Suitable for enclosed fixture. Minimum lamp compartment dimensions: 61.5cm x 60.5cm x 10.5cm

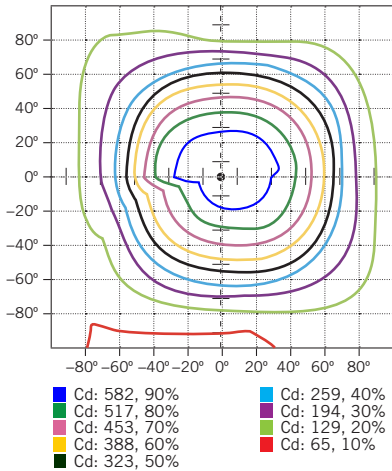
OPERATING SPECIFICATIONS

ELECTRICAL AND PERFORMANCE CHARACTERISTICS

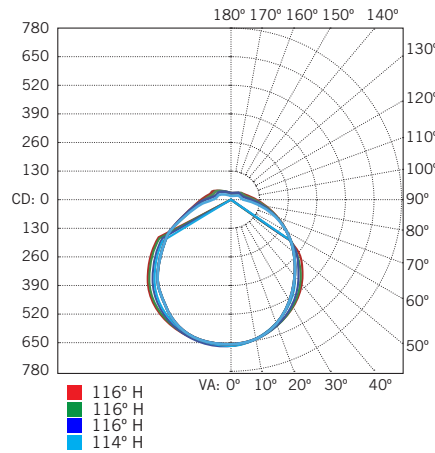
Catalog Number	Input Voltage	CRI	Wattage	Nominal Lumens	Color Temp.	Beam Angle	Efficacy	Power Factor	Max. THD
KT-LED17PLL-22GC-830-D	120-277V	>80	17W	2050	3000K	160°	121 lm/W	>0.9	20%
KT-LED17PLL-22GC-835-D	120-277V	>80	17W	2100	3500K	160°	127 lm/W	>0.9	20%
KT-LED17PLL-22GC-840-D	120-277V	>80	17W	2200	4000K	160°	129 lm/W	>0.9	20%
KT-LED17PLL-22GC-850-D	120-277V	>80	17W	2200	5000K	160°	129 lm/W	>0.9	20%

PHOTOMETRIC SPECIFICATIONS

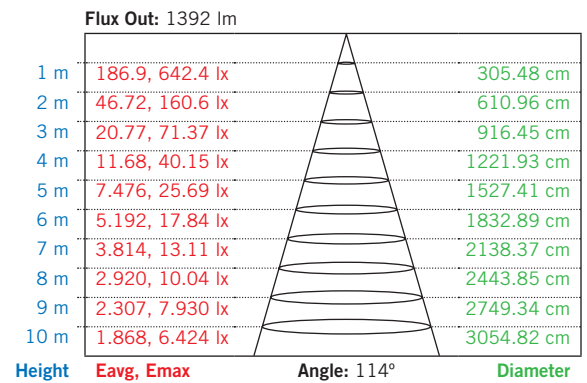
ISOCANDELA PLOT



POLAR CANDELA DISTRIBUTION



LUX DISTANCE CURVE

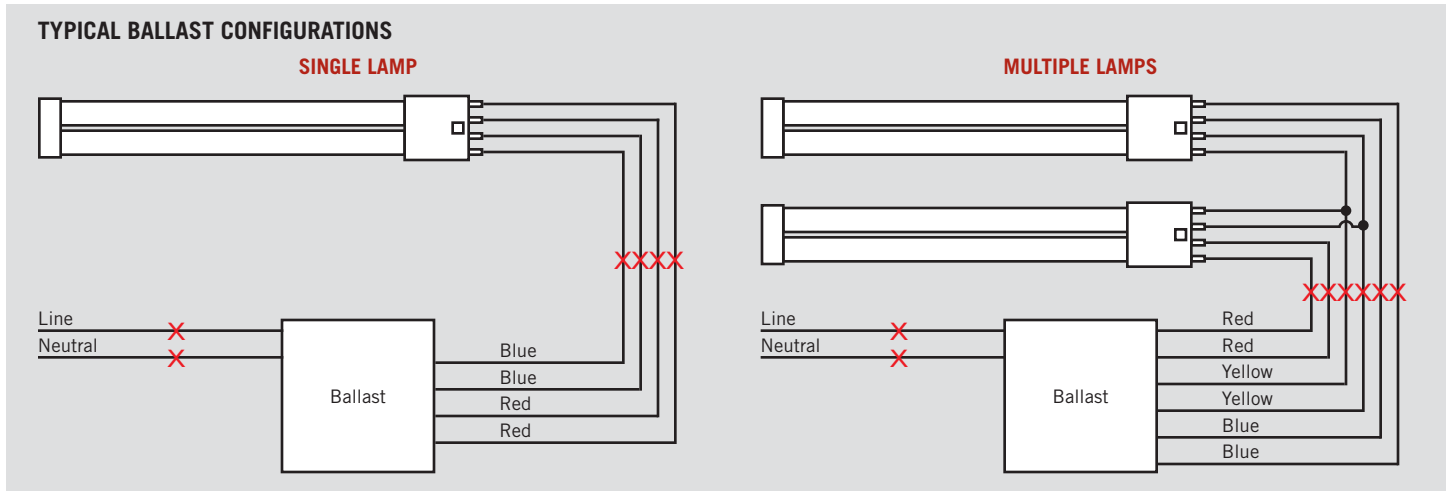


NOTE: Charts are represented by 5000K

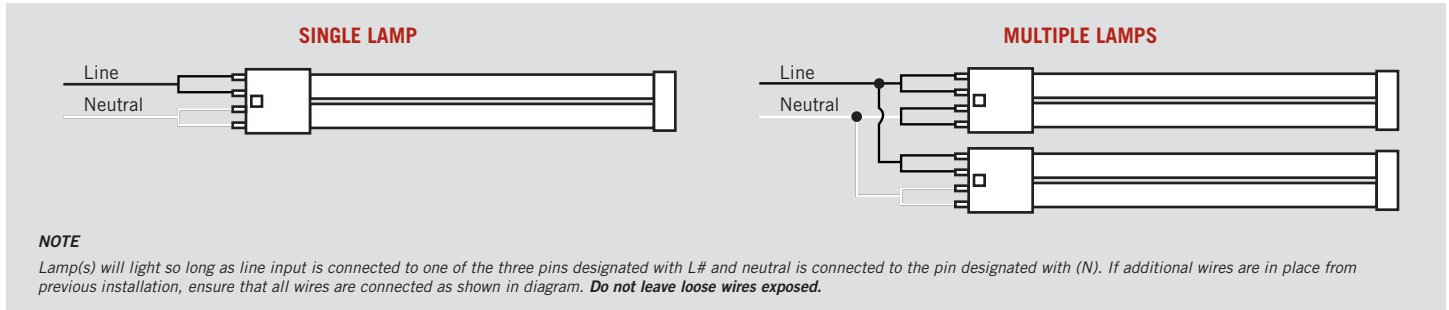
KT-LED17PLL-22GC-8XX-D /G2
PLL LED LAMP

WIRING DIAGRAMS

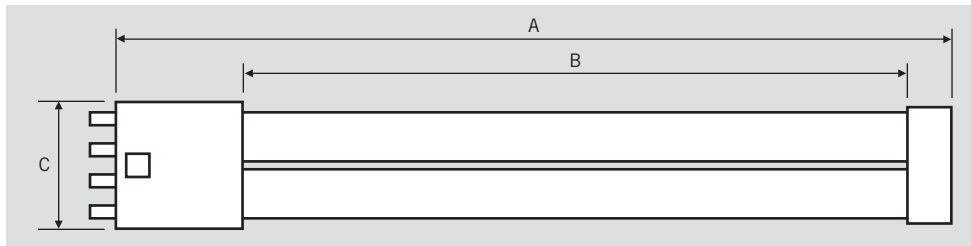
1. Cut all existing connections to ballast as shown below and remove ballast.



2. Re-wire fixture as shown below.



PHYSICAL CHARACTERISTICS



LAMP DIMENSIONS

A (Body Length)	21.8"
B (Illuminated Length)	18.9"
C (Width)	1.7"

BASE TYPE: 2G11



KT-LED17PLL-22GC-8XX-D /G2

PLL LED LAMP

ORDERING INFORMATION

ORDER CODE	PACK QTY.	EASY CODE	UPC
KT-LED17PLL-22GC-830-D /G2	24	YMX-12	843654131108
KT-LED17PLL-22GC-835-D /G2	24	TWJ-68	843654131115
KT-LED17PLL-22GC-840-D /G2	24	SFM-03	843654131122
KT-LED17PLL-22GC-850-D /G2	24	EGB-03	843654131139

CATALOG NUMBER BREAKDOWN

KT-LED17PLL-22GC-8XX-D /G2

1 2 3 4 5 6 7 8 9 10

- 1 Keystone Technologies
- 2 LED Lamp
- 3 Wattage
- 4 Lamp Type
- 5 Nominal Length (Inches)
- 6 Glass
- 7 800 Series
- 8 Color Temperature
- 9 Direct-Drive Series
- 10 2nd Generation



KT-LED18PSHID-E26-8XX-D /G4

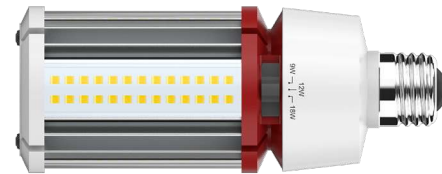
HID REPLACEMENT LED LAMP

DESCRIPTION

18W HID Replacement LED Lamp | Power Select | 80 CRI | IP64



LAMP TYPE: HID Replacement LED
BASE TYPE: E26 (Medium)
SELECTABLE WATTAGE: 18W, 12W, 9W
COLOR TEMPERATURE: 3000K, 4000K, 5000K
METAL HALIDE EQUIVALENT: 70W
COLOR RENDERING INDEX (CRI): > 80
WARRANTY: 5 Years



PRODUCT FEATURES

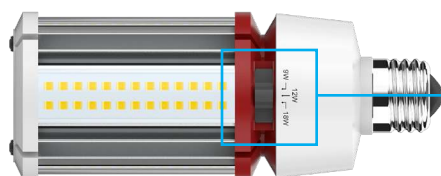
- Replacement for conventional metal halide lamp
- Environmentally friendly: No mercury used
- Instant startup
- Integral driver eliminates the need for external driver or ballast; includes 4kV surge protection
- Not for use with standard dimmers; see instructions
- 50,000+ hour lifetime
- Operating temperature: -30°C/-22°F to 45°C/113°F
- Suitable for use in fully enclosed fixtures
- Minimum lamp compartment dimensions: 6.0" x 6.0" x 6.4"
- UL listed
- IP64 rated; integrated heat sink quickly dissipates heat and guides water intrusion out of the lamp

Lamp does not meet CEC T20 requirements. Not to be sold or offered for sale in California, except when sold wholesale in California for final retail sale outside the state.

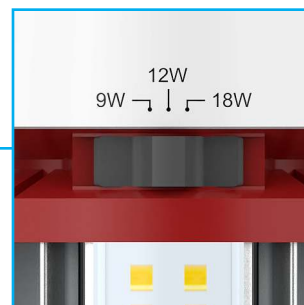
ELECTRICAL AND PERFORMANCE SPECIFICATIONS

Keystone Catalog Number	Input Voltage	Selectable Power	CCT	Lumens	Efficacy	Base Type	CRI	PF
KT-LED18PSHID-E26-830-D /G4	120-277V	18W	3000K	2430	135 lm/W	E26	> 80	≥90
		12W		1620	135 lm/W			
		9W		1215	135 lm/W			
KT-LED18PSHID-E26-840-D /G4	120-277V	18W	4000K	2520	140 lm/W	E26	> 80	≥90
		12W		1680	140 lm/W			
		9W		1260	140 lm/W			
KT-LED18PSHID-E26-850-D /G4	120-277V	18W	5000K	2610	145 lm/W	E26	> 80	≥90
		12W		1740	145 lm/W			
		9W		1305	145 lm/W			

SELECTABILITY



Power Select Switch

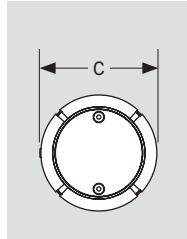
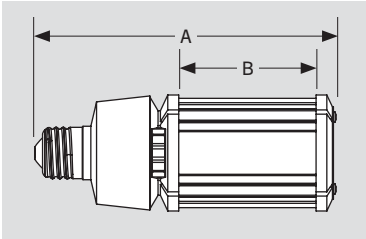




KT-LED18PSHID-E26-8XX-D /G4

HID REPLACEMENT LED LAMP

PHYSICAL CHARACTERISTICS



LAMP DIMENSIONS

A (Body Length)	6.00"
B (Illuminated Length)	3.13"
C (Diameter)	2.32"

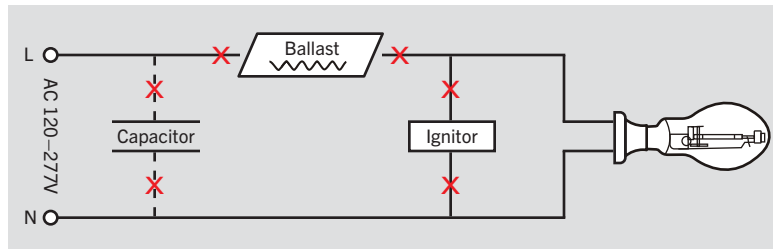
BASE TYPE: E26 (Medium)

WIRING INSTRUCTIONS

STEP 1

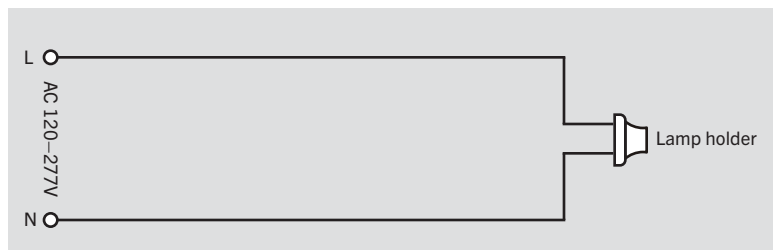
Disconnect power. Disconnect and remove existing ballast, capacitor, and/or ignitor (where applicable) from fixture.

Note: Follow all federal and local regulations when disposing of lamps and removed components.



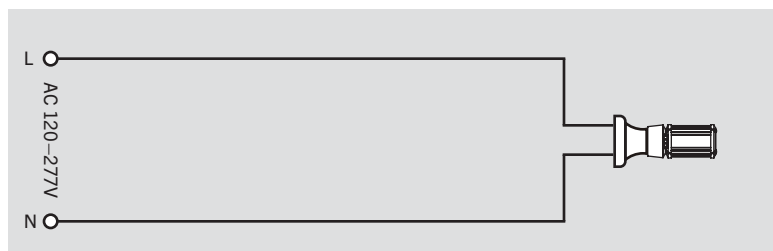
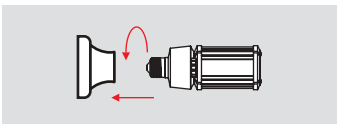
STEP 2

Rewire for line voltage to the lamp socket.



STEP 3

Install new LED replacement lamp. Ensure lamp is operating properly when power is turned on.





KT-LED18PSHID-E26-8XX-D /G4

HID REPLACEMENT LED LAMP

ORDERING INFORMATION

ORDER CODE	PACK QTY.	UPC	EASY CODE
KT-LED18PSHID-E26-830-D /G4	16	843654138121	QGY-82
KT-LED18PSHID-E26-840-D /G4	16	843654138138	ERU-18
KT-LED18PSHID-E26-850-D /G4	16	843654138145	CKR-15


CATALOG NUMBER BREAKDOWN

KT-LED18PSHID-E26-8XX-D /G4

1 2 3 4 5 6 7 8 9 10

- 1 Keystone Technologies
- 2 LED Lamp
- 3 Wattage
- 4 Power Select
- 5 Lamp Type
- 6 Base Type
- 7 80 CRI
- 8 Color Temperature
- 9 Direct Drive
- 10 Fourth Generation

Product Engineer Spec

Product Spec			
Category	LED Lamps	Picture	
Order #	4524		
Item #	LED5A19/45L/950		
Mounting	E26		
Housing color	white		
Electric Characteristics		Photometric Characteristics	
Rated Wattage (W)	5 ±10%	Lumen (lm)	450
Tested Wattage (W)	-	CRI	90
Input Voltage (V)	120	CCT (K)	5000K
Voltage Frequency (Hz)	60Hz	Beam Angle (°)	Omni
Input Current (A)	-		
Power Factor	≥0.9	General Characteristics	
Replacement Wattage (W)	40	Operating Temperature	-4°F~104°F
Surge protect level	-	Storage Temperature	-4°F~140°F
Dimmable	TRIAC	IP rating	-
		Rated Life	25000 hrs
		Warranty	3
Product Dimensions		Suggested Accessory	
Weight (lbs.)	0.119		
MOL (in)	4.25		
DIA (in)	2.36		
Qualifications			
UL/ETL	UL	LM79	√
Energy Star	V2.0	LM80	√
DLC	-	IES File	√
JA8	√	Lighting Facts	√
CEC	V3.0	FDA	-
FCC	√	NEMA	-
RoHS	√	Dimmer List	√
Comments:			

Version	2.1	Date	12/20/24
Prepared By	JC		

PRODUCT SPECIFICATION	
Category	LED MR16
Item Number	4565
Stock Code	LED6MR16/50L/FL/830
Mounting	GU5.3
Housing Color	White



ELECTRICAL CHARACTERISTICS			
Rated Wattage (W)	6	Replacement Wattage (W)	35
Tested Wattage (W)	6		
Input Voltage (V)	12V	Surge Protect Level	-
Voltage Frequency (Hz)	50/60	Dimmable	Yes
Input Current (A)	0.56	AUX (12V) Line	-
Power Factor	>0.9		
THD	-		

PHOTOMETRIC CHARACTERISTICS			
Lumen (lm)	500	CCT (K)	3000K
Efficacy (lm/w)	83	Beam Angle (°)	40°
CRI	80	CBCP	898

GENERAL CHARACTERISTICS	
Operating Temperature (°F)	-4°F ~ 104°
Storage Temperature (°F)	-4°F ~ 140°
IP Rating	Damp Location
IK Rating	-
Rated Life (Hrs)	25,000
Warranty (Yrs)	3

ACCESSORIES		
Item #	Stock Code	Description

PRODUCT DIMENSIONS		
Width- in / (mm)	1.97" / 50	
Height- in / (mm)	1.91" / 48.5	
Depth- in / (mm)	- / -	
IK Rating	-	
Weight (lbs)	1.76oz	
Mounting Height (ft)	-	
Cable Length (ft)	-	

CERTIFICATIONS			
UL/ETL	UL	CEC	
NSF/ETL Sanitation		JA8	
Energy Star		FCC	✓
DLC		RoHs	✓

DOCUMENTS			
LM79	✓	IES File	✓
LM80	✓	Dimmer List	

COMMENTS

Version	2.1	Date	12/20/24
Prepared By	JC		

PRODUCT SPECIFICATION	
Category	LED PAR
Item Number	5925
Stock Code	LED8PAR20/50L/FL/950
Base	E26
Housing Color	White



ELECTRICAL CHARACTERISTICS			
Rated Wattage (W)	8	Replacement Wattage (W)	50
Tested Wattage (W)	8		
Input Voltage (V)	120V	Surge Protect Level	-
Voltage Frequency (Hz)	50/60		
Input Current (A)	0.075	Dimmable	Yes
Power Factor	>0.9	AUX (12V) Line	-
THD	-		

PHOTOMETRIC CHARACTERISTICS			
Lumen (lm)	500	CCT (K)	5000K
Efficacy (lm/w)	63	Beam Angle (°)	40°
CRI	90	CBCP	1031

GENERAL CHARACTERISTICS	
Operating Temperature (°F)	-4°F ~ 104°
Storage Temperature (°F)	-4°F ~ 140°
IP Rating	Damp Location
IK Rating	-
Rated Life (Hrs)	25,000
Warranty (Yrs)	5

ACCESSORIES		
Item #	Stock Code	Description

PRODUCT DIMENSIONS		
Width- in / (mm)	2.50" / 63.5	
Height- in / (mm)	3.50" / 88.9	
Depth- in / (mm)	- / -	
IK Rating	-	
Weight (lbs)	3.68oz	
Mounting Height (ft)	-	
Cable Length (ft)	-	

CERTIFICATIONS			
UL/ETL	UL	CEC	
NSF/ETL Sanitation		JA8	
Energy Star		FCC	✓
DLC		RoHs	✓

DOCUMENTS			
LM79	✓	IES File	✓
LM80	✓	Dimmer List	

COMMENTS

Version	2.1	Date	12/20/24
Prepared By	JC		

PRODUCT SPECIFICATION	
Category	LED Lamp
Item Number	4587
Stock Code	LED9A19/EC/81L/940
Mounting	E26
Housing Color	White



ELECTRICAL CHARACTERISTICS			
Rated Wattage (W)	9	Replacement Wattage (W)	60
Tested Wattage (W)	9		
Input Voltage (V)	120V	Surge Protect Level	-
Voltage Frequency (Hz)	60		
Input Current (A)	0.08	Dimmable	Yes
Power Factor	>0.9	AUX (12V) Line	-
THD	-		

PHOTOMETRIC CHARACTERISTICS			
Lumen (lm)	810	CCT (K)	4000K
Efficacy (lm/w)	90	Beam Angle (°)	Omni
CRI	90		

GENERAL CHARACTERISTICS	
Operating Temperature (°F)	-4°F ~ 104°
Storage Temperature (°F)	-4°F ~ 140°
IP Rating	Damp Location
IK Rating	-
Rated Life (Hrs)	25,000
Warranty (Yrs)	3

ACCESSORIES		
Item #	Stock Code	Description

PRODUCT DIMENSIONS		
Width- in / (mm)	2.36" 59.94	
Height- in / (mm)	4.25" 107.95	
Depth- in / (mm)	- -	
IK Rating	-	
Weight (lbs)	1.67oz	
Mounting Height (ft)	-	
Cable Length (ft)	-	

CERTIFICATIONS			
UL/ETL	UL	CEC	✓
NSF/ETL Sanitation		JA8	✓
Energy Star		FCC	✓
DLC		RoHs	✓

DOCUMENTS			
LM79	✓	IES File	✓
LM80	✓	Dimmer List	

COMMENTS

A19/A21 LAMPS

PROJECT: _____

SCHEDULE: _____ DATE: _____

PREPARE BY: _____

NOTES: _____

DESCRIPTION

naturaLED® offers various direct replacement for A- lamps for your decorative lighting, which is free of mercury and lead, JA8 Listed and dimmability functions. Our A19/A21 comes in the choice of 5 watt, 9 watt, 12 watt and 17 watt to replace your existing incandescent up to 100 watt, saving up to 75% of energy. It is a great value energy efficient lamp, using less energy and lasts up to 25,000 hours average life. naturaLED® lamps are ideal lighting solution for track lights, display lights, hotel boutiques, residential, retail, museum lighting and any hospitality applications.



Rated Life Hours 25,000
Warranty 3 Years

APPLICATIONS

Residential, Decorative, Recessed Downlight, Track , Accent, Retail, Restaurant, Hospitality Lighting

FEATURES

- UL Damp
- Title20/JA8
- Color Temp: 2700K, 3000K, 4000K, 5000K
- Voltage: 120V
- Power Factor: >0.9
- Dimmable
- CRI: >90
- Operating temperature: - 4°F - 104°F
- Instant on / Uniform light distribution and consistent color
- Up to 70% energy savings
- Omni-directional
- Direct Replacement traditional incandescent design
- Contains no mercury or lead
- 3Year Warranty
- 25,000 hrs rated average life

What is CRI 90



CRI80

High CRI with LED

Color Rendering Index (CRI) describes how an object appears to the human eye based on ideal or natural light source. The CRI is an index, a measure, that tells something about how colors are represented by light coming from a certain light bulb, compared to how the colors are rendered with the light coming from a reference illuminant.



CRI90

The CRI reports a unit less value, that can differ between 0 and 100. The value 100 means that there is no difference in color rendition between the light of the observed light bulb and the light of the reference illuminant. Lighting with a CRI of 85 to 90 is typically "excellent" at rendering colors of objects while CRI90 or greater are "superior".

SAMPLE NUMBER LED12A19/110L/927

STYLE	WATTAGE	SERIES	LUMENS	CRI/COLOR TEMP
LED	12	A19	110L	927
LED Lighting	12 Watt	A19 Lamp	1,100 Lumens	CRI 90 2700K



ORDERING

Watts (W)	Ordering Code	Description	CCT (K)	Lumens (Lm)	Base	CRI	Equiv. Wattage (W)	Damp Location
12	4513	LED12A19/110L/927	2700K	1,100	E26	90	75	•
12	4528	LED12A19/110L/930	3000K	1,100	E26	90	75	•
12	4533	LED12A19/110L/940	4000K	1,100	E26	90	75	•
12	4529	LED12A19/110L/950	5000K	1,100	E26	90	75	•
17	4514	LED17A21/160L/927	2700K	1,600	E26	90	100	•
17	4530	LED17A21/160L/930	3000K	1,600	E26	90	100	•
17	4531	LED17A21/160L/950	5000K	1,600	E26	90	100	•
5	4524	LED5A19/45L/950	5000K	450	E26	90	40	•
6	5948	LED6A19/48L/850	5000K	480	E26	80	40	•
6.5	4512	LED6.5A19/48L/927	2700K	480	E26	90	40	•
9	4525	LED9A19/81L/927	2700K	810	E26	90	60	•
15	5962	LED15A21/160L/830	3000K	1,600	E26	80	100	•

DIMENSIONS

6.5-Watt
1.91-oz



9 Watt
1.97-oz



12 Watt
3.20-oz

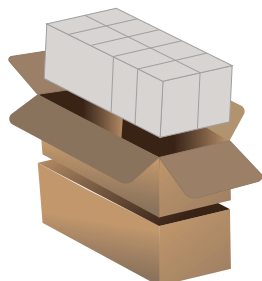


17 Watt
5.62-oz



PACKAGE

Case Qty 20 pcs
(10 for inner package)



SWP ADJUSTABLE SLIM WALL PACK

DESCRIPTION

naturaLED® slim, low-profile cutoff wall pack with the smooth contemporary design. Well-engineered, high-quality die-cast aluminum, delivering bright, crisp light. The excellent thermal design ensures our SWP's performance over rated life. Installation is made simple and easy with an adjustable angle and hinged junction box. Our Slim Wall Packs are available in 15W, 28W and 45W with color options of Black and Bronze. Optional 3/4" knuckle-mount, adjustable swivel bracket or slip fitter provides you the flexibility for your application. SWP is ideal for landscape, wall/surface, low-level pathway, apartment buildings, schools and multi-use facilities.

APPLICATIONS

Security, Pathway, Perimeter, Entryway, Area Lighting, and building facades

FEATURES

- DLC Premium
- IP65 Rated
- ETL Listed
- ADA Compliance (4" Depth)
- ColorTemp: 4000K, 5000K
- Voltage: 120-277V
- Surge Protection: 15W= 2KV, 28/45W= 4KV
- Beam Angle: 140°
- Dimmable: 1-10V (28W/45W)
- CRI: 80
- Operating Temperature: -22°F - 122°F
- Adjustable fixture angle
- 1/2" NPT Knock Out
- Photocell Sensor Compatible
- Material: Die Cast Aluminum
- Finish: Corrosion Resistant Powder Coating
- Colors: Dark Bronze / Black
- 5 Year Warranty
- Optional for Purchase: Photocell Sensor, Slip Fitter, Swivel Bracket, 3/4" NPT Knuckle Mount

PROJECT:

SCHEDULE:

DATE:

PREPARE BY:

NOTES:







Adjustable Angle



Rated Life 50,000 Hours
Warranty 5 Years

ACCESSORIES

	Photocell Sensor
	Slip Fitter
	Swivel Bracket
	Knuckle Mount

SAMPLE NUMBER LED-FXSWP15/840/DB

STYLE	FAMILY	SERIES	WATTAGE	CRI/COLOR TEMP	FINISH COLOR
LED	FX	SWP	15	840	DB
LED Lighting	Fixture	Slim Wall Pack	15 Watt	CRI 80 4000K	Dark Bronze



ADJUSTABLE SLIM WALL PACK

WALL & AREA LUMINAIRES

ORDERING

*P= Premium DLC / *S = Standard DLC

Watts (W)	Ordering Code	Description	CCT (K)	Lumens (Lm)	Equiv. Wattage (W)	Dim (V)	Depth*	Color	IP65 Rated	DLC (S/P)
15	9302	LED-FXSWP15/850/DB	5000K	2,062	100	-	4"	Dark Bronze	•	-
15	9308	LED-FXSWP15/850/BK	5000K	2,062	100	-	4"	Black	•	-
28	9304	LED-FXSWP28/850/DB	5000K	3,513	175	1-10V	4"	Dark Bronze	•	P
28	9309	LED-FXSWP28/840/BK	4000K	3,418	175	1-10V	4"	Black	•	P
28	9310	LED-FXSWP28/850/BK	5000K	3,513	175	1-10V	4"	Black	•	P
45	9311	LED-FXSWP45/840/BK	4000K	5,539	250	1-10V	4"	Black	•	P
45	9312	LED-FXSWP45/850/BK	5000K	5,680	250	1-10V	4"	Black	•	P

*Accessible for Americans with Disability Act

ACCESSORIES (Ordered Separately)

Slip Fitter



P10076 MT-SF-SWP/DB
(Slip Fitter Dark Bronze)



P10007 MT-SF-SWP/BK
(Slip Fitter Black)



Knuckle Mount



P10075 MT-KNC-SWP/DB
(3/4" NPT Knuckle Dark Bronze)



P10006 MT-KNC-SWP/BK
(3/4" NPT Knuckle Black)



Swivel Bracket



P10074 MT-SB-SWP/DB
(Swivel Bracket Dark Bronze)



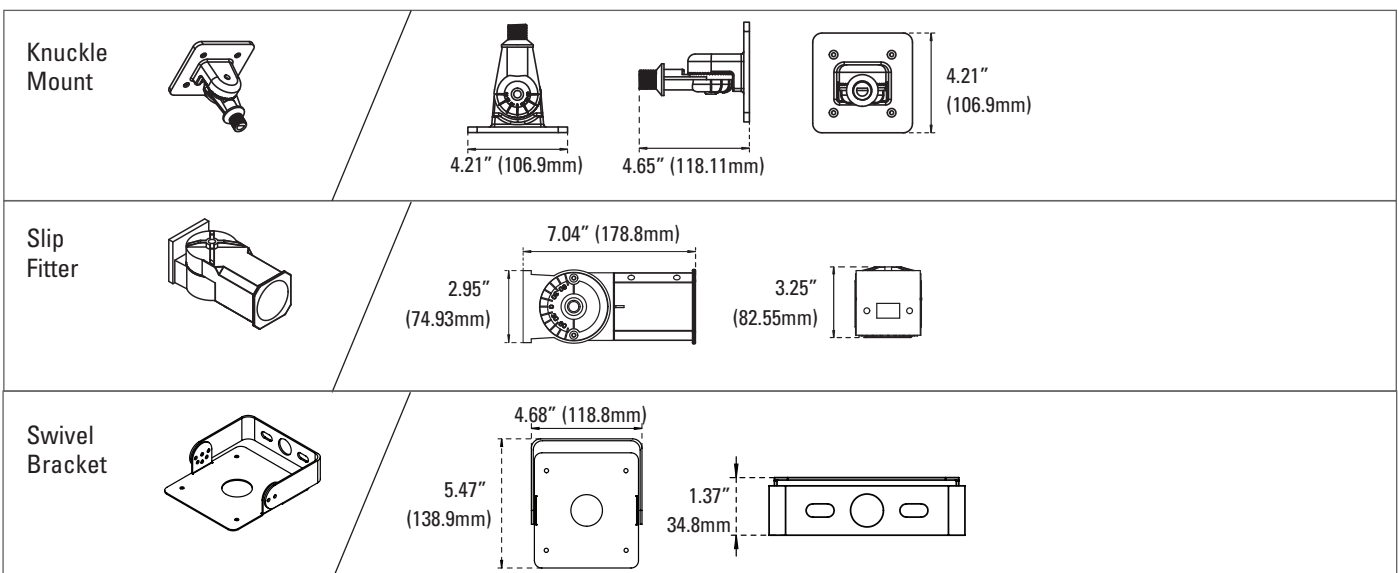
P10005 MT-SB-SWP/BK
(Swivel Bracket Black)



Photocell Sensor

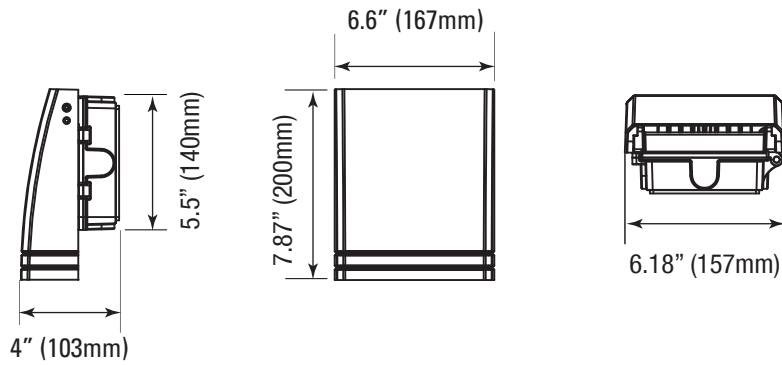


P10036 SEN-PHO-BT-MT/MV
(Button Photocell 120-277V)



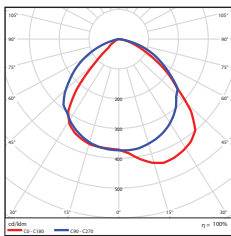
DIMENSIONS

15W / 28W / 45W
5.45-lbs



PHOTOMETRICS CHART

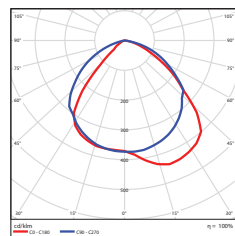
15 Watt



Center Beam Fc	Beam Width
2.5R	11.7 fc 5.3 R 6.0 R
5.0R	29.2 fc 10.6 R 13.5 R
7.5R	13.0 fc 15.8 R 20.3 R
10.0R	7.31 fc 21.1 R 27.0 R
12.5R	4.68 fc 26.4 R 33.8 R
15.0R	3.25 fc 31.7 R 40.5 R

Vert. Spread: 93.1°
Horiz. Spread: 107.0°

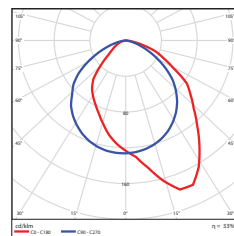
28 Watt DLC Premium



Center Beam Fc	Beam Width
2.5R	206 fc 4.2 R 6.3 R
5.0R	51.6 fc 8.5 R 12.6 R
7.5R	22.9 fc 12.7 R 18.9 R
10.0R	12.9 fc 17.0 R 25.2 R
12.5R	8.25 fc 21.2 R 31.6 R
15.0R	5.73 fc 25.5 R 37.9 R

Vert. Spread: 80.7°
Horiz. Spread: 103.2°

45 Watt DLC Premium

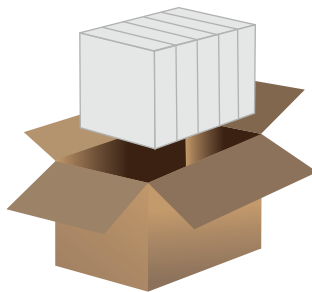


Center Beam Fc	Beam Width
2.5R	286 fc 3.6 R 5.4 R
5.0R	71.6 fc 7.2 R 10.9 R
7.5R	31.8 fc 10.8 R 16.3 R
10.0R	17.9 fc 14.4 R 21.7 R
12.5R	11.5 fc 18.0 R 27.2 R
15.0R	7.96 fc 21.6 R 32.6 R

Vert. Spread: 71.6°
Horiz. Spread: 94.8°

PACKAGE

Case Qty 5 pcs



Version	2.0	Date	8/19/25
Prepared By	JC		

PRODUCT SPECIFICATION

Category	Floodlight
Item Number	9798
Stock Code	BFS20S/55/8C3/BZ/PHO-KNC
Mounting	Knuckle Mount 1/2" knuckle NPT
Housing Color	Bronze



ELECTRICAL CHARACTERISTICS			
Rated Wattage (W)	10/15/20	Replacement Wattage (W)	100-150
Tested Wattage (W)			
Input Voltage (V)	120-277V		
Voltage Frequency (Hz)	50/60	Surge Protect Level	2KV
Input Current (A)	0.18	Dimmable	-
Power Factor	>0.9	AUX (12V) Line	-
THD	<20%		

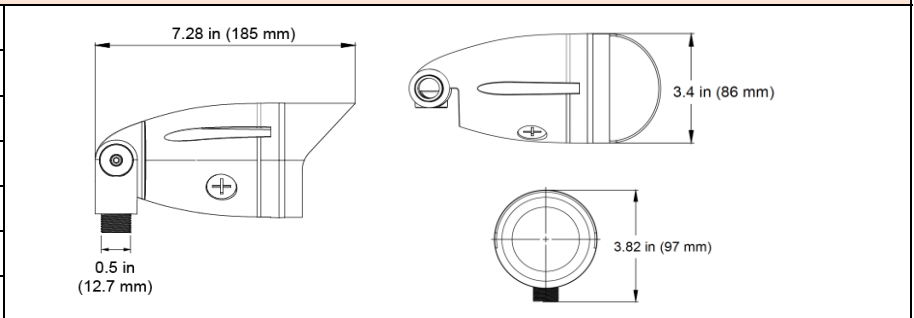
PHOTOMETRIC CHARACTERISTICS			
Lumen (lm)	1,050	CCT (K)	CCT3 (30/40/50K)
	1,575		
	2,100		
Efficacy (lm/w)	105lm/w@3000K 115lm/w@4000K 110lm/w@5000K	Beam Angle (°)	5x5
CRI	>80		

GENERAL CHARACTERISTICS	
Operating Temperature (°F)	-40°F ~ 122°F
Storage Temperature (°F)	-40°F ~ 140°F
IP Rating	IP65
Rated Life (Hrs)	50,000
Warranty (Yrs)	5

ACCESSORIES		
Item #	Stock Code	Description

PRODUCT DIMENSIONS

Length- in / (mm)	7.28"	185
Width- in / (mm)	3.40"	86
Height- in / (mm)	3.82"	97
EPA (ft²)	-	
Weight (lbs)	1.39	
Mounting Height (ft)	-	
Cable Length (ft)	-	



CERTIFICATIONS			
UL/ETL	ETL, cETL	CEC	
NSF/ETL Sanitation		JA8	
Energy Star		FCC	✓
DLC	5.1S	RoHs	✓

DOCUMENTS			
LM79		IES File	✓
LM80	✓	Dimmer List	
Title 20		TAA	
Title 24			

COMMENTS

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Attachment C: Mechanical Systems

City of Patterson

Detailed HVAC Inventory - City of Patterson - Aquatic Center



City of Patterson: Add Controls to Select HVAC Units																
General Information				Existing Equipment Data										Proposed Controls Data		
Map ID Tag	Site	Building	Unit Location	System Type	Make	Model	Mfg. Year	Size Tons (pre)	SEER (pre)	Unit Condition	Replace Unit? (Y/N)	Add Controls? (Y/N)	Proposed System Type	Size Tons	SEER	
No ID tag	Aquatic Center	Main	Rooftop	Split Condenser	No Access	-	-	3	14	Good	N	Y	Install WiFi Programmable Thermostats	3	14	
No ID tag	Aquatic Center	Main	Rooftop	Split Condenser	No Access	-	-	3	14	Good	N	Y	Install WiFi Programmable Thermostats	3	14	

Detailed HVAC Inventory - City of Patterson - City Hall

City of Patterson: Add Controls to Select HVAC Units															
General Information				Existing Equipment Data									Proposed Controls Data		
Map ID Tag	Site	Building	Unit Location	System Type	Make	Model	Mfg. Year	Size Tons (pre)	SEER (pre)	Unit Condition	Replace Unit? (Y/N)	Add Controls? (Y/N)	Proposed System Type	Size Tons	SEER
No ID tag	City Hall	Main	Ground Mount	Ductless Split Condenser	Mr Cool	A-24-HP-C-230G	2021	2	19	Good	N	N	No Change	2	19
No ID tag	City Hall	Main	Basement	HHW Boiler Nat. Gas	LAARS	SMB-250N	2005	-	N/A	Poor	Y	N	No Change	-	N/A
No ID tag	City Hall	Main	Basement	1-HP HHW Pump	Baldor	VEJMM3116T	2005	-	N/A	Poor	Y	N	No Change	-	N/A
AH-1	City Hall	Main	Basement	Air Handler	McQuay	CAH031GDAM	2005	-	N/A	Poor	N	Y	RCx of SP fan controls and sensors	-	N/A
No ID tag	City Hall	Main	Basement	Wall Mount Heat-Pump	Marvair	AVP24ACC00M	2006	2	10	Poor	Y	N	No Change	2	23
No ID tag	City Hall	Main	Rooftop	Gas Package	Trane	YHC036A3RLA0R000	2006	3	12	Poor	Y	Y	Install WiFi Programmable Thermostat & Gateway	3	15.2
No ID tag	City Hall	Main	Rooftop	Air-Cooled Condensing Unit	McQuay	AC2050BC12-ER11	2006	50	12	Poor	Y	N	No Change	50	15.6

Detailed HVAC Inventory - City of Patterson - Corporate Yard



City of Patterson: Add Controls to Select HVAC Units															
General Information				Existing Equipment Data									Proposed Controls Data		
Map ID Tag	Site	Building	Unit Location	System Type	Make	Model	Mfg. Year	Size Tons (pre)	SEER (pre)	Unit Condition	Replace Unit? (Y/N)	Add Controls? (Y/N)	Proposed System Type	Size Tons	SEER
No ID tag	Corporate Yard	Main	Ground Mount	Ductless Split Condenser	Cooper	CH18MSPH230V0	2022	2	23	Good	N	N	No Change	2	23
No ID tag	Corporate Yard	Main	Ground Mount	Split Condenser	Trane	4TWZ0048A1000AA	2009	4	14	Poor	Y	Y	Install WiFi Programmable Thermostats	4	15
No ID tag	Corporate Yard	Main	Ground Mount	Split Condenser	Trane	4TWZ0060A1000AA	2009	5	14	Poor	Y	Y	Install WiFi Programmable Thermostats	5	15
No ID tag	Corporate Yard	Main	Ground Mount	Split Condenser	Trane	4TWZ0060A1000AA	2009	5	14	Poor	Y	Y	Install WiFi Programmable Thermostats	5	15

Detailed HVAC Inventory - City of Patterson - Fire Station #1



City of Patterson: Add Controls to Select HVAC Units															
General Information				Existing Equipment Data									Proposed Controls Data		
Map ID Tag	Site	Building	Unit Location	System Type	Make	Model	Mfg. Year	Size Tons (pre)	SEER (pre)	Unit Condition	Replace Unit? (Y/N)	Add Controls? (Y/N)	Proposed System Type	Size Tons	SEER
No ID tag	Fire Station #1	Main	Rooftop	Gas Package	Bryant	582KP05A067A2A0AAA	2022	4	14	Good	N	Y	Install WiFi Programmable Thermostats	4	14
No ID tag	Fire Station #1	Main	Rooftop	Gas Package	Bryant	Illegible	-	4	12	Poor	Y	Y	Install WiFi Programmable Thermostats	4	16
No ID tag	Fire Station #1	Main	Rooftop	Gas Package	Rheem	RGEA14036AJT06XAB	2020	3	14	Good	N	Y	Install WiFi Programmable Thermostats	3	14
No ID tag	Fire Station #1	Main	Ground Mount	Ductless Split Condenser	BDP	DAQMA-S122-3AAA	2015	1	16	Good	N	N	No Change	1	16
No ID tag	Fire Station #1	Main	Rooftop	Ductless Split Heat-Pump Condenser	LG	LSU180HEV	-	2	20	Good	N	N	No Change	2	20

Detailed HVAC Inventory - City of Patterson - Fire Station #2



City of Patterson: Add Controls to Select HVAC Units															
General Information				Existing Equipment Data									Proposed Controls Data		
Map ID Tag	Site	Building	Unit Location	System Type	Make	Model	Mfg. Year	Size Tons (pre)	SEER (pre)	Unit Condition	Replace Unit? (Y/N)	Add Controls? (Y/N)	Proposed System Type	Size Tons	SEER
AC-1	Fire Station #2	Main	Rooftop	Gas Package	Trane	YHC043	-	4	11.7	Poor	Y	Y	Install WiFi Programmable Thermostats	4	16
AC-2	Fire Station #2	Main	Rooftop	Gas Package	Trane	YHC063	-	5	11.7	Poor	Y	Y	Install WiFi Programmable Thermostats	5	15
AC-3	Fire Station #2	Main	Rooftop	Gas Package	Trane	YHC063	-	5	11.7	Poor	Y	Y	Install WiFi Programmable Thermostats	5	15
CU-1	Fire Station #2	Main	Rooftop	Ductless Split Condenser	No Namepla	-	-	2	12.0	Poor	Y	N	No Change	2	23

Detailed HVAC Inventory - City of Patterson - Hammon Senior Center



City of Patterson: Add Controls to Select HVAC Units															
General Information				Existing Equipment Data									Proposed Controls Data		
Map ID Tag	Site	Building	Unit Location	System Type	Make	Model	Mfg. Year	Size Tons (pre)	SEER (pre)	Unit Condition	Replace Unit? (Y/N)	Add Controls? (Y/N)	Proposed System Type	Size Tons	SEER
No ID tag	Hammon Senior Center	Main	Rooftop	Ductless Split Condenser	Bryant	38MAQB36R-301	2017	3	20	Good	N	N	No Change	3	20
CU-3	Hammon Senior Center	Main	Rooftop	Split Condenser	York	YCHD60S43S1A	2017	5	14	Good	N	Y	Install WiFi Programmable Thermostats	5	14
CU-4	Hammon Senior Center	Main	Rooftop	Split Condenser	York	YCHD60S43S1A	2017	5	14	Good	N	Y	Install WiFi Programmable Thermostats	5	14
CU-2	Hammon Senior Center	Main	Rooftop	Split Condenser	York	YCHD60S43S1A	2017	5	14	Good	N	Y	Install WiFi Programmable Thermostats	5	14
CU-1	Hammon Senior Center	Main	Rooftop	Split Condenser	York	YCHD60	2017	5	14	Good	N	Y	Install WiFi Programmable Thermostats	5	14
CU-5	Hammon Senior Center	Main	Rooftop	Split Condenser	York	YCHD48	2017	4	14	Good	N	Y	Install WiFi Programmable Thermostats	4	14
CU-8	Hammon Senior Center	Main	Rooftop	Split Condenser	York	YCHD48	2017	4	14	Good	N	Y	Install WiFi Programmable Thermostats	4	14
CU-9	Hammon Senior Center	Main	Rooftop	Split Condenser	York	YCHD60	2017	5	14	Good	N	Y	Install WiFi Programmable Thermostats	5	14
CU-6	Hammon Senior Center	Main	Rooftop	Split Condenser	York	YCHD36	2017	3	14	Good	N	Y	Install WiFi Programmable Thermostats	3	14
CU-7	Hammon Senior Center	Main	Rooftop	Split Condenser	York	No Nameplate	-	3	14	Good	N	Y	Install WiFi Programmable Thermostats	3	14

Detailed HVAC Inventory - City of Patterson - Museum



City of Patterson: Add Controls to Select HVAC Units															
General Information				Existing Equipment Data									Proposed Controls Data		
Map ID Tag	Site	Building	Unit Location	System Type	Make	Model	Mfg. Year	Size Tons (pre)	SEER (pre)	Unit Condition	Replace Unit? (Y/N)	Add Controls? (Y/N)	Proposed System Type	Size Tons	SEER
No ID tag	Museum	Main	Ground Mount	Split Condenser	Carrier	38TXA042	2000	3.5	12	Poor	N	N	No Change	3.5	12

Detailed HVAC Inventory - City of Patterson - Old Corporate Yard



City of Patterson: Add Controls to Select HVAC Units															
General Information				Existing Equipment Data									Proposed Controls Data		
Map ID Tag	Site	Building	Unit Location	System Type	Make	Model	Mfg. Year	Size Tons (pre)	SEER (pre)	Unit Condition	Replace Unit? (Y/N)	Add Controls? (Y/N)	Proposed System Type	Size Tons	SEER
No ID tag	Old Corporate Yard	Main	Ground Mount	Ductless Split Condenser	Mr Cool	Multi2-18HP230V1	-	2	16	Good	N	N	No Change	2	16
No ID tag	Old Corporate Yard	Main	Window	Window Mount AC	Frigidaire	No Access	0	1	9	Good	N	N	No Change	1	9
No ID tag	Old Corporate Yard	Main	Rooftop	Evaporative Cooler			0	-	-	Good	N	N	No Change	-	-

Detailed HVAC Inventory - City of Patterson - Temporary Police Station



City of Patterson: Add Controls to Select HVAC Units															
General Information				Existing Equipment Data									Proposed Controls Data		
Map ID Tag	Site	Building	Unit Location	System Type	Make	Model	Mfg. Year	Size Tons (pre)	SEER (pre)	Unit Condition	Replace Unit? (Y/N)	Add Controls? (Y/N)	Proposed System Type	Size Tons	SEER
No ID tag	Temporary Police Station	Portable	Exterior	Wall Mount Heat-Pump	Bard		2022	4	11	Good	N	N	No Change	4	11
No ID tag	Temporary Police Station	Portable	Exterior	Wall Mount Heat-Pump	Bard		2022	4	11	Good	N	N	No Change	4	11
No ID tag	Temporary Police Station	Portable	Exterior	Wall Mount Heat-Pump	Bard		2006	3	11	Good	N	N	No Change	3	11
No ID tag	Temporary Police Station	Portable	Exterior	Wall Mount Heat-Pump	Bard		2006	3	11	Good	N	N	No Change	3	11
No ID tag	Temporary Police Station	Portable	Exterior	Wall Mount Heat-Pump	Bard		2006	3	11	Good	N	N	No Change	3	11
No ID tag	Temporary Police Station	Portable	Exterior	Wall Mount Heat-Pump	Bard		2006	3	11	Good	N	N	No Change	3	11
No ID tag	Temporary Police Station	Portable	Exterior	Wall Mount Heat-Pump	Bard		2006	3	11	Good	N	N	No Change	3	11
No ID tag	Temporary Police Station	Portable	Exterior	Wall Mount Heat-Pump	Bard		2006	3	11	Good	N	N	No Change	3	11
No ID tag	Temporary Police Station	Portable	Exterior	Wall Mount Heat-Pump	Bard		2006	3	11	Good	N	N	No Change	3	11
No ID tag	Temporary Police Station	Locker Rms	Exterior	Ductless Split Heat-Pump Condenser	Carrier	38MGHBQ36DA3	2024	3	20	Good	N	N	No Change	3	20
No ID tag	Temporary Police Station	Portable	Window	Window Mount AC	No Namepl	-	-	1	9	Good	N	N	No Change	1	9
No ID tag	Temporary Police Station	Portable	Window	Window Mount AC	No Namepl	-	-	1	9	Good	N	N	No Change	1	9

Detailed HVAC Inventory - City of Patterson - Waste Water Treatment Plant



City of Patterson: Add Controls to Select HVAC Units															
General Information				Existing Equipment Data									Proposed Controls Data		
Map ID Tag	Site	Building	Unit Location	System Type	Make	Model	Mfg. Year	Size Tons (pre)	SEER (pre)	Unit Condition	Replace Unit? (Y/N)	Add Controls? (Y/N)	Proposed System Type	Size Tons	SEER
No ID tag	WWTP North	Lab	Rooftop	Gas Package	Carrier	No Access	-	8	10	Poor	N	N	No Change	8	10
No ID tag	WWTP North	Lab	Rooftop	Gas Package	Carrier	No Access	-	2	10	Poor	N	N	No Change	2	10
No ID tag	WWTP South	MCCD	Window	Window Mount AC	No Name Pla		-	1	9	Poor	N	N	No Change	1	9
No ID tag	WWTP South	Office Portab	Exterior	Wall Mount Heat-Pump	Bard	Illegible	-	4	9	Poor	N	N	No Change	4	9
No ID tag	WWTP South	Electrical	Ground Mount	Package Heat-Pump	Carrier	50TCQA07A2A6A0A0A0AB	2015	6	14	Good	N	N	No Change	6	14

COVER

Project Name: City Hall - City of Patterson

Date: 09/03/2025

Location: Patterson, CA

Attention: Tim McKeveny

Mark For	Qty	Model Number	Description
	1	38RCD0505G-2G09D	AIR-COOLED CONDENSING UNIT <ul style="list-style-type: none">• 208/230-3-60• 050• Dual Refrigeration Circuit• BACNET IP + BACNET MSTP• Single Point, No Disconnect• No PRVs• Variable Compressor with Standard Interrupt• With Accumulator & Check Valves• Copper/Aluminum Coil• PIC6+ EMM• Skid Only• Sound Treatment with Blanket• Full Hail Guard• Green Speed
	1		Start-up, First Unit
	1	48NGUB360605	3T R454b Gas/Electric RTU, 3 Tons 208/3
	1		Verical Drybulb Economizer
	1		Curb Adapter
	1	RAV-HB241KRTP-UL	TC 24K High Wall
	1	RAV-BP241AT2P-UL	TC 24K SDI Condensing Unit, 2 Tons, 208/1
	1	RBC-AWSU52-UL	TC Wired Remote Controller



Performance Report

Project Name:
City of Patterson City Hall

Tag Name:
50 T DX Condenser

Submitted by: Ryan Walsh

Tag Name: 50 T DX Condenser 38RC Gemini Select Air Cooled Condensing Unit

Unit Information	
Model Number	38RCD0505GA3D09D
Unit Quantity	1
Condenser Type	Air Cooled Condenser
Manufacturing Source	Charlotte, NC USA
Refrigerant Type	R-32
Refrigerant Weight	lb 93
Rigging Weight	lb 2453
Operating Weight	lb 2546
Unit Dimensions (L x W x H)	in 98 x 88 x 79
Linear Pipe Length	ft 0.0
Liquid Line Connection Size	in 5/8 (A), 5/8 (B)
Suction Line Connection Size	in 1 3/8 (A), 1 3/8 (B)

Operating Conditions	
Condenser	Al/Cu Condenser Coil
Number of Circuits	Dual Refrigeration Circuit
Capacity Split (Ckt A/Ckt B)	% 47/53
Entering Air Temperature	°F 95.0
Number of Fans	3
Total Condenser Fan Airflow	CFM 33410
Altitude	ft 0
Suction Line Loss	°F 2.0
Sat. Condensing Temp (Ckt A)	°F 131.26
Sat. Condensing Temp (Ckt B)	°F 135.29
Sat. Discharge Temp (Ckt A)	°F 131.51
Sat. Discharge Temp (Ckt B)	°F 135.58
Sat. Suction Temp	°F 45.00

Performance Information	
Condenser Total Fan Power	kW 3.534
Compressor Power	kW 51.50
Capacity Control Steps	4
Total Capacity	Tons 50.58
Circuit A Capacity	Tons 23.76
Circuit B Capacity	Tons 26.82
Efficiency @ AHRI Conditions	BTU/(W-hr) 11.25
Efficiency @ Operating Conditions	BTU/(W-hr) 11.03
IPLV/IP	BTU/(W-hr) 15.64
IEER	BTU/(W-hr) 16.29

Electrical Information	
Unit Voltage	208/230-3-60
Electrical Connection	Single Point Power
SCCR	5kA SCCR
Minimum Voltage	V 187
Maximum Voltage	V 253
Nominal Voltage	V 220
MCA	A 228.3
MOCP	A 250
ICF	A 499.2
RecFuse Size	A 250

Unit Features	
BACnet IP / MSTP	
Energy Management Module	
Low Sound (Includes independent compressor blankets)	
5kA SCCR	
Standard Scroll Compressor	
Al/Cu Condenser Coil	
Greenspeed Intelligence: High-Efficiency Variable Condenser Fans	
Terminal Block	
Single Point Power	
Security Grilles/Hail Guards Only	
Bottom Skid	

- (1) 38RC units are not designed for Refrigeration duty. Unit operational range should be reviewed to ensure that operation at full and part load conditions with Saturated Suction Temperatures at or below 30°F are avoided. Operation below 30°F SST may result in ice build-up on evaporator coil resulting in liquid flood-back and possible compressor failure. Return/Mixed Air Temperature should not be below 55°F.**
- (2) Liquid line check valve(s) prevent charge migration to compressor. These valves may be required for certain applications, refer to PD.**
- (3) Dual suction riser may be required, refer to PD.**
- (4) Do NOT exceed 200ft max linear separation or 75ft vertical liquid lift. Oil management is critical on split systems for compressor reliability. Refrigerant circuit warranty may be void beyond these limits.**

Table 3 — 38RC040-060 Unit Physical Data — English

38RC UNIT SIZE	040		050		060
Nominal Capacity (tons)	40		50		60
Circuit	Dual	Single	Dual	Single	Dual
Operating Weights (lb)					
MCHX	2149	2023	2223	2080	2325
Cu-AI RTPF	2294	2168	2402	2259	2403
REFRIGERANT CHARGE (lb)					
Total MCHX ^a	43.1	43.9	55.7	53.1	66.2
Circuit A/Circuit B MCHX	23.6/19.5	43.9	24.6/31.1	53.1	32.1/34.1
Total RTPF ^a	88.1	88.8	100.7	98	111.1
Circuit A/Circuit B RTPF	46.1/42	88.8	47.1/53.6	98	54.6/56.5
NITROGEN SHIPPING CHARGE			15 psig		
Compressor hp (Qty) (CKT A/CKT B)	10 (2) / 9 (2)	13 (3)	11 (2) / 13 (2)	15 (3)	13 (2) / 15 (2)
CAPACITY STEPS					
Standard	4	3	4	3	4
Digital Option	36	27	36	27	36
CRANKCASE HEATER (W) (each compressor)			90 (60 Hz)		
CONDENSER FANS					
Low Noise	Plastic Type, Axial, Vertical Discharge				
Quantity	3	3	3	3	4
rpm	850 (60 Hz)				
Diameter (in.)	30				
Total Watts (60 Hz)	3500	3500	3500	3500	5200
Total Airflow (60 Hz) (cfm)	30501		30501		38800
CONDENSER COIL					
No. Coils per Circuit	1	2	1	2	1
sq ft	67.8	67.8	67.8	67.8	67.8
TEMPERATURE RELIEF	Fusible Plug on Liquid Lines of Each Circuit - 210°F				
CONNECTIONS (in.) ODF (CKT A/CKT B)					
Suction Line	1-5/8 / 1-5/8	2-1/8	1-5/8 / 1-5/8	2-1/8	1-5/8 / 1-5/8
Liquid Line	5/8 / 5/8	7/8	5/8 / 5/8	7/8	5/8 / 5/8
MAXIMUM HEIGHT FOR 3°F SUBCOOLING (ft) ^b	75	75	75	75	75
Capacity Per Circuit (%) (CKT A/CKT B)	54/46	100	48/52	100	46/54
MINIMUM UNIT CAPACITY (%)^c					
Standard Compressor	27	33	23	33	23
Digital Compressor	13	16	11	16	11

NOTE(S):

- a. Typical operating charge with 25 ft of interconnecting piping. Operating charge is approximate for maximum system capacity. Unit is factory supplied with nitrogen holding charge. Refrigerant charge for dual circuit units is the total for both circuits.
- b. Maximum vertical separation between evaporator coil and condensing unit if condensing unit is below the evaporator.
- c. Refer to Loading Sequences tables in Application Data.

LEGEND

- CKT** — Circuit
- MCHX** — Microchannel Heat Exchanger
- ODF** — Outside Diameter, Female
- RTPF** — Round Tube Plate Fin

Table 4 — 38RC040-060 Unit Physical Data — SI

38RC UNIT SIZE	040		050		060
Nominal Capacity (kW)	141		176		211
Circuit	Dual	Single	Dual	Single	Dual
Operating Weights (kg)					
MCHX	975	918	1008	943	1055
Cu-AI RTPF	1041	983	1090	1025	1090
REFRIGERANT CHARGE (kg)					
Total MCHX^a	19.5	19.9	25.3	24.1	29.9
Circuit A/Circuit B MCHX	10.7/8.8	19.9	11.2/14.1	24.1	14.5/15.4
Total RTPF^a	40	40.3	45.7	44.4	50.4
Circuit A/Circuit B RTPF	20.9/19.1	40.3	21.4/24.3	44.4	24.7/25.7
NITROGEN SHIPPING CHARGE			103 kPa		
Compressor hp (Qty) (CKT A/CKT B)	10 (2) / 9 (2)	13 (3)	11 (2) / 13 (2)	15 (3)	13 (2) / 15 (2)
CAPACITY STEPS					
Standard	4	3	4	3	4
Digital Option	36	27	36	27	36
CRANKCASE HEATER (W) (each compressor)			90 (60 Hz)		
CONDENSER FANS					
Low Noise	Plastic Type, Axial, Vertical Discharge				
Quantity	3	3	3	3	4
rpm	850 (60 Hz)				
Diameter (mm)	762				
Total Watts (60 Hz)	3500	3500	3500	3500	5200
Total Airflow (60 Hz) (cu m/s)	51821		51821		65921
CONDENSER COIL			MCHX Type		
No. Coils per Circuit	1	2	1	2	1
sq m	6.30	6.30	6.30	6.30	6.30
TEMPERATURE RELIEF CONNECTIONS (in.) ODF (CKT A/CKT B)	Fusible Plug on Liquid Lines of Each Circuit - 99°C				
Suction Line	1-5/8 1-5/8	2-1/8	1-5/8 / 1-5/8	2-1/8	1-5/8 / 1-5/8
Liquid Line	5/8 / 5/8	7/8	5/8 / 5/8	7/8	5/8 / 5/8
MAXIMUM HEIGHT FOR 1.8°C SUBCOOLING (m)^b	22.9	22.9	22.9	22.9	22.9
Capacity Per Circuit (%) (CKT A/CKT B)	54/46	100	48/52	100	46/54
MINIMUM UNIT CAPACITY (%)^c					
Standard Compressor	27	33	23	33	23
Digital Compressor	13	16	11	16	11

NOTE(S):

- Typical operating charge with 7.62 m of interconnecting piping. Operating charge is approximate for maximum system capacity. Unit is factory supplied with nitrogen holding charge. Refrigerant charge for dual circuit units is the total for both circuits.
- Maximum vertical separation between evaporator coil and condensing unit if condensing unit is below the evaporator.
- Refer to Loading Sequences tables in Application Data.

LEGEND

- CKT** — Circuit
- MCHX** — Microchannel Heat Exchanger
- ODF** — Outside Diameter, Female
- RTPF** — Round Tube Plate Fin

Rig and Place Unit

The maximum altitude intended for this appliance is 10,000 ft (3048 m). For operation above this consult with Carrier Service.

All units are designed for overhead rigging, and it is *important that this method be used*. Lifting holes are provided in the frame base rails. It is recommended to use shackles in the lifting holes (see rigging label on the unit and Fig. 2 and 3 for rigging weights and center of gravity). All panels must be in place when rigging.

IMPORTANT: To maintain unit stability while lifting, use 4 cables, chains or straps of equal length. Attach one end of each cable to shackle attachment point and the other end of each cable to the overhead rigging point.

Use spreader bars or frame to keep the cables, chains, and straps clear of the unit sides. Leave standard coil protection packaging in place during rigging to provide protection to coils. Remove and discard all coil protection after rigging cables are detached.

⚠ CAUTION

All panels must be in place when rigging. Failure to comply could result in equipment damage.

⚠ CAUTION

For unit sizes 025 to 060 when handling with a forklift, handle only through fork pocket holes. Failure to follow this caution could result in equipment damage or personal injury.

For unit sizes 070 to 150, do not forklift the unit unless unit is attached to a skid designed for forklifting. Failure to follow this caution could result in equipment damage or personal injury.

DOMESTIC UNITS

Standard 38RC unit packaging consists of coil protection only. *Skids are not provided.* If overhead rigging is not available at the job site, place the unit on a skid or pad before dragging or rolling. When rolling, use a minimum of 3 rollers. When dragging, pull the pad or skid. *Do not apply force to the unit.* When in final position, raise from above to lift unit off the pad or skid.

EXPORT UNITS

All export units are mounted on skids with vertical coil protection. Leave the unit on the skid until it is in final position. *While on the skid, the unit can be rolled or skidded. Apply force to the skid, not to the unit.* Use a minimum of 3 rollers when rolling. When in final position, raise from above to remove the skid.

PLACING UNITS

⚠ WARNING

UNIT MUST NOT BE ACCESSIBLE TO THE GENERAL PUBLIC.

When considering location of the unit, be sure to consult National Electrical Code (NEC, U.S.A.) and local code requirements. Allow sufficient space for airflow, wiring, piping, and service. The placement area must be level and strong enough to support the operating weight of the unit. See Table 7 and Fig. 4. When unit is in proper location, use of mounting holes in base rails is recommended for securing unit to supporting structure. For mounting units 38RC025-060 on vibration isolators, 4 x 24 in. perimeter support ASTM "C" channels between unit and the isolators are recommended with a minimum of 4 channels per unit. Fasteners for mounting unit are field supplied. See Fig. 5.

38RC070-150 MOUNTING

The unit may be mounted on a level pad directly on the base rails, on rails along the long axis of the machine, or on vibration isolation springs; see Fig. 6. For all units, ensure placement area is strong enough to support unit operating weight; see Table 7 and Fig. 4. Mounting holes are provided for securing the unit to the pad, mounting rail, or vibration isolation springs. The base rail is made from steel; see Fig. 7 for base rail shape. See Fig. 9-14 for locations of mounting points. At the mounting points, a U-shaped channel is welded into the base rail to provide a flat plate for mounting. See Fig. 8 for mounting plate dimensions. The 1.46 in. (37 mm) dimension shown is from the outside edge of the rail to the mounting hole.

NOTE: The 1.46 in. (37 mm) dimension in Fig. 8 is not the same dimension as the 1.48 in. (37.5 mm) flange that is turned under the base rail in Fig. 7.

Bolt the unit securely to pad or rails. If vibration isolators (field-supplied, see Fig. 6) are required for a particular installation, see unit weight distribution in Fig. 4 to aid in the proper selection of isolators. Once installed, the unit must be level to within 1/8 in. per ft (1 cm per meter) along the long axis of the unit. This is required for oil return to the compressor(s). For more details about physical data, see Tables 1-6.

NOTE: For units that are point loaded, such as those using rubber and shear isolators, the mounting pocket in the base rail must be supported. If the isolator includes a plate that spans across the mounting pocket, no further support is needed. If the isolator is point loaded, add a backup plate to the mounting plate 1/4 in. thick x 6 in. wide x 8 in. long, centered on the unit mounting plate.

Refer to Fig. 9-14 for airflow clearances. Recommended minimum clearances are 6 ft (1829 mm) for unrestricted airflow and service on sides of unit, 4 ft (1219 mm) on ends, and unrestricted clear air space above the unit. Provide ample space to connect liquid and suction lines to indoor unit. For multiple units, allow 10 ft (3048 mm) separation between airflow surfaces. If walls surround the unit, wall height should not exceed the top of the unit fan discharge. Installation in a pit is not recommended.

IMPORTANT: Be sure to mount unit level to within 1/8 in. per ft (10.4 mm per m) to ensure proper oil equalization between compressors.

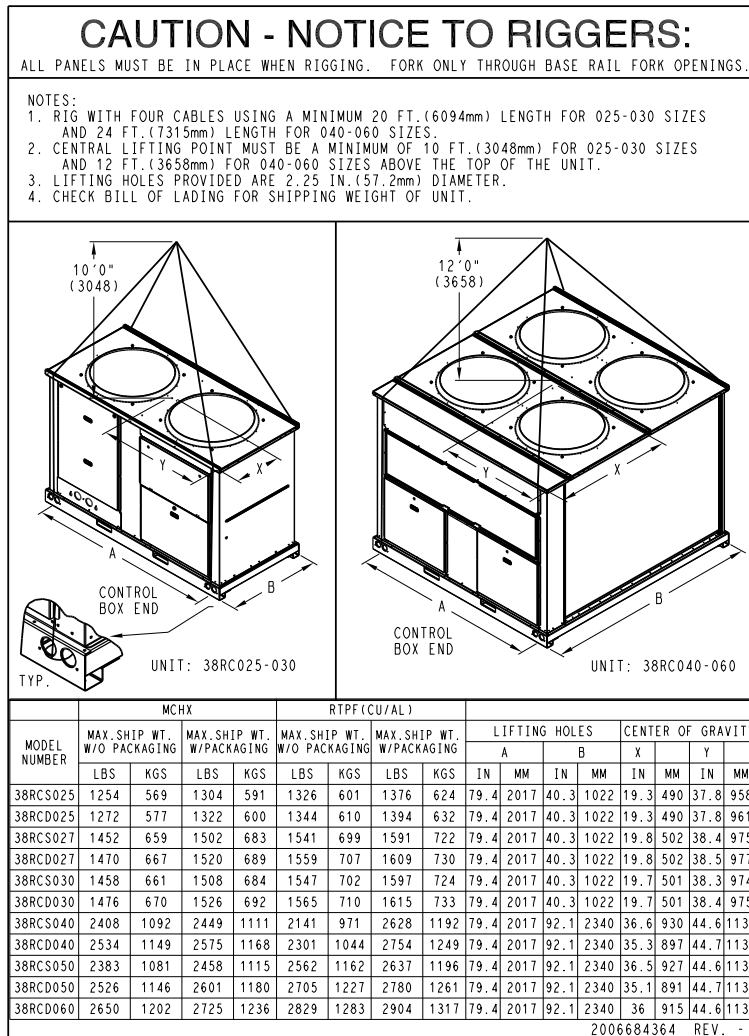
Refer to Fig. 15 for outdoor fan and compressor layout. Refer to Fig. 16 and 17 for unit piping installation. See Table 8 for refrigerant specialties part numbers. See Tables 9 and 10 for liquid line valve requirements.

Operating Limits

- Maximum outdoor ambient:
 - Full capacity 122°F (50°C)
 - Unloaded 125°F (51.6°C) 100% outdoor air application; return air temperature maximum 95°F (35°C)
- Minimum operating outdoor air temperature with installed high-efficiency variable condenser fans and wind baffles -20°F (-28.8°C):
 - Minimum return air temperature 55°F (-12.8°C)
 - Maximum return air temperature 95°F (35°C)
- Range of acceptable saturation suction temperature 35 to 55°F (1.7 to 12.8°C)

- Maximum discharge temperature 268°F (131°C)
- Minimum suction superheat 12° F (6.7°C)
- Maximum vertical liquid lift separation 75 ft (22.8 m) 60 Hz

Check valves required with all units with Microchannel (MCHX) condenser coils. Check valves required for all units with linear line length more than 100 ft (30.5 m). Check valves required for any 38RC025-030 dual circuit units where evaporator is located higher than the condensing unit and the linear line length is more than 55 ft (16.8 m). Maximum linear separation between condensing unit and air handling unit 200 ft (61 m).



LEGEND

- MCHX** — Microchannel Heat Exchanger
- RTPF** — Round Tube, Plate Fin (Condenser Coil)

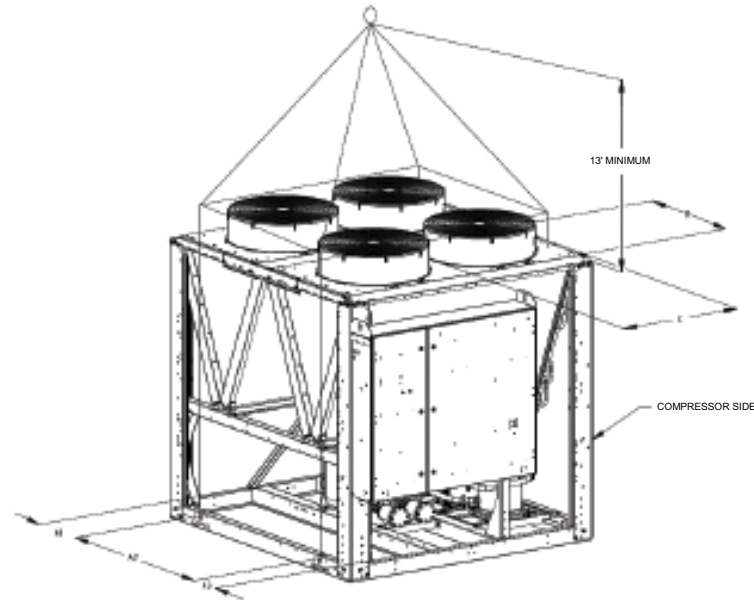
Fig. 2 — Rigging Label, 38RC025-060

CAUTION - NOTICE TO RIGGERS:
ALL PANELS MUST BE IN PLACE WHEN RIGGING. DO NOT FORK THESE UNITS IF NO SKID IS SUPPLIED.

ATTENTION - AVIS AUX MONTEURS:
TOUS LES PANNEAUX DOIVENT ÊTRE EN PLACE LORS DU GRÉEMENT. NE PAS TRANSFÉRER CES UNITÉS PAR CHARIOT-FOURCHE. SI AUCUN CHÂSSIS OU SUPPORT N'EST FOURNI.

- NOTE:**
1. 1.50 dia (38.1mm) lifting holes provided for field supplied clevis.
 2. Rig with a minimum of 25 ft (7620mm) length chain or cables.
 3. If central lifting point is used, it must be minimum of 13 ft (3962mm) above the top of the unit.
 4. Spreader bars made from steel or double nailed, and notched 2x6's approximately 8 ft (2438mm) long, must be placed just above the top of the unit and coils.
 5. If overhead rigging is not available, the unit can be moved on roller or dragged. When unit is moved on roller, the unit steel skid, if equipped, must be removed. To lift the unit, use jacks at rigging points. Use a minimum of one roller every 6 ft (1829 mm) to distribute the load. If the unit is to be dragged, lift the unit as described above, and place unit on a pad. Apply moving force to the pad, not the unit. When in its final location, raise the unit and remove the pad.
 6. Check the unit model number, position 10 to determine the unit weight as per condenser option.
 7. Check the bill of the lading to determine shipping weight of the unit.

- REMARQUE:**
1. Des trous de soulèvement mesurant 1,50 (38,1 mm) de diamètre, sont prévus pour la chape fournie avec l'unité.
 2. Installer avec une chaîne ou des câbles d'une longueur minimale de 25 pieds (7620 mm) pour le gréement.
 3. Dans le cas où un point de soulèvement central est employé, celui-ci doit être situé à un minimum de 3962 mm au-dessus de la surface supérieure de l'unité.
 4. Des écarteurs en acier ou en 2x6, cloués et entaillés, d'environ 2438 mm de long doivent être affixés juste au-dessus du haut de l'unité et des bobines ventilatrices.
 5. Si aucun système de gréement n'est disponible, l'unité peut être déplacée sur un rouleau ou traînée. Pour déplacer l'unité sur un rouleau, les patins en acier du support de l'unité, si équipée, doivent être retirés. Pour élever l'unité, utiliser des crics aux points d'ancrage. Pour faire répartir la charge, utiliser au moins un patin à tous les 6 pieds (1829 mm). Si l'unité doit être traînée, celle-ci doit être soulevée comme décrit ci-dessus et apposée sur une plaque de soutien. Appliquer la force de déplacement sur la plaque de soutien, et non sur l'unité. Une fois l'unité à son emplacement définitif, la lever et retirer la plaque de soutien.
 6. Vérifier le numéro de modèle de l'unité, la position 10 pour déterminer le poids de l'unité en fonction de l'option condenseur.
 7. Consulter la fiche de livraison pour déterminer le poids de l'appareil à l'expédition.



LEGEND

- MCHX** — Microchannel Heat Exchanger
RTPF — Round Tube, Plate Fin (Condenser Coil)

Model Number	Max Shipping Wt w/o Packaging		Max Shipping Wt with Packaging		Max Shipping Wt w/o Packaging		Max Shipping Wt with Packaging		Lifting Holes						Center of Gravity									
	Model Number Position 10 = 4, 5, H, J		Model Number Position 10 = 4, 5, H, J		Model Number Position 10 = 0, 3, G, M		Model Number Position 10 = 0, 3, G, M		A1		A2		A3		B				C					
	MCHX		MCHX		RTPF		RTPF		in		mm		in		mm		MCHX		RTPF		MCHX		RTPF	
	lb	kg	lb	kg	lb	kg	lb	kg	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
38RCD070	2992	1358	3345	1518	3312	1503	3665	1663	16.1	409	62.0	1575	16.1	409	35.5	902.5	36.6	930.7	42.0	1066.7	42.3	1073.2		
38RCD080	3850	1747	4358	1977	4288	1946	4795	2176	16.1	409	109.0	2769	16.1	409	61.3	1556.8	62.2	1580.4	42.0	1066.8	42.4	1077.0		
38RCD090	4042	1834	4549	2064	4522	2052	5029	2282	16.1	409	109.0	2769	16.1	409	62.6	1590.2	63.4	1611.6	40.6	1030.7	41.0	1041.6		
38RCD100	4050	1837	4557	2068	4529	2055	5037	2285	16.1	409	109.0	2769	16.1	409	62.6	1591.1	63.5	1612.3	40.5	1029.5	41.0	1040.6		
38RCD110	4939	2241	5599	2541	5536	2512	6197	2812	16.1	409	156.0	3963	16.1	409	83.7	2125.2	84.9	2156.9	41.0	1042.4	41.6	1055.8		
38RCD130	5157	2340	5818	2640	5796	2630	6457	2930	16.1	409	156.0	3963	16.1	409	83.5	2121.5	84.7	2150.9	39.7	1009.5	40.3	1023.2		
38RCD150	5163	2343	5824	2642	5803	2633	6464	2933	16.1	409	156.0	3963	16.1	409	83.5	2122.0	84.7	2151.3	39.7	1008.7	40.3	1022.5		

Fig. 3 — Rigging Label, 38RC070-150

Table 7 — Maximum Operational Corner Weights

38RCS MCHX Unit^{a,b}

38RCS UNIT SIZE	TOTAL WEIGHT (lb)	OPERATIONAL CORNER WEIGHT (lb)				TOTAL WEIGHT (kg)	OPERATIONAL CORNER WEIGHT (kg)			
		A	B	C	D		A	B	C	D
025	1223	410	283	216	314	555	186	129	98	142
027	1338	432	310	249	346	607	196	141	113	157
030	1372	444	318	254	356	622	202	144	115	161
040	2023	639	621	376	387	918	290	282	171	176
050	2080	659	640	386	396	943	299	290	175	180

NOTE(S):

- a. Weights include refrigerant charge.
- b. For support points, see Fig. 4.

38RCD MCHX Unit^{a,b}

38RCD UNIT SIZE	TOTAL WEIGHT (lb)	OPERATIONAL CORNER WEIGHT (lb)						TOTAL WEIGHT (kg)	OPERATIONAL CORNER WEIGHT (kg)					
		A	B	C	D	E	F		A	B	C	D	E	F
025	1223	410	283	216	314	—	—	555	186	129	98	142	—	—
027	1338	432	310	249	346	—	—	607	196	141	113	157	—	—
030	1372	444	318	254	356	—	—	622	202	144	115	161	—	—
040	2149	692	676	385	395	—	—	975	314	307	175	179	—	—
050	2223	719	704	397	405	—	—	1008	326	319	180	184	—	—
060	2325	749	721	419	436	—	—	1055	340	327	190	198	—	—
070	3345	1145	1081	521	598	—	—	1517	519	490	236	271	—	—
080	4358	1294	1210	877	977	—	—	1976	587	549	398	443	—	—
090	4549	1387	1232	879	1051	—	—	2063	629	559	399	477	—	—
100	4557	1388	1231	882	1056	—	—	2067	629	558	400	479	—	—
115	5599	924	772	990	1143	864	905	2539	419	350	449	518	392	411
130	5818	984	772	1007	1219	872	964	2639	446	350	457	553	396	437
150	5824	985	773	1008	1220	873	965	2641	447	351	457	553	396	437

NOTE(S):

- a. Weights include refrigerant charge.
- b. For support points, see Fig. 4.

38RCS Cu-AI RTPF Unit^{a,b}

38RCS UNIT SIZE	TOTAL WEIGHT (lb)	OPERATIONAL CORNER WEIGHT (lb)				TOTAL WEIGHT (kg)	OPERATIONAL CORNER WEIGHT (kg)			
		A	B	C	D		A	B	C	D
025	1295	408	287	248	352	587	185	130	113	160
027	1428	431	316	288	393	648	195	143	131	178
030	1461	442	323	295	402	663	200	146	134	182
040	2168	673	656	414	426	983	305	298	188	193
050	2259	702	685	430	442	1025	319	311	195	200

NOTE(S):

- a. Weights include refrigerant charge.
- b. For support points, see Fig. 4.

38RCD Cu-AI RTPF Unit^{a,b}

38RCD UNIT SIZE	TOTAL WEIGHT (lb)	OPERATIONAL CORNER WEIGHT (lb)						TOTAL WEIGHT (kg)	OPERATIONAL CORNER WEIGHT (kg)					
		A	B	C	D	E	F		A	B	C	D	E	F
025	1295	408	287	248	352	—	—	587	185	130	113	160	—	—
027	1428	431	316	288	393	—	—	648	195	143	131	178	—	—
030	1461	442	323	295	402	—	—	663	200	146	134	182	—	—
040	2294	727	711	424	433	—	—	1041	330	322	192	196	—	—
050	2402	763	748	441	450	—	—	1090	346	339	200	204	—	—
060	2504	794	766	464	484	—	—	1136	360	348	210	220	—	—
070	3665	1224	1162	602	677	—	—	1662	555	527	273	307	—	—
080	4795	1407	1316	980	1092	—	—	2175	638	597	444	495	—	—
090	5029	1502	1353	1002	1172	—	—	2281	681	614	454	532	—	—
100	5037	1505	1353	1003	1176	—	—	2284	683	614	455	533	—	—
115	6197	1004	851	1121	1273	967	980	2810	455	386	508	578	439	445
130	6457	1074	856	1141	1359	979	1048	2928	487	388	517	616	444	476
150	6464	1075	855	1142	1363	979	1050	2932	488	388	518	618	444	476

NOTE(S):

- a. Weights include refrigerant charge.
- b. For support points, see Fig. 4.

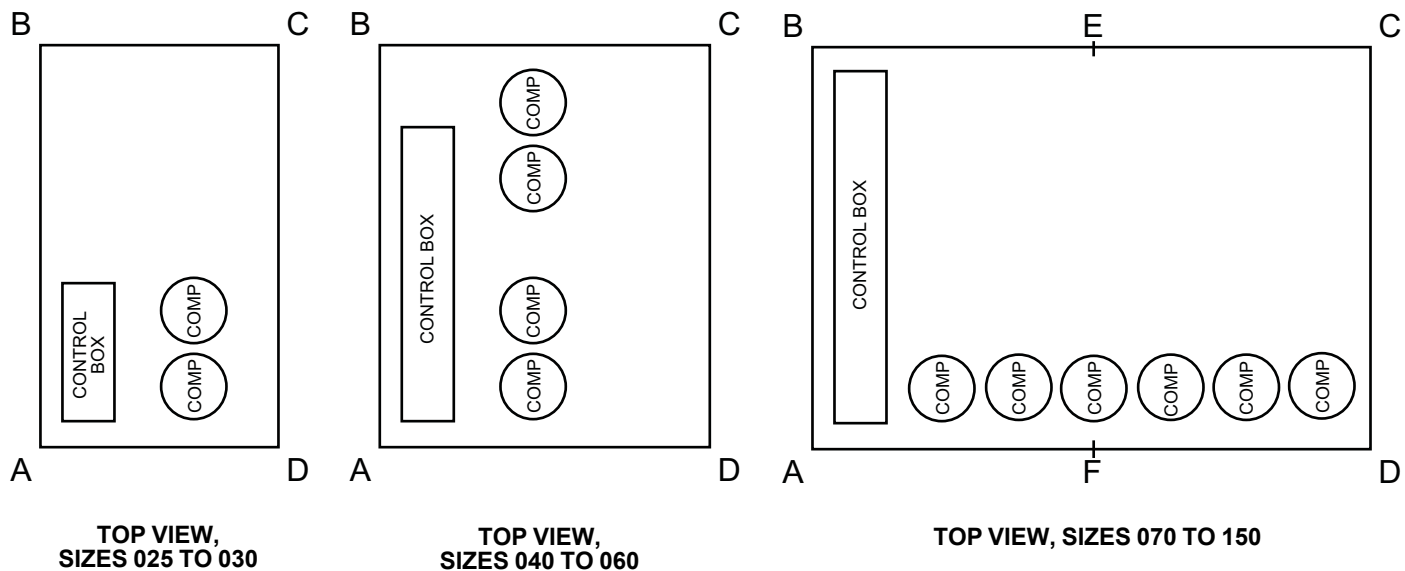


Fig. 4 — Compressor Locations and Support Points

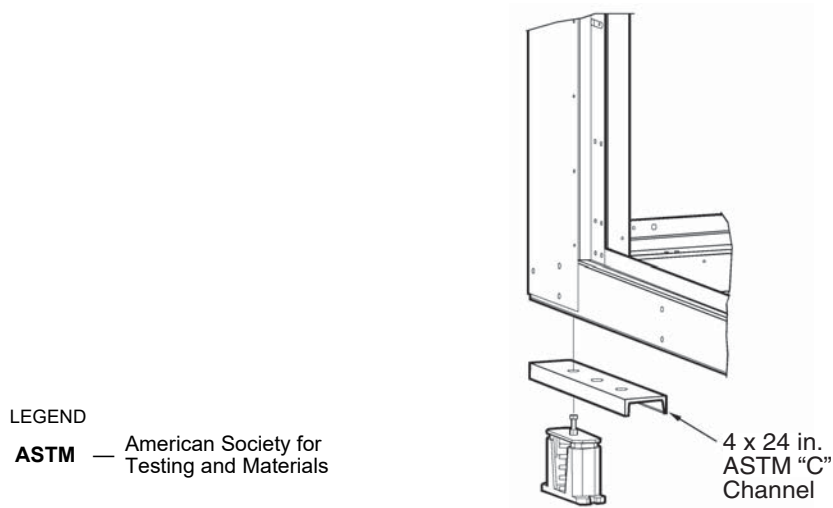


Fig. 5 — Perimeter Support Channel

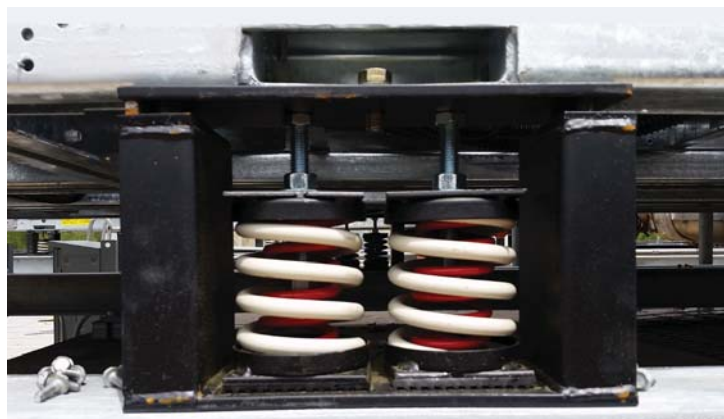
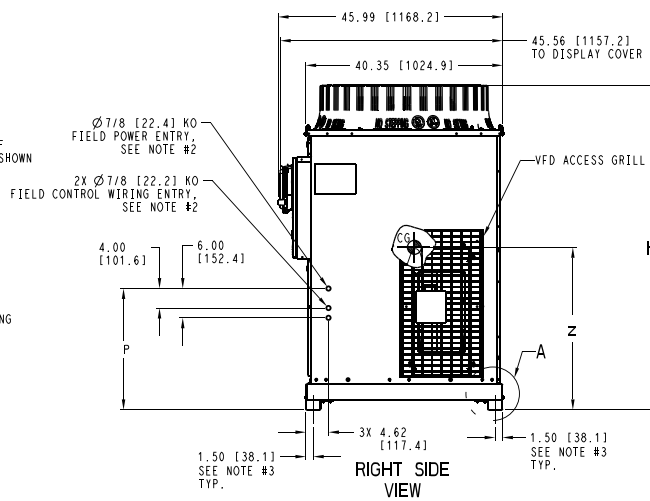
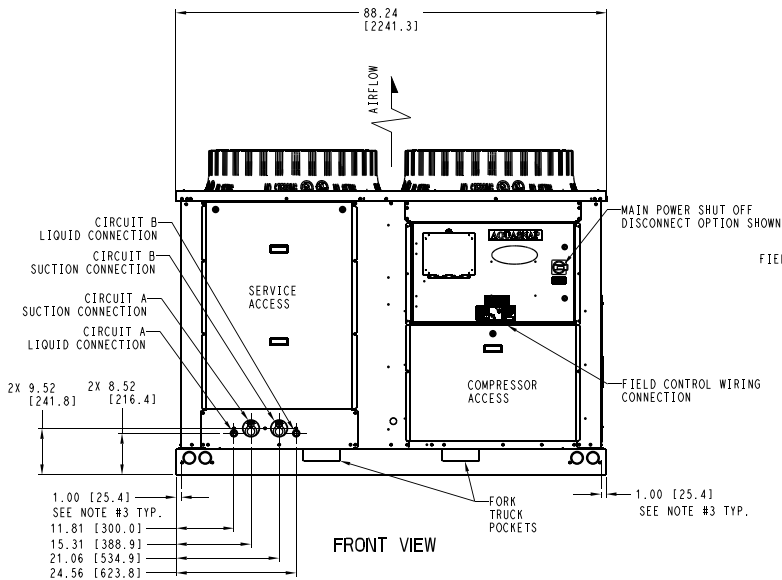
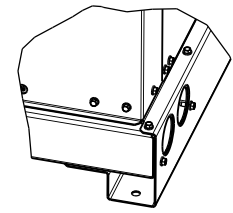
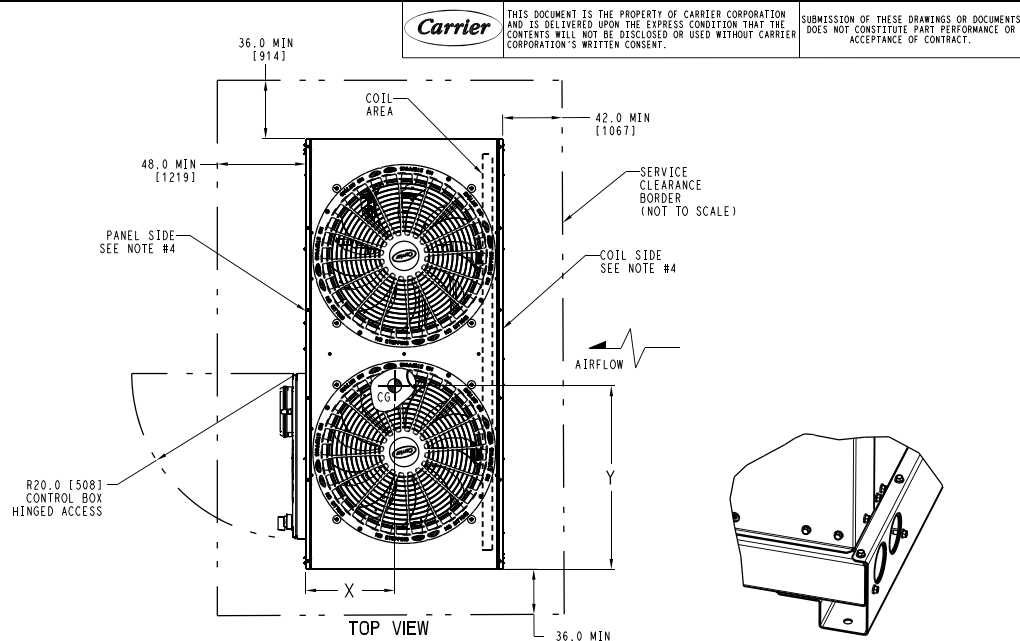


Fig. 6 — Isolation Springs

	UNIT	CENTER OF GRAVITY			UNIT HEIGHT H	POWER ENTRY P	SERVICE VALVE CONNECTIONS	
		X	Y	Z			SUCTION	LIQUID
NO. LOW AMBIENT (STD)	38RCS025	17.7[451]	38.3[973]	28.3[719]	66.5 [1689]	24.9 [632]	1-3/8 [35]	5/8 [16]
	38RCD025	17.9[454]	38.7[983]	27.6[701]			1-1/8 [29]	5/8 [16]
	38RCS027	17.0[433]	36.2[919]	31.7[805]			1-3/8 [35]	5/8 [16]
	38RCD027	17.2[437]	36.7[931]	31.0[787]			1-3/8 [35]	5/8 [16]
	38RCS030	17.0[433]	36.2[919]	31.7[805]			1-5/8 [41]	7/8 [22]
	38RCD030	17.2[437]	36.7[931]	31.0[787]			1-3/8 [35]	5/8 [16]
GREENSPEED	38RCS025	18.4[466]	36.2[920]	27.8[706]	66.5 [1689]	24.9 [632]	1-3/8 [35]	5/8 [16]
	38RCD025	18.5[469]	36.7[931]	27.2[690]			1-1/8 [29]	5/8 [16]
	38RCS027	17.6[447]	34.6[880]	31.1[791]			1-3/8 [35]	5/8 [16]
	38RCD027	17.7[450]	35.1[891]	30.4[773]			1-3/8 [35]	5/8 [16]
	38RCS030	17.6[447]	34.6[880]	31.1[791]			1-5/8 [41]	7/8 [22]
	38RCD030	17.7[450]	35.1[891]	30.4[773]			1-3/8 [35]	5/8 [16]

- NOTES:
- BE SURE TO USE A WET RAG AND REMOVE ALL VALVE CORES BEFORE BRAZING FIELD PIPING.
 - TEMPERATURE RELIEF DEVICES LOCATED ON LIQUID LINE AND HAVE 3/8" SAE FLARE CONNECTION. DO NOT CAP OR OTHERWISE OBSTRUCT THE TEMPERATURE/PRESSURE RELIEF.
 - Ø7/8 [22.2] PILOT HOLE PROVIDED FOR LOCATING FIELD POWER WIRING. ACTUAL HOLE REQUIRED DEPENDS ON FIELD WIRE SIZING.
 - Ø0.524 [13.30] HOLE USED FOR MOUNTING UNIT.
 - UNIT MUST HAVE CLEARANCES AS FOLLOWS:
TOP - DO NOT RESTRICT.
COIL END - 42 [1067] FROM SOLID SURFACE.
PANEL SIDE - 48 [1219] PER NEC.
 - CARRIER DOES NOT RECOMMEND INSTALLATION IN A PIT.
 - UNIT CAN BE HANDLED USING THE FORK TRUCK LIFT POCKETS.
 - DIMENSIONS ARE IN " INCH [MM]".
 - FOR 38RCS PIPING, REFER TO "CIRCUIT A LIQUID CONNECTION" AND "CIRCUIT A SUCTION CONNECTION" DIMENSIONS SHOWN.
 - DRAWING SHOWN WITH GREENSPEED OPTION.

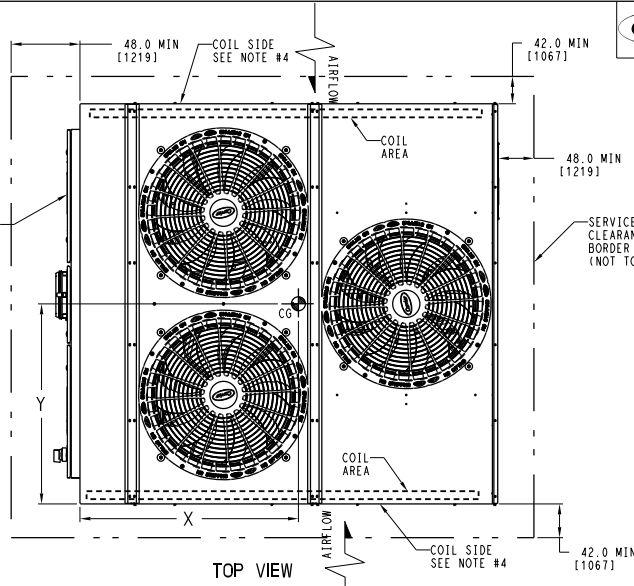


ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES	38RC 025 / 027 / 030T UNIT ASSY	38RC60001010	REV
U.S. ECCN:EAR99	1 OF 1	05/15/2024	-			-

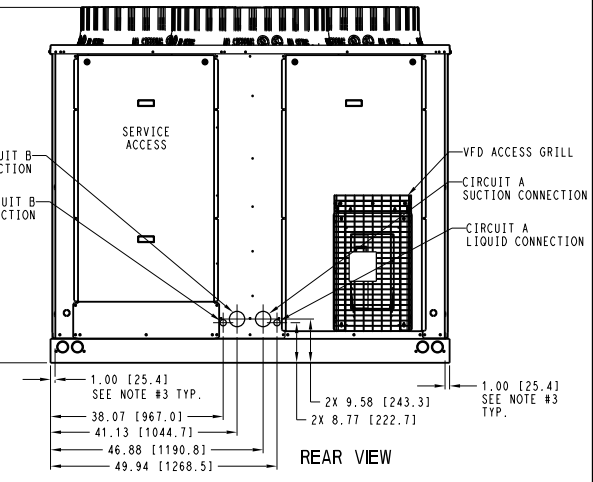
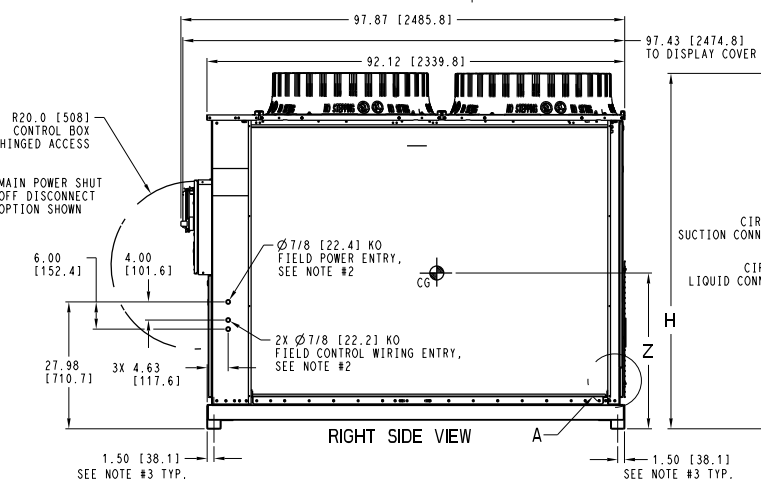
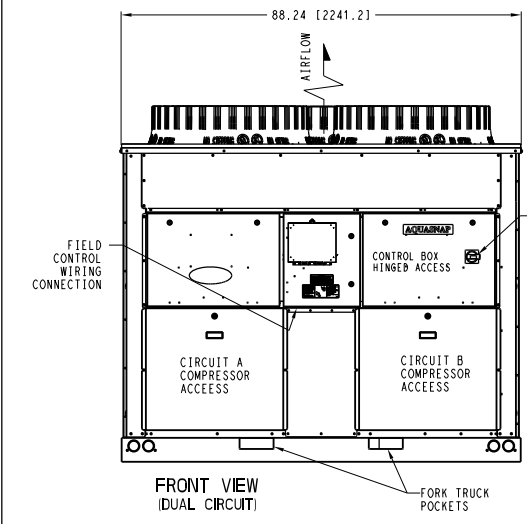
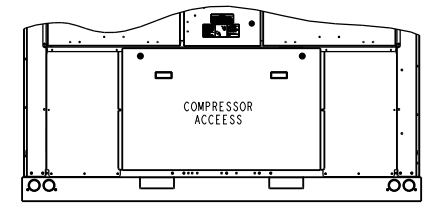
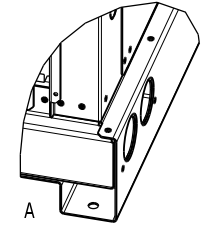
Fig. 9 — 38RC Unit Dimensions, Sizes 025-030

UNIT	CENTER OF GRAVITY			UNIT HEIGHT H	SERVICE VALVE CONNECTIONS	
	X	Y	Z		SUCTION	LIQUID
38RCS040	35.1[892]	43.5[1105]	31.6[803]	78.5 [1994]	2-1/8 [54]	7/8 [22]
38RCD040	34.3[871]	43.5[1104]	29.8[758]		1-5/8 [41]	5/8 [16]
38RCS050	33.7[856]	43.5[1104]	31.1[789]		2-1/8 [54]	7/8 [22]
38RCD050	32.6[827]	43.4[1102]	29.1[738]		1-5/8 [41]	5/8 [16]
38RCS040	36.7[933]	44.4[1128]	31.3[794]	78.5 [1994]	2-1/8 [54]	7/8 [22]
38RCD040	35.9[911]	44.3[1126]	29.6[751]		1-5/8 [41]	5/8 [16]
38RCS050	35.2[895]	44.3[1126]	30.7[781]		2-1/8 [54]	7/8 [22]
38RCD050	34.1[865]	44.2[1122]	28.8[731]		1-5/8 [41]	5/8 [16]

- NOTES:
- BE SURE TO USE A WET RAG AND REMOVE ALL VALVE CORES BEFORE BRAZING FIELD PIPING.
 - TEMPERATURE RELIEF DEVICES LOCATED ON LIQUID LINE AND HAVE 3/8" SAE FLARE CONNECTION. DO NOT CAP OR OTHERWISE OBSTRUCT THE TEMPERATURE/PRESSURE RELIEF.
 - Ø7/8 [22.2] PILOT HOLE PROVIDED FOR LOCATING FIELD POWER WIRING. ACTUAL HOLE REQUIRED DEPENDS ON FIELD WIRE SIZING.
 - Ø0.524 [13.30] HOLE USED FOR MOUNTING UNIT.
 - UNIT MUST HAVE CLEARANCES AS FOLLOWS:
 TOP - DO NOT RESTRICT.
 COIL END - 42 [1067] FROM SOLID SURFACE.
 PANEL SIDE - 48 [1219] PER NEC.
 - CARRIER DOES NOT RECOMMEND INSTALLATION IN A PIT.
 - UNIT CAN BE HANDLED USING THE FORK TRUCK LIFT POCKETS.
 - DIMENSIONS ARE IN "INCH [MM]".
 - FOR 38RCS PIPING, REFER TO "CIRCUIT A LIQUID CONNECTION" AND "CIRCUIT A SUCTION CONNECTION" DIMENSIONS SHOWN.
 - DRAWING SHOWN WITH GREENSPEED OPTION.



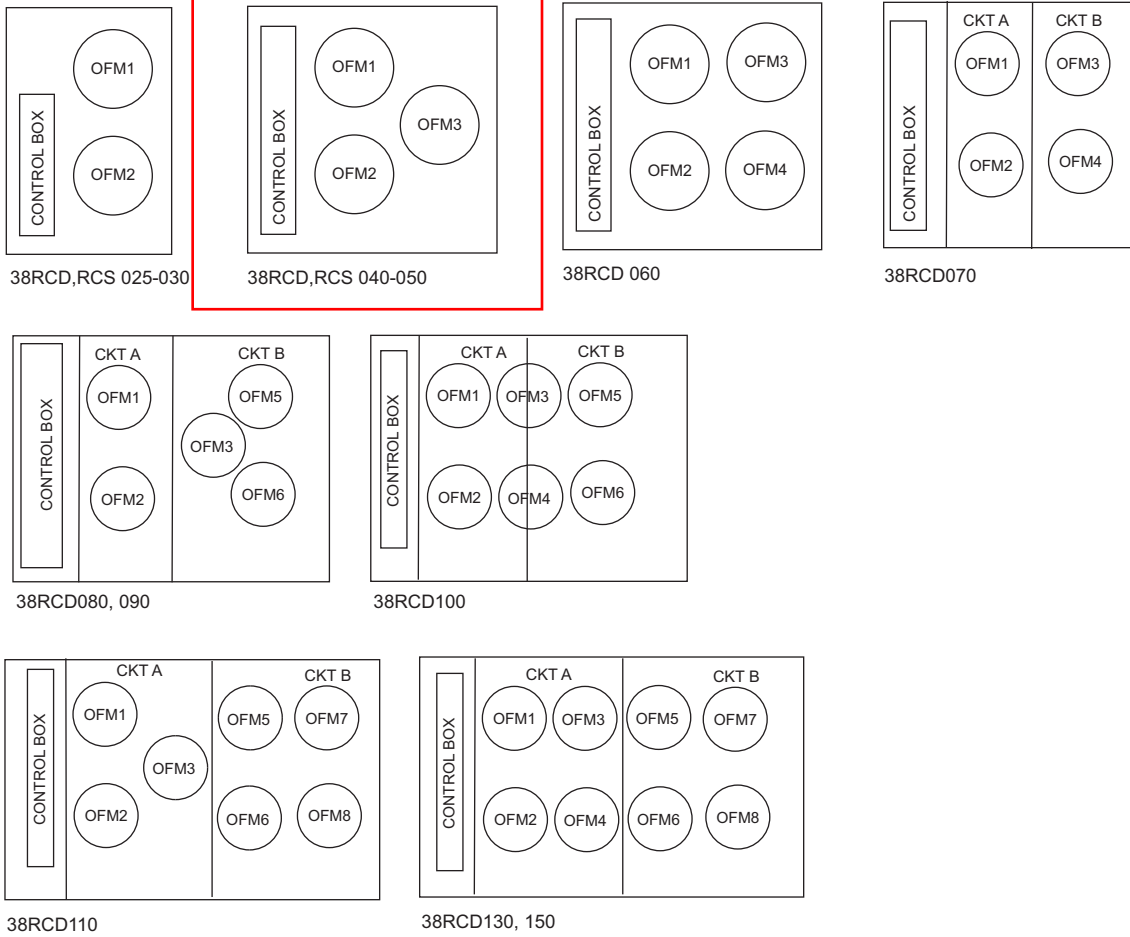
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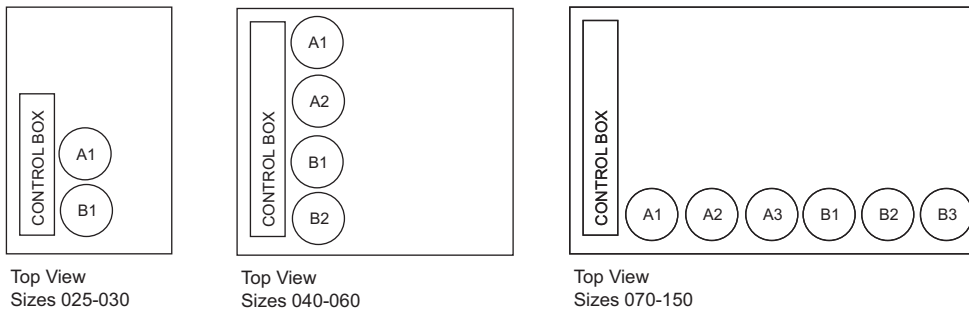
ITC CLASSIFICATION U.S. ECCN:EAR99	SHEET 1 OF 1	DATE 05/15/2024	SUPERCEDES -	38RC 040 / 050T UNIT ASSY	38RC60001020	REV -
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Fig. 10 — 38RC Unit Dimensions, Sizes 040-050

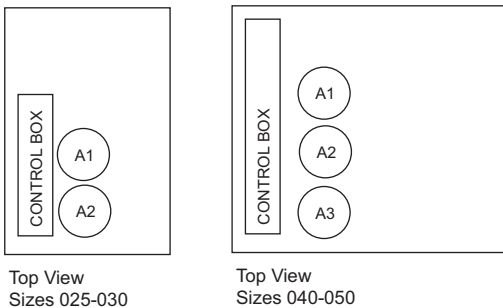
Outdoor Fan Layout (Top View)



Compressor Layout Dual Circuit, 38RCD



Compressor Layout Single Circuit, 38RCS



LEGEND

- A** — Circuit 1 Compressor
- B** — Circuit 2 Compressor
- OFM** — Outdoor Fan

Fig. 15 — Outdoor Fan and Compressor Layout

3 Ton

Project: City of Patterson
Prepared By: Ryan Walsh

09/03/2025
12:47PM

3 Ton

**Tag Cover Sheet
Unit Report
Certified Drawing
Performance Report**

Unit Report For 3 Ton

Project: City of Patterson
Prepared By: Ryan Walsh

09/03/2025
12:47PM

Unit Parameters

Unit Model:.....**48NGUB3606050**
Unit Size:.....**36 (3.0 Tons)**
Volts-Phase-Hertz:.....**208-3-60**
Heating Type:.....**Gas**
Refrigerant:.....**R-454B**
Heat Control:.....**60,000 Btuh**
Duct Cfg:.....**Vertical/Vertical**
DX Options:.....**Ultra Low NOx Unit**

Dimensions (ft. in.) & Weight (lb.) ***

Unit Length:.....**4' 0.1875"**
Unit Width:.....**3' 8.125"**
Unit Height:.....**3' 8.75"**

*** Weights and Dimensions are approximate. Weight does not include roof curbs, unit packaging, field installed accessories or factory installed options. Approximate dimensions are provided primarily for shipping purposes. For exact dimensions and weights, refer to appropriate product data catalog.

Base Unit Weight (Does not include any accessories):
450.....lb

Warranty Information

1 year warranty on parts
5 year warranty on compressor
5 year warranty on heat exchanger

No optional warranties were selected.

Ordering Information

Part Number	Description	Quantity
48NGUB3606050	Rooftop Unit	1

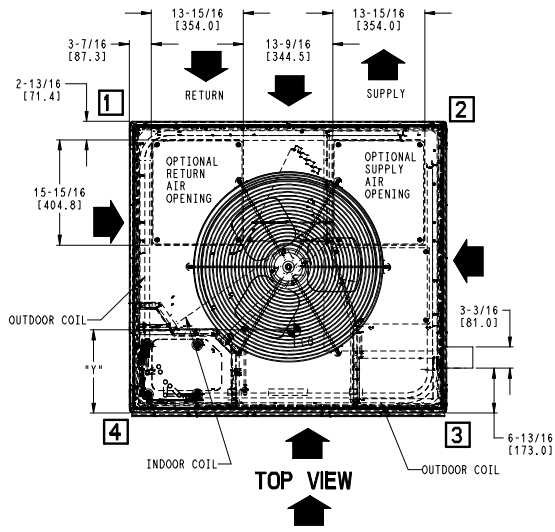
Certified Drawing for 3 Ton

Project: City of Patterson
Prepared By: Ryan Walsh

09/03/2025
12:47PM

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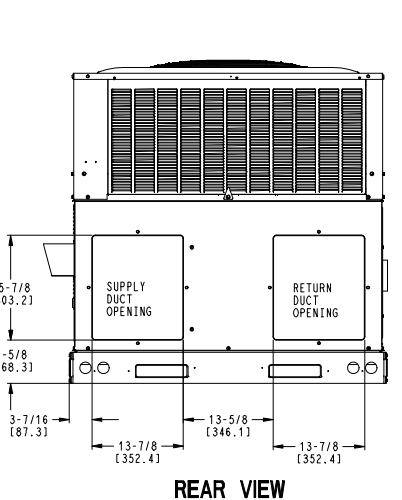
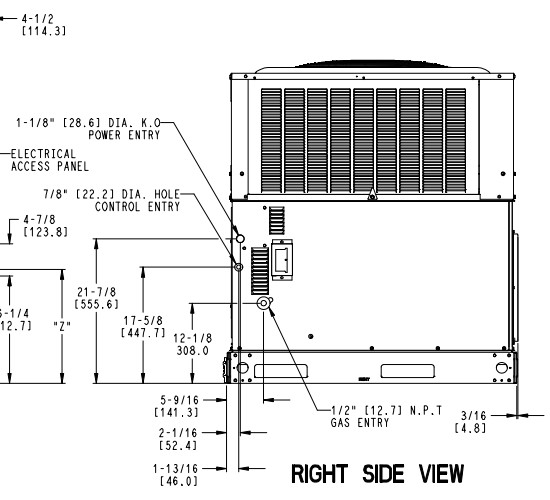
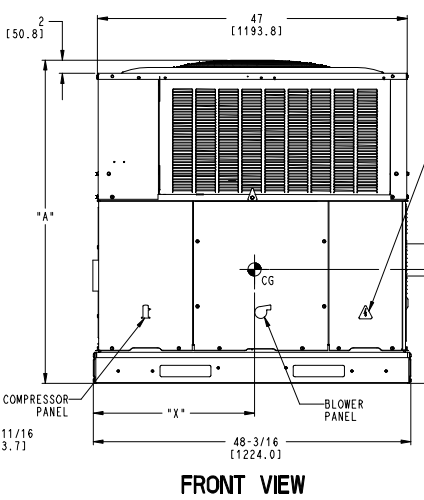
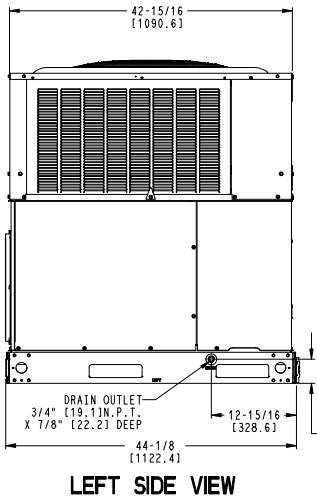
COOLING CAPACITY	UNIT WT.		UNIT HEIGHT IN/MM		CENTER OF GRAVITY IN/MM					
	LB	KG	"A"	"A"	X	Y	Z			
36	450	203.9	44-3/4	1137	22-13/16	579.4	18	457.2	17-1/8	435.0
48	500	226.7	50-3/4	1289	22-13/16	579.4	18	457.2	17-3/8	441.3
60	515	233.5	52-3/4	1340	22-13/16	579.4	18	457.2	17-5/8	447.7

COOLING CAPACITY	SHIPPING HEIGHT		SHIPPING LENGTH		SHIPPING WIDTH		SHIPPING WEIGHT	
	IN	MM	IN	MM	IN	MM	LB	KG
36	48-3/4	1238	48-1/4	1226	44	1118	464	210.2
48	54-3/4	1391	48-1/4	1226	44	1118	514	233.1
60	56-3/4	1441	48-1/4	1226	44	1118	529	239.8

UNIT	CORNER WEIGHT LB/KG			
	"1"	"2"	"3"	"4"
36	98.2	44.5	87.0	39.5
48	108.7	49.3	96.8	43.9
60	111.5	50.6	99.2	45.0

NOTE: 1. ALL TABLE DATA RELEVANT FOR ALL FACTORY INSTALLED OPTIONS EXCEPT ECONOMIZER.
2. * - INDICATES ALL FIOP CODES FOR THE MODELS LISTED.

REQUIRED CLEARANCES TO COMBUSTIBLE MATL.		REQUIRED CLEARANCE FOR OPERATION AND SERVICING	
TOP OF UNIT.....	14 [355.6]	EVAP. COIL ACCESS SIDE.....	36 [914.0]
DUCT SIDE OF UNIT.....	2 [50.8]	POWER ENTRY SIDE.....	42 [1066.8]
SIDE OPPOSITE DUCTS.....	14 [355.6]	(EXCEPT FOR NEC REQUIREMENTS)	
BOTTOM OF UNIT.....	12 [304.8]	UNIT TOP.....	48 [1219.2]
FLUE PANEL.....	36 [914.4]	SIDE OPPOSITE DUCTS.....	36 [914.0]
		DUCT PANEL.....	12 [304.8]*
NEC REQUIRED CLEARANCES		*MINIMUM DISTANCES: IF UNIT IS PLACED LESS THAN 12 [304.8] FROM WALL SYSTEM, THEN SYSTEM PERFORMANCE MAYBE COMPROMISED.	
BETWEEN UNITS, POWER ENTRY SIDE.....	42 [1066.8]	DIMENSIONS IN [] ARE IN MM	
UNIT AND UNGROUNDED SURFACES, POWER ENTRY SIDE.....	36 [914.0]		
UNIT AND BLOCK OR CONCRETE WALLS AND OTHER GROUNDED SURFACES, POWER ENTRY SIDE.....	42 [1066.8]		



04/10/25	ORIG. DRW	SINGLE ZONE ELECTRIC COOLING WITH GAS HEATING(LG)	SD6111-4	-
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Performance Summary For 3 Ton

Project: City of Patterson
Prepared By: Ryan Walsh

09/03/2025
12:47PM

Part Number:48NGUB3606050

Refrigerant:..... **R-454B**
ARI SEER2:..... **15.20**

Base Unit Dimensions

Unit Length:..... **48.2** in
Unit Width:..... **44.1** in
Unit Height:..... **44.8** in
Base Unit Weight (Does not include any accessories):..... 450 lb

Unit

Unit Voltage-Phase-Hertz:..... **208-3-60**
Air Discharge:..... **Vertical**
Fan Drive Type:..... **Direct**
Actual Airflow:..... **1217** CFM
Site Altitude:..... **0** ft

Cooling Performance

Condenser Entering Air DB:..... **95.0** F
Evaporator Entering Air DB:..... **80.0** F
Evaporator Entering Air WB:..... **67.0** F
Entering Air Enthalpy:..... **31.44** BTU/lb
Evaporator Leaving Air DB:..... **59.9** F
Evaporator Leaving Air WB:..... **58.2** F
Evaporator Leaving Air Enthalpy:..... **25.17** BTU/lb
Net Cooling Capacity:..... **34.34** MBH
Net Sensible Capacity:..... **26.41** MBH
Total Unit Power Input:..... **2.90** kW
Coil Bypass Factor:..... **0.091**

Heating Performance

Heating Airflow:..... **1217** CFM
Entering Air Temp:..... **70.0** F
Leaving Air Temp:..... **107.3** F
Gas Heating Input Capacity:..... **60.0** MBH
Gas Heating Output Capacity:..... **49.0** MBH
Temperature Rise:..... **37.3** F
AFUE (%):..... **81.0**

Supply Fan

External Static Pressure:..... **0.50** in wg
Options / Accessories Static Pressure
Wet Coil:..... **0.05** in wg
Application External Static (ESP + Unit Opts/Acc.):..... **0.55** in wg
Fan RPM:..... **1000**
Fan Power:..... **0.31** BHP
Fan Motor Size, hp:..... **3/4**
NOTE:..... **8 Motor Speed, Vert**

Selection includes construction throwaway filter into the base fan curve. This filter is not MERV Rated.

Electrical Data

Minimum Voltage:..... **197**
Maximum Voltage:..... **253**
Compressor RLA:..... **9.9**
Compressor LRA:..... **82**
Outdoor Fan FLA (ea):..... **1.05**
Indoor Fan Motor FLA (Total):..... **5.8**
Power Supply MCA:..... **19.3**

Performance Summary For 3 Ton

Project: City of Patterson
 Prepared By: Ryan Walsh

09/03/2025
 12:47PM

Power Supply MOCP (Fuse or HACR):.....**25**
 Inducer Motor FLA:.....**0.27**

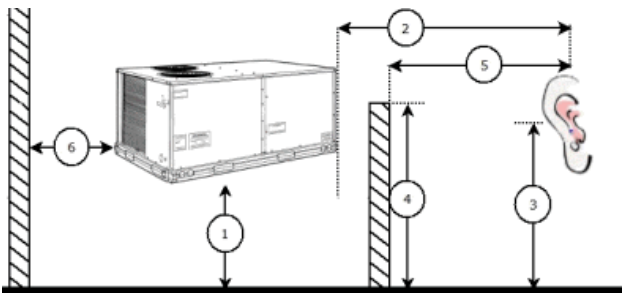
Control Panel SCCR: 5kA RMS at Rated Symmetrical Voltage

Acoustics

Sound Rating:.....**74.0 db**
 Sound Power Levels, db re 10E-12 Watts

	Discharge	Inlet	Outdoor
63 Hz	NA	NA	NA
125 Hz	NA	NA	58.0
250 Hz	NA	NA	64.0
500 Hz	NA	NA	69.0
1000 Hz	NA	NA	70.0
2000 Hz	NA	NA	66.0
4000 Hz	NA	NA	60.0
8000 Hz	NA	NA	53.0

Advanced Acoustics



Advanced Acoustics Parameters

- 1. Unit height above ground:.....**30.0** ft
- 2. Horizontal distance from unit to receiver:.....**50.0** ft
- 3. Receiver height above ground:.....**5.7** ft
- 4. Height of obstruction:.....**0.0** ft
- 5. Horizontal distance from obstruction to receiver:.....**0.0** ft
- 6. Horizontal distance from unit to obstruction:.....**0.0** ft

Detailed Acoustics Information

Octave Band Center Freq. Hz	63	125	250	500	1k	2k	4k	8k	Overall
A	0.0	58.0	64.0	69.0	70.0	66.0	60.0	53.0	74.2 Lw
B	- 26.2	41.9	55.4	65.8	70.0	67.2	61.0	51.9	73.2 LwA
C	0.0	25.6	31.6	36.6	37.6	33.6	27.6	20.6	41.8 Lp
D	- 26.2	9.5	23.0	33.4	37.6	34.8	28.6	19.5	40.8 LpA

Legend

- A Sound Power Levels at Unit's Acoustic Center, Lw
- B A-Weighted Sound Power Levels at Unit's Acoustic Center, LwA
- C Sound Pressure Levels at Specific Distance from Unit, Lp
- D A-Weighted Sound Pressure Levels at Specific Distance from Unit, LpA

Residential & Light Commercial Heat Pump System



Indoor Model: RAV-HB241KRTP-UL
Outdoor Model: RAV-BP241AT2P-UL

Submittal Data

Job Name _____ Location _____
 Tag _____



OUTDOOR UNIT STANDARD FEATURES

- Digital inverter compressor technology
- System can operate in cooling only mode with heating locked out
- Line lengths up to 164 ft
- Low-ambient cooling down to 5°F
- System diagnostics

OUTDOOR UNIT MODEL		RAV-BP241AT2P-UL
SYSTEM PERFORMANCE		
Nominal Cooling Capacity†	Btu/h	24,000
SEER2		22.7
EER2		11.8
Nominal Heating Capacity†	Btu/h	27,000
HSPF2		10.4
COP		11.3
REFRIGERANT LINES		
Total Piping Length	ft	164
Vertical Lift	ft	98
Suction Line Size	in	5/8
Liquid Line Size	in	3/8
AMBIENT OPERATING RANGE		
Cooling DB Min ~ Max	F	5~115
Heating DB Min ~ Max	F	-13~59
REFRIGERANT		R454B
FACTORY CHARGE	lbs	4.63

AIRFLOW		
Cooling	CFM	2300
Heating	CFM	2220
SOUND PRESSURE LEVEL		
Cooling	db(A)	52
Heating	db(A)	54
ELECTRICAL		
Power Supply	V/Ph/Hz	208-230/1/60
Minimum Circuit Amps (MCA)	A	17
Recommended Fuse Size	A	20
Maximum Over Current Protection (MOCP)	A	25
PHYSICAL DATA		
Unit Width	in	35-3/8
Unit Height	in	35
Unit Length	in	12-5/8
Unit Weight	lbs	132.2

Legend

- db** — Dry Bulb
SEER — Seasonal Energy Efficiency Ratio
HSPF — Heating Seasonal Performance Factor
wb — Wet Bulb

†Rated per AHRI (Air-Conditioning, Heating and Refrigeration Institute) 210/240 Standard.
 Cooling: Indoor 80°F (27°C) db/67°F (20°C) wb; Outdoor 95°F (35°C) db
 Heating: Indoor 70°F (21°C) db; Outdoor 47°F (8°C) db/43°F (6°C) wb



RAV-SM242KRTP-UL HIGH WALL FEATURES

- R-410A refrigerant
- Five sizes from 12,000 to 36,000 Btu/h
- Quiet operation (as low as 35 dBA)
- Auto or manually set three fan speeds
- Easy to remove cleanable filter

INDOOR UNIT MODEL		RAV-HB241KRTP-UL
PERFORMANCE		
Cooling Rated Capacity	Btu/h	24,000
Heating Rated Capacity	Btu/h	27,000
Fan Type (Qty)		Turbo (1)
Airflow (H/M/L)	CFM	705/530/355
Sound Pressure (H/M/L)	dBA	46/41/35
ELECTRICAL		
Power Supply	V/Ph/Hz	From ODU
FILTER		
Type		Washable
Quantity		2
MERV Corresponding Value		5
Dimensions (W x L x D)	in.	15-3/4 x 16-3/8 x 1/16

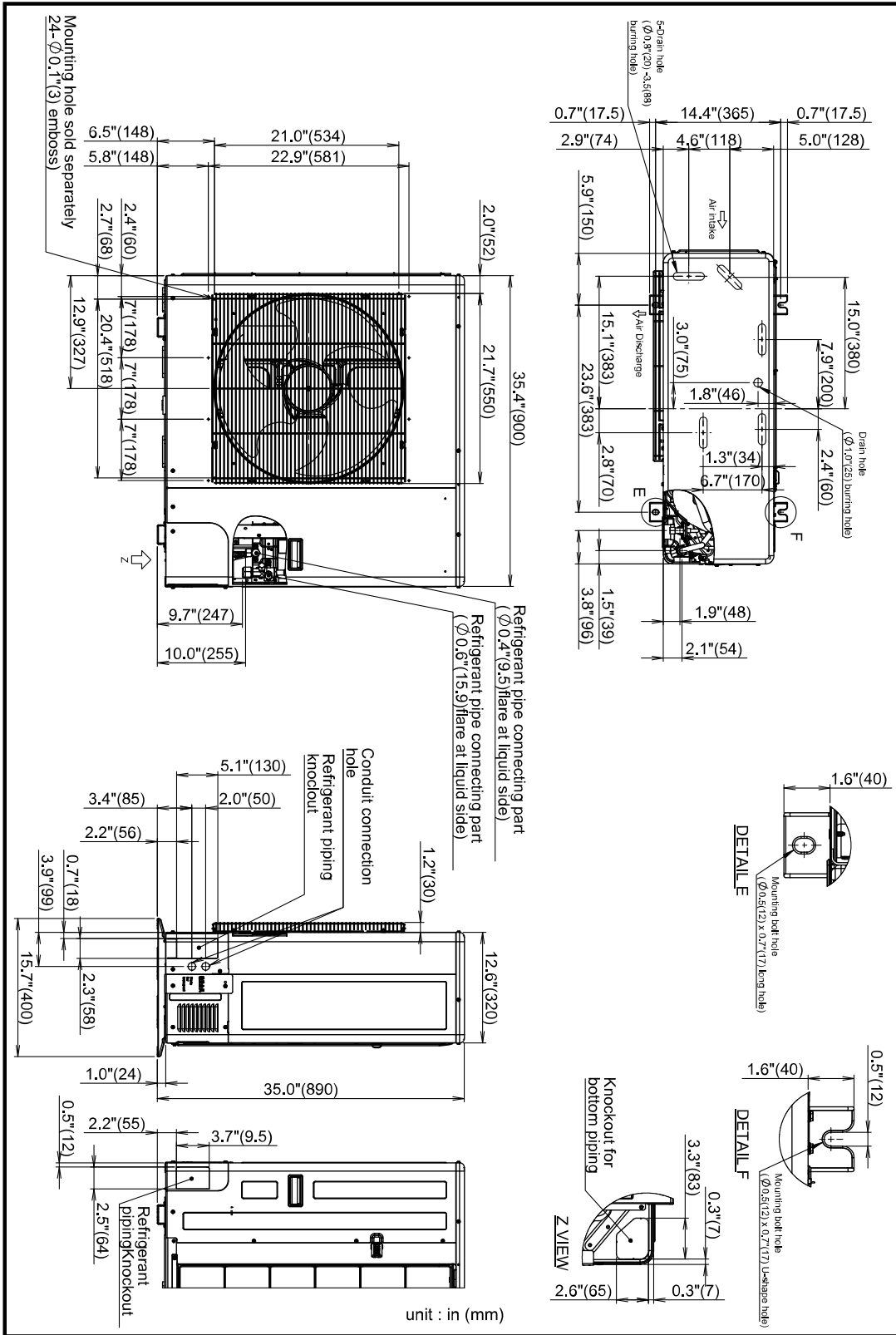
PHYSICAL DATA		
Pipe Connection Size - Liquid (High Pressure)	in	3/8 (Flare)
Pipe Connection Size - Gas (Low Pressure)	in	5/8 (Flare)
Refrigerant		R-410A
External Finish		Munsell 2.5GY9.0/0.5
Unit Width	in	41-3/8
Unit Height	in	12-5/8
Unit Depth	in	9-7/8
Unit Net Weight	lb	33.1
MOTOR		
Motor Type		DC
Motor Watts	W	30

ACCESSORIES

- Wired Remote Controller (7-Day Programmable) RBC-AWSU52-UL
- Simple Wired Remote Controller RBC-ASCU11-UL
- Remote Sensor TCB-TC41U-UL
- Condensate Drain Pipe Kit 53DS-900---118

DIMENSIONAL DRAWING

OUTDOOR UNIT RAV-BP241AT2P-UL

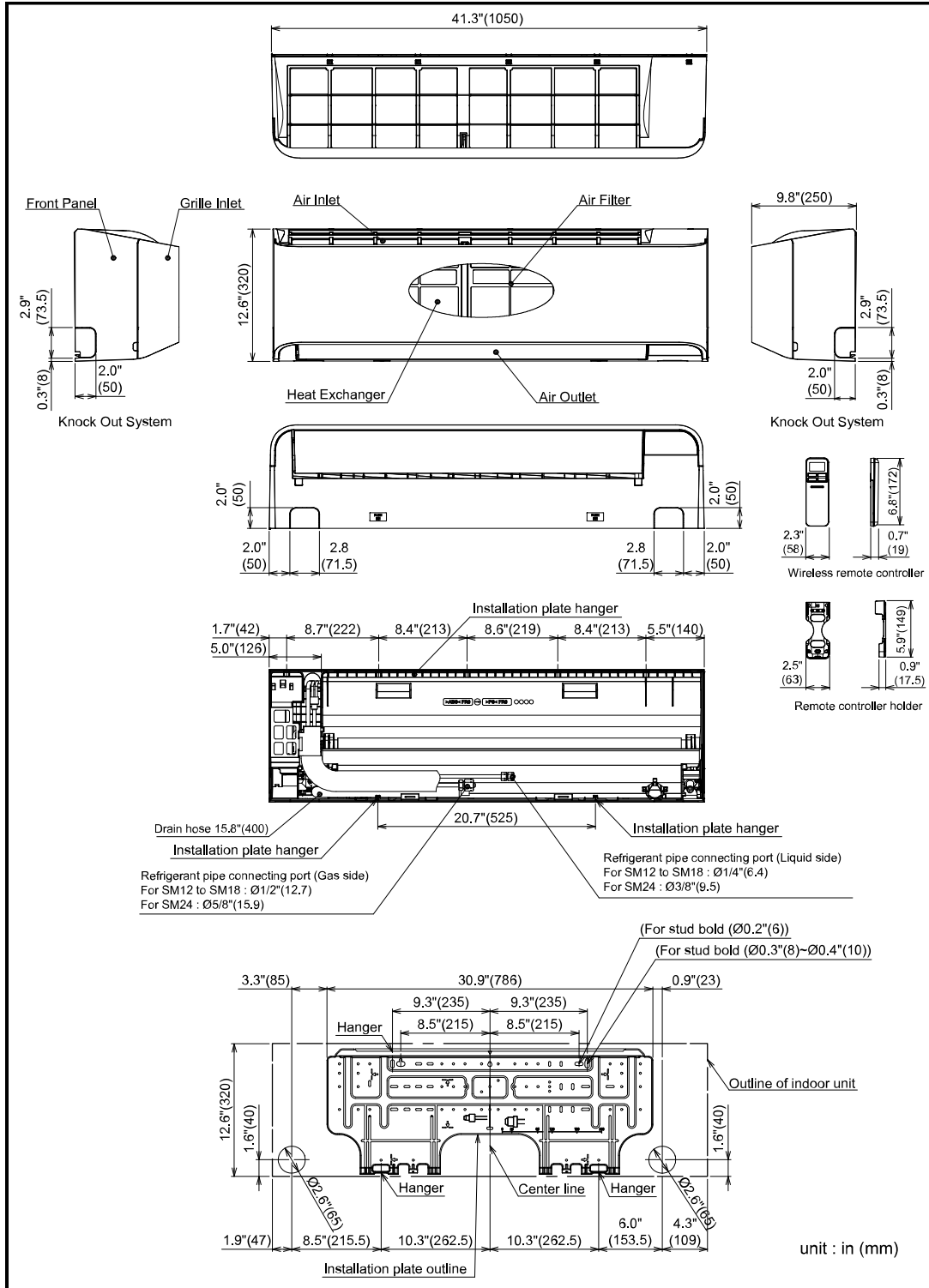


unit : in (mm)



DIMENSIONAL DRAWING

INDOOR UNIT HIGH WALL RAV-HB241KRTP-UL



Mark For	Qty	Model Number	Description
	3	48NGUB600905	5T R454b Gas/Electric RTU, 5 Tons 208/3
	1	48NGUB480905	4T R454b Gas/Electric RTU, 4 Tons 208/3
	4		Verical Drybulb Economizer
	4		Curb Adapter
	1	RAV-HB241KRTP-UL	TC 24K High Wall
	1	RAV-BP241AT2P-UL	TC 24K SDI Condensing Unit, 2 Tons, 208/1
	1		TC Wired Remote Controller

5t

**Tag Cover Sheet
Unit Report
Certified Drawing
Performance Report**

Unit Report For 5t

Project: City of Patterson
Prepared By: Ryan Walsh

09/03/2025
01:04PM

Unit Parameters

Unit Model:.....**48NGUB6009050**
Unit Size:.....**60 (5 Tons)**
Volts-Phase-Hertz:.....**208-3-60**
Heating Type:.....**Gas**
Refrigerant:.....**R-454B**
Heat Control:.....**90,000 Btuh**
Duct Cfg:.....**Vertical/Vertical**
DX Options:.....**Ultra Low NOx Unit**

Dimensions (ft. in.) & Weight (lb.) ***

Unit Length:.....**4' 0.1875"**
Unit Width:.....**3' 8.125"**
Unit Height:.....**4' 4.75"**

*** Weights and Dimensions are approximate. Weight does not include roof curbs, unit packaging, field installed accessories or factory installed options. Approximate dimensions are provided primarily for shipping purposes. For exact dimensions and weights, refer to appropriate product data catalog.

Base Unit Weight (Does not include any accessories):
515.....lb

Warranty Information

1 year warranty on parts
5 year warranty on compressor
5 year warranty on heat exchanger

No optional warranties were selected.

Ordering Information

Part Number	Description	Quantity
48NGUB6009050	Rooftop Unit	3

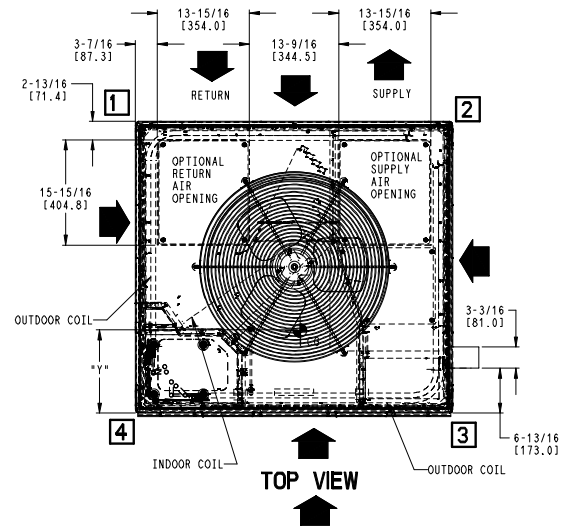
Certified Drawing for 5t

Project: City of Patterson
Prepared By: Ryan Walsh

09/03/2025
01:04PM

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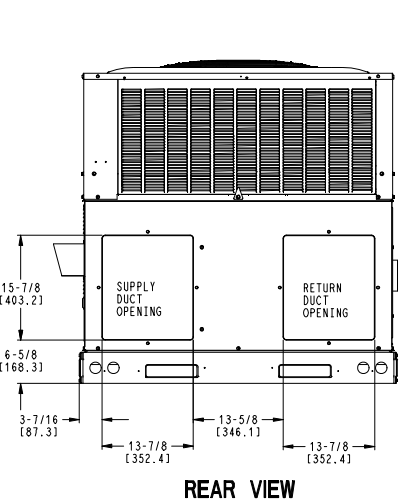
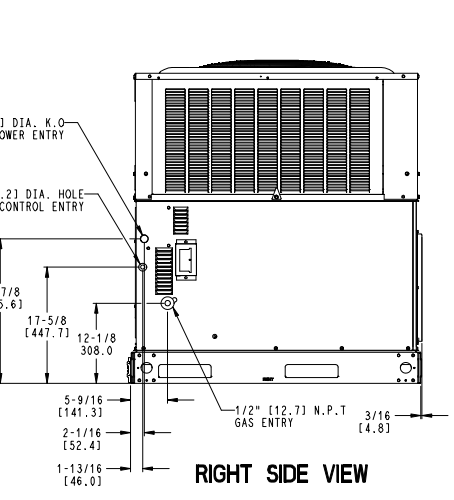
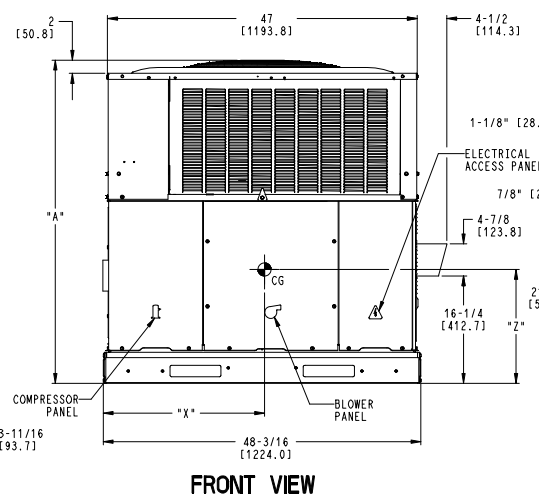
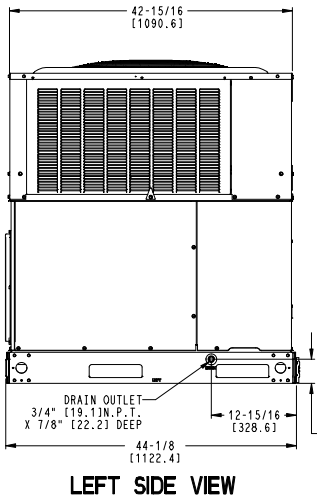
COOLING CAPACITY	UNIT WT.		UNIT HEIGHT IN/MM		CENTER OF GRAVITY IN/MM					
	LB	KG	"A"	"A"	X	Y	Z			
36	450	203.9	44-3/4	1137	22-13/16	579.4	18	457.2	17-1/8	435.0
48	500	226.7	50-3/4	1289	22-13/16	579.4	18	457.2	17-3/8	441.3
60	515	233.5	52-3/4	1340	22-13/16	579.4	18	457.2	17-5/8	447.7

COOLING CAPACITY	SHIPPING HEIGHT		SHIPPING LENGTH		SHIPPING WIDTH		SHIPPING WEIGHT	
	IN	MM	IN	MM	IN	MM	LB	KG
36	48-3/4	1238	48-1/4	1226	44	1118	464	210.2
48	54-3/4	1391	48-1/4	1226	44	1118	514	233.1
60	56-3/4	1441	48-1/4	1226	44	1118	529	239.8

UNIT	CORNER WEIGHT LB/KG			
	"1"	"2"	"3"	"4"
36	98.2	44.5	87.0	39.5
48	108.7	49.3	96.8	43.9
60	111.5	50.6	99.2	45.0

NOTE: 1. ALL TABLE DATA RELEVANT FOR ALL FACTORY INSTALLED OPTIONS EXCEPT ECONOMIZER.
2. * - INDICATES ALL FIOP CODES FOR THE MODELS LISTED.

REQUIRED CLEARANCES TO COMBUSTIBLE MATL.		REQUIRED CLEARANCE FOR OPERATION AND SERVICING	
TOP OF UNIT.....	14 [355.6]	EVAP. COIL ACCESS SIDE.....	36 [914.0]
DUCT SIDE OF UNIT.....	2 [50.8]	POWER ENTRY SIDE.....	42 [1066.8]
SIDE OPPOSITE DUCTS.....	14 [355.6]	(EXCEPT FOR NEC REQUIREMENTS)	
BOTTOM OF UNIT.....	12 [304.8]	UNIT TOP.....	48 [1219.2]
FLUE PANEL.....	36 [914.4]	SIDE OPPOSITE DUCTS.....	36 [914.0]
		DUCT PANEL.....	12 [304.8]*
NEC REQUIRED CLEARANCES		*MINIMUM DISTANCES: IF UNIT IS PLACED LESS THAN 12 [304.8] FROM WALL SYSTEM, THEN SYSTEM PERFORMANCE MAYBE COMPROMISED.	
BETWEEN UNITS, POWER ENTRY SIDE.....	42 [1066.8]	DIMENSIONS IN [] ARE IN MM	
UNIT AND UNGROUNDED SURFACES, POWER ENTRY SIDE.....	36 [914.0]		
UNIT AND BLOCK OR CONCRETE WALLS AND OTHER GROUNDED SURFACES, POWER ENTRY SIDE.....	42 [1066.8]		



04/10/25	ORIG. DRW	SINGLE ZONE ELECTRIC COOLING WITH GAS HEATING(LG)	SD6111-4	-
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Performance Summary For 5t

Project: City of Patterson
Prepared By: Ryan Walsh

09/03/2025
01:04PM

Part Number:48NGUB6009050

Refrigerant:..... **R-454B**
ARI SEER2:..... **15.20**

Base Unit Dimensions

Unit Length:..... **48.2** in
Unit Width:..... **44.1** in
Unit Height:..... **52.8** in
Base Unit Weight (Does not include any accessories):..... **515** lb

Unit

Unit Voltage-Phase-Hertz:..... **208-3-60**
Air Discharge:..... **Vertical**
Fan Drive Type:..... **Direct**
Actual Airflow:..... **1750** CFM
Site Altitude:..... **0** ft

Cooling Performance

Condenser Entering Air DB:..... **95.0** F
Evaporator Entering Air DB:..... **80.0** F
Evaporator Entering Air WB:..... **67.0** F
Entering Air Enthalpy:..... **31.44** BTU/lb
Evaporator Leaving Air DB:..... **58.5** F
Evaporator Leaving Air WB:..... **56.9** F
Evaporator Leaving Air Enthalpy:..... **24.33** BTU/lb
Net Cooling Capacity:..... **56.00** MBH
Net Sensible Capacity:..... **40.70** MBH
Total Unit Power Input:..... **4.80** kW
Coil Bypass Factor:..... **0.100**

Heating Performance

Heating Airflow:..... **1750** CFM
Entering Air Temp:..... **70.0** F
Leaving Air Temp:..... **109.2** F
Gas Heating Input Capacity:..... **90.0** MBH
Gas Heating Output Capacity:..... **74.0** MBH
Temperature Rise:..... **39.2** F
AFUE (%):..... **81.0**

Supply Fan

External Static Pressure:..... **0.50** in wg
Options / Accessories Static Pressure
Wet Coil:..... **0.08** in wg
Application External Static (ESP + Unit Opts/Acc.):..... **0.58** in wg
Fan RPM:..... **1040**
Fan Power:..... **0.69** BHP
Fan Motor Size, hp:..... **1**
NOTE:..... **7 Motor Speed, Vert**

Selection includes construction throwaway filter into the base fan curve. This filter is not MERV Rated.

Electrical Data

Minimum Voltage:..... **197**
Maximum Voltage:..... **253**
Compressor RLA:..... **14**
Compressor LRA:..... **150**
Outdoor Fan FLA (ea):..... **1.05**
Indoor Fan Motor FLA (Total):..... **6.9**
Power Supply MCA:..... **25.5**

Performance Summary For 5t

Project: City of Patterson
 Prepared By: Ryan Walsh

09/03/2025
 01:04PM

Power Supply MOCP (Fuse or HACR):..... **35**
 Inducer Motor FLA:..... **0.27**

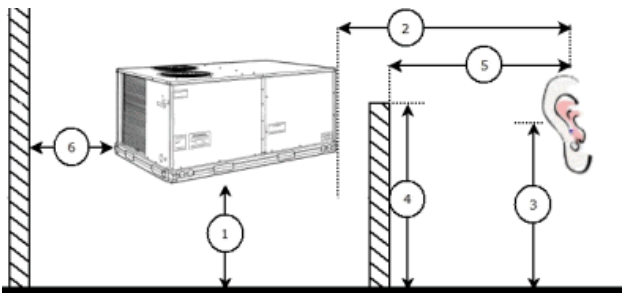
Control Panel SCCR: 5kA RMS at Rated Symmetrical Voltage

Acoustics

Sound Rating:..... **77.0 db**
 Sound Power Levels, db re 10E-12 Watts

	Discharge	Inlet	Outdoor
63 Hz	NA	NA	NA
125 Hz	NA	NA	60.0
250 Hz	NA	NA	64.0
500 Hz	NA	NA	71.0
1000 Hz	NA	NA	74.0
2000 Hz	NA	NA	64.0
4000 Hz	NA	NA	60.0
8000 Hz	NA	NA	54.0

Advanced Acoustics



Advanced Acoustics Parameters

- 1. Unit height above ground:..... **30.0** ft
- 2. Horizontal distance from unit to receiver:..... **50.0** ft
- 3. Receiver height above ground:..... **5.7** ft
- 4. Height of obstruction:..... **0.0** ft
- 5. Horizontal distance from obstruction to receiver:..... **0.0** ft
- 6. Horizontal distance from unit to obstruction:..... **0.0** ft

Detailed Acoustics Information

Octave Band Center Freq. Hz	63	125	250	500	1k	2k	4k	8k	Overall
A	0.0	60.0	64.0	71.0	74.0	64.0	60.0	54.0	76.5 Lw
B	- 26.2	43.9	55.4	67.8	74.0	65.2	61.0	52.9	75.6 LwA
C	0.0	27.6	31.6	38.6	41.6	31.6	27.6	21.6	44.1 Lp
D	- 26.2	11.5	23.0	35.4	41.6	32.8	28.6	20.5	43.2 LpA

Legend

- A Sound Power Levels at Unit's Acoustic Center, Lw
- B A-Weighted Sound Power Levels at Unit's Acoustic Center, LwA
- C Sound Pressure Levels at Specific Distance from Unit, Lp
- D A-Weighted Sound Pressure Levels at Specific Distance from Unit, LpA

4t

Project: City of Patterson
Prepared By: Ryan Walsh

09/03/2025
01:04PM

4t

**Tag Cover Sheet
Unit Report
Certified Drawing
Performance Report**

Unit Report For 4t

Project: City of Patterson
Prepared By: Ryan Walsh

09/03/2025
01:04PM

Unit Parameters

Unit Model:.....**48NGUB4809050**
Unit Size:.....**48 (4 Tons)**
Volts-Phase-Hertz:.....**208-3-60**
Heating Type:.....**Gas**
Refrigerant:.....**R-454B**
Heat Control:.....**90,000 Btuh**
Duct Cfg:.....**Vertical/Vertical**
DX Options:.....**Ultra Low NOx Unit**

Dimensions (ft. in.) & Weight (lb.) ***

Unit Length:.....**4' 0.1875"**
Unit Width:.....**3' 8.125"**
Unit Height:.....**4' 2.75"**

*** Weights and Dimensions are approximate. Weight does not include roof curbs, unit packaging, field installed accessories or factory installed options. Approximate dimensions are provided primarily for shipping purposes. For exact dimensions and weights, refer to appropriate product data catalog.

Base Unit Weight (Does not include any accessories):
500.....lb

Warranty Information

1 year warranty on parts
5 year warranty on compressor
5 year warranty on heat exchanger

No optional warranties were selected.

Ordering Information

Part Number	Description	Quantity
48NGUB4809050	Rooftop Unit	1

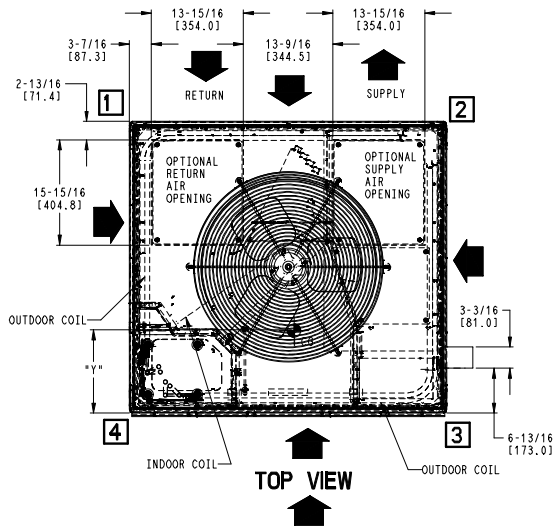
Certified Drawing for 4t

Project: City of Patterson
Prepared By: Ryan Walsh

09/03/2025
01:04PM

CARRIER / BRYANT / ICP YAC (LARGE CHASSIS)

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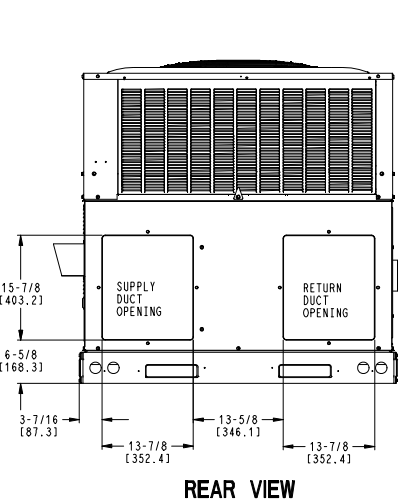
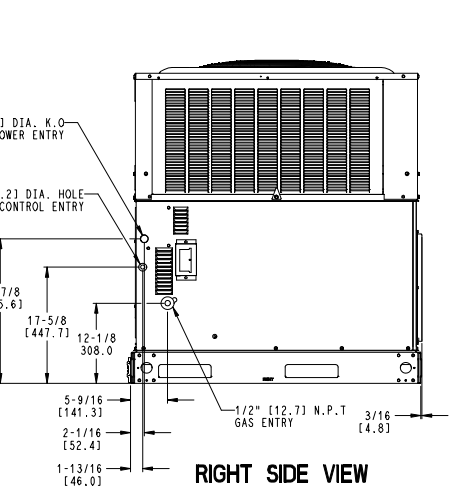
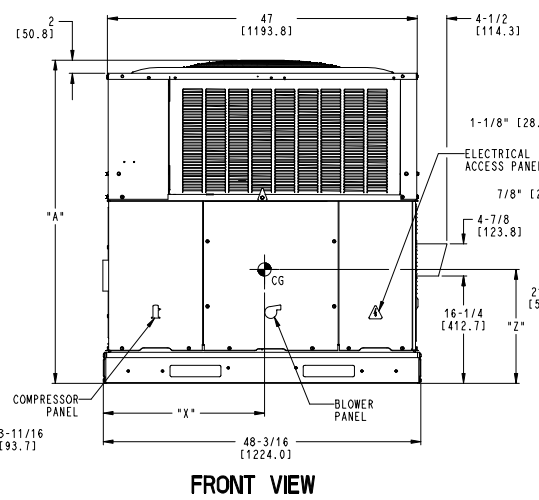
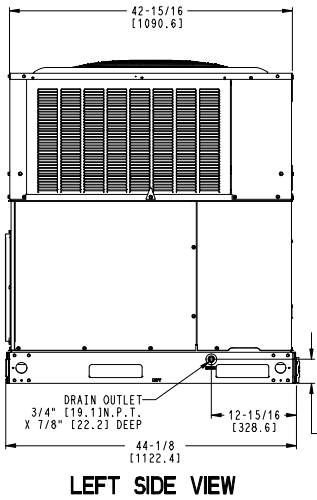
COOLING CAPACITY	UNIT WT.		UNIT HEIGHT IN/MM		CENTER OF GRAVITY IN/MM					
	LB	KG	"A"	"A"	X	Y	Z			
36	450	203.9	44-3/4	1137	22-13/16	579.4	18	457.2	17-1/8	435.0
48	500	226.7	50-3/4	1289	22-13/16	579.4	18	457.2	17-3/8	441.3
60	515	233.5	52-3/4	1340	22-13/16	579.4	18	457.2	17-5/8	447.7

COOLING CAPACITY	SHIPPING HEIGHT		SHIPPING LENGTH		SHIPPING WIDTH		SHIPPING WEIGHT	
	IN	MM	IN	MM	IN	MM	LB	KG
36	48-3/4	1238	48-1/4	1226	44	1118	464	210.2
48	54-3/4	1391	48-1/4	1226	44	1118	514	233.1
60	56-3/4	1441	48-1/4	1226	44	1118	529	239.8

UNIT	CORNER WEIGHT LB/KG			
	"1"	"2"	"3"	"4"
36	98.2	44.5	87.0	39.5
48	108.7	49.3	96.8	43.9
60	111.5	50.6	99.2	45.0

NOTE: 1. ALL TABLE DATA RELEVANT FOR ALL FACTORY INSTALLED OPTIONS EXCEPT ECONOMIZER.
2. * - INDICATES ALL FIOP CODES FOR THE MODELS LISTED.

REQUIRED CLEARANCES TO COMBUSTIBLE MATL.		REQUIRED CLEARANCE FOR OPERATION AND SERVICING	
	INCHES (MM)		INCHES (MM)
TOP OF UNIT	14 [355.6]	EVAP. COIL ACCESS SIDE	36 [914.0]
DUCT SIDE OF UNIT	2 [50.8]	POWER ENTRY SIDE	42 [1066.8]
SIDE OPPOSITE DUCTS	14 [355.6]	(EXCEPT FOR NEC REQUIREMENTS)	
BOTTOM OF UNIT	12 [304.8]	UNIT TOP	48 [1219.2]
FLUE PANEL	36 [914.4]	SIDE OPPOSITE DUCTS	36 [914.0]
		DUCT PANEL	12 [304.8]*
NEC REQUIRED CLEARANCES		*MINIMUM DISTANCES: IF UNIT IS PLACED LESS THAN 12 [304.8] FROM WALL SYSTEM, THEN SYSTEM PERFORMANCE MAYBE COMPROMISED.	
BETWEEN UNITS, POWER ENTRY SIDE	42 [1066.8]	DIMENSIONS IN [] ARE IN MM	
UNIT AND UNGROUNDED SURFACES, POWER ENTRY SIDE	36 [914.0]		
UNIT AND BLOCK OR CONCRETE WALLS AND OTHER GROUNDED SURFACES, POWER ENTRY SIDE	42 [1066.8]		



04/10/25	ORIG. DRW	SINGLE ZONE ELECTRIC COOLING WITH GAS HEATING(LG)	SD6111-4	-
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Performance Summary For 4t

Project: City of Patterson
Prepared By: Ryan Walsh

09/03/2025
01:04PM

Part Number:48NGUB4809050

Refrigerant:..... **R-454B**
ARI SEER2:..... **16.00**

Base Unit Dimensions

Unit Length:..... **48.2** in
Unit Width:..... **44.1** in
Unit Height:..... **50.8** in
Base Unit Weight (Does not include any accessories):..... 500 lb

Unit

Unit Voltage-Phase-Hertz:..... **208-3-60**
Air Discharge:..... **Vertical**
Fan Drive Type:..... **Direct**
Actual Airflow:..... **1772** CFM
Site Altitude:..... **0** ft

Cooling Performance

Condenser Entering Air DB:..... **95.0** F
Evaporator Entering Air DB:..... **80.0** F
Evaporator Entering Air WB:..... **67.0** F
Entering Air Enthalpy:..... **31.44** BTU/lb
Evaporator Leaving Air DB:..... **59.9** F
Evaporator Leaving Air WB:..... **58.5** F
Evaporator Leaving Air Enthalpy:..... **25.37** BTU/lb
Net Cooling Capacity:..... **48.37** MBH
Net Sensible Capacity:..... **38.55** MBH
Total Unit Power Input:..... **3.89** kW
Coil Bypass Factor:..... **0.109**

Heating Performance

Heating Airflow:..... **1772** CFM
Entering Air Temp:..... **70.0** F
Leaving Air Temp:..... **108.7** F
Gas Heating Input Capacity:..... **90.0** MBH
Gas Heating Output Capacity:..... **74.0** MBH
Temperature Rise:..... **38.7** F
AFUE (%):..... **81.0**

Supply Fan

External Static Pressure:..... **0.50** in wg
Options / Accessories Static Pressure
Wet Coil:..... **0.08** in wg
Application External Static (ESP + Unit Opts/Acc.):..... **0.58** in wg
Fan RPM:..... **1075**
Fan Power:..... **0.69** BHP
Fan Motor Size, hp:..... **1**
NOTE:..... **8 Motor Speed, Vert**

Selection includes construction throwaway filter into the base fan curve. This filter is not MERV Rated.

Electrical Data

Minimum Voltage:..... **197**
Maximum Voltage:..... **253**
Compressor RLA:..... **11.9**
Compressor LRA:..... **112**
Outdoor Fan FLA (ea):..... **1.05**
Indoor Fan Motor FLA (Total):..... **6.9**
Power Supply MCA:..... **22.9**

Performance Summary For 4t

Project: City of Patterson
 Prepared By: Ryan Walsh

09/03/2025
 01:04PM

Power Supply MOCP (Fuse or HACR):..... **30**
 Inducer Motor FLA:..... **0.27**

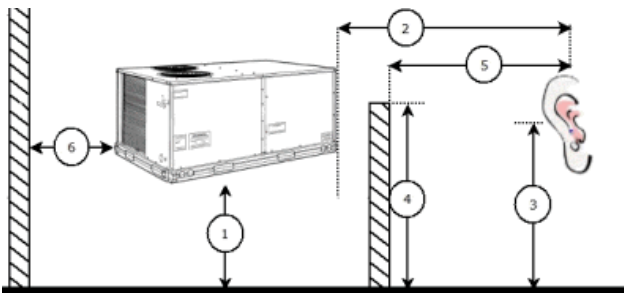
Control Panel SCCR: 5kA RMS at Rated Symmetrical Voltage

Acoustics

Sound Rating:..... **71.0 db**
 Sound Power Levels, db re 10E-12 Watts

	Discharge	Inlet	Outdoor
63 Hz	NA	NA	NA
125 Hz	NA	NA	59.0
250 Hz	NA	NA	61.0
500 Hz	NA	NA	64.0
1000 Hz	NA	NA	68.0
2000 Hz	NA	NA	62.0
4000 Hz	NA	NA	58.0
8000 Hz	NA	NA	53.0

Advanced Acoustics



Advanced Acoustics Parameters

- 1. Unit height above ground:..... **30.0** ft
- 2. Horizontal distance from unit to receiver:..... **50.0** ft
- 3. Receiver height above ground:..... **5.7** ft
- 4. Height of obstruction:..... **0.0** ft
- 5. Horizontal distance from obstruction to receiver:..... **0.0** ft
- 6. Horizontal distance from unit to obstruction:..... **0.0** ft

Detailed Acoustics Information

Octave Band Center Freq. Hz	63	125	250	500	1k	2k	4k	8k	Overall
A	0.0	59.0	61.0	64.0	68.0	62.0	58.0	53.0	71.2 Lw
B	- 26.2	42.9	52.4	60.8	68.0	63.2	59.0	51.9	70.3 LwA
C	0.0	26.6	28.6	31.6	35.6	29.6	25.6	20.6	38.8 Lp
D	- 26.2	10.5	20.0	28.4	35.6	30.8	26.6	19.5	37.9 LpA

Legend

- A Sound Power Levels at Unit's Acoustic Center, Lw
- B A-Weighted Sound Power Levels at Unit's Acoustic Center, LwA
- C Sound Pressure Levels at Specific Distance from Unit, Lp
- D A-Weighted Sound Pressure Levels at Specific Distance from Unit, LpA

OPTIONS:
MATERIAL: 18ga. GALV STEEL
INSULATED PANELS (WHERE REQUIRED)
1" 1-1/2LB DUCT INSULATION (R VALUE 3.85)
GASKET PROVIDED WITH CURB
1 1/2" ADDED TO EXISTING CURB O.D.

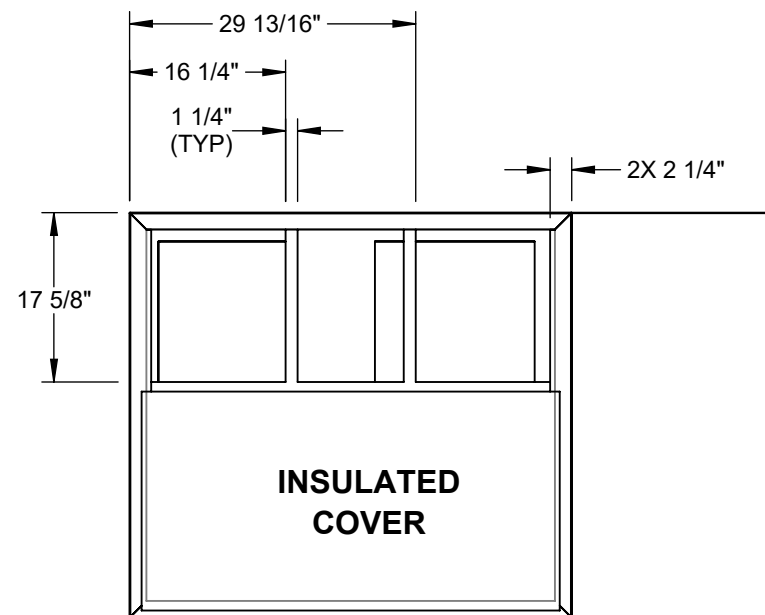
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REVISIONS				
REV.	ECO#	DESCRIPTION	DATE	APPROVED
1		INITIAL DRAWING		

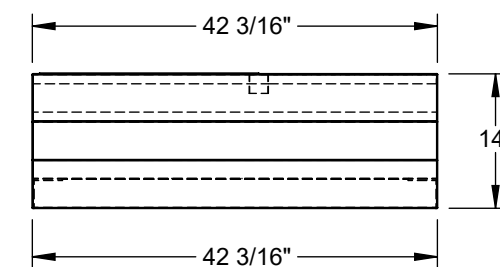
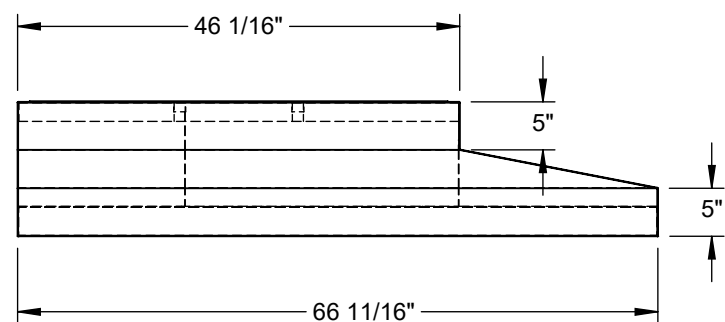
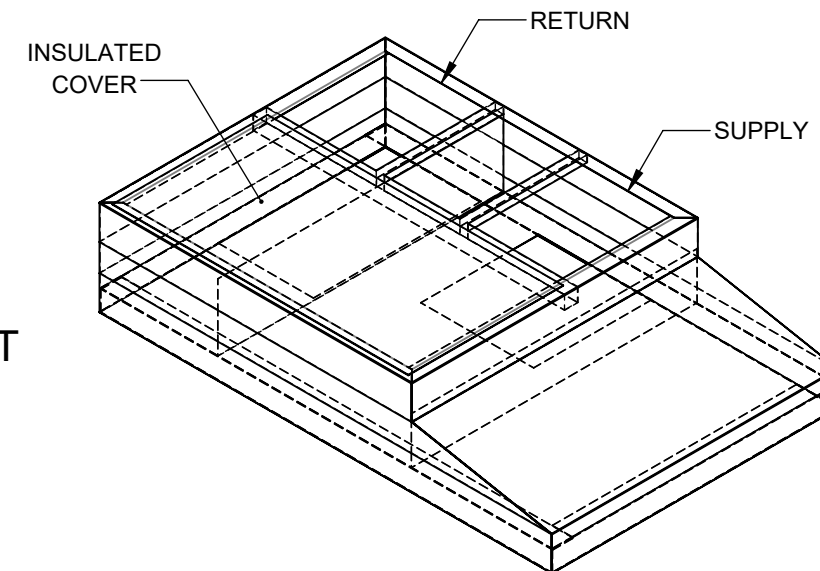
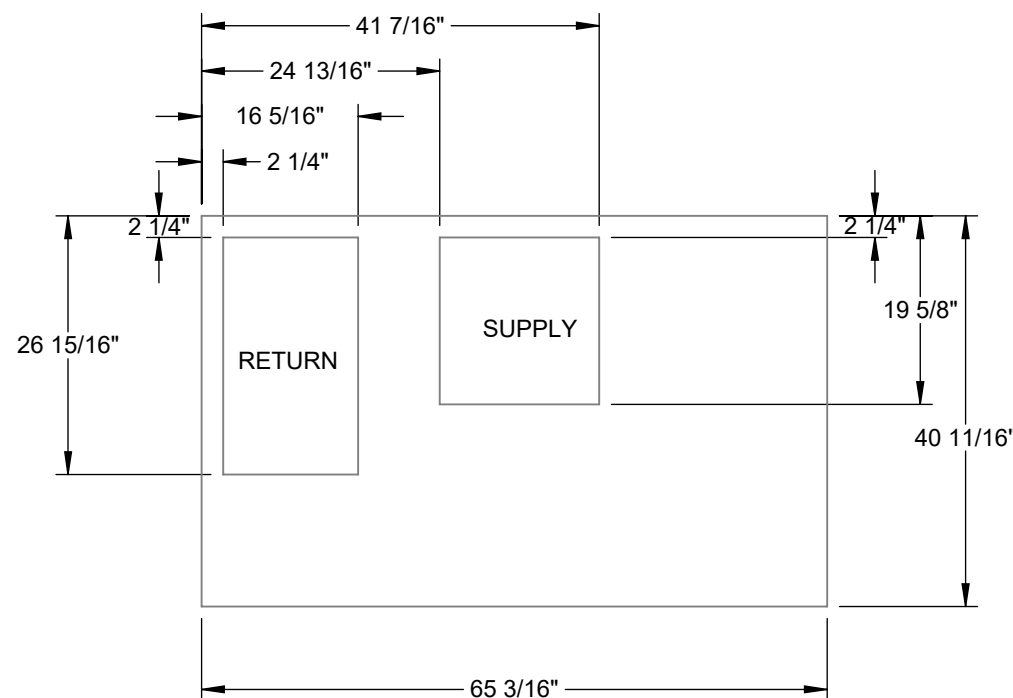
Attn: _____

Tag: _____

Approval: _____



EXISTING CURB LAYOUT



CURB SHOWN IS CDI STANDARD CONFIGURATION CDI RESERVES THE RIGHT TO CHANGE LAYOUT WITHOUT NOTIFICATION. IF CURB IS NEEDED IN A DIFFERENT CONFIGURATION CDI MUST BE NOTIFIED PRIOR TO PLACING AN ORDER.

OPERATIONAL HEIGHT OF CDI ADAPTER IS 3" LESS THAN OVERALL CURB HEIGHT SHOWN.

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	DRAWN: <u>jdiemert</u>		7/30/2020	1-3100-4023	
	CHECKED:			APPROXIMATE CURB WEIGHT (LBS.):	
DIMENSIONS ARE AS FOLLOWS: 1.00 in [25.40 mm]				126.7948	ECO #:
*VERIFY EXISTING CURB OD *VERIFY SUPPLY AND RETURN OPENINGS *NOTE ANY CHANGES *CALL WITH ANY QUESTIONS *FAX BACK IF DRAWING IS OK AS IS				Contact us @ www.cdicurbs.com or 1-888-234-7001	SCALE: 1:20 SHEET: 1 OF 6
				REV: 1	

Residential & Light Commercial Heat Pump System



Indoor Model: RAV-HB241KRTP-UL
Outdoor Model: RAV-BP241AT2P-UL

Submittal Data

Job Name _____ Location _____
 Tag _____



OUTDOOR UNIT STANDARD FEATURES

- Digital inverter compressor technology
- System can operate in cooling only mode with heating locked out
- Line lengths up to 164 ft
- Low-ambient cooling down to 5°F
- System diagnostics

OUTDOOR UNIT MODEL		RAV-BP241AT2P-UL
SYSTEM PERFORMANCE		
Nominal Cooling Capacity†	Btu/h	24,000
SEER2		22.7
EER2		11.8
Nominal Heating Capacity†	Btu/h	27,000
HSPF2		10.4
COP		11.3
REFRIGERANT LINES		
Total Piping Length	ft	164
Vertical Lift	ft	98
Suction Line Size	in	5/8
Liquid Line Size	in	3/8
AMBIENT OPERATING RANGE		
Cooling DB Min ~ Max	F	5~115
Heating DB Min ~ Max	F	-13~59
REFRIGERANT		R454B
FACTORY CHARGE	lbs	4.63

AIRFLOW		
Cooling	CFM	2300
Heating	CFM	2220
SOUND PRESSURE LEVEL		
Cooling	db(A)	52
Heating	db(A)	54
ELECTRICAL		
Power Supply	V/Ph/Hz	208-230/1/60
Minimum Circuit Amps (MCA)	A	17
Recommended Fuse Size	A	20
Maximum Over Current Protection (MOCP)	A	25
PHYSICAL DATA		
Unit Width	in	35-3/8
Unit Height	in	35
Unit Length	in	12-5/8
Unit Weight	lbs	132.2

Legend

- db** — Dry Bulb
SEER — Seasonal Energy Efficiency Ratio
HSPF — Heating Seasonal Performance Factor
wb — Wet Bulb

†Rated per AHRI (Air-Conditioning, Heating and Refrigeration Institute) 210/240 Standard.
 Cooling: Indoor 80°F (27°C) db/67°F (20°C) wb; Outdoor 95°F (35°C) db
 Heating: Indoor 70°F (21°C) db; Outdoor 47°F (8°C) db/43°F (6°C) wb



RAV-SM242KRTP-UL HIGH WALL FEATURES

- R-410A refrigerant
- Five sizes from 12,000 to 36,000 Btu/h
- Quiet operation (as low as 35 dBA)
- Auto or manually set three fan speeds
- Easy to remove cleanable filter

INDOOR UNIT MODEL		RAV-HB241KRTP-UL
PERFORMANCE		
Cooling Rated Capacity	Btu/h	24,000
Heating Rated Capacity	Btu/h	27,000
Fan Type (Qty)		Turbo (1)
Airflow (H/M/L)	CFM	705/530/355
Sound Pressure (H/M/L)	dBA	46/41/35
ELECTRICAL		
Power Supply	V/Ph/Hz	From ODU
FILTER		
Type		Washable
Quantity		2
MERV Corresponding Value		5
Dimensions (W x L x D)	in.	15-3/4 x 16-3/8 x 1/16

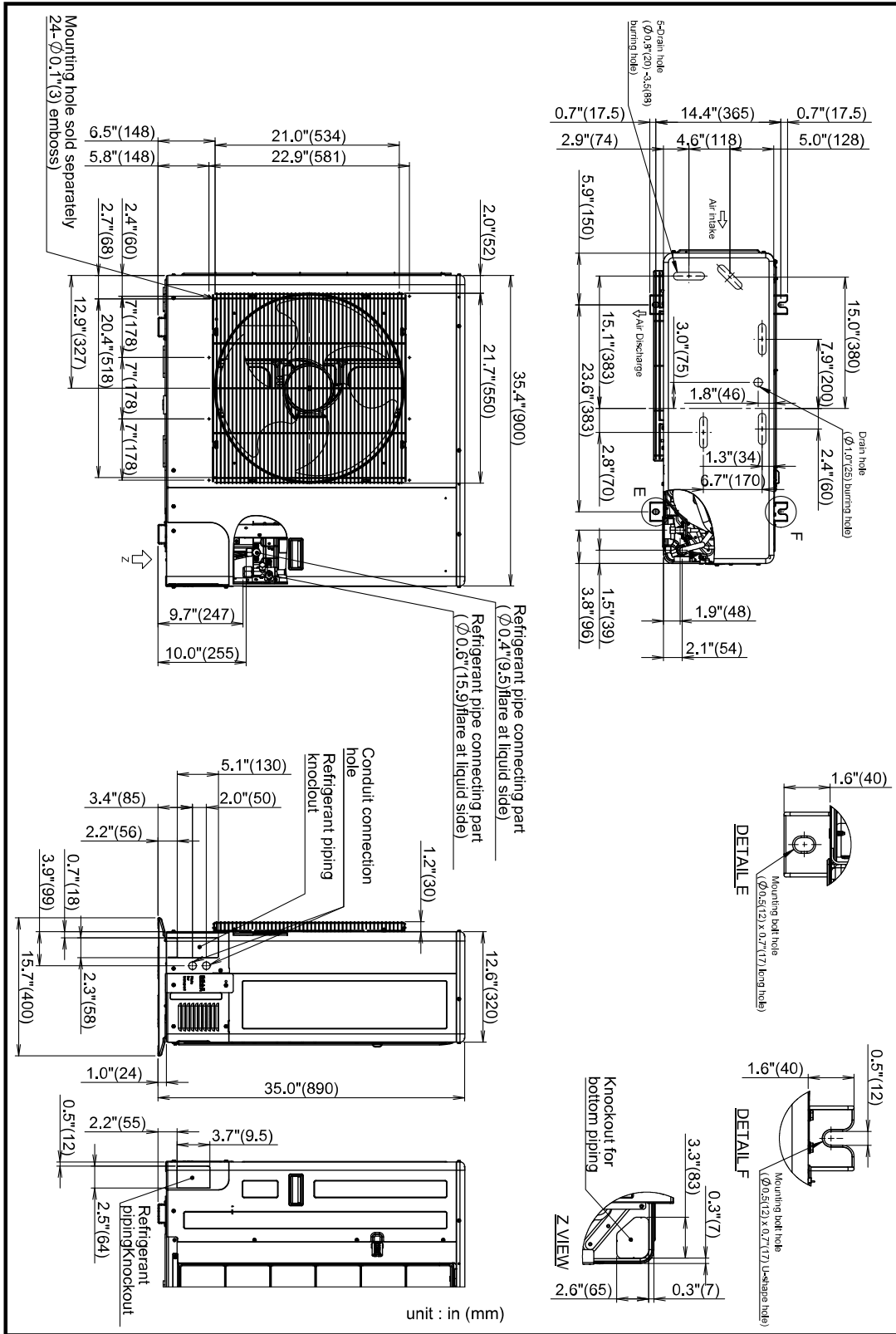
PHYSICAL DATA		
Pipe Connection Size - Liquid (High Pressure)	in	3/8 (Flare)
Pipe Connection Size - Gas (Low Pressure)	in	5/8 (Flare)
Refrigerant		R-410A
External Finish		Munsell 2.5GY9.0/0.5
Unit Width	in	41-3/8
Unit Height	in	12-5/8
Unit Depth	in	9-7/8
Unit Net Weight	lb	33.1
MOTOR		
Motor Type		DC
Motor Watts	W	30

ACCESSORIES

- Wired Remote Controller (7-Day Programmable) RBC-AWSU52-UL
- Simple Wired Remote Controller RBC-ASCU11-UL
- Remote Sensor TCB-TC41U-UL
- Condensate Drain Pipe Kit 53DS-900---118

DIMENSIONAL DRAWING

OUTDOOR UNIT RAV-BP241AT2P-UL



Mark For	Qty	Model Number	Description
	1	27SCA548A003	15 SEER2 HP, 1-Stage, Heat Pump Condenser, 4 Tons 208/1
	1	FJ5ANXC48L00	4T R454B Fan Coil ; 4 Tons 208/1
	2	27SCA560A003	15 SEER2 HP, 1-Stage, Heat Pump Condenser, 5 Tons 208/1
	2	FJ5ANXD60L00	5T R454B Fan Coil ; 5 Tons 208/1

Default

Submittal Cover Sheet Unit Report Performance Summary Report

Unit Report For Default

Project: 27SCA548A003
Prepared By: Ryan Walsh

06/27/2025



Outdoor Unit Parameters

Unit Model:.....**27SCA**
Unit Size:.....**4 Tons (Size 48)**
Voltage:.....**208/230-1-60** V-Ph-Hz

Indoor Coil Parameters

Unit Model:.....**FJ5A**
Unit Size:.....**48,000 Btuh (Size 48)**
Voltage:.....**208-1-60** V-Ph-Hz
Heating Size:.....**No Heat**

Outdoor Unit Dimensions and Weight

Unit Length:.....**31.1875** in
Unit Width:.....**31.1875** in
Unit Height:.....**38.875** in
Unit Shipping Weight:.....**253.** lb

Indoor Coil Dimensions and Weight

Unit Length:.....**22.0625** in
Unit Width:.....**21.125** in
Unit Height:.....**53.4375** in
Unit Shipping Weight:.....**182.** lb

RESIDENTIAL APPLICATIONS

This warranty is to the original purchasing owner and subsequent owners only to the extent and as stated in the Warranty Conditions and below. The limited warranty period in years, depending on the part and the claimant, is as shown in the table below.

Limited Warranty (Years)		
Item	Original Owner	Subsequent Owner
Parts	10* (or 5)	5
Compressor	10* (or 5)	5

*If properly registered within 90 days of original installation, otherwise 5 years (except in California and Quebec and other jurisdictions that prohibit warranty benefits conditioned on registration). See Warranty Conditions below.

OTHER APPLICATIONS

The warranty period is five (5) years on the compressor, and one (1) year on all other parts. The warranty is the original owner only and is not available for subsequent owners.

Ordering Information

Part Number	Description	Quantity
Outdoor Unit		
27SCA548A003	27SCA Comfort Single Stage Heat Pump with Puron Refrigerant Advanced 4 Tons Cooling 15 SEER @ ARI Conditions	1
Indoor Coil		
FJ5ANXC48L00	FJ5A Comfort Series Fan Coil with Puron Advance (R-454B) Refrigerant 48000 BTU Cooling 208/230-1-60 Singular, TXV/ 21 Inches Cabinet Aluminum	1

The Product and Ratings Data in this program is subject to change at any time and without notice. Please refer to the latest product literature and the AHRI directory at www.ahridirectory.org for the most up-to-date information.

Performance Summary For Default

Project: 27SCA548A003
Prepared By: Ryan Walsh

06/27/2025

System Performance

System:	27SCA/FJ5A	Actual Clg Airflow:.....	1600.0	CFM
System Quantity:.....	1	Standard Clg Airflow:.....	1600.0	CFM
Altitude:.....	0.0 ft	Total Net Clg Capacity:.....	46.82	MBH
Linear Pipe Length:.....	0.0 ft	Net Sensible Clg Capacity:.....	36.12	MBH
COP @ 47 F:.....	3.72	Htg HP Capacity:.....	47.13	MBH
COP @ 17 F:.....	2.68	Htg HP Integrated Capacity:.....	47.13	MBH
SEER @ ARI Conditions:.....	15.0	Heating HP Compressor Power:.....	3.56	kW
EER @ ARI Conditions:.....	12.0	Total System Power:.....	3.90	kW
HSPF @ ARI Conditions:.....	7.5			

System Parameters

Outdoor Unit Parameters

Unit Model:.....	27SCA548A003
Unit Size (Nominal):.....	4 Tons (Size 48)
Voltage:.....	208/230-1-60 V-Ph-Hz
Clg Ent Air DB Ambient:.....	95.0 °F
Htg Ent Air DB Ambient:.....	47.0 °F

Indoor Coil Parameters

Unit Model:.....	FJ5ANXC48L00
Unit Size (Nominal):.....	48,000 Btuh (Size 48)
Voltage:.....	208-1-60 V-Ph-Hz
Ent Air DB:.....	80.00 °F
Ent Air WB:.....	67.00 °F
Ent Enthalpy:.....	31.44 BTU/lb
Lvg Air DB:.....	59.10 °F
Lvg Air WB:.....	57.85 °F
Lvg Enthalpy:.....	24.94 BTU/lb
Htg Ent Air DB:.....	70.0 °F
Htg Lvg Air DB:.....	97.3 °F
Heating Size (Nominal):.....	No Heat
Total External Static Pressure:.....	0.50 in wg

Electrical Data

Outdoor Electrical Data

Unit Voltage:.....	208/230-1-60 V-Ph-Hz
Fan Motor FLA:.....	1.40 Amps
MCA:.....	29.4 Amps
Max Fuse:.....	50 Amps
Operating Range Min:.....	197 V
Operating Range Max:.....	253 V
Compressor RLA:.....	22.4 Amps
Compressor LRA:.....	126.0 Amps

Indoor Electrical Data:

(For units with no factory installed electric heaters)

Unit Voltage:.....	208-1-60 V-Ph-Hz
Unit FLA:.....	6.1 Amps
Unit MCA:.....	7.6 Amps
Unit MOCP:.....	15.0 Amps
Unit Min Wire Size:.....	14.0
Unit Fuse/Ckt Bkr Amps:.....	15.0 Amps
Motor HP:.....	3/4 HP

Notice: Indoor Elect. data is for 208-1-60 voltage

The Product and Ratings Data in this program is subject to change at any time and without notice. Please refer to the latest product literature and the AHRI directory at www.ahridirectory.org for the most up-to-date information.

Default

**Submittal Cover Sheet
Unit Report
Performance Summary Report
Certified Drawings**

Unit Report For Default

Project: 27SCA
Prepared By: Ryan Walsh

07/02/2025



Outdoor Unit Parameters

Unit Model:.....**27SCA**
Unit Size:.....**5 Tons (Size 60)**
Voltage:.....**208/230-1-60** V-Ph-Hz

Indoor Coil Parameters

Unit Model:.....**FJ5A**
Unit Size:.....**60,000 Btuh (Size 60)**
Voltage:.....**208-1-60** V-Ph-Hz
Heating Size:.....**No Heat**

Outdoor Unit Dimensions and Weight

Unit Length:.....**35** in
Unit Width:.....**35** in
Unit Height:.....**35.5** in
Unit Shipping Weight:.....**255** lb

Indoor Coil Dimensions and Weight

Unit Length:.....**22.0625** in
Unit Width:.....**24.6875** in
Unit Height:.....**59.1875** in
Unit Shipping Weight:.....**210** lb

RESIDENTIAL APPLICATIONS

This warranty is to the original purchasing owner and subsequent owners only to the extent and as stated in the Warranty Conditions and below. The limited warranty period in years, depending on the part and the claimant, is as shown in the table below.

Limited Warranty (Years)		
Item	Original Owner	Subsequent Owner
Parts	10* (or 5)	5
Compressor	10* (or 5)	5

*If properly registered within 90 days of original installation, otherwise 5 years (except in California and Quebec and other jurisdictions that prohibit warranty benefits conditioned on registration). See Warranty Conditions below.

OTHER APPLICATIONS

The warranty period is five (5) years on the compressor, and one (1) year on all other parts. The warranty is the original owner only and is not available for subsequent owners.

Ordering Information

Part Number	Description	Quantity
Outdoor Unit		
27SCA560A003	27SCA Comfort Single Stage Heat Pump with Puron Refrigerant Advanced 5 Tons Cooling 15 SEER @ ARI Conditions	1
Indoor Coil		
FJ5ANXD60L00	FJ5A Comfort Series Fan Coil with Puron Advance (R-454B) Refrigerant 60000 BTU Cooling 208/230-1-60 Singular, TXV/ 24 Inches Cabinet Aluminum	1

The Product and Ratings Data in this program is subject to change at any time and without notice. Please refer to the latest product literature and the AHRI directory at www.ahridirectory.org for the most up-to-date information.

Performance Summary For Default

Project: 27SCA
Prepared By: Ryan Walsh

07/02/2025

System Performance

System:	27SCA/FJ5A	Actual Clg Airflow:.....	2000.0	CFM
System Quantity:.....	1	Standard Clg Airflow:.....	2000.0	CFM
Altitude:.....	0.0 ft	Total Net Clg Capacity:.....	57.94	MBH
Linear Pipe Length:.....	0.0 ft	Net Sensible Clg Capacity:.....	44.65	MBH
COP @ 47 F:.....	3.74	Htg HP Capacity:.....	57.74	MBH
COP @ 17 F:.....	2.60	Htg HP Integrated Capacity:.....	57.74	MBH
SEER @ ARI Conditions:.....	14.5	Heating HP Compressor Power:.....	4.26	kW
EER @ ARI Conditions:.....	12.0	Total System Power:.....	4.84	kW
HSPF @ ARI Conditions:.....	7.5			

System Parameters

Outdoor Unit Parameters

Unit Model:.....	27SCA560A003	
Unit Size (Nominal):.....	5 Tons (Size 60)	
Voltage:.....	208/230-1-60	V-Ph-Hz
Clg Ent Air DB Ambient:.....	95.0	°F
Htg Ent Air DB Ambient:.....	47.0	°F

Indoor Coil Parameters

Unit Model:.....	FJ5ANXD60L00	
Unit Size (Nominal):.....	60,000 Btuh (Size 60)	
Voltage:.....	208-1-60	V-Ph-Hz
Ent Air DB:.....	80.00	°F
Ent Air WB:.....	67.00	°F
Ent Enthalpy:.....	31.44	BTU/lb
Lvg Air DB:.....	59.33	°F
Lvg Air WB:.....	57.95	°F
Lvg Enthalpy:.....	25.00	BTU/lb
Htg Ent Air DB:.....	70.0	°F
Htg Lvg Air DB:.....	96.7	°F
Heating Size (Nominal):.....	No Heat	
Total External Static Pressure:.....	0.50	in wg

Electrical Data

Outdoor Electrical Data

Unit Voltage:.....	208/230-1-60	V-Ph-Hz
Fan Motor FLA:.....	1.50	Amps
MCA:.....	31.1	Amps
Max Fuse:.....	50	Amps
Operating Range Min:.....	197	V
Operating Range Max:.....	253	V
Compressor RLA:.....	23.7	Amps
Compressor LRA:.....	157.0	Amps

Indoor Electrical Data:

(For units with no factory installed electric heaters)

Unit Voltage:.....	208-1-60	V-Ph-Hz
Unit FLA:.....	6.1	Amps
Unit MCA:.....	7.6	Amps
Unit MOCP:.....	15.0	Amps
Unit Min Wire Size:.....	14.0	
Unit Fuse/Ckt Bkr Amps:.....	15.0	Amps
Motor HP:.....	3/4	HP

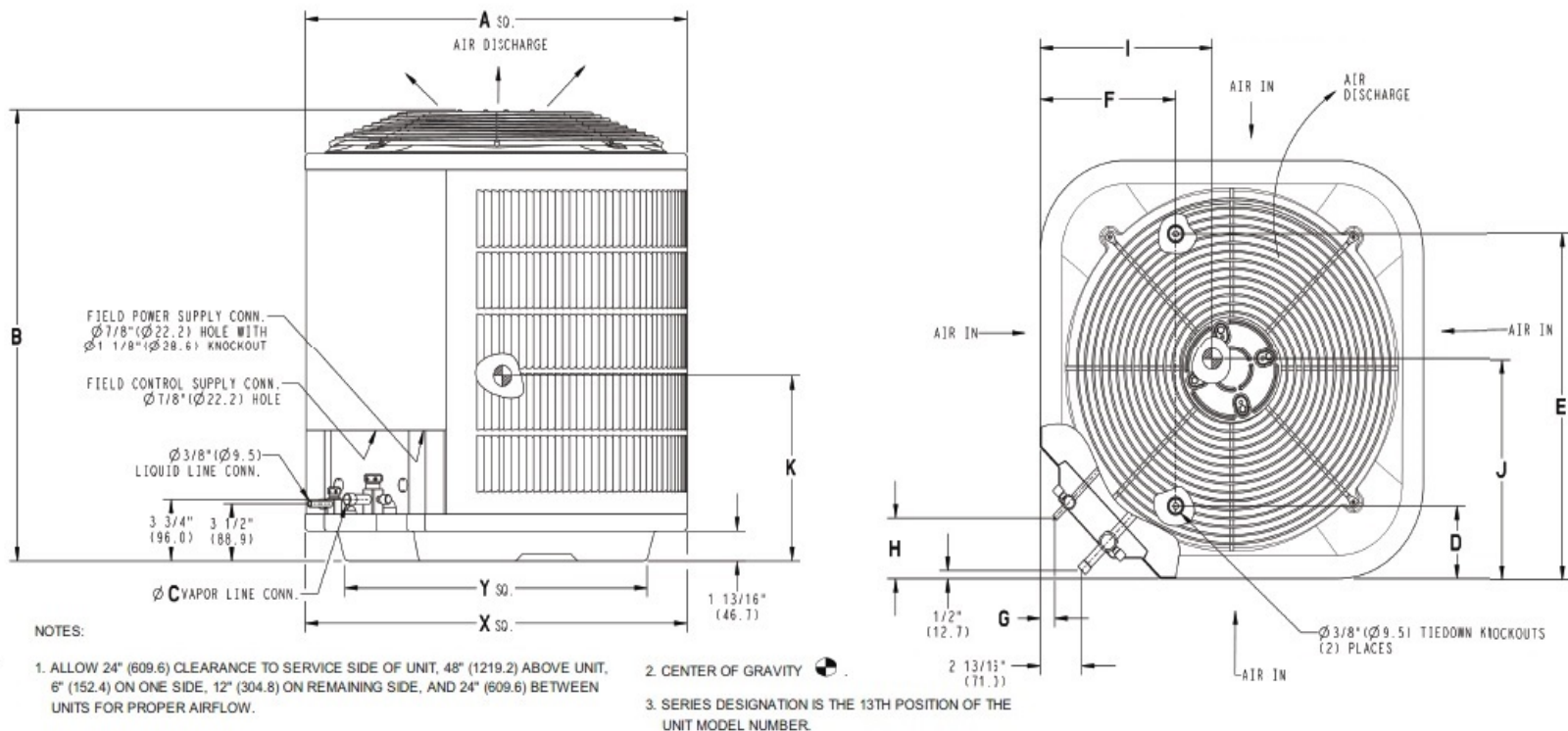
Notice: Indoor Elect. data is for 208-1-60 voltage

The Product and Ratings Data in this program is subject to change at any time and without notice. Please refer to the latest product literature and the AHRI directory at www.ahridirectory.org for the most up-to-date information.

Certified Drawing For Default

Project: 27SCA
Prepared By: Ryan Walsh

07/02/2025



Outdoor Model

Unit Model:.....**27SCA**
 Unit Size:.....**5 Tons (Size 60)**
 Voltage:.....**208/230-1-60** V-Ph-Hz
 SEER:.....**15**
 PartNumber:.....**27SCA560A003**

Shipping Dimensions and Weights	Outdoor Unit
Height	39.81 in
Width	34.25 in
Length	34.25 in
Operating Weight	234. lb
Shipping Weight	255. lb

Dimensions										
A	B	C	D	E	F	G	H	I	J	K
35.00 in	35.50 in	0.88 in	6.56 in	28.44 in	9.13 in	1.13 in	3.81 in	13.00 in	15.50 in	16.75 in

The Product and Ratings Data in this program is subject to change at any time and without notice. Please refer to the latest product literature and the AHRI directory at www.ahridirectory.org for the most up-to-date information.

Certified Drawing For Default

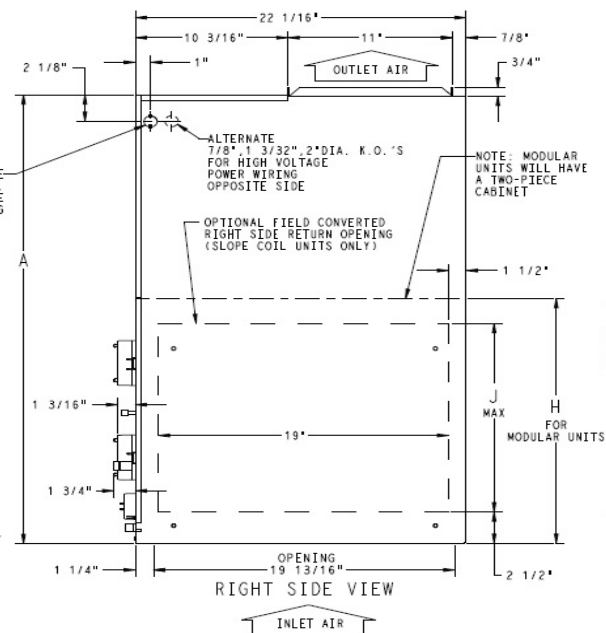
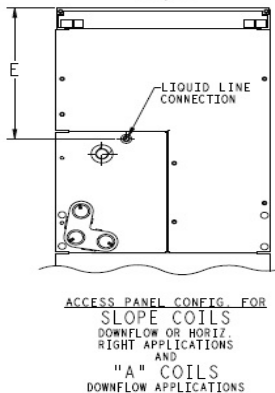
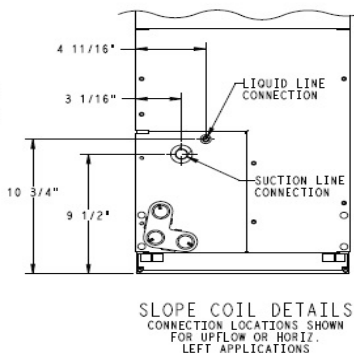
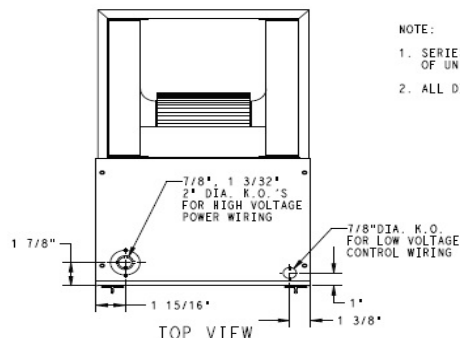
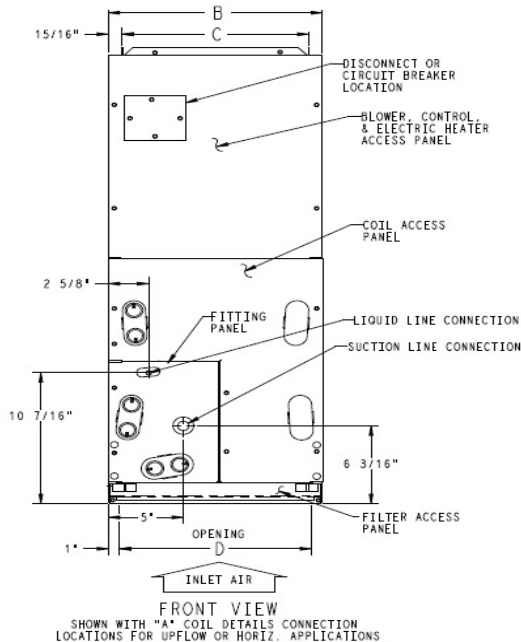
Project: 27SCA
Prepared By: Ryan Walsh

07/02/2025

UNIT CONNECTION SIZES
 SUCTION: 018 & 024 - 5/8" I.D. SWEAT
 030 & 036 - 3/4" I.D. SWEAT
 042 THRU 060 - 7/8" I.D. SWEAT
 LIQUID: 3/8" I.D. SWEAT
 CONDENSATE: 3/4" FPT

NOTE:
 1. SERIES DESIGNATION IS THE 14TH POSITION OF UNIT PRODUCT NUMBER
 2. ALL DIMENSIONS ARE IN "INCHES" UNLESS NOTED.

NOTE: ALLOW 21" FROM FRONT FOR SERVICE



Indoor Coil

Unit Model:.....**FJ5A**
 Unit Size:.....**60,000 Btuh (Size 60)**
 Voltage:.....**208-1-60** V-Ph-Hz
 Cabinet Insulation:**Singular, TXV/ 24 Inches Cabinet**
 PartNumber:.....**FJ5ANXD60L00**

Dimensions and Weights		Indoor Coil
Height		59.19 in
Width		24.69 in
Length		22.06 in
Shipping Weight		210. lb

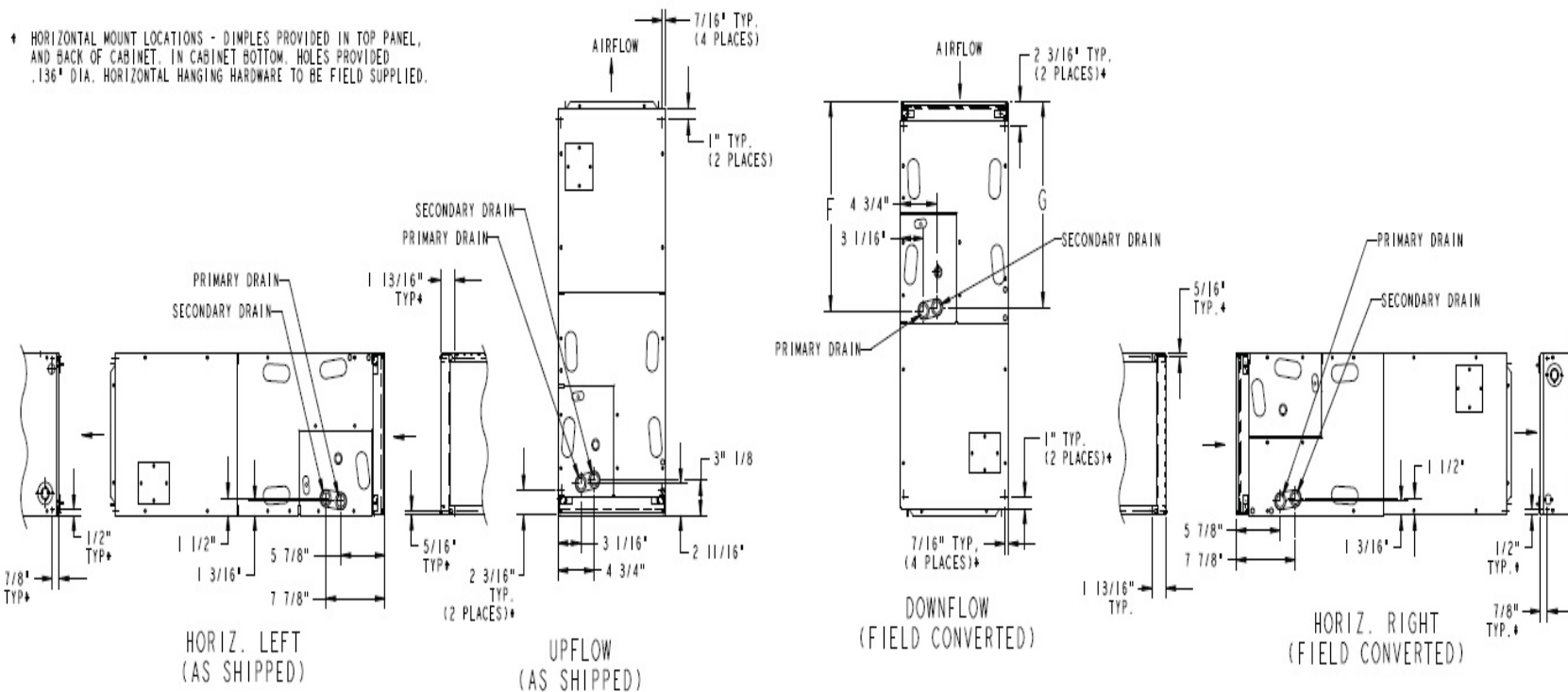
Dimensions									
A	B	C	D	E	F	G	H	J	
59.19 in	24.69 in	22.75 in	22.69 in	25.25 in	32.94 in	32.63 in	--	--	--

The Product and Ratings Data in this program is subject to change at any time and without notice. Please refer to the latest product literature and the AHRI directory at www.ahridirectory.org for the most up-to-date information.

Certified Drawing For Default

Project: 27SCA
 Prepared By: Ryan Walsh

07/02/2025



A-COIL

Indoor Coil

Unit Model:.....**FJ5A**
 Unit Size:.....**60,000 Btuh (Size 60)**
 Voltage:.....**208-1-60** V-Ph-Hz
 PartNumber:.....**FJ5ANXD60L00**

The Product and Ratings Data in this program is subject to change at any time and without notice. Please refer to the latest product literature and the AHRI directory at www.ahridirectory.org for the most up-to-date information.

Attachment D: Control Systems

City of Patterson

Detailed Controls Inventory - City of Patterson - Aquatic Center



City of Patterson: Add Controls to Select HVAC Units																
General Information				Existing Equipment Data										Proposed Controls Data		
Map ID Tag	Site	Building	Unit Location	System Type	Make	Model	Mfg. Year	Size Tons (pre)	SEER (pre)	Unit Condition	Replace Unit? (Y/N)	Add Controls? (Y/N)	Proposed System Type	Size Tons	SEER	
No ID tag	Aquatic Center	Main	Rooftop	Split Condenser	No Access	-	-	3	14	Good	N	Y	Install WiFi Programmable Thermostats	3	14	
No ID tag	Aquatic Center	Main	Rooftop	Split Condenser	No Access	-	-	3	14	Good	N	Y	Install WiFi Programmable Thermostats	3	14	

Detailed Controls Inventory - City of Patterson - City Hall



City of Patterson: Add Controls to Select HVAC Units															
General Information				Existing Equipment Data									Proposed Controls Data		
Map ID Tag	Site	Building	Unit Location	System Type	Make	Model	Mfg. Year	Size Tons (pre)	SEER (pre)	Unit Condition	Replace Unit? (Y/N)	Add Controls? (Y/N)	Proposed System Type	Size Tons	SEER
No ID tag	City Hall	Main	Ground Mount	Ductless Split Condenser	Mr Cool	A-24-HP-C-230G	2021	2	19	Good	N	N	No Change	2	19
No ID tag	City Hall	Main	Basement	HHW Boiler Nat. Gas	LAARS	SMB-250N	2005	-	N/A	Poor	Y	N	No Change	-	N/A
No ID tag	City Hall	Main	Basement	1-HP HHW Pump	Baldor	VEJMM3116T	2005	-	N/A	Poor	Y	N	No Change	-	N/A
AH-1	City Hall	Main	Basement	Air Handler	McQuay	CAH031GDAM	2005	-	N/A	Poor	N	Y	RCx of SP fan controls and sensors	-	N/A
No ID tag	City Hall	Main	Basement	Wall Mount Heat-Pump	Marvair	AVP24ACC00M	2006	2	10	Poor	Y	N	No Change	2	23
No ID tag	City Hall	Main	Rooftop	Gas Package	Trane	YHC036A3RLA0R000	2006	3	12	Poor	Y	Y	Install WiFi Programmable Thermostat & Gateway	3	15.2
No ID tag	City Hall	Main	Rooftop	Air-Cooled Condensing Unit	McQuay	AC2050BC12-ER11	2006	50	12	Poor	Y	N	No Change	50	15.6

Detailed Controls Inventory - City of Patterson - Corporate Yard



City of Patterson: Add Controls to Select HVAC Units															
General Information				Existing Equipment Data									Proposed Controls Data		
Map ID Tag	Site	Building	Unit Location	System Type	Make	Model	Mfg. Year	Size Tons (pre)	SEER (pre)	Unit Condition	Replace Unit? (Y/N)	Add Controls? (Y/N)	Proposed System Type	Size Tons	SEER
No ID tag	Corporate Yard	Main	Ground Mount	Ductless Split Condenser	Cooper	CH18MSPH230V0	2022	2	23	Good	N	N	No Change	2	23
No ID tag	Corporate Yard	Main	Ground Mount	Split Condenser	Trane	4TWZ0048A1000AA	2009	4	14	Poor	Y	Y	Install WiFi Programmable Thermostats	4	15
No ID tag	Corporate Yard	Main	Ground Mount	Split Condenser	Trane	4TWZ0060A1000AA	2009	5	14	Poor	Y	Y	Install WiFi Programmable Thermostats	5	15
No ID tag	Corporate Yard	Main	Ground Mount	Split Condenser	Trane	4TWZ0060A1000AA	2009	5	14	Poor	Y	Y	Install WiFi Programmable Thermostats	5	15

Detailed Controls Inventory - City of Patterson - Fire Station #1



City of Patterson: Add Controls to Select HVAC Units															
General Information				Existing Equipment Data									Proposed Controls Data		
Map ID Tag	Site	Building	Unit Location	System Type	Make	Model	Mfg. Year	Size Tons (pre)	SEER (pre)	Unit Condition	Replace Unit? (Y/N)	Add Controls? (Y/N)	Proposed System Type	Size Tons	SEER
No ID tag	Fire Station #1	Main	Rooftop	Gas Package	Bryant	582KP05A067A2A0AAA	2022	4	14	Good	N	Y	Install WiFi Programmable Thermostats	4	14
No ID tag	Fire Station #1	Main	Rooftop	Gas Package	Bryant	Illegible	-	4	12	Poor	Y	Y	Install WiFi Programmable Thermostats	4	16
No ID tag	Fire Station #1	Main	Rooftop	Gas Package	Rheem	RGEA14036AJT06XAB	2020	3	14	Good	N	Y	Install WiFi Programmable Thermostats	3	14
No ID tag	Fire Station #1	Main	Ground Mount	Ductless Split Condenser	BDP	DAQMA-S122-3AAA	2015	1	16	Good	N	N	No Change	1	16
No ID tag	Fire Station #1	Main	Rooftop	Ductless Split Heat-Pump Condenser	LG	LSU180HEV	-	2	20	Good	N	N	No Change	2	20

Detailed Controls Inventory - City of Patterson - Fire Station #2



City of Patterson: Add Controls to Select HVAC Units															
General Information				Existing Equipment Data									Proposed Controls Data		
Map ID Tag	Site	Building	Unit Location	System Type	Make	Model	Mfg. Year	Size Tons (pre)	SEER (pre)	Unit Condition	Replace Unit? (Y/N)	Add Controls? (Y/N)	Proposed System Type	Size Tons	SEER
AC-1	Fire Station #2	Main	Rooftop	Gas Package	Trane	YHC043	-	4	11.7	Poor	Y	Y	Install WiFi Programmable Thermostats	4	16
AC-2	Fire Station #2	Main	Rooftop	Gas Package	Trane	YHC063	-	5	11.7	Poor	Y	Y	Install WiFi Programmable Thermostats	5	15
AC-3	Fire Station #2	Main	Rooftop	Gas Package	Trane	YHC063	-	5	11.7	Poor	Y	Y	Install WiFi Programmable Thermostats	5	15
CU-1	Fire Station #2	Main	Rooftop	Ductless Split Condenser	No Namepla	-	-	2	12.0	Poor	Y	N	No Change	2	23

Detailed Controls Inventory - City of Patterson - Hammon Senior Center



City of Patterson: Add Controls to Select HVAC Units															
General Information				Existing Equipment Data									Proposed Controls Data		
Map ID Tag	Site	Building	Unit Location	System Type	Make	Model	Mfg. Year	Size Tons (pre)	SEER (pre)	Unit Condition	Replace Unit? (Y/N)	Add Controls? (Y/N)	Proposed System Type	Size Tons	SEER
No ID tag	Hammon Senior Center	Main	Rooftop	Ductless Split Condenser	Bryant	38MAQB36R-301	2017	3	20	Good	N	N	No Change	3	20
CU-3	Hammon Senior Center	Main	Rooftop	Split Condenser	York	YCHD60S43S1A	2017	5	14	Good	N	Y	Install WiFi Programmable Thermostats	5	14
CU-4	Hammon Senior Center	Main	Rooftop	Split Condenser	York	YCHD60S43S1A	2017	5	14	Good	N	Y	Install WiFi Programmable Thermostats	5	14
CU-2	Hammon Senior Center	Main	Rooftop	Split Condenser	York	YCHD60S43S1A	2017	5	14	Good	N	Y	Install WiFi Programmable Thermostats	5	14
CU-1	Hammon Senior Center	Main	Rooftop	Split Condenser	York	YCHD60	2017	5	14	Good	N	Y	Install WiFi Programmable Thermostats	5	14
CU-5	Hammon Senior Center	Main	Rooftop	Split Condenser	York	YCHD48	2017	4	14	Good	N	Y	Install WiFi Programmable Thermostats	4	14
CU-8	Hammon Senior Center	Main	Rooftop	Split Condenser	York	YCHD48	2017	4	14	Good	N	Y	Install WiFi Programmable Thermostats	4	14
CU-9	Hammon Senior Center	Main	Rooftop	Split Condenser	York	YCHD60	2017	5	14	Good	N	Y	Install WiFi Programmable Thermostats	5	14
CU-6	Hammon Senior Center	Main	Rooftop	Split Condenser	York	YCHD36	2017	3	14	Good	N	Y	Install WiFi Programmable Thermostats	3	14
CU-7	Hammon Senior Center	Main	Rooftop	Split Condenser	York	No Nameplate	-	3	14	Good	N	Y	Install WiFi Programmable Thermostats	3	14

Detailed Controls Inventory - City of Patterson - Museum



City of Patterson: Add Controls to Select HVAC Units															
General Information				Existing Equipment Data									Proposed Controls Data		
Map ID Tag	Site	Building	Unit Location	System Type	Make	Model	Mfg. Year	Size Tons (pre)	SEER (pre)	Unit Condition	Replace Unit? (Y/N)	Add Controls? (Y/N)	Proposed System Type	Size Tons	SEER
No ID tag	Museum	Main	Ground Mount	Split Condenser	Carrier	38TXA042	2000	3.5	12	Poor	N	N	No Change	3.5	12

Detailed Controls Inventory - City of Patterson - Old Corporate Yard



City of Patterson: Add Controls to Select HVAC Units															
General Information				Existing Equipment Data									Proposed Controls Data		
Map ID Tag	Site	Building	Unit Location	System Type	Make	Model	Mfg. Year	Size Tons (pre)	SEER (pre)	Unit Condition	Replace Unit? (Y/N)	Add Controls? (Y/N)	Proposed System Type	Size Tons	SEER
No ID tag	Old Corporate Yard	Main	Ground Mount	Ductless Split Condenser	Mr Cool	Multi2-18HP230V1	-	2	16	Good	N	N	No Change	2	16
No ID tag	Old Corporate Yard	Main	Window	Window Mount AC	Frigidaire	No Access	0	1	9	Good	N	N	No Change	1	9
No ID tag	Old Corporate Yard	Main	Rooftop	Evaporative Cooler			0	-	-	Good	N	N	No Change	-	-

Detailed Controls Inventory - City of Patterson - Temporary Police Station



City of Patterson: Add Controls to Select HVAC Units															
General Information				Existing Equipment Data									Proposed Controls Data		
Map ID Tag	Site	Building	Unit Location	System Type	Make	Model	Mfg. Year	Size Tons (pre)	SEER (pre)	Unit Condition	Replace Unit? (Y/N)	Add Controls? (Y/N)	Proposed System Type	Size Tons	SEER
No ID tag	Temporary Police Station	Portable	Exterior	Wall Mount Heat-Pump	Bard		2022	4	11	Good	N	N	No Change	4	11
No ID tag	Temporary Police Station	Portable	Exterior	Wall Mount Heat-Pump	Bard		2022	4	11	Good	N	N	No Change	4	11
No ID tag	Temporary Police Station	Portable	Exterior	Wall Mount Heat-Pump	Bard		2006	3	11	Good	N	N	No Change	3	11
No ID tag	Temporary Police Station	Portable	Exterior	Wall Mount Heat-Pump	Bard		2006	3	11	Good	N	N	No Change	3	11
No ID tag	Temporary Police Station	Portable	Exterior	Wall Mount Heat-Pump	Bard		2006	3	11	Good	N	N	No Change	3	11
No ID tag	Temporary Police Station	Portable	Exterior	Wall Mount Heat-Pump	Bard		2006	3	11	Good	N	N	No Change	3	11
No ID tag	Temporary Police Station	Portable	Exterior	Wall Mount Heat-Pump	Bard		2006	3	11	Good	N	N	No Change	3	11
No ID tag	Temporary Police Station	Portable	Exterior	Wall Mount Heat-Pump	Bard		2006	3	11	Good	N	N	No Change	3	11
No ID tag	Temporary Police Station	Locker Rms	Exterior	Ductless Split Heat-Pump Condenser	Carrier	38MGHBQ36DA3	2024	3	20	Good	N	N	No Change	3	20
No ID tag	Temporary Police Station	Portable	Window	Window Mount AC	No Namepl	-	-	1	9	Good	N	N	No Change	1	9
No ID tag	Temporary Police Station	Portable	Window	Window Mount AC	No Namepl	-	-	1	9	Good	N	N	No Change	1	9

Detailed Controls Inventory - City of Patterson - Waste Water Treatment Plant



City of Patterson: Add Controls to Select HVAC Units															
General Information				Existing Equipment Data									Proposed Controls Data		
Map ID Tag	Site	Building	Unit Location	System Type	Make	Model	Mfg. Year	Size Tons (pre)	SEER (pre)	Unit Condition	Replace Unit? (Y/N)	Add Controls? (Y/N)	Proposed System Type	Size Tons	SEER
No ID tag	WWTP North	Lab	Rooftop	Gas Package	Carrier	No Access	-	8	10	Poor	N	N	No Change	8	10
No ID tag	WWTP North	Lab	Rooftop	Gas Package	Carrier	No Access	-	2	10	Poor	N	N	No Change	2	10
No ID tag	WWTP South	MCCD	Window	Window Mount AC	No Name Pla		-	1	9	Poor	N	N	No Change	1	9
No ID tag	WWTP South	Office Portab	Exterior	Wall Mount Heat-Pump	Bard	Illegible	-	4	9	Poor	N	N	No Change	4	9
No ID tag	WWTP South	Electrical	Ground Mount	Package Heat-Pump	Carrier	50TCQA07A2A6A0A0A0AB	2015	6	14	Good	N	N	No Change	6	14

TC1 Commercial Connected Thermostat

The Pelican Commercial Connected Thermostat provides customers with virtual indoor climate management. The TC1 delivers on leading edge energy efficiency, built-in notifications, and fine tuned comfort. Coupled with the Pelican Web App, the TC1 tracks space temperature and HVAC operational data in real-time and historically.



+ MESH WIRELESS NETWORK

The TC1 communicates over Pelican's wireless. Install a Pelican Gateway to connect the wireless network to the Internet. Each TC1 has built-in state-of-the-art wireless mesh network auto-healing and repeating capabilities.

+ FAULT ALARMING

Built-in equipment fault and temperature analytics with automated email or text message alerts when a fault is detected.

+ WEB APP

Virtual and central management of TC1 provided for free on all smart phones, tablets, and PCs. Directly manage thermostat temperature levels through the web-app. Designed for intuitive control over multiple thermostats.

+ HISTORICAL TREND DATA

Online viewable historical data of space temperature, set-points, HVAC operation, and fan.

+ INSTALLATION

Industry standard HVAC terminals utilize existing thermostat wire. Included with the TC1 is Pelican's innovative limited wiring relay pack used in applications where there are only three (3) wires to the HVAC unit.

+ SCHEDULING

Through the Pelican Web App you can schedule the TC1 thermostat for daily, 5-2, or 7-day schedules. Thermostats can also be scheduled as groups, for simple multi-thermostat management.

+ SLIM AND SLEEK

The TC1 design provides both a simple touch interactive experience while disappearing on the wall.

Designed and assembled in the USA
5-Year Limited Warranty



Meets California Title 24

Specifications

POWER

Hardwire	24VAC, 60Hz; 105 mA
Voltage Range	23 - 30VAC
Independent Relay Current	2.0A running

COMPATIBILITY

24VAC Conventional, Heat Pump, 4-Pipe, 2-Pipe, and Pelican zone damper control.

WIRING

Conventional	R, C, W, W2, Y, Y2, G
Heat Pump	R, C, O/B, AUX, Y, Y2, G

SYSTEM PROTECTION

Four-Minute Compressor Short-Cycle Protection
Temporary Schedule Override
Auxiliary/Emergency Heat Efficiency Algorithm
Keypad Lockout
Trend Data Analytics and Fault Monitoring

THERMOSTAT RANGE

Operating Range	-20°F to 122°F
Operating Humidity (%RH)	5 to 90% RH; non-condensing
Storage Temperature	-20°F to 160°F

SIZE

Inch	H 5.2" x W 3.9" x D 0.75"
mm	H 132 x W 99 x D 19
Vertical Mounting.	Mounts on vertical single gang ring.

Attachment E: Electrical Systems

City of Patterson

Detailed Transformer Inventory - City of Patterson - Waste Water Treatment Plant



City of Patterson: Replace Select Transformers with High Efficiency Transformer											
General Information			Existing Equipment Data					Proposed Equipment Data			
#	Building	Unit Location	Transformer Type	Make: Model #	kVA	E-Star Rated (Y/N)	Replace (Y/N)	Proposed System Type	Proposed Make	Proposed Model	kVA
1	WWTP South	Office Exterior	Dry Type	GE	50	N	Y	New High Efficiency Transformer	Powersmith	OPAL	50

E-SAVER OPAL™ Series

HIGH PERFORMANCE TRANSFORMERS OPTIMIZED TO DELIVER 25 - 50% LESS LOSSES THAN DOE 2016 MINIMUM EFFICIENCY REQUIREMENT

APPLICATION

The E-SAVER OPAL™ Series is a family of ultra-efficient dry-type isolation transformers that has been optimized for different application load profiles, to maximize energy savings and ensure electrical system compatibility. These energy optimized units are perfect for Net Zero, LEED® and High Performing Buildings.

OPAL™ OPTIMIZED PERFORMANCE FOR THE APPLICATION LOAD

To achieve 25-50% more savings than the DOE 2016 requirement, Powersmiths' developed and implemented a design best practice called OPAL™ - Optimized Performance for the Application Load. Recognizing that the transformer has much more impact in an electrical system than just efficiency, OPAL considers the system as a whole, including goals like managing impedance, arc flash, fault level, inrush, harmonics, and more. OPAL™ is possible thanks to the tight feedback loop between design, onsite manufacturing, and extensive ongoing real world operating performance verification. The result is more savings for the same dollar.



75kVA E-Saver OPAL™ Series shown with Cyberhawk TX™, hinged door and Rotatable IR Port™

K-RATING IS A MODERN REQUIREMENT

Many general purpose transformers are purchased and installed because they have the lowest first cost, however, they carry a UL label on the basis of feeding only linear loads. Since most connected loads today are electronic with nonlinear profiles, a low-voltage isolation transformer needs to be K-rated in order to have a valid UL listing for most applications today. E-Savers are appropriately K-rated.

ENVIRONMENTAL/GREEN BUILDING/LEED®/NET ZERO

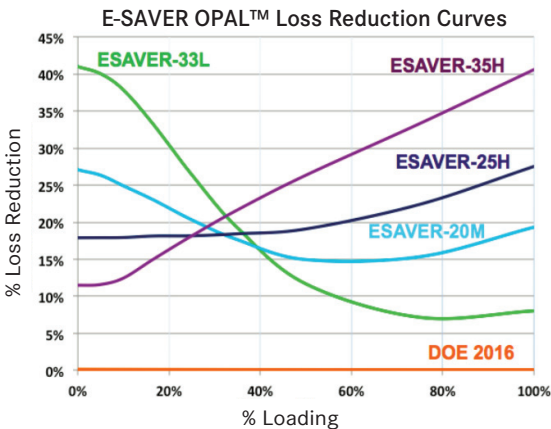
By going meaningfully beyond the DOE 2016 baseline efficiency, the E-Saver™ contributes to green building, LEED®, Net Zero and carbon footprint reduction goals. Additional benefits of Powersmiths products include our ISO14001 certified manufacturing, integrated metering options and ability to integrate with the Powersmiths WOW™ Sustainability Management Platform.

CERTIFICATIONS & TESTING

Powersmiths certifications include ISO 9001 (Quality), ISO 14001 (Environment), ISO 17025 (Efficiency Test Lab), UL and CSA. Powersmiths has a production integrated nonlinear load test program that enables efficiency verification under real-world conditions, as well as IPMVP compliant field measurement of losses and efficiency, and Certified Test Lab Load Profile Test Reports.

METERING & ARC FLASH OPTIONS

Integrated metering can provide information about capacity utilization, load profiles, power quality and energy use. The lockable hinged door option, as well as our patented 360° Rotatable IR Port™ option enable quick and safe access to internal transformer connections, and reduces arc flash risk. Powersmiths also offers transformers with Integrated Power Distribution. For details see the Energy Station TX™ product information.



DOE 2016 IDENTIFIES BILLIONS IN SAVINGS BEYOND NEW LEGAL MINIMUM

Most manufacturers have designed their low-voltage transformers to just meet the new U.S. Dept. of Energy law (DOE 2016), setting minimum efficiency at a single required 35% load point, under an ideal sine wave factory test profile, sacrificing performance elsewhere. The DOE quantifies savings for going beyond DOE 2016 in billions of dollars. Furthermore, the DOE states that lifecycle savings can be maximized by optimizing for real-world loading. Powersmiths OPAL™ enables customers to access these savings – backed by real-world performance verification.

EXPANDED KVA SELECTION ENABLES RIGHT-SIZING

Powersmiths enables right-sizing of electrical infrastructure by offering a much broader selection of transformer kVA sizes. The capital cost, operating cost and footprint reductions can be dramatic – on the order of 30-50%, through smaller transformers, breakers, conductors, and distribution panels.

GUARANTEED PERFORMANCE FOR 32 YEARS

Powersmiths guarantees that every transformer we manufacture meets our published technical data, and furthermore, that this performance is met over the full term of the 32-year pro-rated warranty. Being able to trust that savings are both real and long-term is part of why organizations choose Powersmiths.

E-SAVER OPAL MODEL COMPARISON MATRIX²

Model	Optimized Load Range	Saving beyond DOE 2016*	Temp. Rise	Winding Material ***	Continuous Overload Capacity	K-Rating **/****	Applications
E-Saver-33L	0-25%	33%	<130°C	CU	5%	K7	Most Applications - office, education, healthcare, most other institutional, commercial (light load feeding electronic equipment).
E-Saver-20M	0-100%	20%	<115°C	CU	15%	K1, K9, K13	Where equipment or process loading varies widely, or where the load is expected to change significantly over time.
E-Saver-25H	75-100%	25%	<105°C	CU/AL CU opt.	20%	K13	Dedicated equipment (fans, pumps, elevators, etc.), labs, broadcast, datacenter, industrial where loading is significant.
T1000-30H	50-100%	30%	<105°C	CU	20%	K20	Harmonic Mitigation Transformer - for heavy, harmonic-rich loads, high densities of electronic equipment, where voltage distortion could become excessive.
E-Saver-35H	75-100%	35%	<80°C	CU/AL CU opt.	33%	K20	Heavy loading for extended hours, and need for lower losses & operating costs, overload capacity, faster payback if high energy rate.
E-Saver-50H	75-100%	50%	<65°C	CU	50%	K30	For Special Applications close to full continuous load, where full load losses & heat output must be minimized, significant overload capacity.
E-Saver-S0L	0-100%	30%	<105°C	CU/AL CU opt.	20%	K20 (but not required for apps)	Solar Applications - to avoid solar production waste - minimize transformer idling and full load losses, continuous overload capacity for longer life.

*Estimated average savings vs. DOE 2016 reference for the application load profile

** K-Rating per IEEE-C57.110

*** CU - Copper, AL Aluminum, CU/AL Copper primary with Aluminum Secondary

**** The high K-factor rating is not the goal of the design, but a consequence of the low current densities used to achieve the high loading efficiency goals

¹ U.S. Department of Energy, 10 CFR Part 431, [Docket No. EERE-2010-BT-STD-0048] Energy Conservation Program: Energy Conservation Standards for Distribution Transformers; Final Rule, April 18, 2013

TECHNICAL SPECIFICATIONS

The E-Saver™ is an ultra-efficient low-voltage dry-type isolation transformer that meaningfully exceeds the U.S. Dept. of Energy's new minimum efficiency law, commonly referred to as DOE 2016. Each model is optimized to maximize energy savings and electrical system compatibility in each target application, and has a K-factor listing per UL 1561 and an application appropriate K-rating per C57.110 (see Comparison Matrix). For models with an 'H' designation, K-rating is reduced by one level for 400kVA and larger, reflecting lower harmonic content reality at heavy loading for large kVA transformers (ex.K30->K20, K20->K13, K13->K9) to avoid overbuilding and associated unnecessary cost. See table for individual model attributes.

E-Savers have a common-core (3-phase models), 10kV BIL, 200% rated neutral, are 60Hz rated (std), built to NEMA ST-20 and other applicable ANSI, IEEE standards and are UL listed and CSA approved. Both primary and secondary terminals and voltage taps (typically six 2.5%) are all front-accessible. E-Savers have a 220°C class insulation system that is NOMEX-based with an Epoxy Co-polymer impregnant with technical performance characteristics that embed lower environmental impact, long term reliability and long life expectancy. E-Savers carry OSHPD and IBC Seismic Certification. The seismic bracing option provides a higher 2.28g certification. All E-Saver models come standard in a Type 2 ventilated drip-proof indoor enclosure made of heavy gauge steel finished with epoxy powder coating for durability and low environmental impact, and are UL Listed for 2" rear clearance - a significant improvement over the typical industry 6" limit. A wide variety of enclosures and options are available.

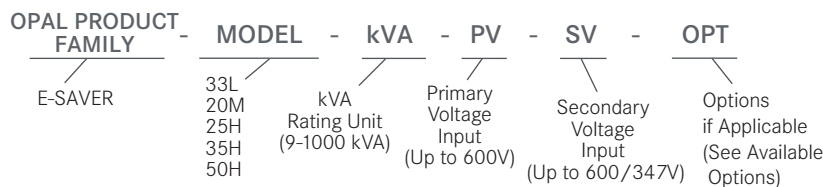
Low Noise: Keeping audible noise at a minimum is key. While the NEMA ST-20 standard sets levels referenced by industry only a type test, not a production test, is required - so transformers on actual projects may be noisy. NEMA ST-20 also allows K13 transformers to be even noisier. Powersmiths builds 3dB quieter than NEMA standard values, and 6dB quieter than the K13+ allowance. Furthermore, every unit is tested to ensure quiet operation. For very sensitive environments, an additional 2dB lower noise option is available.

Management of Impedance, Inrush, Fault Level, Arc Flash: Powersmiths' OPAL™ design best practice includes addressing key transformer attributes like impedance, inrush, fault level, arc flash, to ensure smooth integration into an electrical system, avoiding the negative impacts often associated with high efficiency transformers. See individual technical data sheets for comprehensive values for all parameters.

Impedance: For 33L, 20M, 25H, 35H models, impedance is kept at or above 4.0% in order to manage downstream fault current and arc flash levels, and stay within interrupting capacity (kAIC) ratings. Higher impedance is available to meet specific project needs. 50H models are optimized to project specific requirements.

Inrush: Inrush currents are managed in order to avoid nuisance tripping of the primary breaker and to enable design engineers to use standard 125% rated primary protection, thereby avoiding expensive design changes that otherwise may be needed. Very low inrush designs are available as specific projects may require, for example some datacenter and medical applications.

ORDERING INFORMATION



TECHNICAL DATA

kVA	Audible Noise	33L, 20M, 25H Model Weight Range (lbs)	Standard Case Size (in)	Alternate Smaller Case Size (in)*
15	42 dB	260-340	17.5W x 17D x 27.5H	17.5W x 14.5D x 25H
20	42 dB	300-380	25.5W x 18D x 30H	23W x 15.5D x 27.5H
25	42 dB	340-420	25.5W x 18D x 30H	23W x 15.5D x 27.5H
30	42 dB	380-470	25.5W x 18D x 30H	23W x 15.5D x 27.5H
45	42 dB	490-590	25.5W x 18D x 30H	No Alternate
50	42 dB	540-600	31.5W x 21.5D x 40H	No Alternate
63	47 dB	600-720	31.5W x 21.5D x 40H	26.5W x 20D x 33H
75	47 dB	650-800	31.5W x 21.5D x 40H	26.5W x 20D x 33H
100	47 dB	800-900	31.5W x 21.5D x 40H	No Alternate
112	47 dB	900-1000	31.5W x 21.5D x 40H	No Alternate
125	47 dB	1050-1150	37.5W x 26.5D x 48H	33W x 23D x 38H
150	47 dB	1170-1300	37.5W x 26.5D x 48H	33W x 23D x 38H
175	52 dB	1260-1450	37.5W x 26.5D x 48H	34.5W x 26.5D x 42H
200	52 dB	1375-1550	37.5W x 26.5D x 48H	34.5W x 26.5D x 42H
225	52 dB	1500-1700	37.5W x 31.5D x 52H	34.5W x 26.5D x 42H
250	52 dB	1650-1850	37.5W x 31.5D x 52H	37.5W x 26.5D x 48H
300	52 dB	1850-2000	37.5W x 31.5D x 52H	37.5W x 26.5D x 48H
400	57 dB	2150-2350	51.5W x 38D x 61H	43.5W x 33.5D x 55.5H
450	57 dB	2400-2650	51.5W x 38D x 61H	43.5W x 33.5D x 55.5H
500	59 dB	2800-3000	51.5W x 38D x 61H	43.5W x 33.5D x 55.5H
600	59 dB	3500-3800	64W x 47D x 67H	51.5W x 38D x 61H
750	61 dB	4000-4300	64W x 47D x 67H	Contact Factory
850	61 dB	4300-4850	64W x 47D x 67H	Contact Factory
1000	61 dB	4800-5500	64W x 53D x 67H	Contact Factory

* Typically the min cases are available for the standard models of 33L, 20M, 25H only.

NOTE: The above data applies to the standard configuration of each kVA. Selection of some options may change enclosure size and/or transformer weight. Some options may be mutually exclusive. Consult factory for detailed product data sheet for these and other configurations. Efficiencies tested according to U.S. Dept. of Energy's 10 CFR Part 431, a linear load test at 35% of nameplate capacity. Refer to technical data sheet for comprehensive information for each specific model, kVA, and option selected.

As design optimization is continuous, technical data is updated over time. Please check with Powersmiths for latest revision.

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Email: info@powersmiths.com

WWW.POWERSMITHS.COM

AVAILABLE OPTIONS

Metering: Express Logger™, SMART™ or Cyberhawk TX™ (see product cut sheets for details)

CC: Core & Coils available for OEM Integration

3R: Type 3R, sprinkler proof/ outdoor ventilated enclosure

OSEC: Enclosure for outdoor public areas

SS: Painted stainless steel enclosure

NVI: Non-ventilated indoor enclosure

IRP: 360° Rotatable IR Port™

HD: Hinged Door

F50: 50 Hz design

1S: Single electrostatic shield

2S: Dual electrostatic shields

3S: Triple electrostatic shields

SPD: (120/208 V OR 277/480V)

PRO80: 80kA, 7 mode, Filter

PRO120: 120kA, 7 mode, Filter

PRO200: 200kA, 7 mode, Filter

PRO240: 240kA, 7 mode Filter

PROXX: Where XX is custom ID

LKS: Lug kit, screw-type

LKC: Lug kit, compression type

VLI: Very Low Inrush

IMP: Custom Impedance

COL: Custom color

TS: Thermal sensors at 170°C and 200°C

RTR: Routine Test Report

NLT: Nonlinear Load Test with Certificate

2016TR: DOE 2016 Test Report

CTL: ISO 17025 Certified Test Lab, load profile test

SE: Sensitive environment, extra low noise

SB: Certified Seismic Bracing for 2.28g

(for Certificate details contact Powersmiths)

WM: Wall-mount kit up to 75kVA is available (sold separately)

Attachment F: Building Envelope Systems

City of Patterson

City Hall

Address: 1 Plaza Circle, Patterson, CA 95363

Scope of Work:

60 mil TPO Mechanically Attached Roof Assembly meeting Class “A” Criteria, C.R.R.C. Title 24 Criteria & Carlisle Syn-Tec: 20 Yr. NDL Warranty approval.

Total Area:

Low Slope Roof Area:	8,945 S.F.
Roof Canopies:	1,498 S.F.
Wall & Base Flashing Area:	<u>1,368 S.F.</u>
Total Roof Area:	11,811 S.F.

System Assembly / Spec Plate:

Basis of Design Carlisle Syn-Tec: TPO Membrane MA:

1. TPO Membrane (60mil TPO for field, SRI 0.75)
2. Roof Insulation: Tapered Crickets/ ½” per ft
3. Deck Sheathing: If required, Deck Sheathing installed by others.
4. Cover Boards: Dens Deck Prime ¼”
5. Flashing Membrane & Prefabricated Flashings: 60mil TPO membrane
6. Cross Grip Walk Pad: To be installed per Carlisle Syn-Tec Specifications. (100 L.F.)

SOW:

1. Demolition: Demo existing roofing down to roof deck.
2. Coverboard Installation: Provide & Install 1/4” coverboard (Allowance of 2,000 S.F.) for damaged existing coverboard over existing insulation and roof deck. Mechanically attached using #12 8.75” Screws & 3” Membrane Plates. Fastened at 12-ea per 100 S.F., meeting manufactures written specifications.
3. 60 mill TPO MA: Provide & Install Carlisle Syn-Tec 60 mil TPO Mechanically Attached Assembly with #15-HP-XTRA 9” Screws & Piranha Plates, meeting manufactures written specifications.
4. TPO Clad Metal Edge Installation: Provide & Install Carlisle Syn-Tec “Clad Metal Edge” located @ all perimeters, exposed underdeck canopies. Fastening pattern 4” O.C., Meeting SMACNA & manufactures written specifications. (380 L.F.)
5. TPO Vertical Base Flashings: Provide & Install Carlisle Syn-Tec 60 mil TPO Base Flashing located @ all vertical flashing locations. Meeting manufactures written specifications.
6. TPO VTR Boot Flashings: Provide & Install Carlisle Syn-Tec Boot Flashings located @ all VTR pipe penetrations. (30-ea)
7. Kynar Counter Flashing Assembly: Provide & Install Kynar Factory Coated 24 ga.
8. Counter-Flashing Assembly per SMACNA requirements

-
9. Labor Guarantee: Durations: 2 Yrs. from Acceptance of Carlisle Technical Audit
 10. Carlisle Syn-Tec NDL Warranty: 20 Yrs. from Acceptance of Carlisle Technical audit.

Exclusions:

1. Design Build Qualifications: All design criteria will meet Carlisle Syn-Tec Specification & Assembly Letter requirements.
2. Existing Structural Framing: Excluded in its entirety.
3. Existing TPO Clad Metal Edge Installation: Please be advised that the existing Clad Metal to be used as the required cleat to receive the New Clad Metal Edging.

Clarifications:

1. Stucco Condition: Extensive cracking and holes in stucco at walls and parapets could lead to potential water intrusion in the structure and under the roofing.
2. System Assembly: Above referenced System Assembly meets ASTM: 4450-1989 & 4470-2012
3. Safety Protocols: Allowance of daily Pre-Task Safety meetings as required.
4. JHA Implementation: Allowance of Field Condition JHA Forms "COMPLETED DAILY" as required.
5. Hoisting Criteria: Provision of Reach Lift required for Hoisting all materials & equipment required for this project. Operator Certified.
6. Generated Debris: Removal of all construction debris generated on this project.
7. Provision of Scaffold Stair-Tower: Provision of Stair-Tower for safe Access/Egress to & from Roof Location. Eliminating any need of entering the ongoing Tennant Operations.
8. Affiliations: Union Contractor / Manufacturer Approved.
9. Certifications: Certified Installer/MBE.

Fire Station #1

Address: 344 W Las Palmas Ave, Patterson, CA 95363

Scope of Work:

60 mil TPO Mechanically Attached Roof Assembly meeting Class "A" Criteria, C.R.R.C. Title 24 Criteria & Carlisle Syn-Tec: 20 Yr. NDL Warranty approval.

Total Area:

Low Slope Roof Area:	3,200 S.F.
Roof Canopies:	<u>898 S.F.</u>
Total Roof Area:	4,068 S.F.

System Assembly / Spec Plate:

Basis of Design Carlisle Syn-Tec: TPO Membrane MA:

1. TPO Membrane (60mil TPO for field, SRI 0.75)
2. Roof Insulation: R30-Value / Tapered Crickets/ ½" per ft
3. Deck Sheathing: If required, Deck Sheathing installed by others.
4. Cover Boards: Dens Deck Prime ¼"
5. Flashing Membrane & Prefabricated Flashings: 60mil TPO membrane
6. Safety Yellow Walk Pad: To be installed per Carlisle Syn-Tec Specifications. (50 L.F.)

SOW:

1. Demolition: Demo existing single ply membrane down to BUR system
2. Coverboard Installation: Provide & Install ¼" coverboard (Allowance of 500 S.F.) for damaged existing coverboard over BUR Roof Deck. Mechanically attached using #12-8.75" Screws & 3" Membrane Plates. Fastened at 12-ea per 100.S.F. meeting manufactures written specifications.
3. 60 mill TPO MA: Provide & Install Carlisle Syn-Tec 60 mil TPO Mechanically Attached Assembly with #15-HP-XTRA 9" Screws & Piranha Plates, meeting manufactures written specifications.
4. Existing Tile Coping Installation: Provide & Install an allowance of 20 L.F. of broken or damaged existing perimeter "Tile Ridge", Included in Base Bid
5. TPO Vertical Base Flashings: Provide & Install Carlisle Syn-Tec 60 mil TPO Base Flashing located @ all vertical flashing locations. Meeting manufactures written specifications.
6. TPO VTR Boot Flashings: Provide & Install Carlisle Syn-Tec "Boot Flashings located @ all VTR pipe penetrations. (10-ea)
7. TPO Scuppers: Provide & install Carlisle Syn-Tech 4EA Clad Metal Scupper meeting manufacturers written specifications.
8. Kynar Counter Flashing Assembly: Provide & Install Kynar Factory Coated 24 ga.
9. Counter-Flashing Assembly per SMACNA requirements
10. Labor Guarantee: Durations: 2 Yrs. from Acceptance of Carlisle Technical Audit

11. Carlisle Syn-Tec NDL Warranty: Duration: 20 Yrs. from Acceptance of Carlisle Technical Audit.

Exclusions:

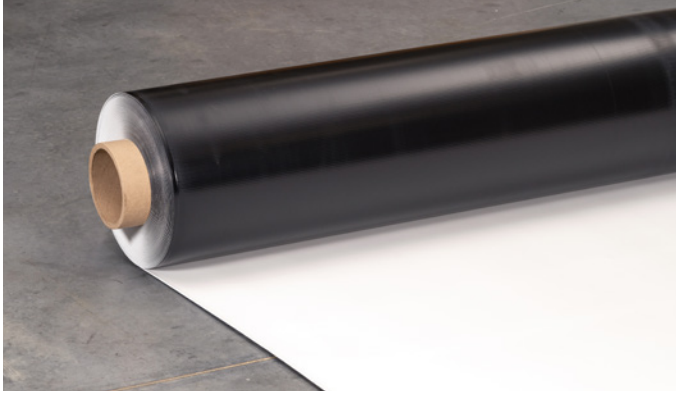
1. Design Build Qualifications: All design criteria will meet Carlisle Syn-Tec Specification & Assembly Letter requirements.
2. Existing Structural Framing: Excluded in its entirety.
3. Existing TPO Clad Metal Edge Installation: Please be advised that the existing Clad Metal to be used as the required cleat to receive the New Clad Metal Edging.
4. Infrared Testing: ABS recommends the provision of Infra-Red Testing to determine the extent if any of potential trapped moisture that may be present with-in the existing BUR Roof Assembly to retain meeting Unified Building Code.

Clarifications

1. System Assembly: Above referenced System Assembly meets ASTM: 4450-1989 &4470-2012
2. Safety Protocols: Allowance of daily Pre-Task Safety meetings as required.
3. JHA Implementation: Allowance of Field Condition JHA Forms "COMPLETED DAILY" as required.
4. Hoisting Criteria: Provision of Reach Lift required for Hoisting all materials & equipment required for this project. Operator Certified.
5. Generated Debris: Removal of all construction debris generated on this project.
6. Provision of Scaffold Stair-Tower: Provision of Stair-Tower for safe Access/Egress to & from Roof Location. Eliminating any need of entering the ongoing Tennant Operations.
7. Affiliations: Union Contractor / Manufacturer Approved.
8. Certifications: Certified Installer/MBE.

Sure-Weld[®] TPO

Reinforced Membrane



Overview

Carlisle's Sure-Weld TPO reinforced membrane is a premium, heat-weldable, single-ply thermoplastic polyolefin (TPO) sheet designed for new roof construction and re-roofing applications. Sure-Weld High Slope (HS) membrane is formulated with additional flame retardant for higher-slope fire code approvals. Sure-Weld Extra is 80 mils (2.03 mm) thick for significantly higher strength and weatherability.

Sure-Weld TPO membranes use advanced polymerization technology that combines the flexibility of ethylene-propylene (EP) rubber with the heat weldability of polypropylene. All Sure-Weld TPO membranes include OctaGuard XT™, an industry-leading, state-of-the-art weathering package. OctaGuard XT technology enables Sure-Weld TPO to withstand the extreme weatherability testing that is intended to simulate exposure to severe climates.

Physical properties of the membrane are enhanced by a strong polyester fabric that is encapsulated between the TPO-based top and bottom plies. The combination of the fabric and TPO plies provides high breaking and tearing strength, as well as excellent puncture resistance. The relatively smooth surface of the membrane produces a total surface fusion weld that results in a consistent, watertight, monolithic roof assembly. The membrane is environmentally friendly and safe to install.

Features and Benefits

- » Living Building Challenge "Red List Free" – Declare Label
- » Sure-Weld TPO is available in 4- and 6-ft (121.92 cm and 182.88 cm) perimeter sheets and 8-, 10-, 12-, and 16-ft (243.84 cm, 304.80 cm, 365.76 cm, and 487.68 cm) Sure-Weld field sheets*
- » Outstanding puncture resistance and excellent fire resistant assemblies
- » Environmentally friendly and stable formulation
- » Excellent resistance to impact and low temperatures
- » UL 2218 Class 4 hail rating
- » Manufactured with non-halogenated flame retardants

- » Excellent chemical resistance to acids, bases and restaurant exhaust emissions
- » Exceptional resistance to heat, solar UV, ozone and oxidation
- » Manufactured using a hot-melt extrusion process for complete scrim encapsulation
- » Enhanced with the OctaGuard XT weathering package
- » Standard Colors:



White Gray Tan

- » Special Colors:



Slate Gray Med Bronze Terra Cotta Patina Green Rock Brown

*Sure-Weld HS Special Color TPO membranes are available in limited sizes. Refer to Carlisle's Sure-Weld TPO Color Palette Sell Sheet for details. Sure-Weld 80-mil in special colors are limited to warranties up to 20 years.



Sustainable Attributes

Carlisle SynTec Systems' focus has always been innovation — Innovation to solve problems, improve performance, reduce labor, and above all, improve sustainability. Carlisle is committed to driving sustainable and efficient processes in the design and manufacturing of our products.

- » Up to 10% pre-consumer recycled content
- » Fully recyclable when used in mechanically attached systems
- » 3rd-party verified Environmental Product Declaration available
- » NSF P151 certification for rainwater catchment**
- » California Title 24 compliant***
- » Free of Living Building Challenge red list chemicals

**White only, produced in Tooele, UT and Carlisle, PA

***White and Tan only

Installation

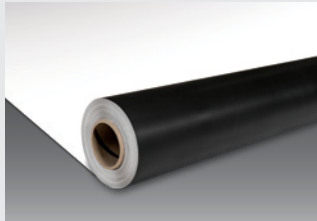
Sure-Weld TPO roofing systems are quick to install, as minimal labor and few components are required. TPO systems are installed using an Automatic Heat Welder, making sheet welding fast, clean, consistent, and easy to learn, while reducing strain on the roofing technician.

Sure-Weld TPO

Reinforced Membrane

Wider is Better

Carlisle's 16-foot Sure-Weld TPO delivers a leap in productivity on adhered and induction welded roofs by cutting down on the number of rolls needed and dramatically reducing the number of seams on the roof.



With fewer rolls to load, stage, and kick out, and fewer seams to weld, contractors can save significant time on each project, moving on to the next one sooner.

16-Foot TPO Benefits

- » Fewer rolls to load and stage on a job saves crane time and labor at the beginning of each project
- » Fewer rolls to position, kick-out, and align during installation saves labor
- » Up to 60% fewer seams vs. 10-foot TPO
- » Fewer seams to weld, probe, and inspect, saving considerable time during installation
- » Fewer T-joint patches to install on each roof
- » Less waste and trash from packaging
- » Less time spent on each project, allowing contractors to complete more roofs and grow their business

Fully-Adhered – membrane is adhered to a suitable substrate utilizing an appropriate bonding adhesive

Mechanically Fastened – membrane is attached to the roof deck over a suitable substrate utilizing plates and fasteners which are overlapped with membrane

Induction-Welded – membrane is attached over a suitable substrate via an induction welding tool being placed over the membrane where a fastened TPO induction welding plate is located to weld the two components together

Review Carlisle specifications and details for complete installation information.

Precautions

- » Sunglasses that filter out ultraviolet light are strongly recommended, as tan and white surfaces are highly reflective. Roofing technicians should dress appropriately and wear sunscreen.
- » Surfaces may become slippery due to frost and ice buildup. Exercise caution during cold conditions to prevent falls. Exercise caution when walking on wet membrane. Membranes may be slippery when wet.
- » Care must be exercised when working close to a roof edge when the surrounding area is snow-covered, as the roof edge may not be clearly visible.
- » Use proper stacking procedures to ensure sufficient stability of the rolls.
- » Store membrane in the original undisturbed plastic wrap in a cool, shaded area and cover with light-colored, breathable, waterproof tarpaulins. Membrane that has been exposed to the weather must be prepared with Weathered Membrane Cleaner prior to hot-air welding.
- » Take care not to stand or place heavy objects on the edge of folded-over membrane, as this could cause a hard crease in the membrane.
- » Maximum sustained temperature not to exceed 160°F (71°C) for TPO membrane.
- » Do not use razor blades or other sharp tools to cut the APEEL Protective Film while it is still adhered to the TPO membrane as damage to the underlying membrane may occur. Pull the protective film away from the membrane prior to cutting.
- » Remove APEEL Protective Film by pulling towards the center of the roof. Do not remove the film by pulling towards the roof edge.
- » A static electric charge may develop when removing APEEL Protective Film from the surface of the membrane sheet. To avoid the possibility of ignition, lids must be closed on any flammable products and a fire extinguisher should be readily available.
- » Color membranes will 'fade' over time mainly due to the ultraviolet portion of sunlight. Since most roof surfaces are exposed to variable sunlight, some areas will be more susceptible to color changes caused by UV fading. Warranties for color membranes do not cover fading of colors.

Extreme Testing for Severe Climates

ASTM Standard D6878 is the material specification for Thermoplastic Polyolefin-Based Sheet Roofing. It covers material property requirements for TPO roof sheeting and includes initial and aged properties after heat and xenon-arc exposure. As stated in the scope of the standard, "the tests and property limits used to characterize the sheet are values intended to ensure minimum quality for the intended purpose." Carlisle's goal is to produce TPO that delivers maximum performance for the intended purpose of roofing membranes. Maximum performance requires the membrane to far exceed the requirements of ASTM D6878.

Heat Aging accelerates the oxidation rate that roughly doubles for each 18°F (10°C) increase in roof membrane temperature. Oxidation (reaction with oxygen) is one of the primary chemical degradation mechanisms of roofing materials.

Carlisle Testing – Heat Aging

	ASTM Requirement	Sure-Weld Requirement
ASTM TEST 240°F	32 weeks**	>128 weeks

**Heat exposure comparable to 3,120 weeks (60 years) at 185°F for 8 hours/day.

- » Test specimen is a 2" by 6" (50.8 mm by 152.4 mm) piece of 45-mil (1.14 mm) membrane unbacked, placed in circulating hot-air oven.
- » Criterion – no visible cracks after bending aged test specimen around 3" (76.2 mm)-diameter mandrel.

Q-Trac testing combines accelerated weathering with real-world conditions using an array of ten mirrors to reflect and concentrate full spectrum sunlight onto membrane test specimens. The Q-Trac device automatically tracks the sun's path from morning to night. Also, it adjusts to compensate for seasonal changes in the sun's altitude. Eight years in Q-Trac testing is equal to 40 years of real-world exposure. Carlisle requires its Sure-Weld TPO membranes to pass the equivalent of 40 years of exposure in the Q-Trac.

Carlisle Testing – Q-Trac

	ASTM D6878 Requirement	Sure-Weld Requirement
ASTM TEST N/A	N/A	Equivalent of 40 years of exposure

Environmental Cycling subjects the membrane to repeated cycles of heat aging, hot-water immersion, and xenon-arc exposure.

- » ASTM requirement – none
- » Carlisle Extreme test*:
 - 10 days heat aging at 240°F (116°C) followed by
 - 5 days water immersion at 158°F (70°C) followed by
 - 5,040 kJ/m² (2000 hours at 0.70 W/m² irradiance) xenon-arc exposure

*Test specimen is 2.75" (69.85 mm by 140 mm) by 5.5" piece of membrane with edges sealed.

*Criterion – after 3 complete cycles, test specimens shall remain flexible and not have any cracking under 10x magnification while wrapped around a 3" (76.2 mm)-diameter mandrel.

Supplemental Approvals, Statements and Characteristics:

1. Sure-Weld TPO meets or exceeds the requirements of ASTM D6878 Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing.
2. Sure-Weld TPO membranes conform to requirements of the US E.P.A. Toxic Leachate Test (40 CFR part 136) performed by an independent analytical laboratory.
3. Sure-Weld TPO was tested for dynamic puncture resistance per ASTM D5635-04 using the most recently modified impact head. 45-mil (1.14 mm) was watertight after an impact energy of 12.5 J (9.2 ft-lbf) and 60-mil (1.52 mm) was watertight after 22.5 J (16.6 ft-lbf). 80-mil (2.03 mm) Extra was watertight after an impact energy of 30.0 J (22.1 ft-lbf).
4. All FM approved assemblies have been tested to pass FM 4470 for foot traffic resistance.

Optional APEEL™ Protective Film

Shield Carlisle's Sure-Weld TPO membrane from dirt and scuffs during installation with APEEL Protective Film. Factory-applied and easy to remove, APEEL eliminates the need for rooftop cleaning upon project completion.



- » Ideal for re-roofing, re-cover, and new construction projects
- » Simple and easy to remove
- » Saves time and money when compared to pressure washing
- » Protecting from dirt maintains maximum membrane reflectivity and long-term performance

Installation

Simply order membrane with APEEL, install, and remove the film to reveal a clean, new roof.

- » APEEL Protective Film should be removed from within areas that are to be heat-welded together. In areas that do not require heat-welding, the APEEL Protective Film can be left in place for up to 90 days without degrading due to its excellent heat- and UV-resistance.
- » When the installation of the entire TPO roofing system is complete, remove and discard the APEEL Protective Film.

Sure-Weld TPO

Reinforced Membrane

Typical Properties and Characteristics

Physical Property	ASTM D6878 Requirement	45-mil (1.14 mm)	60-mil (1.52 mm)	80-mil Extra (2.03 mm)
Tolerance on Nominal Thickness, % ASTM D751 test method	+15, -10	± 10	± 10	± 10
Thickness Over Scrim, in. (mm) ASTM D7635 optical method, average of 3 areas	0.015 min (0.380)	0.018 typical (0.457)	0.024 typical (0.610)	0.034 typical (0.864)
Breaking Strength, lbf (kN) ASTM D751 grab	220 (976 N) min	225 (1.0) min 320 (1.4) typical	250 (1.1) min 360 (1.6) typical	350 (1.6) min 425 (1.9) typical
Elongation Break of Reinforcement, % ASTM D751 grab method	15 min	15 min 25 typical	15 min 25 typical	15 min 25 typical
Tearing Strength, lbf (N) ASTM D751 proc. B 8 in. x 8 in.	55 (245) min	55 (245) min 130 (578) typical	55 (245) min 130 (578) typical	55 (245) min 130 (578) typical
Brittleness Point, °F (°C) ASTM D2137	-40 (-40) max	-40 (-40) max -50 (-46) typical	-40 (-40) max -50 (-46) typical	-40 (-40) max -50 (-46) typical
Linear Dimensional Change, % ASTM D1204, 6 hours at 158°F	± 1 max	± 1 max -0.2 typical	± 1 max -0.2 typical	± 1 max -0.2 typical
Ozone Resistance, no cracks 7X ASTM D1149, 100 ppm, 168 hrs	PASS	PASS	PASS	PASS
UV Exposure (Xenon Arc), no cracks 7X ASTM G155, min. exposure 10,080 kJ/m ² (4,000 hrs - 0.70 W/m ²)	PASS	PASS	PASS	PASS
Water Absorption Resistance, mass % ASTM D471 top surface only 166 hours at 158°F water	± 3.0 max	± 3.0 max 0.90 typical	± 3.0 max 0.90 typical	± 3.0 max 0.90 typical
Factory Seam Strength, lbf (N) ASTM D751 grab method	66 (290) min	66 (290) min	66 (290) min	66 (290) min
Field Seam Strength, lbf/in (kN/m) ASTM D1876 tested in peel	No requirement	25 (4.4) min 50 (8.8) typical	25 (4.4) min 60 (10.5) typical	40 (7.0) min 70 (12.3) typical
Water Vapor Permeance, perms ASTM E96 proc. B	No requirement	0.10 max 0.05 typical	0.10 max 0.05 typical	0.10 max 0.05 typical
Puncture Resistance, lbf (kN) FTM 101C, method 2031 (see supplemental section)	No requirement	250 (1.1) min 325 (1.4) typical	300 (1.3) min 350 (1.6) typical	400 (1.8) min 450 (2.0) typical
Properties After Heat Aging ASTM D573, 32 weeks @ 240°F or 8 weeks @ 275°F No cracking when bent around 3" diameter mandrel Weight Change, %	PASS No cracking ± 1.5 max	PASS No cracking 1.0 max	PASS No cracking 1.0 max	PASS No cracking 1.0 max
Typical Weights lb/ft² (kg/m²)		0.25	0.33	0.45
Air Permeance, ASTM E2178	No Requirement	PASS	PASS	PASS

Typical properties and characteristics are based on samples tested and are not guaranteed for all samples of this product. This data and information is intended as a guide and does not reflect the specification range for any particular property of this product.



LEED Information

Pre-consumer Recycled Content	10%
Post-consumer Recycled Content	0%
Manufacturing Location	Senatobia, MS Tooele, UT Carlisle, PA
Solar Reflectance Index (SRI)	99 (white) 86 (tan)

Radiative Properties for Cool Roof Rating Council (CRRC) and LEED

	Test Method	White TPO	Tan TPO	Gray TPO
CRRC – Initial solar reflectance	ASTM C1549	0.79	0.71	0.46
CRRC – Solar reflectance after 3 years	ASTM C1549 (uncleaned)	0.70	0.64	0.43
CRRC – Initial thermal emittance	ASTM C1371	0.90	0.86	0.89
CRRC – Thermal emittance after 3 years	ASTM C1371 (uncleaned)	0.86	0.87	0.88
LEED – Thermal emittance	ASTM E408	0.90	0.86	0.85
SRI – Initial (Solar Reflectance Index)	ASTM E1980	99	86	52
SRI – 3 year aged (Solar Reflectance Index)		85	77	49

Radiative Properties (Initial) for Special Colors

	Reflectance	Emittance	SRI
Medium Bronze	0.12	0.89	8
Rock Brown	0.23	0.88	23
Slate Gray	0.20	0.89	18
Terra Cotta	0.25	0.88	24
Patina Green	0.25	0.88	25

Solar Reflectance Index (SRI) is calculated per ASTM E1980. The SRI is a measure of the roof's ability to reject solar heat, as shown by a small temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.90) is 0 and a standard white (reflectance 0.80, emittance 0.90) is 100. Materials with the highest SRI values are the coolest choices for roofing. Due to the way SRI is defined, particularly hot materials can even take slightly negative values and particularly cool materials can even exceed 100.

Sure-Weld® TPO

Non-Reinforced Flashing



Overview

Carlisle's Sure-Weld TPO Non-Reinforced Flashing is a 60-mil thermoplastic polyolefin (TPO)-based membrane available in 12" and 24" by 50' rolls. When the use of prefabricated accessories is not feasible, this product can be used to create inside and outside corners, field-fabricated pipe flashings, sealant pockets, and scuppers. Standard colors are white, tan, and gray.

Features and Benefits

- » New and improved TPO Flashing provides 35% more flexibility, making it easier to field-fabricate details
- » Compounded with the same OctaGuard XT™ weathering package as Carlisle's Sure-Weld TPO membranes for maximum longevity
- » Superior weldability allows for consistent, high-quality seams in penetrations and other critical roof areas
- » Available in white, gray, and tan colors to match Carlisle's Sure-Weld TPO membranes

Installation

1. TPO Flashing is used to flash various roofing system details and penetrations. The specific installation method will vary based on the situation.
2. Use a lower temperature setting on the heat welder than when welding reinforced TPO membrane. Typically, a setting of "6" on a scale of "10" is appropriate for welding TPO Flashing.

3. Use the edge of the roller to crease the flashing into any membrane step-offs for a proper seal.

Review Carlisle specifications and details for complete installation information.

Precautions

- » Review the applicable Safety Data Sheet for complete safety information prior to use.
- » Sunglasses that filter out ultraviolet light are strongly recommended, as tan and white surfaces are highly reflective. Roofing technicians should dress appropriately and wear sunscreen.
- » Store TPO Flashing in a cool, shaded area and cover with light-colored, breathable, waterproof tarpaulins. TPO Flashing that has been exposed to the weather for approximately 7 days or longer must be prepared with Weathered Membrane Cleaner prior to hot air welding.

Typical Properties and Characteristics

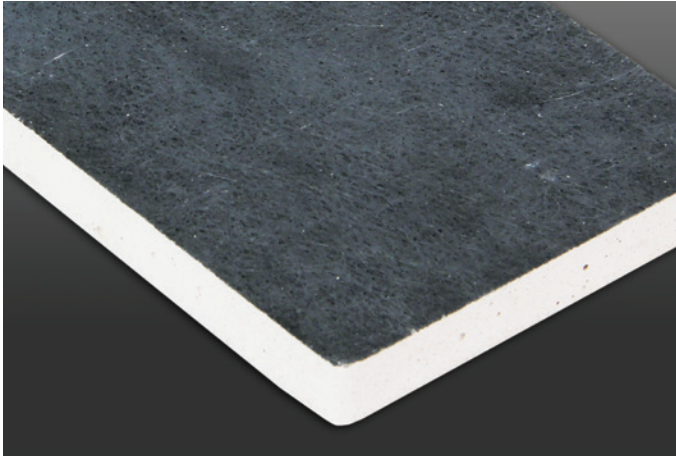
Properties	ASTM Test Method	Specification
Tolerance on nominal thickness, %	D 412	plus 15/ minus 10
Weight, lb/ft ² (kg/m ²), typical		0.30 (1.5)
Tensile strength, min., psi (Mpa)	D 412 Die C	1200 (8.3)
Elongation, ultimate, min., %	D 412 Die C	600
Tear strength, min., lbf/in (kN/m)	D 624 Die C	250 (43.8)
Ozone resistance, 168h @ 100 pphm, 50% ext.	D 1149	No Cracks
Heat aging: 28 days at 240°F (116°C)	D 573	
Tensile strength, min., psi (MPa)	D 412	1000 (6.9)
Elongation, ultimate, min., %	D 412	500
Tear strength, min., lbf/in (kN/m)	D 624	200 (35.0)
Linear dimensional change, max. %	D 1204	±4
Resistance to Xenon-arc weathering	G 155	No Cracks
Xenon-Arc, 10,080 kJ/m ² total radiant Exposure, visual condition at 10X	0.70 W/m ² 80°C B.P.T.	

Typical properties and characteristics are based on samples tested and are not guaranteed for all samples of this product. This data and information is intended as a guide and does not reflect the specification range for any particular property of this product.

LEED® Information

Pre-consumer Recycled Content	0%
Post-consumer Recycled Content	0%
Manufacturing Location	Greenville, IL
Solar Reflectance Index (SRI)	N/A

DensDeck® Prime Roof Board



Overview

DensDeck Prime Roof Board's patented design features a gypsum core with embedded glass mat facers on the top and bottom of the board. DensDeck Prime can be used in a variety of commercial roof systems and provides an excellent thermal barrier as well as exceptional fire, moisture, and wind uplift resistance properties.

DensDeck Prime is typically used as a cover board over insulation in fully adhered EPDM, TPO, and PVC applications. It is compatible with solvent-based bonding adhesives. For applications in which Flexible FAST™ Adhesive is used to attach insulation and a vapor barrier is specified, DensDeck Prime can be used as a base layer for Carlisle's VapAir™ Seal 725TR Air and Vapor Barrier (in conjunction with CCW 702-LV or CAV-GRIP® III Primer). DensDeck Prime is also compatible with hot asphalt and can be used as a membrane underlayment in hot mopped roofing systems or as a parapet wall substrate in all systems.

Features and Benefits

- » UL code ratings available for high slopes and wood decks
- » FM Approved
- » Improves resistance to foot traffic and hail damage
- » Excellent wind uplift ratings
- » Resistant to deterioration, warping, and jobsite damage
- » 5/8" DensDeck Prime can replace any generic type "X" gypsum board in any roof assembly in the UL Fire Resistance Directory under the prefix "P"

Installation

DensDeck Prime may be secured with Flexible FAST Adhesive, fastened in accordance with an approved fastening pattern, or mopped with Type III or IV asphalt.

Maximum asphalt application temperatures of 425°F (218°C) to 450°F (232°C) are recommended. Application temperatures above these recommended temperatures may adversely affect roof system performance.

Edge joints should be located on and parallel to deck ribs. End joints of adjacent lengths should be staggered.

1. This material shall be installed with ends and edges butted tightly.
2. When installed over combustible wood decks or insulations, all joints should be staggered.
3. In accordance with approved shop drawings, FM Approved fasteners shall be installed with plates through the roof board, flush with the surface.
4. When attaching VapAir Seal 725TR, use DensDeck Prime in conjunction with CCW-702, 702-LV, or CAV-GRIP III Primer.

Review Carlisle specifications and details for complete installation information.

Precautions

- » Panels must be kept dry before, during and after installation. Apply only as much roof board as can be covered by roof membrane in the same day.
- » When applying solvent-based adhesives or primers, allow sufficient time for the solvents to flash off.
- » 1/4" DensDeck Prime is not recommended for vertical parapet applications.
- » In ballasted roofing systems, DensDeck Prime is not an acceptable membrane underlayment.

Ratings and Certifications

- » Manufactured to conform to ASTM C-1177
- » Tested in accordance with ASTM E-84 or CAN/ULC-S102
- » Non-combustible when tested in accordance with ASTM E-136
- » UL Classified when tested in accordance with ASTM E-119

DensDeck Prime Roof Board

Typical Properties and Characteristics

Properties	¼" (6.4 mm)	½" (12.7 mm)	⅝" (15.9 mm)
Thickness, nominal	¼" (6.4 mm) ± ⅛" (1.6 mm)	½" (12.7 mm) ± ⅜" (.8 mm)	⅝" (15.9 mm) ± ⅜" (.8 mm)
Width, standard	4' (1219 mm) ± ⅛" (3 mm)	4' (1219 mm) ± ⅛" (3 mm)	4' (1219 mm) ± ⅛" (3 mm)
Length, standard	4' (1219 mm) 8' (2438 mm) ± ¼" (6.4 mm)	4' (1219 mm) 8' (2438 mm) ± ¼" (6.4 mm)	4' (1219 mm) 8' (2438 mm) ± ¼" (6.4 mm)
Weight, nominal, lbs./sq. ft. (Kg/m ²) ⁷	1.2 (5.9)	2.0 (9.8)	2.5 (12.2)
Surfacing	Fiberglass mat with non-asphaltic coating	Fiberglass mat with non-asphaltic coating	Fiberglass mat with non-asphaltic coating
Flexural Strength ¹ , parallel, lbf. min. (N)	≥ 40 (178)	≥ 80 (356)	≥ 100 (444)
Flute Spanability ²	2⅝" (67 mm)	5" (127 mm)	8" (203 mm)
Permeance ³ , perms (ng/Pa•S•m ²)	> 30 (>1710)	> 23 (>1300)	> 17 (>970)
R Value ⁴ , ft ² •°F•hr/BTU (m ² •K/W)	0.28	0.56	0.67
Linear Variation with Change in Temp., in/in °F (mm/mm/°C)	8.5 x 10 ⁻⁶ (15.3 x 10 ⁻⁶)	8.5 x 10 ⁻⁶ (15.3 x 10 ⁻⁶)	8.5 x 10 ⁻⁶ (15.3 x 10 ⁻⁶)
Linear Variation with Change in Moisture	6.25 x 10 ⁻⁶	6.25 x 10 ⁻⁶	6.25 x 10 ⁻⁶
Water Absorption ⁵ , %	5	5	5
Compressive Strength ⁶ , psi nominal ¹	900	900	900
Surface Water Absorption, grams, nominal	1.0	1.0	1.0
Flame Spread, Smoke Developed (ASTM E84)	0/0	0/0	0/0
Bending Radius	4' (1219 mm)	6' (1829 mm)	8' (2438 mm)

¹ Tested in accordance with ASTM C473 method B.

⁴ Tested in accordance with ASTM C518 (heat flow meter).

⁷ Represents approximate weight for design and shipping purposes. Actual weight may vary based on manufacturing location and other factors.

² Tested in accordance with ASTM E661.

⁵ Tested in accordance with ASTM C1177.

³ Tested in accordance with ASTM E96 (dry cup method).

⁶ Tested in accordance with ASTM C473.

LEED® Information

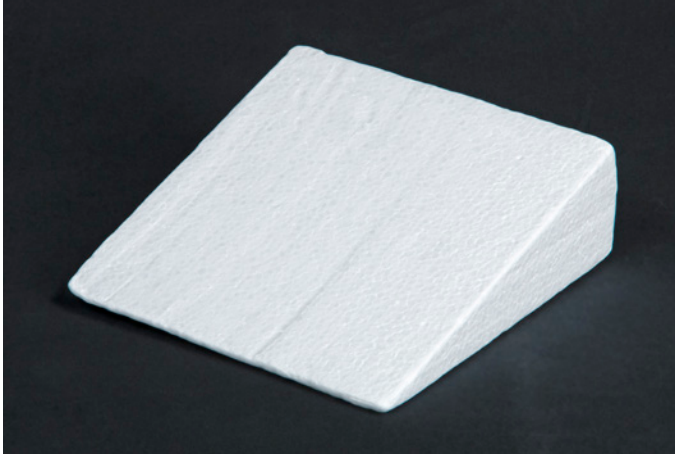
Manufacturing Location ¹	Total Recycled Content ²	Pre-Consumer Recycled Content ²	Post-Consumer Recycled Content ²
Acme, TX	0%	0%	0%
Antioch, CA	0%	0%	0%
Ft. Dodge, IA	0%	0%	0%
Las Vegas, NV	0%	0%	0%
Lovell, WY	0%	0%	0%
Newington, NH	30%	30%	0%
Savannah, GA	0%	0%	0%
Tacoma, WA	14%	14%	0%
Wheatfield, IN	94%	94%	0%

¹ Manufacturing locations subject to change. Please visit www.gpgypsum.com and click on Sustainability.

² Recycled content subject to change +/- 1.0%.

³ Based on ICC Evaluation Service Verification of Attributes Report for Dens® brand products issued August 1, 2009. www.saveprogram.icc-es.org

InsulFoam Tapered Insulation



Overview

Carlisle's InsulFoam Tapered EPS is an engineered insulation made of closed-cell, lightweight expanded polystyrene (EPS). This product is available in a wide range of panel sizes and densities that meet or exceed the requirements of ASTM C578, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation. InsulFoam Tapered offers a long-term, stable R-value and has excellent dimensional stability, compressive strength, and water resistance properties.

Features and Benefits

- » Labor and cost savings: no complicated filler panel systems, can be installed in a single layer for thicknesses up to 40", and is significantly more cost-effective than extruded polystyrene, perlite, and isocyanurate tapered systems
- » Promotes positive drainage: ideal for both new construction and re-roofing projects in which positive slope is desired or ponded water is a concern
- » Environmentally friendly: contains no ozone-depleting blowing agents, may contain recycled material, and is 100% recyclable if removed or replaced
- » Stable R-value: thermal properties will remain stable over the material's entire service life, no thermal drift
- » Proven performance: manufactured using the same chemistry since the mid-1950s for proven performance
- » Water resistance: does not readily absorb moisture from the environment

Panel Characteristics

InsulFoam Tapered is available in 4' x 4' and 4' x 8' panels with thicknesses from 0 (1/8" actual) to 40" in a single layer. There are no limitations to available slope per foot.

Applications

InsulFoam Tapered is well-suited for a variety of single-ply roof systems, including EPDM, TPO, and PVC, and assembly types, including ballasted, mechanically fastened, and fully adhered. Consult Carlisle Specifications and Details for more information.

Installation Considerations

1. Install only as much insulation as can be covered by a roof membrane system, and/or made watertight by the end of each day.
2. InsulFoam Tapered should not be exposed directly to solvent- or petroleum-based adhesives and sealants.
3. Allow approximately a 1/4" space between insulation and vertical surfaces or roof projections. Do not force or jam product into place.
4. Review the layout of all tapered EPS systems before loading and installing panels.
5. In re-cover applications, ensure no moisture is trapped in the new or existing roofing system.

Loose-Laid Insulation

Install InsulFoam Tapered with continuous side joints and end joints, staggered so they are offset by a minimum of 12" from the end joints in adjacent rows. Insulation should abut tightly against adjacent boards. Joints greater than 1/2" should be filled with the same insulation that is being used in the field of the roof. If insulation is being installed over a thermal barrier or existing layer of insulation, or under a cover board, all joints must be offset a minimum of 6" between layers. When installing InsulFoam Tapered directly to a metal deck, the edges of the insulation parallel to the deck ribs must be solidly supported and centered on the ribs. Additionally, for metal decks, ensure that the insulation has a thickness that is adequate to span the rib openings. When conditions dictate, in order to prevent wind blow-off or damage during installation, loose-laid insulation should be weighed down or tacked into place with a minimal quantity of mechanical fasteners.

Review Carlisle specifications and details for complete installation information.

InsulFoam Tapered Insulation

Typical Physical Properties

Property	Type I	Type VIII	Type II	Type IX	Type XIV	Type XV	Test Method
Nominal Density (pcf)	1.0	1.25	1.5	2	2.5	3	ASTM C303
C-Value (Conductance) BTU/(hr-ft ² -°F) (per inch)	.260	.255	.240	.230	0.222	0.217	ASTM C518 or ASTM C177
R-Value (Thermal Resistance) (hr-ft ² -°F)/BTU (per inch @ 75°F)	3.85	3.92	4.17	4.50	4.50	4.60	ASTM C518 or ASTM C177
Compressive Strength (psi, 10% deformation)	10-14	13-18	15-21	25-33	40	60	ASTM D1621
Flexural Strength (min. psi)	25	30	35	50	60	75	ASTM C203
Dimensional Stability (maximum %)	2.0	2.0	2.0	2.0	2.0	2.0	ASTM D2126
Water Vapor Permeance (max. perm., 1 inch)	5.0	3.5	3.5	2.0	2.5	2.5	ASTM E96
Water Absorption (max. % vol.)	4.0	3.0	3.0	2.0	2.0	2.0	ASTM C272
Capillarity	none	none	none	none	none	none	–
Flame Spread	< 20	< 20	< 20	< 20	< 20	< 20	ASTM E84
Smoke Developed	150-300	150-300	150-300	150-300	150-300	150-300	ASTM E84

LEED® Information

Pre-consumer Recycled Content	Up to 25%
Post-consumer Recycled Content	0%
Manufacturing Location(s)	Anchorage, AK Puyallup, WA Dixon, CA Chino, CA Mead, NE Aurora, CO Phoenix, AZ Lakeland, FL

HP-X Fastener



Overview

Carlisle's HP-X Fastener is a specialized, high performance fastener designed to secure Carlisle single-ply membrane and insulation. The HP-X Fastener can be used on steel decks (20-gauge [0.91 mm] or 22-gauge [0.76 mm] or wood [minimum $1\frac{5}{32}$ " [12 mm] CDX plywood]). The HP-X Fastener is designed to offer an optimum combination of driving performance, back-out, and corrosion resistance with excellent pull-out performance.

Features and Benefits

- » Oversized heavy shank and #15 thread diameter for enhanced pull-out resistance
- » Miniature drill point penetrates decks quickly and contributes to exceptional resistance to back-out as well as pull-out
- » Deep buttress threads further increase pull-out and back-out resistance
- » Excellent corrosion resistance, surpassing the FM4470 corrosion test

Installation

1. No pre-drilling is necessary for wood and steel decks. Simply insert the HP-X Fastener through an approved Carlisle plate and install with a standard clutch drive electric screw gun (0–2,500 rpm).
2. Optimum fastener performance is achieved when the fastener is installed perpendicular to the deck and into the top flutes of a steel deck.

Review Carlisle specifications and details for complete installation information.

Precautions

- » The strength of different roof decks varies widely and can be adversely affected by moisture and other conditions. Therefore, Carlisle recommends conducting a fastener pull test to help evaluate deck conditions and fastener suitability.
- » Care must be taken not to overdrive the fastener.
- » Eye protection is recommended during drilling and installation.

Packaging Information

Size Inches (mm)	Weight/Carton (Kg)	Thread Length Inches (mm)	Packaging Fasteners/Carton
2 (50)	20 lbs (9.08)	Full	1,000
3 (75)	29 lbs (13.16)	Full	1,000
4 (100)	38 lbs (17.25)	3 (76)	1,000
5 (125)	24 lbs (10.89)	4 (102)	500
6 (150)	28 lbs (12.71)	4 (102)	500
7 (175)	34 lbs (15.44)	4 (102)	500
8 (200)	38 lbs (17.25)	4 (102)	500
9 (230)	42 lbs (19.07)	4 (102)	500
10 (255)	47 lbs (21.33)	4 (102)	500
11 (280)	52 lbs (23.61)	4 (102)	500
12 (305)	56 lbs (25.42)	4 (102)	500
14 (355)	32 lbs (14.52)	4 (102)	250
16 (405)	38 lbs (17.25)	4 (102)	250

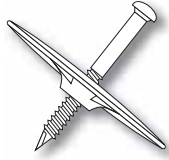
Typical Properties and Characteristics

Head	#3 Phillips Truss Head .435" (11.04 mm) diameter
Thread	.265" (6.73 mm) diameter
Shank	.202" (5.13 mm) diameter
Coating	CR-10

Typical properties and characteristics are based on samples tested and are not guaranteed for all samples of this product. This data and information is intended as a guide and does not reflect the specification range for any particular property of this product.

FASTENERS & PLATES

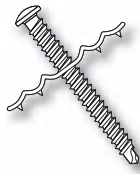
ASAP WITH POLYMER PLATE



A pre-assembled #12 diameter fastener and plastic insulation plate applicable to steel and wood decks. Used to secure insulation only. Longer fastener sizes available as special order.

Sizes Available:
2¼", 3"– 12" (1" Increments)
Size & Quantity Per Box:
2¼"– 8": 250; 9"– 12": 200

HP-X ASAP



A pre-assembled HP-X Fastener and Piranha Plate™ applicable to steel, wood and CDX plywood decks. Used to secure Sure-Weld and Sure-Flex membranes.

Sizes Available:
2"–10" (1" Increments)
12"–16" (2" Increments)
Size & Quantity Per Box:
2"– 9": 250; 10"– 12": 200; 14"– 16": 150



HP PRE-ASSEMBLED



Pre-assembled HP Fastener and Polymer seam plate applicable to steel, wood and CDX plywood decks. Used to secure Sure-Tough membranes.

Sizes Available:
2¼", 3"– 12" (1" Increments)
Size & Quantity Per Box:
2¼", 3", 3¾", 3¾": 450; 4", 5": 400; 6": 350;
7", 8": 300; 9": 250; 10"– 12": 200



RHINO BOND® PLATE

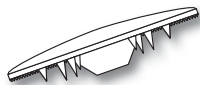


3"-round, specially coated plates used with HP-X Fasteners and the RhinoBond induction welding system. Available in TPO and PVC versions.

Sizes Available:
3" diameter
Quantity Per Box: 500/carton



HP POLYMER SEAM PLATE



Along with the HP Fastener, used to mechanically fasten reinforced Sure-Tough membrane and RUSS over steel decks.

Sizes Available:
2" diameter
Quantity Per Box: 1,000



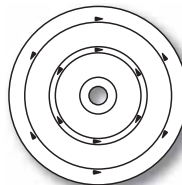
HP-XTRA POLYMER SEAM PLATE

Also Available (Not shown)

For use with HP-XTRA Fastener to secure Sure-Tough membranes to steel decks.

Sizes Available:
2 ¾" diameter
Quantity Per Box: 1,000

PIRANHA PLATE



Along with the appropriate fastener, used to secure Sure-Weld and Sure-Flex membranes to steel, concrete and wood decks.

Sizes Available:
2 ¾" diameter
Quantity Per Box: 1,000



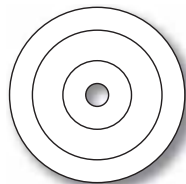
HP-XTRA PIRANHA PLATE

Also Available (Not shown)

For use with HP-XTRA Fastener to secure Sure-Weld and Sure-Flex membranes to steel and wood decks.

Sizes Available:
2 ¾" diameter
Quantity Per Box: 1,000

SEAM FASTENING PLATE

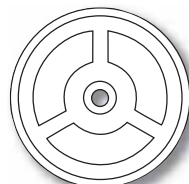


Applicable with HP, HD 14-10 and CD-10 fasteners to mechanically attach reinforced Sure-Tough membrane (excluding steel decks) and RUSS (except when used with mechanically fastened EPDM to steel decks).

Sizes Available:
2" diameter
Quantity Per Box: 1,000



INSULATION FASTENING PLATE



Applicable with InsulFast, HP, CD-10 and HD 14-10 fasteners. Used for insulation securement only on steel, wood and concrete decks.

Sizes Available:
3" diameter
Quantity Per Box: 1,000

Experience the Carlisle Difference

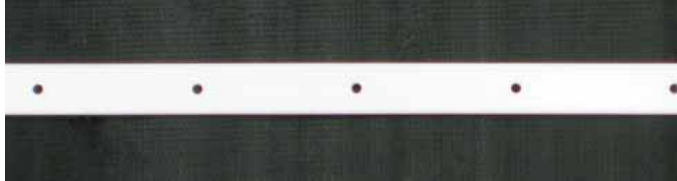
800-479-6832 • P.O. Box 7000 • Carlisle, PA 17013 • Fax: 717-245-7053 • www.carlisesyntec.com

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Fastening and Termination Bars



Polymer Fastening Bar

The Polymer Fastening Bar is an engineered polymer bar that's used to mechanically fasten EPDM membranes per Carlisle Specifications. The bar is packaged in a 1" x 250' coil that has pre-punched holes every 3" on center. The bar can be easily cut to any desired length. When installing, make sure that all corners of cut bar are rounded. Install the bar using HP or HP-X Fasteners.

Typical Properties and Characteristics

Material	Engineered Polymer
Dimensions	1" (25 mm) wide x 250' (76 m) long
Packaging	250 lf (76 m) per carton
Weight	10 lbs. (5 kg) carton
Recycled Content	0% pre-consumer recycled content
Manufacturing Location	Addison, IL

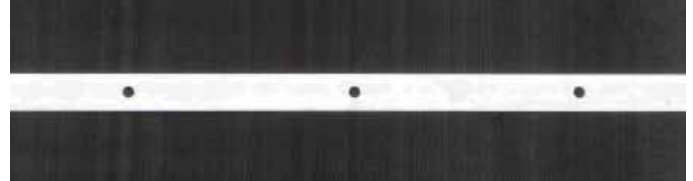


Termination Bar

The Termination Bar is an extruded aluminum bar that's designed for securing and sealing compression type flashing terminations per Carlisle Specifications. The bar is packaged in 1" x 10' lengths, 500 linear feet per package and has pre-punched holes every 6" on center. This bar features a top edge for ease of applying Carlisle's Lap Sealant for EPDM installations or Universal Single Ply Sealant for TPO, PVC, and KEE HP installations. The bar can be easily cut to any desired length. When installing, make sure that all corners of cut bar are rounded. Install the bar using HP-X Fasteners, or Term-Bar Nail In Fasteners.

Typical Properties and Characteristics

Material	6063-T6 Extruded Aluminum
Dimensions	1" (25 mm) wide x 10' (3 m) long
Packaging	50 pcs; 500 lf (152 m) per carton
Weight	69 lbs. (31 kg) carton
Recycled Content	0% pre-consumer recycled content 15% post-consumer recycled content
Manufacturing Location	Cleveland, OH



Metal Fastening Bar

The Metal Fastening Bar is a Galvalume™ coated metal that's used to mechanically fasten EPDM membranes per Carlisle Specifications. The bar is packaged in 1" x 10' lengths, 500 linear feet per package and has pre-punched holes every 6" on center. The bar can be easily cut to any desired length. When installing, make sure that all corners of cut bar are rounded. Install the bar using HP-X Fasteners.

Typical Properties and Characteristics

Material	Galvalume Coated Metal
Dimensions	1" (102 mm) wide x 10' (3 m) long
Packaging	50 pcs; 500 lf (152 m) per carton
Weight	85 lbs. (39 kg) carton
Recycled Content	49% pre-consumer recycled content
Manufacturing Location	Cleveland, OH



Sure-Seal Ballast Retaining Bar

The Ballast Retaining Bar is an extruded aluminum bar that's designed as a ballast retaining perimeter securement system, which comes packaged in 4" x 10' lengths, 250 linear feet per package. The ballast retaining bar has pre-punched holes every 6" on center for installation, and also has pre-punched drainage holes every 4" on center.

Typical Properties and Characteristics

Material	6063-T6 Extruded Aluminum
Dimensions	4" (102 mm) wide x 10' (3 m) long
Packaging	25 pcs; 250 lf (76 m) per carton
Weight	123 lbs. (56 kg) carton

Sure-Weld[®] TPO

Coated Metal



Overview

Sure-Weld TPO Coated Metal is a 24-gauge (0.6 mm) galvanized steel sheet that is coated with a layer of .035" non-reinforced TPO flashing. TPO membrane may be welded directly to the coated metal, eliminating the need to strip in the metal with a separate piece of TPO Pressure-Sensitive Coverstrip. The sheet is cut to the appropriate width and used to fabricate metal drip edges or other roof perimeter edging profiles. The metal is available in 4' by 10' (1.2 m by 3.1 m) sheets and comes packaged 10 or 25 sheets per pallet.

Carlisle's TPO Coated Metal is part of Carlisle's comprehensive TPO accessory offering that meets the stringent quality tolerances required to be included in a Carlisle warranted roofing system.

Features and Benefits

- » Allows direct welding of TPO membrane to the metal, eliminating the need to strip in edging with additional TPO Pressure-Sensitive Coverstrip.
- » Easy to cut and form for creating a variety of edge sizes and profiles.

Installation

1. Install TPO Coated Metal with 1/8" to 1/4" (3-6 mm) between adjoining sections.
2. Install 2"-wide (5 cm) duct tape over joints in TPO Coated Metal.
3. Heat-weld 6"-wide (15.5 cm) piece of TPO non-reinforced flashing over joint.
4. Position TPO reinforced membrane and heat-weld to the TPO Coated Metal with a minimum 1 1/2" (4 cm) weld.

Review Carlisle specifications and details for complete installation information.

Precautions

- » Store coated metal in a cool, shaded area and cover with light-colored, breathable, waterproof tarpaulins. TPO Coated Metal that has been exposed to the weather must be prepared with Weathered Membrane Cleaner prior to hot-air welding.

Typical Properties and Characteristics

Sheet Size	4' by 10' (1.2 m by 3.0 m)
Weight	1.1 lb/ft ² (5.4 kg/m ²)
Color	Gray, White, Tan, Patina Green, Rock Brown, Terra Cotta, Medium Bronze, and Slate Gray
Flashing Thickness	0.035" (0.9 mm) nominal
Steel Thickness	0.024" (0.6 mm) nominal (24 gauge)
Steel Type	Hot Dipped Galvanized Steel – G90
Conforms to ASTM A653	
Packaging	10 or 25 sheets per pallet - White, Gray, and Tan 5 sheets per pallet - Patina Green, Rock Brown, Terra Cotta, Medium Bronze, and Slate Gray

Typical properties and characteristics are based on samples tested and are not guaranteed for all samples of this product. This data and information is intended as a guide and does not reflect the specification range for any particular property of this product.

LEED[®] Information

Pre-consumer Recycled Content	0%
Post-consumer Recycled Content	0%
Manufacturing Location	Franklin Park, IL
Solar Reflectance Index (SRI)	N/A



Sure-Weld[®] TPO

Universal Corners



Overview

Carlisle's labor-saving, pre-molded Sure-Weld TPO Universal Corners are ideal for flashing corners on a variety of details.

Carlisle's Sure-Weld TPO Universal Corners are a part of the Certified Fabricated Accessory (CFA) program. CFAs are the only factory-fabricated TPO accessories that meet the stringent quality tolerances required to be included in a Carlisle warranted roofing system.

Features and Benefits

- » Conforms easily to details on new construction installations, where right angles are common
- » Each Universal Corner can be cut into one outside corner or one inside corner
- » Large, 6"-wide deck flange reduces the need for T-Joint Covers (when used as an outside corner)
- » Provide a substantial labor savings compared to field-fabricating from non-reinforced flashing
- » More professional, consistent appearance than field-fabricated corners

Productivity Boosting Features and Benefits:

- » Up to 60% labor savings compared to traditional field fabrication
- » Quick and simple installation with no stretching required
- » One product to utilize for both an inside or outside corner



Installation

See the diagram on page two for cutting instructions. The cutting instructions are also molded into each part. Use a lower temperature setting on the heat welder than when welding reinforced TPO membrane. Typically, a setting of 6 on a scale of 10 is appropriate for welding Universal Corners.

Outside Corner

1. Clean the surface to be welded with Weathered Membrane Cleaner.
2. Place the outside Corner into position over the outside intersection of the corner.
3. Begin welding at the bottom point of the outside corner. Weld straight up the vertical portion of the corner. Weld each side of the outside corner, working from the inside toward the outside.
4. Weld the bottom flange starting on the inside and working towards the outer edges. Use the edges of the roller to crease the corner into any membrane step-off to create a proper seal.
5. Once the material has completely cooled, probe all welded edges of the corner to ensure watertight performance.

Inside Corner

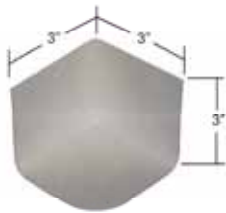
1. Clean the surfaces to be welded with Weathered Membrane Cleaner.
2. Position the inside corner into the corner setting. Begin welding at the innermost corner point and work up and away from the corner. Weld each side of the inside corner, working from the inside toward the outside.
3. Weld the bottom flange starting on the inside and working towards the outer edges. Use the edge of the roller to crease the corner into any membrane step-off to create a proper seal.
4. Once the material has completely cooled, probe all welded edges of the corner to ensure watertight performance.

Review Carlisle specifications and details for complete installation information.

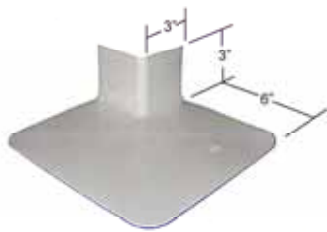
Sure-Weld TPO

Universal Corners

Each Universal Corner can be cut into one Inside or Outside Corner.



Inside Corner



Outside Corner

Typical Properties and Characteristics

Thickness	0.060" (1.5 mm)
Packaging	20 per carton
Color	White, gray and tan
Material	Injection-molded TPO

Typical properties and characteristics are based on samples tested and are not guaranteed for all samples of this product. This data and information is intended as a guide and does not reflect the specification range for any particular property of this product.

LEED® Information

Pre-consumer Recycled Content	0%
Post-consumer Recycled Content	0%
Manufacturing Location	Bloomington, IL

Precautions

- » Store TPO Universal Corners in a cool, shaded area and cover with light-colored, breathable, waterproof tarpaulins. TPO Universal Corners or TPO membrane that has been exposed to the weather prior to use must be prepared with Weathered Membrane Cleaner before hot-air welding.



Sure-Weld® TPO

T-Joint Covers



Overview

Let Carlisle simplify your next Sure-Weld TPO installation with molded T-Joint Covers. Sure-Weld TPO T-Joint Covers are used to seal step-offs at splice intersections. T-Joint Covers are mandatory on all 60- and 80-mil TPO systems and on 45-mil systems where step-offs have not been properly sealed. Sure-Weld TPO T-Joint Covers consist of 60-mil non-reinforced TPO formed into a perfect 4.5"-diameter circle and packaged 100 parts per carton. Available in white, tan and gray.

Carlisle's Sure-Weld TPO T-Joint Covers are part of the Certified Fabricated Accessory (CFA) program. Certified Fabricated Accessories are the only factory-fabricated TPO accessories that meet the stringent quality tolerances required to be included in a Carlisle warranted roofing system.

Features and Benefits

- » Every T-Joint cover is a perfect 4.5" diameter circle
- » More consistent appearance than hand-cut flashing
- » Provides substantial labor savings compared to field-cut flashing
- » Seals channels at splice intersections created by seam step-offs

Installation

1. If membrane has been exposed to the weather, clean splice intersection area with Weathered Membrane Cleaner.
2. Use a lower temperature setting on the hand heat welder than that used for welding reinforced TPO membrane. (Typically a setting of "6" on a scale of "10" is appropriate for welding TPO T-Joint Covers.)
3. Center the T-Joint Cover over the splice intersection, begin welding at the center point and work towards the outside. Use the edge of the roller to crease the T-Joint cover into membrane step-offs to achieve a proper seal.
4. Using a probe, check all splices for voids and cold welds only once the T-Joint Cover has completely cooled. Make any needed repairs.

Review Carlisle specifications and details for complete installation information.

Precautions

- » The TPO T-Joint Cover is not intended to overlay fasteners and plates as this requires the use of reinforced membrane.
- » Store T-Joint Covers in a cool, shaded area and cover with light-colored, breathable, waterproof tarpaulins. T-Joint Covers that have been exposed to the weather must be prepared with Weathered Membrane Cleaner before hot-air welding.

Typical Properties and Characteristics

Size	4.5" (114 mm)
Thickness	0.060" (1.5 mm)
Packaging	100 per box
Weight (per box)	3.5 lbs. (1.6 kg)
Material	Non-Reinforced TPO
Color	White, Gray, Tan

Typical properties and characteristics are based on samples tested and are not guaranteed for all samples of this product. This data and information is intended as a guide and does not reflect the specification range for any particular property of this product.

LEED® Information

Pre-consumer Recycled Content	0%
Post-consumer Recycled Content	0%
Manufacturing Location	Bloomington, IL
Solar Reflectance Index (SRI)	N/A



Sure-Weld[®] TPO

Pipe Seals



Overview

Let Carlisle simplify your next Sure-Weld TPO installation with TPO Molded Pipe Seals. TPO Pipe Seals are injection-molded, pre-formed flashings for pipes ¾" (19.0 mm) to 8" (203.2 mm) in diameter. TPO Pipe Seals are packaged in boxes of eight and come with universal stainless steel clamping rings.

Carlisle's TPO Molded Pipe Seals are part of the Certified Fabricated Accessory (CFA) program. Certified Fabricated Accessories are the only factory-fabricated TPO accessories that meet the stringent quality tolerances required to be included in a Carlisle warranted roofing system.

Features and Benefits

- » Provides a reliable method of waterproofing round pipe penetrations
- » Provides a substantial labor savings compared to field fabricating from non-reinforced flashing
- » Provides more consistent appearance than field-fabricated pipe flashings
- » Double-ribbed cutting guide provides easier, smoother and straighter cuts
- » Rib design also keeps the clamp in the proper position for the life of the roofing system

Productivity Boosting Features and Benefits:

- » Up to 60% labor savings compared to traditional field fabrication
- » Quick and simple installation with no stretching required
- » Provides a consistent, finished appearance



Installation

1. Cut pipe seal between the two raised "ribs" to the desired diameter as illustrated on the flange of the pipe seal. (Do not cut off both raised "ribs".)
2. Pull TPO Pipe Seal over pipe until base flange is in contact with the membrane. (Application of heat to the top portion of the TPO Pipe Seal may be necessary to allow installation over the pipe.)
3. Mark pipe around the top of the TPO Pipe Seal.
4. Pull TPO Pipe Seal upwards on pipe until mark on the pipe is visible.
5. Install Water Cut-off Mastic below mark which indicates the top of the installed TPO Pipe Seal.
6. Pull TPO Pipe Seal back down over pipe and into position.
7. Heat weld the TPO Pipe Seal base flange to deck membrane (the hand-welder temperature setting should be between 5 and 6).
8. Install a stainless steel universal clamping ring to provide constant compression of the sealant.

Review Carlisle specifications and details for complete installation information.

Precautions

- » Remove all lead and other flashing.
- » Temperature of pipe must not exceed 160°F (71°C).
- » When used with mechanically fastened membrane, install a minimum of four fastening plates around pipe penetrations. Position fastening plates around the penetration so the plates are covered by the pipe seal flange. A minimum 1½"-wide weld must be maintained around the outer edge of the flange beyond the plates. If fastening plates cannot be installed in a manner to allow a minimum 1½" weld, the plates must be placed outside the TPO Pipe Seal flange and covered with a reinforced TPO overlay.
- » Store pre-molded pipe seals in a cool, shaded area and cover with light-colored, breathable, waterproof tarpaulins. TPO Pipe Seals or membrane that has been exposed to the weather prior to use must be prepared with Weathered Membrane Cleaner prior to hot-air welding.

Sure-Weld TPO

Pipe Seals

Typical Properties and Characteristics

Sizes	¾" to 8" O.D. pipe (19.0 to 203.2 mm)
Packaging	8/box
Weight (each)	0.63 lbs (0.3 kg)
Material	Injection-molded TPO
Color	White, gray and tan

Typical properties and characteristics are based on samples tested and are not guaranteed for all samples of this product. This data and information is intended as a guide and does not reflect the specification range for any particular property of this product.

LEED® Information

Pre-consumer Recycled Content	0%
Post-consumer Recycled Content	0%
Manufacturing Location	Bloomington, IL
Solar Reflectance Index (SRI)	N/A

Please use the chart below to cross-reference your pipe size with the proper step to cut as shown.

Copper Tubing (C.T.S.)

Nominal tube size	¾"	1"	1¼"	1½"	2"	2½"	3"	4"	5"	6"	8"
Pipe O.D.	.88	1.13	1.38	1.63	2.13	2.63	3.13	4.13	5.13	6.13	N/A
Step of boot used	1	1	1	1½	2	2	3	4	5	6	N/A

Schedule 40 / 80 Steel Pipe - PVC Standard - Polyethylene Pipe IPS

Nominal tube size	¾"	1"	1¼"	1½"	2"	2½"	3"	4"	5"	6"	8"
Pipe O.D.	1.05	1.32	1.66	1.90	2.38	2.88	3.50	4.50	5.56	6.63	8.63
Step of boot used	1	1	1½	1½	2	3	3	4	5	6	8

Cast Iron Pipe

Nominal tube size	Pit Class A & Spun 100 – 250					Pit Class B, C & D					
	2"	3"	4"	6"	8"	2"	3"	4"	6"	8"	
Pipe O.D.	2.50	3.96	4.80	6.90	9.50	N/A	3.96	5.00	7.10	9.30	
Step of boot used	2	4	5	6	N/A	N/A	4	5	6	N/A	

Sewer - Soil Pipe

PVC Plastic SDR 35 & 41 - Cast Iron Soil Pipe no hub - service weight & extra heavy

Nominal tube size	4"	4"	4"	4"	6"	6"	6"	6"	8"	8"	8"	8"
Pipe O.D.	4.22	4.38	4.30	4.62	6.28	6.30	6.30	6.62	8.40	8.38	8.38	8.75
Step of boot used	4	4	4	4	6	6	6	6	8	8	8	8

Conduit EMT

Nominal tube size	¾"	1"	1¼"	1½"	2"	2½"	3"	3½"	4"
Pipe O.D.	.922	1.16	1.51	1.74	2.19	2.88	3.50	4.00	4.50
Step of boot used	1	1	1	1½	2	3	3	4	4

Conduit IMC

Nominal tube size	¾"	1"	1¼"	1½"	2"	2½"	3"	3½"	4"
Pipe O.D.	1.02	1.29	1.63	1.88	2.36	2.85	3.47	3.97	4.46
Step of boot used	1	1	1½	1½	2	3	3	4	4

Conduit Rigid

Nominal tube size	¾"	1"	1¼"	1½"	2"	2½"	3"	3½"	4"	5"
Pipe O.D.	1.05	1.32	1.66	1.90	2.37	2.87	3.5	4	4.5	5.56
Step of boot used	1	1	1½	1½	2	3	3	4	4	5

Universal Single-Ply Sealant

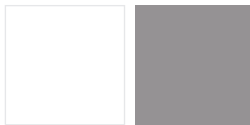


Overview

Carlisle's Universal Single-Ply Sealant is a 100% solids, solvent-free, one-part polyether sealant that provides a weather-tight seal to a variety of substrates. Universal Single-Ply Sealant can be used as a sealant above Termination Bar for Sure-Weld®, Sure-Flex™, and Sure-White® fully adhered and mechanically fastened roofing systems. It is also excellent for use in counter flashing, coping, and scupper details. Available in White and Gray.

Features and Benefits

- » Excellent adhesion to a variety of substrates
- » Low VOC
- » Wide range of applications
- » Gray is approved for use as a lap sealant on Gray Sure-Seal Elastoform Flashing
- » Standard Colors:



White

Gray

Coverage Rate

25' (7.6 m) per tube or 600' (183 m) per carton using a ¼" (8 mm) bead.

Application

1. Universal Single-Ply Sealant is a one-component, ready-to-use material that requires no mixing or preparation.
2. Surface preparation: Surfaces shall be dry, clean, and free of all dust or contamination that may negatively affect adhesion. Cleaning with Carlisle's Weathered Membrane Cleaner or Low-VOC Membrane Cleaner may be required.
3. Use a high-quality caulking gun to ensure ease of application.
4. Universal Single-Ply Sealant typically is tack-free in 25 minutes and skins over within 45 minutes. Full cure occurs in 3 to 7 days, depending on temperature and humidity levels.
5. Clean up: Remove excess sealant adjacent to joint prior to cleaning with Carlisle's Weathered Membrane Cleaner or Low-VOC Membrane Cleaner.

IMPORTANT – Gray Universal Single-Ply Sealant is required for use as a lap sealant when installing Gray Sure-Seal Pressure-Sensitive Elastoform Flashing to Gray TPO membrane. To ensure adequate adhesion, primer must be installed to the surface of the Elastoform Flashing in any area that is to receive the Gray Universal Single-Ply Sealant.

Review Carlisle specifications and details for complete installation information.

Precautions

- » Store in original, unopened containers in a cool, dry area. Protect unopened containers from heat and direct sunlight. Elevated temperatures will reduce shelf life.
- » Do not use Universal Single-Ply Sealant in temperatures below 40°F (4°C).
- » For industrial professional use only. May not be repackaged or resold for other than industrial or professional use.
- » Avoid prolonged contact with skin.
- » Uncured adhesive is an eye irritant. In case of contact with eyes, immediately flush with water.
- » Do not ingest. If ingested, contact a physician immediately.
- » Review Safety Data Sheet for complete safety information prior to use.
- » KEEP OUT OF THE REACH OF CHILDREN.

Universal Single-Ply Sealant

Typical Properties and Characteristics

Color	White or Gray
Viscosity	850,000 Cps.
Tack-Free Time	25 minutes depending on temp/humidity
Cure Time	3-7 days depending on temp/humidity
Flow, Sag, or Slump	None (¼" [8 mm] Bead)
Staining	None
Ozone Resistance	Good
UV Resistance	Excellent
Cured Hardness (Shore A)	17-55
Shear Strength	150-208 PSI
Weight per Carton	25 lbs (11.3kg) @ 24/ctn 12.5 lbs (5.7kg) @ 12/ctn
Packaging	White – 24 Cartridges, 10.1 fl. oz. (298 mL) each Gray – 12 Cartridges, 10.1 fl. oz. (298 mL) each
Shelf Life	12 months, unopened container @ 90°F (32°C)
VOC Content	22 g/L

Typical properties and characteristics are based on samples tested and are not guaranteed for all samples of this product. This data and information is intended as a guide and does not reflect the specification range for any particular property of this product.

LEED® Information

Pre-consumer Recycled Content	0%
Post-consumer Recycled Content	0%
Manufacturing Location	MI
Solar Reflectance Index (SRI)	N/A

Water Cut-Off Mastic



Overview

Let Carlisle simplify your next membrane installation with its Water Cut-Off Mastic. Water Cut-Off Mastic is a one-component, low-viscosity, self-wetting, butyl-blend mastic designed to be used in conjunction with roofing and waterproofing systems. It is primarily used as a sealing agent between various membranes and applicable when membrane is being terminated using a compression-type seal.

Water Cut-Off Mastic is an extremely tacky material and will remain as such when used with compression-type terminations.

Features and Benefits

- » Extremely tacky
- » Provides a durable compression-type seal between various membranes and parapet wall constructions

Coverage Rate

10 linear feet per tube at the recommended application rate of a ½" bead.

Application

1. All surfaces to be sealed with Water Cut-Off Mastic must be free of moisture, oil, dirt and other foreign materials. Water Cut-Off Mastic cannot be used on insulation.
2. Apply a ½" (13 mm) bead of Water Cut-Off Mastic between the substrate and the edge of the membrane.
3. Apply appropriate termination material and secure to provide constant compression for the Water Cut-Off Mastic.

Review Carlisle specifications and details for complete application information.

Precautions

- » Review the applicable Material Safety Data Sheet for complete safety information prior to use.
- » Water Cut-Off Mastic is FLAMMABLE – contains solvents that are dangerous fire and explosion hazards when exposed to heat, flame or sparks. Store and use away from all sources of heat, flame or sparks. Do not smoke while applying. Do not use in a confined or unventilated area. Vapors are heavier than air and may travel along ground to a distant ignition source and flash back.
- » Avoid breathing vapors. Keep container closed when not in use. Use with adequate ventilation. If inhaled, remove to fresh air. If not breathing, perform artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.
- » If swallowed, DO NOT INDUCE VOMITING. Call a physician immediately.
- » Avoid contact with eyes. Safety glasses or goggles are recommended. If splashed in eyes, immediately flush eyes with plenty of clean water for at least 15 minutes. Contact a physician immediately.
- » Avoid contact with skin. Wash hands thoroughly after handling. In case of contact with skin, thoroughly wash affected area with soap and water.
 Note: Permeation-resistant gloves (that meet ANSI/ISEA 105-2005) are recommended to be worn when using this product to protect hands from irritating ingredients.

Water Cut-Off Mastic

Typical Properties and Characteristics

Color	Gray
Solids	80%
Flash Point	40°F (4°C) Closed Cup
Service Temperature	-40°F to 200°F (-40°C to 93°C)
Specific Gravity	1.29
Cold Weather Flexibility	Excellent
Average Brookfield Viscosity	1,320,000 cps
Packaging	25 tubes/carton
Clean up	Weathered Membrane Cleaner
Average net weight/carton	28 lbs (13 kg)
Shelf life	1 year, unopened container

Typical properties and characteristics are based on samples tested and are not guaranteed for all samples of this product. This data and information is intended as a guide and does not reflect the specification range for any particular property of this product.

LEED® Information

Pre-consumer Recycled Content	0%
Post-consumer Recycled Content	0%
Manufacturing Location	Carlisle, PA
VOC Content	250 g/L

Attachment G: Renewable Energy Systems

City of Patterson

System 1 Design

Location: City Hall
Address: 1 Plaza Circle, Patterson, CA 95363
Estimated Power Rating: 24,200 W-DC
Estimated Year 1 Production: 42,976 kWh



System 2 Design

Location: Fire Station #1
Address: 344 W Las Palmas Ave, Patterson, CA 95363
Estimated Power Rating: 21,780 W-DC
Estimated Year 1 Production: 38,021 kWh



System 3 Design

Location: Fire Station #2
Address: 1950 Keystone Pacific Pkwy, Patterson, CA 95363
Estimated Power Rating: 39,040 W-DC
Estimated Year 1 Production: 65,621 kWh



System 4 Design

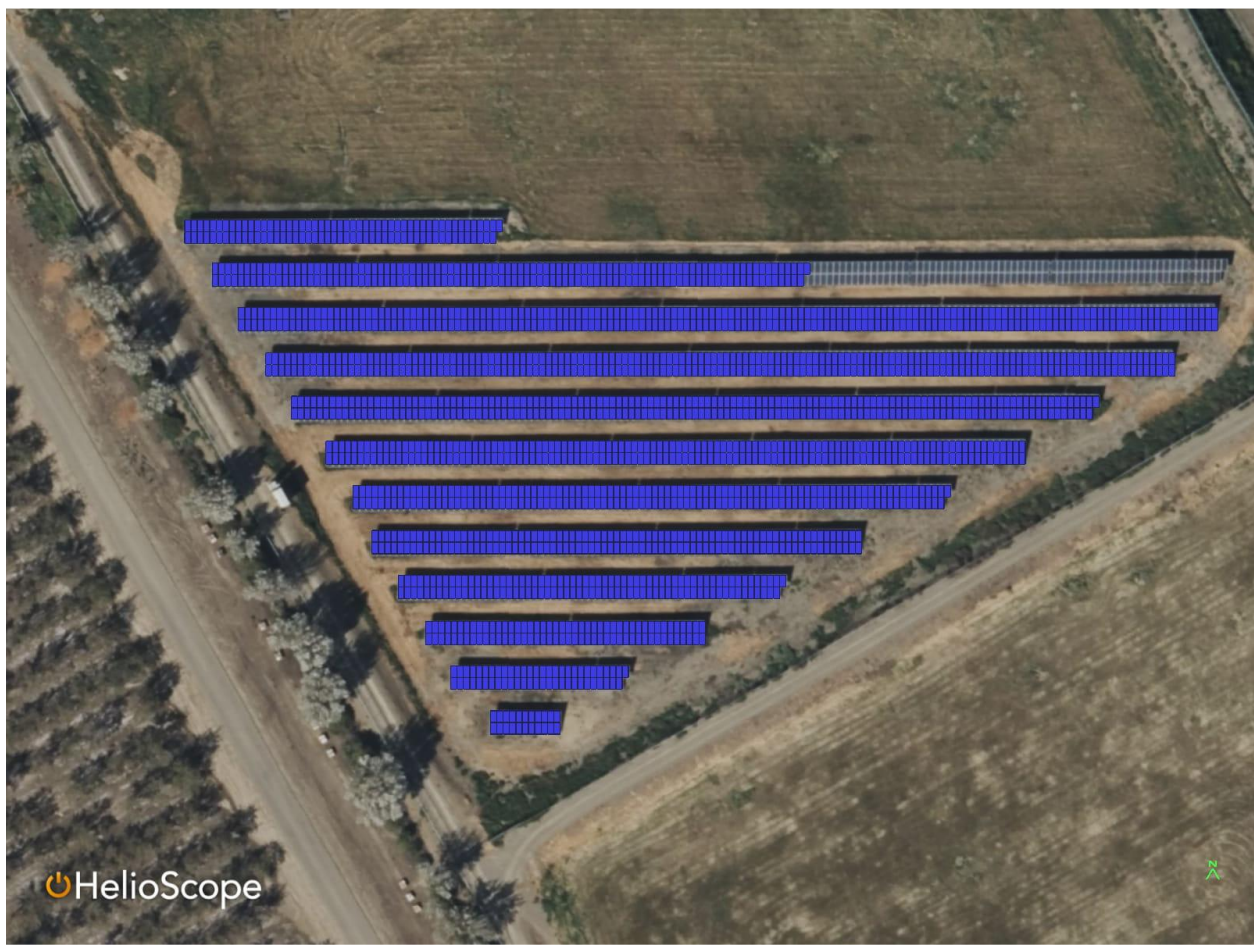
Location: Old Corporate Yard
Address: 420 S 4th St, Patterson, CA 95363
Estimated Power Rating: 13,310 W-DC
Estimated Year 1 Production: 21,909 kWh



System 5 Design

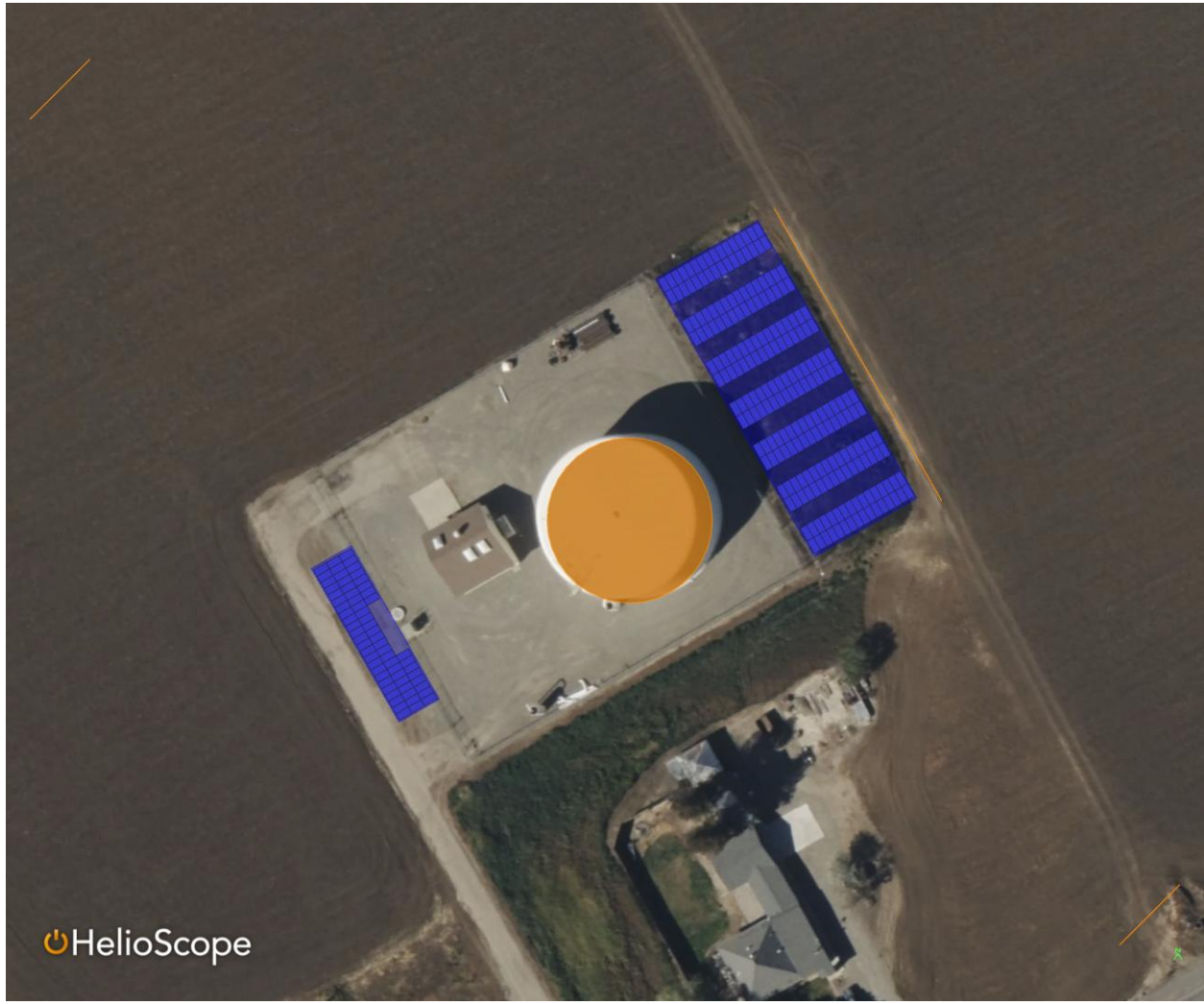
Location: Wastewater Treatment Plant South
Address: 14901 Poplar Ave, Patterson, CA 95363
Estimated Power Rating: 584,100 W-DC
Estimated Production: 1,020,726 kWh

The scope of work only includes repairing the repowering the existing ground mount solar system. The Power Rating and Production is an estimate. Actual numbers might vary.



System 6 Design

Location: Well 8
Address: Orange Ave, Patterson, CA 95363
Estimated Power Rating: 177,120 W-DC
Estimated Production: 299,093 kWh



System 7 Design

Location: Well 9
Address: 636 Orange Ave, Patterson, CA 95363
Estimated Power Rating: 153,720 W-DC
Estimated Production: 257,116 kWh



System 8 Design

Location: Well 11
Address: 15804 Sycamore, Patterson, CA 95363
Estimated Power Rating: 139,080 W-DC
Estimated Production: 237,566 kWh



Assumptions:

1. All technology & equipment specified/used in this project will meet or exceed all currently applicable & proposed safety, environmental and interconnection standards, as well as all fire safety requirements.
2. All PV system equipment & components will be UL certified.
3. ABS will obtain permits (without any building and safety or planning fees from the City) & utility approvals necessary to install the PV System.
4. Assumes all carport foundation drilling in clean dirt. All rock drilling to be at additional costs.
5. Interconnection work/outages will be scheduled during normal business hours.
6. Building department and utility inspections will be scheduled during normal business hours.
7. Pricing assumes that ABS's employees will have free and clear access to all array locations simultaneously during business hours (M-F 0700-1700).
8. ABS will provide electrical drawings stamped by a licensed California Registered Electrical Professional Engineer.
9. The planned AC electrical tie-in will not require component upgrades or improvements.
10. The System & installation will meet all requirements for interconnection with appropriate documentation. ABS will be responsible for providing all documentation.
11. System layout is acceptable to AHJ in terms of clearances.
12. Single mobilization and completion of project in one phase.
13. As built plans are available for engineering reference.
14. ABS is not responsible for superficial marking of parking area due to use of equipment.
15. On-site staging areas are available for storage of equipment and materials.
16. No special safety requirements beyond ABS's standard safety regulations will be enforced.
17. Pricing includes NEMA 3R painted steel electrical equipment.
18. Module pricing is based on current market value. Price is subject to adjustment based on market conditions at time of construction.
19. Steel pricing is based on current market value. Price is subject to adjustment based on market conditions at time of construction.
20. Ground penetrating radar (GPR) is accurate down to a depth of 3'-4'. There may be underground utilities below this level that are untraceable with GPR that would require the use of an underground camera to be located at additional cost.
21. Pricing assumes the structure can support the additional loads of the PV array system.
22. Pricing is based on prevailing wage rates.
23. Panels, inverters and equipment is subject to change based on availability, but the system size and production shall remain unchanged.

Exclusions:

1. UL recertification of existing electrical equipment beyond our scope of work
2. Repairs of any electrical code violations at the existing facility
3. Removal and/or disposal of hazardous materials
4. Arc flash or breaker coordination studies
5. 3rd party (private) locating services
6. Pedestrian & vehicle traffic control
7. Re-creation of building plan sets
8. Lightening protection systems
9. Revenue grade metering
10. ADA design/compliance
11. Sprinklers & gutters
12. Inverter enclosures
13. Phasing
14. Electrical infrastructure upgrades

Harvest the Sunshine

JA SOLAR

630W



JAM66D45 LB n-type Double Glass Bifacial Modules

Premium Cells

n-
Bycium+
16BB

MBB Half-Cell
Technology

26%



Cell Conversion
Efficiency

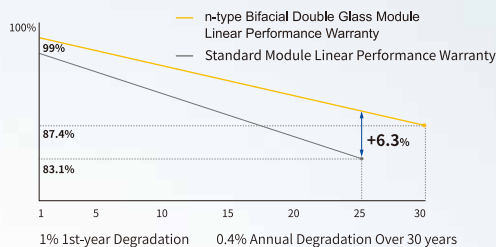
Premium Modules

Higher power
generation better LCOE

n-type with very
Lower LID

Better Temperature
Coefficient

Better low irradiance
response



12-year product
warranty

30-year linear power
output warranty

Comprehensive Certificates

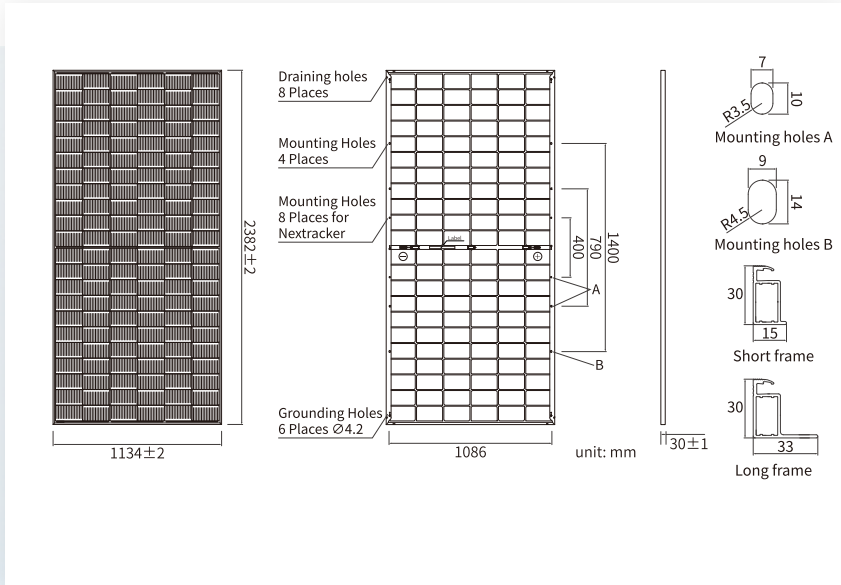
- IEC 61215, IEC 61730, UL 61215, UL 61730
- ISO 9001: 2015 Quality management systems
- ISO 14001: 2015 Environmental management systems
- ISO 45001: 2018 Occupational health and safety management systems
- IEC 62941: 2019 Terrestrial photovoltaic (PV) modules - Quality system for PV module manufacturing



DEEP BLUE 4.0 Pro

JAM66D45 LB

n-type Double Glass Bifacial Modules



MECHANICAL PARAMETERS

Cell	Mono
Weight	33.1kg
Dimensions	2382±2mm × 1134±2mm × 30±1mm
Cable Cross Section Size	4mm ² (IEC), 12 AWG(UL)
No. of cells	132(6×22)
Junction Box	IP68, 3diodes
Connector	QC 4.10-351/ MC4-EVO2A
Cable Length (Including Connector)	Portrait: 300mm(+)/400mm(-) Landscape: 1500mm(+)/1500mm(-)
Front Glass/Back Glass	2.0mm/2.0mm
Packaging Configuration	36pcs/Pallet, 720pcs/40HQ Container

Remark: customized frame color and cable length available upon request

ELECTRICAL PARAMETERS AT STC

TYPE	JAM66D45 -605/LB	JAM66D45 -610/LB	JAM66D45 -615/LB	JAM66D45 -620/LB	JAM66D45 -625/LB	JAM66D45 -630/LB
Rated Maximum Power(Pmax) [W]	605	610	615	620	625	630
Open Circuit Voltage (Voc) [V]	47.90	48.10	48.30	48.50	48.70	48.90
Maximum Power Voltage(Vmp) [V]	39.60	39.77	39.96	40.21	40.45	40.70
Short Circuit Current(Isc) [A]	16.00	16.05	16.10	16.13	16.15	16.18
Maximum Power Current(Imp) [A]	15.28	15.34	15.39	15.42	15.45	15.48
Module Efficiency [%]	22.4	22.6	22.8	23.0	23.1	23.3
Power Tolerance	0~+3%					
Temperature Coefficient of Isc(α _{Isc})	+0.045%/°C					
Temperature Coefficient of Voc (β _{Voc})	-0.250%/°C					
Temperature Coefficient of Pmax(γ _{Pmp})	-0.290%/°C					
STC	Irradiance 1000W/m ² , cell temperature 25°C, AM1.5G					

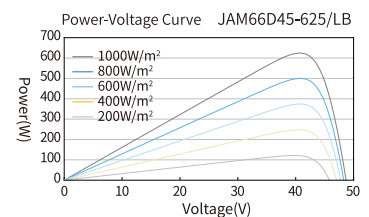
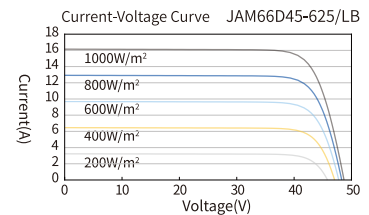
Remark: Electrical data in this catalog do not refer to a single module and they are not part of the offer. They only serve for comparison among different module types.

ELECTRICAL CHARACTERISTICS WITH 10% SOLAR IRRADIATION RATIO

TYPE	JAM66D45 -605/LB	JAM66D45 -610/LB	JAM66D45 -615/LB	JAM66D45 -620/LB	JAM66D45 -625/LB	JAM66D45 -630/LB
Rated Max Power(Pmax) [W]	653	659	664	670	675	680
Open Circuit Voltage(Voc) [V]	47.90	48.10	48.30	48.50	48.70	48.90
Max Power Voltage(Vmp) [V]	39.60	39.77	39.96	40.21	40.45	40.70
Short Circuit Current(Isc) [A]	17.28	17.33	17.39	17.42	17.44	17.47
Max Power Current(Imp) [A]	16.50	16.56	16.62	16.65	16.69	16.72
Irradiation Ratio (rear/front)	10%					

* For Nexttracker installations, maximum static load please take compatibility approve letter between JA Solar and Nexttracker for reference.

CHARACTERISTICS



OPERATING CONDITIONS

Maximum System Voltage	1500V DC
Operating Temperature	-40°C~+85°C
Maximum Series Fuse Rating	35A
Maximum Static Load, Front*	5400Pa(112 lb/ft ²)
Maximum Static Load, Back*	2400Pa(50 lb/ft ²)
NOCT	45±2°C
Bifaciality	80%±5%
Safety Class	Class II
Fire Performance	UL Type 29/Class C

Commercial: 60K-3P-480V



Perfect for Large Industrial

Simplifies adding energy storage to small commercial buildings.

Native 277/480V 3P output with Wye or Delta options simplifies installation removing the need for external transformers

AC/DC Coupling Capability

Enabling seamless integration with existing grid-tied PV systems

Allows for efficient DC coupling using the integrated 4x channel MPPT charge controller.

Modular & Scalable Energy

Modular and flexible design allowing for easy installation and expansion.

Accommodates a range of system sizes with outputs starting from 60kW going to 600kW

Seamless Backup Power

Helps meet your corporate renewable energy goals and decarbonization efforts

Blazing fast 20ms transfer time with 200A grid relay allows for business continuity during grid outages.

60K-3P-480V C&I Hybrid Inverter

Input Data (PV)	
Max. Allowed PV Power (STC)	78,000W
MPPT Voltage Range	150-850V
Startup Voltage	180V
Max. Input Voltage ¹	1,000V
Max. operating input current per MPPT	36A
Max. short circuit current per MPPT	55A
No. of MPP Trackers	4
No. of PV Strings per MPPT	2
Max. AC Coupled Input	60,000W
Output Data (AC)	
Nominal AC Voltage (3Φ) ²	277/480V (4-wire Wye) or 480V (3-wire Delta)
Grid Frequency	50 / 60Hz
Real Power, max continuous (3Φ)	60,000W
Max. Output Current	72.3A
Peak Apparent Power (10s, off-grid, 3Φ)	90,000VA
Max. Grid Passthrough Current (10min)	200A
Continuous Grid Passthrough Current	180A
Power Factor Output Range	+/- 0.8 adjustable
Backup Transfer Time	Up to 15ms
CEC Efficiency	96.5%
Max Efficiency	97.5%
Design (DC to AC)	Transformerless DC
Stackable	Up to 10 in parallel
Battery Input Data (DC)	
Supported Battery Chemistry	Lithium-ion
No. of Battery Inputs	2
Battery Input Terminal Rating	50A
Nominal DC Voltage	≥ 600V
Operating Voltage Range	160 - 700V
Battery Capacity Range	50 — 9900Ah
Max. Battery Charge / Discharge Current	100A (50A per input)
Charge Controller Type	CC/CV - BMS Controlled
Grid to Battery Charging Efficiency	96.0%
Automatic Generator Start (AGS)	2 Wire Start - Integrated
BMS Communication ³	CAN (Controller Area Network)
General Data	
Dimensions (H x W x D)	894 x 528 x 295 mm (35.2 x 20.8 x 11.6 in)
Weight	80 Kg / 176 lb.
Enclosure	IP65 / NEMA 3R
Operating Temperature	-40 – 60°C, >45°C Derating
Operating Altitude ⁴	2000 m (6561 ft)
Noise Level @ 1m	< 30 dB @ 25°C (77°F)
Idle Consumption - No Load	60W
Communication and Monitoring	Wi-Fi & LAN Hardware Included
Warranty	10 Years
Category	
Certifications and Listings (Grid Support Interactive Inverter)	UL 1741-2021 (UL1741SB), CSA C22.2 No 107.1-16, IEEE 1547-2018 & 1547a-2020 & 1547.1-2020 (SRD V2.0), UL 1741 CRD-PCS, UL1699B, CEC, SGIP, CSIP
PV DC Disconnect Switch — NEC 240.15	Integrated
Ground Fault Detection — NEC 690.5	Integrated
PV Rapid Shutdown Control — NEC 690.12	Integrated
PV Arc Fault Detection — NEC 690.11	Integrated
PV Input Lightning Protection	Integrated
PV String Input Reverse Polarity Protection	Integrated
Surge Protection	DC Type II / AC Type III

¹ See Installation Guide for details on sizing array strings. Highest input voltage is based on the open-circuit voltage of the array at minimum design temperature

² Does not support corner grounded delta, high leg delta, or 240V delta systems. Consult installation manual or solark.com for details..

³ Active BMS communication is required for all lithium batteries. See solark.com for list of compatible battery partners.

⁴ Derating occurs above 2000m (6561 ft).

Sol-Ark reserves the right to modify specifications at any time, and without prior notice. See sol-ark.com for the latest information.

Commercial: 30K-3P-208V



Perfect for Light Commercial

Simplifies adding energy storage to small commercial buildings.

Native 120/208 3P output simplifies installation removing the need for bulky step-down transformers

AC/DC Coupling Capability

Enabling seamless integration with existing grid-tied PV systems

Allows for efficient DC coupling using the integrated 4x channel MPPT charge controller.

Modular & Scalable Energy

Modular and flexible design allowing for easy installation and expansion.

Accommodates a range of system sizes with outputs starting from 30kW going to 300kW

Seamless Backup Power

Helps met your corporate renewable energy goals and decarbonization efforts

Blazing fast 20ms transfer time with 200A grid relay allows for business continuity during grid outages.

Input Data (PV)	
Max. Allowed PV Power (STC)	39,000W
MPPT Voltage Range	150-500V
Startup Voltage	180V
Max. Input Voltage ¹	550V
Max. operating input current per MPPT	36A
Max. short circuit current per MPPT	55A
No. of MPP Trackers	4
No. of PV Strings per MPPT	2
Max. AC Coupled Input Power	30,000W
Output Data (AC)	
Nominal AC Voltage (3Φ)	120/208V
Grid Frequency	50 / 60Hz
Real Power, max continuous (3Φ)	30,000W
Max. Output Current	83.4A
Peak Apparent Power (10s, off-grid, 3Φ)	45,000VA
Max. Grid Passthrough Current (10min)	200A
Continuous Grid Passthrough Current	180A
Power Factor Output Range	+/- 0.8 (adjustable)
Backup Transfer Time	20ms (adjustable)
CEC Efficiency	96.5%
Max Efficiency	97.5%
Design (DC to AC)	Transformerless DC
Stackable	Up to 10 in parallel
Battery Input Data (DC)	
Battery Chemistry	Lithium-ion
No. of Battery Inputs	2
Battery Input Terminal Rating	50A
Nominal DC Voltage	≥300V
Operating Voltage Range	160 - 500V
Battery Capacity Range	50 — 9900Ah
Max. Battery Charge / Discharge Current	100A (50A per input)
Charge Controller Type	CC/CV - BMS Controlled
Grid to Battery Charging Efficiency	96.0%
Automatic Generator Start (AGS)	2 Wire Start - Integrated
BMS Communication ²	CAN (Controller Area Network)
General Data	
Dimensions (H x W x D)	894 x 528 x 295 mm (35.2 x 20.8 x 11.6 in)
Weight	80 Kg / 176 lb.
Enclosure	IP65 / NEMA 3R
Operating Temperature	-40 – 60°C, >45°C Derating
Operating Altitude ³	2000 m (6561 ft)
Noise Level	< 30 dB @ 25°C (77°F)
Idle Consumption - No Load	60W
Communication and Monitoring	Wi-Fi & LAN Hardware Included
Warranty	10 Years
Category	
Certifications and Listings (Grid Support Interactive Inverter)	UL 1741-2021 (UL1741SB), CSA C22.2 No 107.1-16, IEEE 1547-2018 & 1547a-2020 & 1547.1-2020 (SRD V2.0), UL 1741 CRD-PCS, UL1699B, CEC, SGIP, CSIP
PV DC Disconnect Switch — NEC 240.15	Integrated
Ground Fault Detection — NEC 690.5	Integrated
PV Rapid Shutdown Control — NEC 690.12	Integrated
PV Arc Fault Detection — NEC 690.11	Integrated
PV Input Lightning Protection	Integrated
PV String Input Reverse Polarity Protection	Integrated
Surge Protection	DC Type II / AC Type III

¹ See Installation Guide for details on sizing array strings. Highest input voltage is based on the open-circuit voltage of the array at minimum design temperature.

² Active BMS communication is required for all lithium batteries. See solark.com for list of compatible battery partners.

³ Derating occurs above 2000m (6561 ft).

Sol-Ark reserves the right to modify its specifications at any time and without prior notice. Please visit sol-ark.com for the latest information.



/ STP 33-US-41 / STP 50-US-41 / STP 62-US-41



Sunny Tripower CORE1-US

33 / 50 / 62

It stands on its own

/ **New! Complies with IEEE 1547-2018 and UL 1741 SB standards**



Fully integrated

- No additional racking required for rooftop installation
- Integrated DC and AC disconnects and overvoltage protection
- 12 direct string inputs for reduced labor and material costs
- Up to 60% faster commercial PV system installation

Increased power, flexibility

- Six MPP trackers for flexible stringing and maximum power production
- ShadeFix, SMA's proprietary shade management solution, optimizes at the string level
- Intelligent string monitoring to pinpoint array performance issues

Enhanced safety, reliability

- Integrated SunSpec PLC signal for module-level rapid shutdown
- DC AFCI arc-fault protection certified to Standard UL 1699B Ed. 1

Smart monitoring, control, service

- I-V curve diagnostic function to visualize and document PV string electrical characteristics
- Increased ROI with SMA ennexOS cross sector energy management platform
- SMA Smart Connected proactive O&M solution reduces time spent diagnosing and servicing in the field

The Sunny Tripower CORE1 is the world's first free-standing PV inverter for commercial rooftops, carports, ground mount and repowering legacy solar projects.

From distribution to construction to operation, the Sunny Tripower CORE1 enables logistical, material, labor and service cost reductions, and is the most versatile, cost-effective commercial solution available. Integrated SunSpec PLC for rapid shutdown and enhanced DC AFCI arc-fault protection ensure compliance to the latest safety codes and standards. With Sunny Tripower CORE1 and SMA's ennexOS cross sector energy management platform, system integrators can deliver comprehensive commercial energy solutions for increased ROI.



Technical data	Sunny Tripower CORE1 33-US	Sunny Tripower CORE1 50-US	Sunny Tripower CORE1 62-US
Input (DC)			
Maximum array power	50000 Wp STC	75000 Wp STC	93750 Wp STC
Maximum system voltage	1000 V		
Rated MPP voltage range	330 V ... 800 V	500 V ... 800 V	550 V ... 800 V
MPPT operating voltage range	150 V ... 1000 V		
Minimum DC voltage / start voltage	150 V / 188 V		
MPP trackers / strings per MPP input	6 / 2		
Maximum usable operating input current / per MPP tracker	120 A / 20 A		
Maximum short circuit current per MPPT / per string input	32 A / 30 A		
Output (AC)			
AC nominal power	33300 W	50000 W	62500 W
Maximum apparent power	33300 VA	53000 VA	66000 VA
Output phases / line connections	3 / 3-(N)-PE		
Nominal AC voltage	480 V / 277 V WYE		
AC voltage range	244 V ... 305 V		
Maximum output current	40 A	64 A	80 A
Rated grid frequency	60 Hz		
Grid frequency / range	50 Hz, 60 Hz / -6 Hz ... +6 Hz		
Power factor at rated power / adjustable displacement	1 / 0.0 leading ... 0.0 lagging		
Harmonics THD	<3%		
Efficiency			
CEC efficiency	97.5%	97.5%	97.5%
Protection and safety features			
Load rated DC disconnect	●		
Load rated AC disconnect	●		
Ground fault monitoring: Riso / Differential current	● / ●		
DC AFCI arc-fault protection	●		
SunSpec PLC signal for rapid shutdown	●		
DC reverse polarity protection	●		
AC short circuit protection	●		
DC surge protection: Type 2 / Type 1+2	○ / ○		
AC surge protection: Type 2 / Type 1+2	○ / ○		
Protection class / overvoltage category (as per UL 840)	I / IV		
General data			
Device dimensions (W/H/D)	621 mm / 733 mm / 569 mm (24.4 in x 28.8 in x 22.4 in)		
Device weight	84 kg (185 lbs)		
Operating temperature range	-25 °C ... +60 °C (-13 °F ... +140 °F)		
Storage temperature range	-40 °C ... +70 °C (-40 °F ... +158 °F)		
Audible noise emissions (full power @ 1m and 25 °C)	65 dB(A)		
Topology	Transformerless		
Cooling concept	OptiCool (forced convection, variable speed fans)		
Enclosure protection rating	Type 4X, 3SX (as per UL 50E)		
Corrosivity classification according to IEC 61701	C3*		
Maximum permissible relative humidity (non-condensing)	100%		
Additional information			
Mounting	Free-standing with included mounting feet		
DC connection	Amphenol UTX PV or H4Plus connectors		
AC connection	Screw terminals - 4 AWG to 4/0 AWG CU/AL		
LED indicators (Status / Fault / Communication)	●		
Network interfaces: Ethernet / WLAN / RS485	● (2 ports) / ▲ / ○		
Data protocols: SMA Modbus / SunSpec IEEE 1547 Modbus / Webconnect	● / ● / ●		
ShadeFix technology for string level optimization	●		
Intelligent string performance monitoring	●		
I-V curve diagnostic function	●		
Integrated Plant Control / Q on Demand 24/7	● / ●		
SMA Smart Connected (proactive monitoring and service support)	●		
Certifications			
Certifications and approvals	UL 1741, UL 1699B Ed. 1, UL 1998, CSA 22.2 107-1, PV Rapid Shutdown System Equipment, UL 3741		
FCC compliance	FCC Part 15 Class A		
Grid interconnection standards	IEEE 1547-2018, UL 1741 SA/SB - CA Rule 21, HECO SRD V2.0		
Advanced grid support capabilities	L/HFRT, L/HVRT, Volt-VAr, Volt-Watt, Frequency-Watt, Ramp Rate Control, Fixed Power Factor		
Warranty			
Standard	10 years		
Optional extensions	15 / 20 years		
○ Optional features ● Standard features - Not available ▲ Subject to availability	Data at nominal conditions - status: 08/2023 * ≥ 2 km from the coast		
Type designation	STP 33-US-41	STP 50-US-41	STP 62-US-41



SMA Data Manager M
EDMM-US-10



SMA Sensor Module
MD.SEN-US-40



Universal Mounting System
UMS_KIT-10

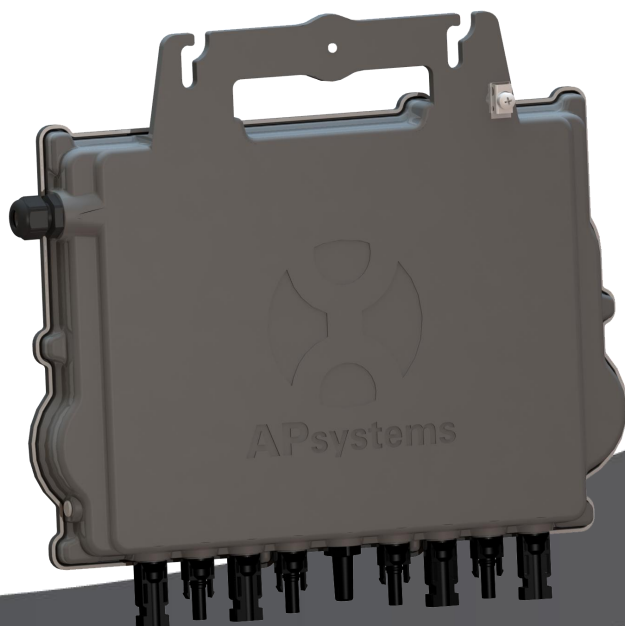


AC Surge Protection Module Kit
AC_SPD_KIT1-10, AC_SPD_KIT2_T1T2
DC Surge Protection Module Kit
DC_SPD_KIT4-10, DC_SPD_KIT5_T1T2



APsystems Microinverter Installation Manual

APsystems QT2 Microinverter (For North America)



ALTENERGY POWER SYSTEM Inc.
Usa.APsystems.com
canada.APsystems.com

APsystems America
8627 N. Mopac Expy, Suite 150, Austin, TX 78759
EMAIL: info.usa@APsystems.com

APsystems Canada
8627 N. Mopac Expy, Suite 150, Austin, TX 78759
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Please scan this QR code to have access to our APPs and Products information

Table of Contents

1. Important Safety Instructions	2
1.1 Safety Instructions	2
1.2 Radio Interference Statement	3
1.3 Symbols in lieu of words	4
2. APsystems Microinverter System Introduction	4
3. APsystems Microinverter QT2 Introduction	7
4. APsystems Microinverter System Installation	8
4.1 Additional accessories supplied by APsystems	8
4.2 Other required accessories not supplied by APsystems	8
4.3 PV Rapid Shut Down Equipment	9
4.4 Installation Procedures	10
4.4.1 Step 1 - Verify that grid voltage matches microinverter rating	10
4.4.2 Step 2 – AC Bus Cable distribution	10
4.4.3 Step 3 - Attach the APsystems Microinverters to the Racking	10
4.4.4 Step 4 - Ground the system	11
4.4.5 Step 5 - Connect the APsystems microinverter to AC bus cable	12
4.4.6 Step 6 - Install a Bus Cable End Cap at the end of AC bus cable	13
4.4.7 Step 7 - Connect APsystems Microinverters to the PV Modules	13
4.4.8 Step 8 - Connect APsystems Microinverters to Grid	14
4.4.9 Step 9 - AC Extension Cable	15
4.4.10 Step 10 - Complete the APsystems installation map	15
5. APsystems microinverter system operating instructions	16
6. Troubleshooting	17
6.1 Status Indications and Error Reporting	17
6.1.1 Start up LED	17
6.1.2 Operation LED	17
6.1.3 GFDI Error	17
6.2 ECU_APP	17
6.3 Installer EMA (web portal or EMA Manager APP)	17
6.4 Trouble Shooting Guide	17
6.5 APsystems Technical Support	18
6.6 Maintenance	18
7. Replace a microinverter	19
8. Technical Data	20
8.1 QT2 3-Phase Microinverter Datasheet	21
9. QT2 - Wiring Diagram	22
9.1 QT2 Connected to Delta Type 3-Phase Grid	22
9.2 QT2 Connected to Wye Type 3-Phase Grid	23
10. QT2 Accessory	24
10.1 Dimensions	24
10.2 Wiring Diagram	25
11. APsystems Microinverter Installation Map	26

1. Important Safety Instructions

This manual contains important instructions to follow during installation and maintenance of the APsystems Photovoltaic Grid-connected Microinverter. To reduce the risk of electrical shock and ensure a safe installation and operation of the APsystems Microinverter, the following symbols appear throughout this document to indicate dangerous conditions and important safety instructions.

Specifications are subject to change without notice. Please ensure you are using the most recent update found at <https://usa.apsystems.com/resources/library/> or <https://canada.apsystems.com/resources/library/>

WARNING

This indicates a situation where failure to follow instructions may cause a serious hardware failure or personnel danger if not applied appropriately. Use extreme caution when performing this task.

NOTICE

This indicates information that is important for optimized microinverter operation. Follow these instructions closely.

1.1 Safety Instructions

- ✓ **Do NOT** disconnect the PV module from the APsystems Microinverter without first disconnecting the AC power.
- ✓ Only qualified professionals should install and/or replace APsystems Microinverters.
- ✓ Perform all electrical installations in accordance with local electrical codes.
- ✓ Before installing or using the APsystems Microinverter, please read all instructions and cautionary markings in the technical documents and on the APsystems Microinverter system and the solar-array.
- ✓ Be aware that the body of the APsystems Microinverter is the heat sink and can reach a temperature of 80°C. To reduce risk of burns, do not touch the body of the Microinverter.
- ✓ **Do NOT** attempt to repair the APsystems Microinverter. If it fails, contact APsystems Customer Support to obtain an RMA number and start the replacement process. Damaging or opening the APsystems Microinverter will void the warranty.
- ✓ **Caution!**
The external protective earthing conductor is connected to the inverter protective earthing terminal through AC connector. When connecting, connect the AC connector first to ensure the inverter earthing then do the DC connections. When disconnecting, disconnect the AC by opening the branch circuit breaker first but maintain the protective earthing conductor in the branch circuit breaker connect to the inverter ,then disconnect the DC inputs.
- ✓ Please install AC breakers on the AC side of the inverter.
CAUTION – Hot surfaces - To reduce the risk of burns - Do not touch. Risk of electric shock-(a) both ac and dc voltage source are terminated inside this equipment. Each circuit must be individually disconnected before servicing, and (b) When the photovoltaic array is exposed to light, it supplies a dc voltage to this equipment. Warranty void if cover removed. No user serviceable parts inside.Refer servicing to qualified service personnel. This inverter has an integral ground-fault detector / interrupter (GFDI).This Utility-InteractiveInverter contains active anti-islanding protection(IEEE1547) and is tested per FCC/IC.

1. Important Safety Instructions

1.2 Radio Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

WARNING

RF exposure warning

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provide with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

1. Important Safety Instructions

1.3 Symbols in lieu of words

 **APsystems** Trademark.



Caution, risk of electric shock.



Caution, hot surface.



NOTICE, danger! This device directly connected with electricity generators and public grid.

Qualified personnel

Person adequately advised or supervised by an electrically skilled person to enable him or her to perceive risks and to avoid hazards which electricity can create. For the purpose of the safety information of this manual, a "qualified person" is someone who is familiar with requirements for safety, electrical system and EMC and is authorized to energize, ground, and tag equipment, systems, and circuits in accordance with established safety procedures. The inverter and photovoltaic system may only be commissioned and operated by qualified personnel.

WARNING

English Warning Statement:

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

WARNING

French Warning Statement:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

2. APsystems Microinverter System Introduction

The APsystems Microinverter is used in utility-interactive grid-tied applications, comprised of three key elements:

- APsystems Microinverter
- APsystems Energy Communication Unit (ECU)
- APsystems Energy Monitor and Analysis (EMA) web-based monitoring and analysis system

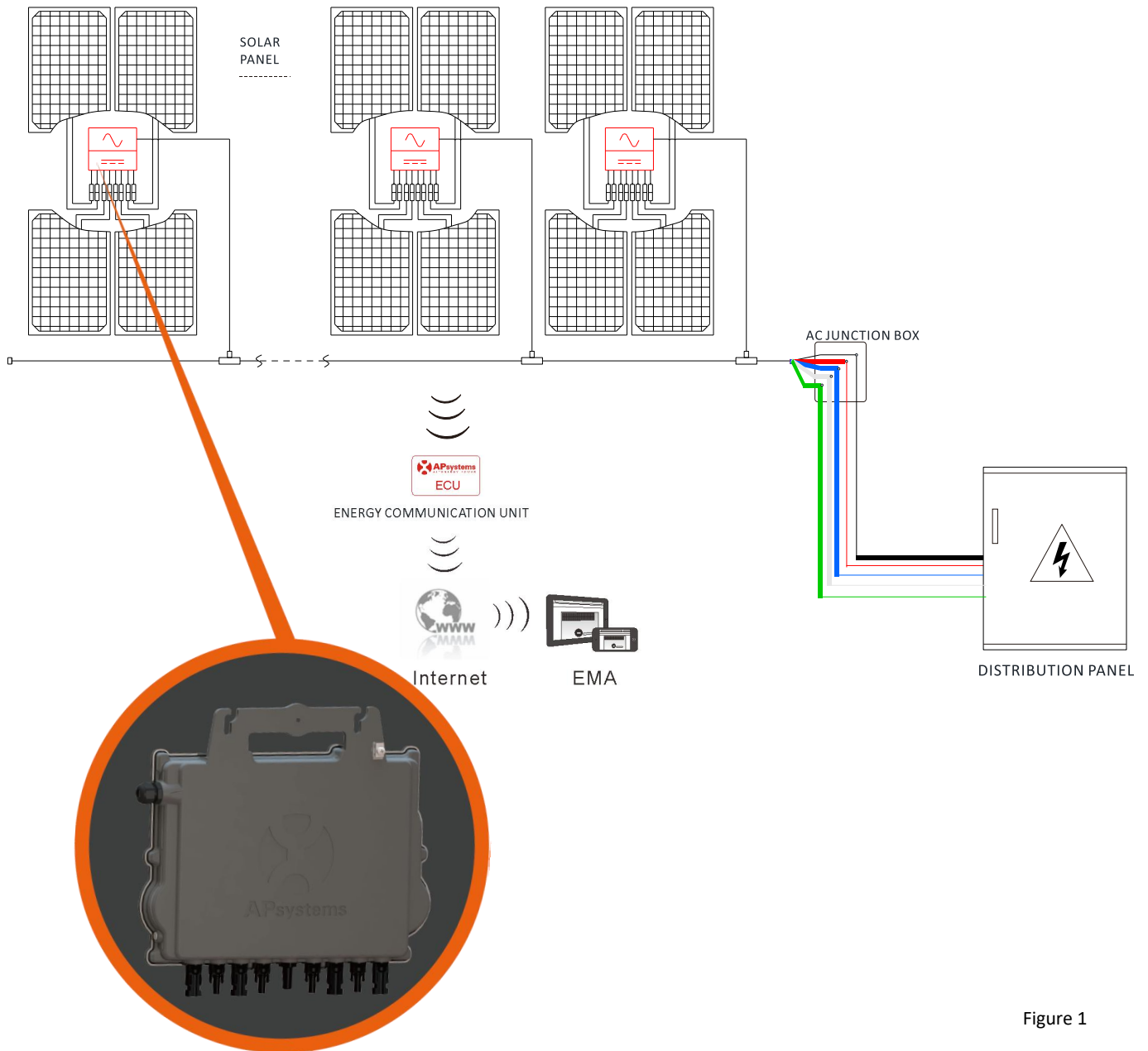


Figure 1

2. APsystems Microinverter System Introduction

This integrated system improves safety; maximizes solar energy harvest; increases system reliability, and simplifies solar system design, installation, maintenance, and management.

Safety with APsystems Microinverters

In a typical string inverter installation, PV modules are connected in series. The voltage adds-up to reach high voltage value (from 600Vdc up to 1000Vdc) at the end of the PV string. This extreme high DC voltage brings a risk of electrical shocks or electrical arcs which could cause fire.

When using an APsystems microinverter, PV modules are connected in parallel. Voltage at the back of each PV module never exceeds PV modules Voc, which is lower than 60Vdc for most of PV modules used with APsystems microinverters. This low voltage is considered “safe to touch” by fire departments and negates the risk of electrical shock, electrical arcs and fire hazards.

APsystems Microinverters maximize PV energy production

Each 2 input channels have individual Maximum Peak Power Tracking (MPPT) control, which ensures that the maximum power is produced to the utility grid regardless of the performance of the PV modules of other channels in the array. When PV modules in the array are affected by shade, dust, different orientation, or any situation in which one channel underperforms compared with the other channels, the APsystems Microinverter ensures top performance from the array by maximizing the performance of each channel individually within the array.

More reliable than centralized or string inverters

The distributed APsystems Microinverter system ensures that no single point of system failure exists across the PV system. APsystems Microinverters are designed to operate at full power at ambient outdoor temperatures of up to 65 deg C (or 149 F). The inverter case is designed for outdoor installation and complies with the Type 6 environmental enclosure rating.

Simple to install

APsystems Microinverters are compatible with most of 60 and 72 cell PV modules or 120 and 144 half-cut cells PV modules. (In order to confirm compatibility of PV module with APsystems microinverter, feel free to check our online “E-decider” module compatibility tool or contact your local APsystems Technical Support).

Installation requires a minimum number of accessories and microinverters offer a lot of versatility to the installer: microinverters can indeed be installed on different roofs with different orientation or with modules having different orientation.

In the same way, end-users can extend their system whenever they want with microinverters.

Smart system performance monitoring and analysis

The APsystems Energy Communication Unit (ECU) is installed by simply plugging it into any wall outlet and providing an Ethernet or Wi-Fi connection to a broadband router or modem. After installing and setting the ECU (see ECU Instruction Manual), the full network of APsystems Microinverters automatically reports to the APsystems Energy Monitor and Analysis (EMA) web server.

3. APsystems Microinverter QT2 Introduction

APsystems 2nd generation of native 3-phase quad microinverters are reaching unprecedented power outputs of 1728VA (for the type of QT2-208) or 1800VA (for the type of QT2-480) to adapt to today's larger power PV module. With balancing 3-phase output, 4 DC inputs, encrypted ZigBee signals, the QT2 benefits from an entirely new architecture.

The innovative design makes the product unique while maximizing power production. The components are encapsulated with silicone to reduce stress on the electronics, facilitate thermal dissipation, enhance waterproof properties, and ensure maximum reliability of the system via rigorous testing methods including accelerated life testing. A 24/7 energy access through apps or web-based portal facilitate remote diagnosis and maintenance.

The new QT2 is interactive with power grids through a feature referred to as RPC (Reactive Power Control) to better manage photovoltaic power spikes in the grid. In addition, it provides 96.5% peak efficiency with 20% less components compared to the last generation product. QT2 is a game changer in 3-phase installations for commercial PV rooftops.

Key Product Feature:

- Designed for 3-phase grid connection
- 4 input channels with module level DC voltage
- Single unit connects to 4 modules
- Maximum continuous AC output power 1728VA for QT2-208 and 1800VA for QT2-480
- Engineered to match the highest power modules available (Maximum input current 20A)
- Safety protection relay integrated
- Adjustable output power factor
- Balancing 3-phase output

4. APsystems Microinverter System Installation

A PV system using APsystems Microinverters is simple to install. Each Microinverter easily mounts on the PV racking, directly beneath the PV module(s). Low voltage DC wires connect from the PV module directly to the Microinverter, eliminating the risk of high DC voltage.

Installation MUST comply with local regulations and technical rules.

Special Statement: we advise installation of an RCD breaker only if required by the local electrical code.

WARNING

- ①. Perform all electrical installations in accordance with local electrical codes.
- ②. Be aware that only qualified professionals should install and/or replace APsystems Microinverters.
- ③. Before installing or using an APsystems Microinverter, please read all instructions and warnings in the technical documents and on the APsystems Microinverter system itself as well as on the PV array.
- ④. Be aware that installation of this equipment includes the risk of electric shock.
- ⑤. Do not touch any live parts in the system, including the PV array, when the system has been connected to the electrical grid.

NOTICE

Even if not required by local electrical code, we strongly recommend to install surge protection devices in the dedicated AC box.

4.1 Additional accessories supplied by APsystems

- AC Bus cable
- AC Bus Cable End Cap
- AC Bus Cable T-CONN Cap
- ECU
- AC connectors male/female

4.2 Other required accessories not supplied by APsystems

In addition to your PV array and its associated hardware, you may need the following items:

- An AC connection junction box
- Mounting hardware suitable for module racking
- Sockets and wrenches for mounting hardware

4. APsystems Microinverter System Installation

4.3 PV Rapid Shut Down Equipment

This product is PV Rapid Shut Down Equipment and conforms with NEC-2014 and NEC-2017 section 690.12, for AC and DC conductors, when installed according to the following requirements:

- Microinverters and all DC connections must be installed inside the array boundary.
- The array boundary is defined as 305 mm (1 ft.) from the array in all directions, or 1 m (3 ft.) from the point of entry inside a building.

This rapid shutdown system must be provided with an initiating device and (or with) status indicator which must be installed in a location accessible to first responders, or be connected to an automatic system which initiates rapid shutdown upon the activation of a system disconnect or activation of another type of emergency system.

The initiator shall be listed and identified as a disconnecting means that plainly indicates whether it is in the “off” or “on” position. Examples are:

- Service disconnecting means
- PV system disconnecting means
- Readily accessible switch or circuit breaker

The handle position of a switch or circuit breaker is suitable for use as an indicator. Refer to NEC for more information.

Additionally, in a prominent location near the initiator device, a placard or label must be provided with a permanent marking including the following wording:

'PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN' The term 'PHOTOVOLTAIC' may be replaced with 'PV.'

The label requires reference NEC 690.65 to meet the audit requirements.

4. APsystems Microinverter System Installation

4.4 Installation Procedures

4.4.1 Step 1 - Verify that grid voltage matches microinverter rating

4.4.2 Step 2 – AC Bus Cable distribution

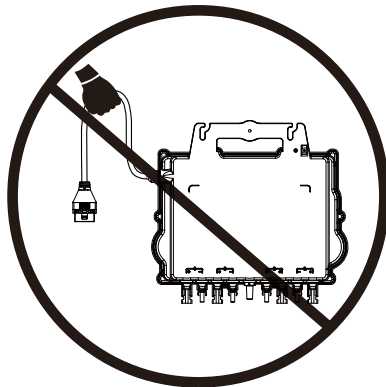
- Each connector drop of the AC Bus cable matches the position of the microinverter.
- One end of the AC bus cable is used to access the junction box into the power grid.
- Wire the conductors of the AC bus: L1 - BLACK ; L2 - RED; L3 - BLUE; N - WHITE; PE - GREEN.**

WARNING

Wiring color code can be different according to the local regulation. Check all the wires of the installation before connecting to the AC bus to be sure they match. Wrong cabling can damage irreparably the microinverters: such damage is not covered by the warranty.

WARNING

Do NOT carry the microinverter by the AC cable. This may cause the AC cable to partially or fully disconnect from the unit, resulting in no or poor operation.



4.4.3 Step 3 - Attach the APsystems Microinverters to the Racking

- Mark the location of the microinverter on the rack, with respect to the PV module junction box or any other obstructions.
- Mount one microinverter at each of these locations using hardware recommended by your module racking vendor.

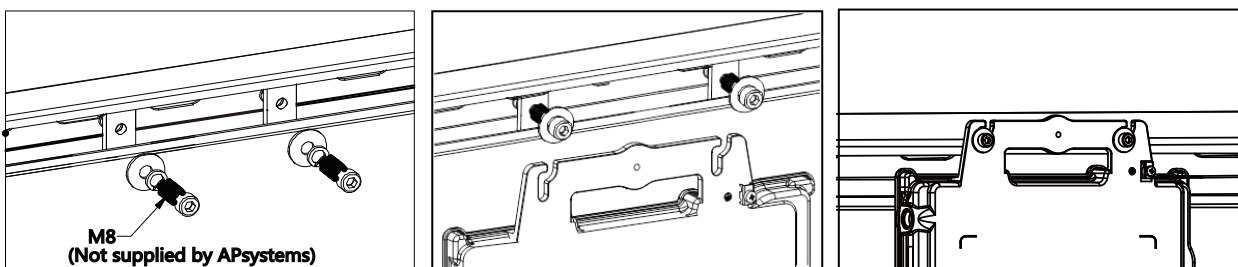


Figure 2

4. APsystems Microinverter System Installation

WARNING

Install the microinverters (including DC and AC connectors) under the PV modules to avoid direct exposure to rain, UV or other harmful weather events. Allow a minimum of 1.5 cm (3/4") below and above the casing of the microinverter to allow proper air flow. The racking must be properly grounded as per local electrical code.

4.4.4 Step 4 - Ground the system

There're 2 ways to ground the QT2 series microinverters.

1. By grounding washer attached.

After the microinverters and racking are reliably installed, the microinverter's grounding washer can connect to the racking to ensure proper earthing.

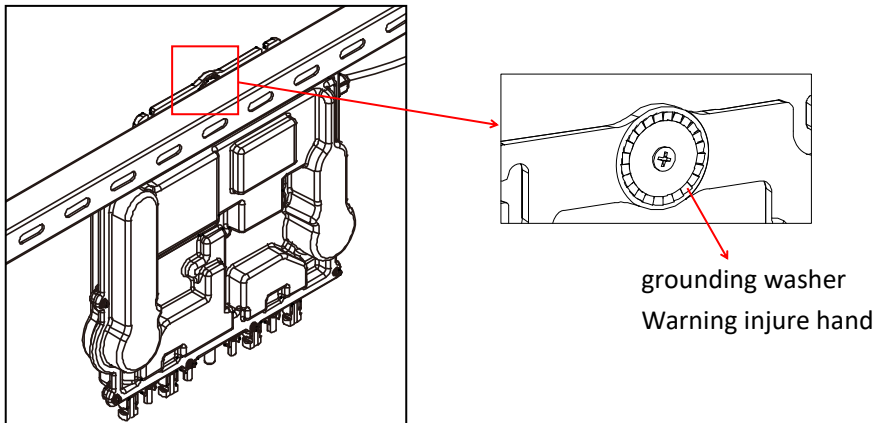


Figure 3

2. By grounding copper wire.

Fix the grounding copper wire by the grounding lug.

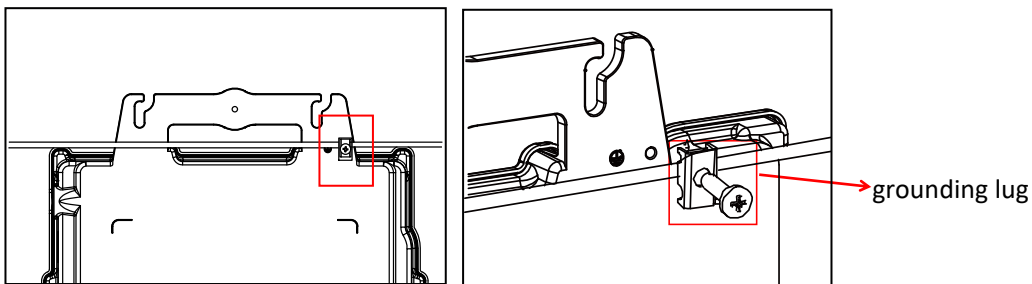


Figure 4

4. APsystems Microinverter System Installation

4.4.5 Step 5 - Connect the APsystems microinverter to AC bus cable

Insert the microinverter AC connector into the trunk cable connector. Make sure to hear the “click” as a proof of robust connection

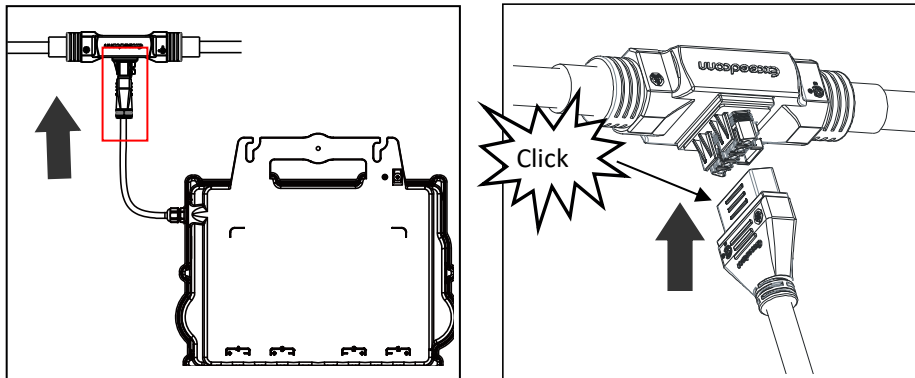


Figure 5

AC connector interface as from left to right.

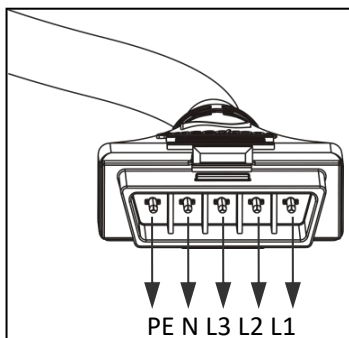


Figure 6

Cover any unused connectors with Bus Cable T-CONN Cap to protect the unused connectors.

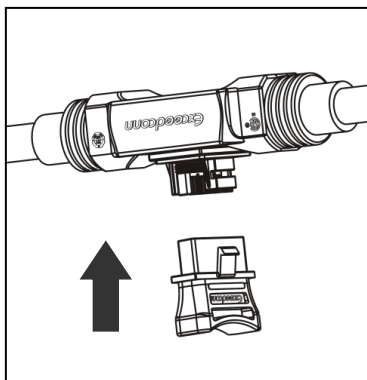


Figure 7

4. APsystems Microinverter System Installation

4.4.6 Step 6 - Install a Bus Cable End Cap at the end of AC bus cable

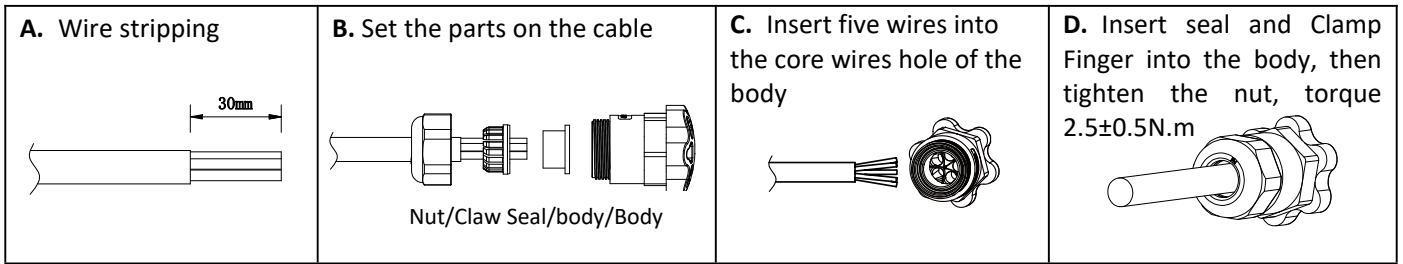


Figure 8

4.4.7 Step 7 - Connect APsystems Microinverters to the PV Modules

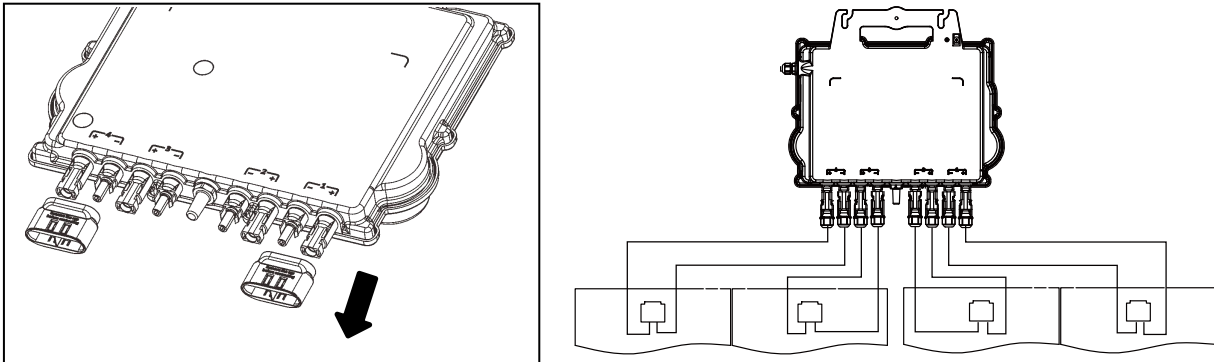


Figure 9



NOTICE

Remove the DC connector caps before PV modules connection.



NOTICE

- The neutral wire is not mandatory to be connected to grid.
- Compatible with both Delta and Wye 3-phase grid.



NOTICE

When plugging in the DC cables, the microinverter should immediately blink green ten times. This will happen as soon as the DC cables are plugged in and will show that the microinverter is functioning correctly. This entire check function will start and end within 10 seconds of plugging in the unit, so pay careful attention to these lights when connecting the DC cables.



WARNING

Double check to make sure all of the AC and DC wiring has been correctly installed. Ensure that none of the AC and/or DC wires are pinched or damaged. Make sure that all of the junction boxes are properly closed.

4. APsystems Microinverter System Installation

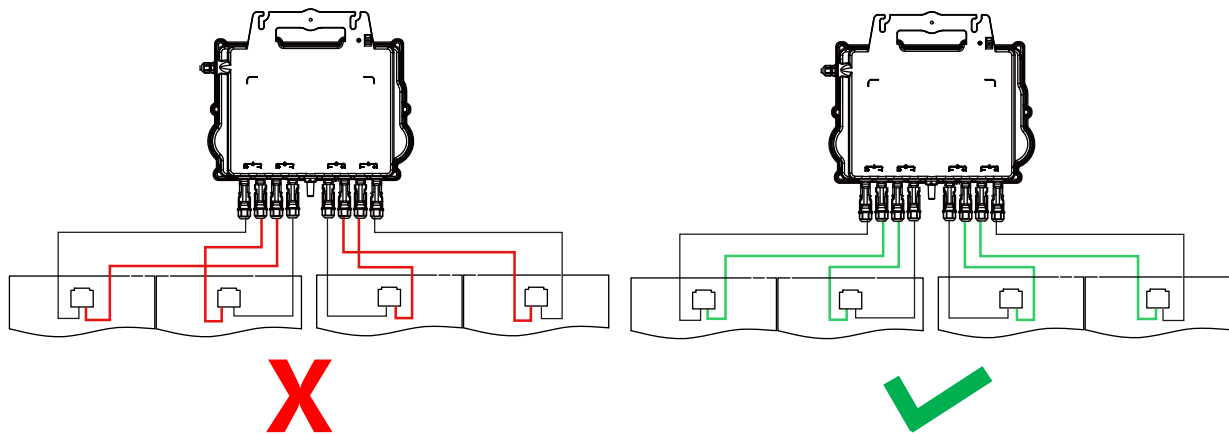


Figure 10

⚠ WARNING

Each PV panel must be carefully connected to the same channel.
Make sure to not split positive and negative DC cables into two different input channels: microinverter will be damaged and warranty will not apply.

4.4.8 Step 8 - Connect APsystems Microinverters to Grid

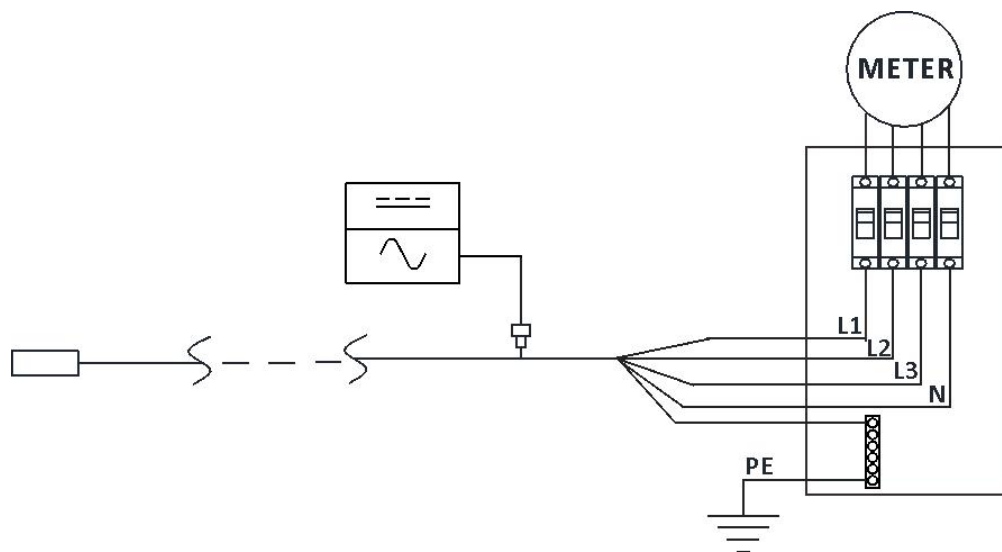


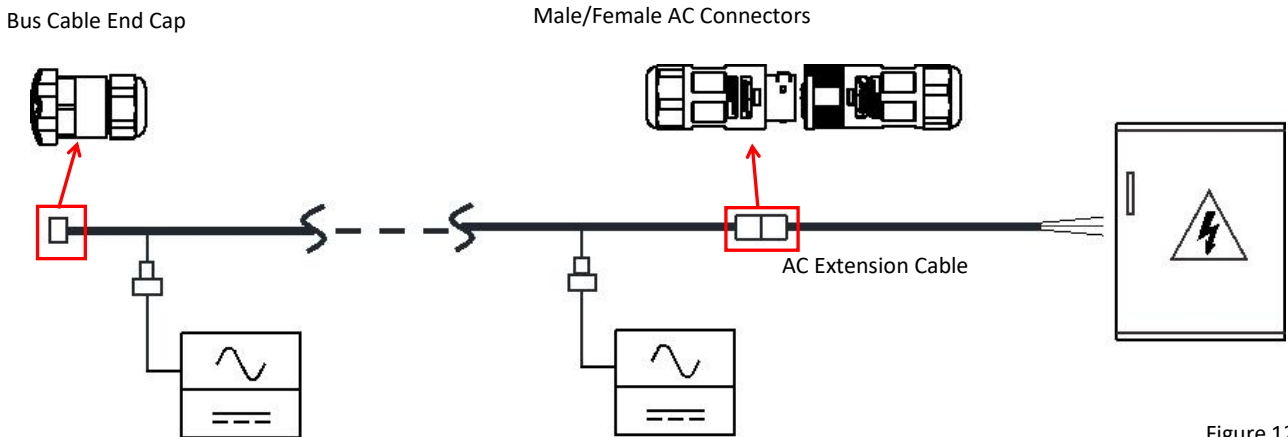
Figure 11

🔔 NOTICE

- ①. Please install bi-polar circuit breakers with proper rated current or according to the local regulation, which are mandatory to connect to grid.
- ②. Leakage current breakers or AFCI/GFCI breakers are not recommended to install.

4. APsystems Microinverter System Installation

4.4.9 Step 9 - AC Extension Cable



When AC extension cable is needed, users could connect the AC bus cable and AC extension cable in a junction box or use a pair of male/female AC connectors that APsystems provides as optional accessory.

4.4.10 Step 10 - Complete the APsystems installation map

- Each APsystems Microinverter has 2 removable serial number labels.
- Complete installation map by sticking ID label of each microinverter at the right location.
- The second serial number label, could be stuck on the solar module frame, which could help later to confirm the position of the microinverter without dismantling the PV module

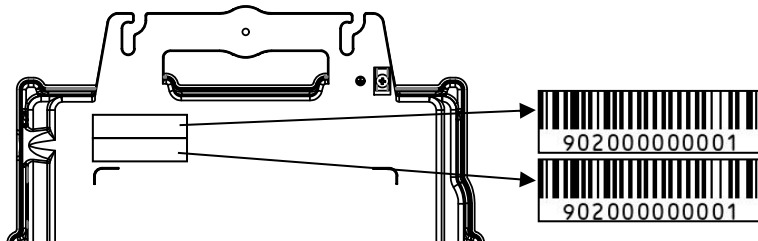


Figure 13

NOTICE

- The layout of the microinverters' serial numbers installation map is only suitable for typical installation
- Installation Map is available in the last page appendix of this manual.
- Use ECU_APP (available in the EMA Manager) to scan the serial numbers on the map when setting up the ECU (see ECU instruction manual for more info).

5. APsystems microinverter system operating instructions

To operate the APsystems microinverter PV system:

1. Turn ON the AC circuit breaker on each microinverter AC branch circuit.
2. Turn ON the main utility-grid AC circuit breaker. Your system will start producing power after approximately one minute of waiting time.
3. Microinverter data will be available in the EMA Manager APP or in the EMA web portal.

Alternatively, LED sequences could be an indicator of microinverters status (see section 6.1)



NOTICE

Once the ECU has been commissioned properly, the APsystems Microinverters will start to send performance data to the ECU. The time required for all of the Microinverters in the system to report to the ECU will vary depending on the number of Microinverters in the system.

6. Troubleshooting

Qualified personnel can use the following troubleshooting steps if the PV system does not operate correctly:

6.1 Status Indications and Error Reporting

Assuming they are easily accessible and visible, Operation LEDs can give a good indication of the microinverters status

6.1.1 Start up LED

Ten short green blinks when DC power is first applied to the Microinverter indicates a successful Microinverter startup.

6.1.2 Operation LED

Flashing Slow Green (5 sec. gap) - Producing power and communicating with ECU

Flashing Slow Red (5 sec. gap) - Not producing power

Flashing Fast Green (2 sec. gap) - Not communicating with ECU over 60mins, but still producing power.

Flashing Fast Red (2 sec. gap) - Not communicating with ECU over 60mins and not producing power.

Steady Red – default, DC side ground fault protection, see 6.1.3

6.1.3 GFDI Error

A solid red LED indicates the Microinverter has detected a Ground Fault Detector Interrupter (GFDI) error in the PV system. Unless the GFDI error has been cleared, the LED will remain red and the ECU will keep reporting the fault. Please contact your local APsystems Technical Support.

6.2 ECU_APP

APsystems ECU_APP (available in the EMA Manager APP) is the recommended tool to do on-site troubleshooting. When connecting the ECU_APP to the ECU hotspot (please check ECU User Manual for more detailed information), installer can check every microinverter status (production, communication) but also ZigBee signal strength, grid profile and other insightful data helping the troubleshooting.

6.3 Installer EMA (web portal or EMA Manager APP)

Before going on site for troubleshooting, installer can also check all information remotely using his installer account, either on the web or using the EMA Manager APP (see EMA Manager APP User Manual for more detailed information). Having access to module data (DC, AC, voltages and currents) gives the first indication on potential issues.

6.4 Trouble Shooting Guide

Professional installers can also refer to our Troubleshooting Guide (<https://usa.apsystems.com/resources/library/> or <https://canada.apsystems.com/resources/library/>, section libraries) for more in depth guidelines on how to troubleshoot and fix PV installations powered by APsystems microinverters.

6. Troubleshooting

6.5 APsystems Technical Support

APsystems local Technical Support team is available to support professional installers to get familiar with our products and to troubleshoot installations when needed.

WARNING

Do not attempt to repair APsystems Microinverters. Please contact your local APsystems Technical Support.

WARNING

- ①. Never disconnect the DC wire connectors under load. Ensure that no current is flowing in the DC wires prior to disconnecting.
- ②. Always disconnect AC power before disconnecting the PV module wires from the APsystems Microinverter.
- ③. The APsystems Microinverter is powered by PV module DC power. AFTER disconnecting the DC power, when reconnecting the PV modules to the Microinverter, be sure to watch for the quick red light followed by ten short green LED flashes.

6.6 Maintenance

APsystems microinverters do not require any specific regular maintenance.

7. Replace a microinverter

Follow the procedure to replace a failed APsystems Microinverter

- A. Disconnect the APsystems Microinverter from the PV Module, in the order shown below:
 1. Disconnect the AC by turning off the branch circuit breaker.
 2. Disconnect the inverter AC connector from the AC Bus.
 3. Disconnect the PV module DC wire connectors from the microinverter.
 4. Remove the Microinverter from the PV array racking.

- B. Install a replacement Microinverter to the rack. Remember to observe the flashing green LED light as soon as the new Microinverter is plugged into the DC cables.

- C. Connect the AC cable of the replacement Microinverter to the AC bus.

- D. Close the branch circuit breaker, and verify proper operation of the replacement Microinverter.

- E. Update the microinverter in EMA Manage through "Replace" function and update the system's map with new serial number labels.

8. Technical Data

WARNING

- ①. Be sure to verify that the voltage and current specifications of your PV module are compatible with the range allowed on APsystems Microinverter. Please check the microinverter datasheet.
- ②. DC operating voltage range of the PV module must be within allowable input voltage range of the APsystems Microinverter.
- ③. The maximum open circuit voltage of the PV module must not exceed the specified maximum input voltage of the APsystems.

2023/06/25 Rev1.5

8.1 QT2 3-Phase Microinverter Datasheet

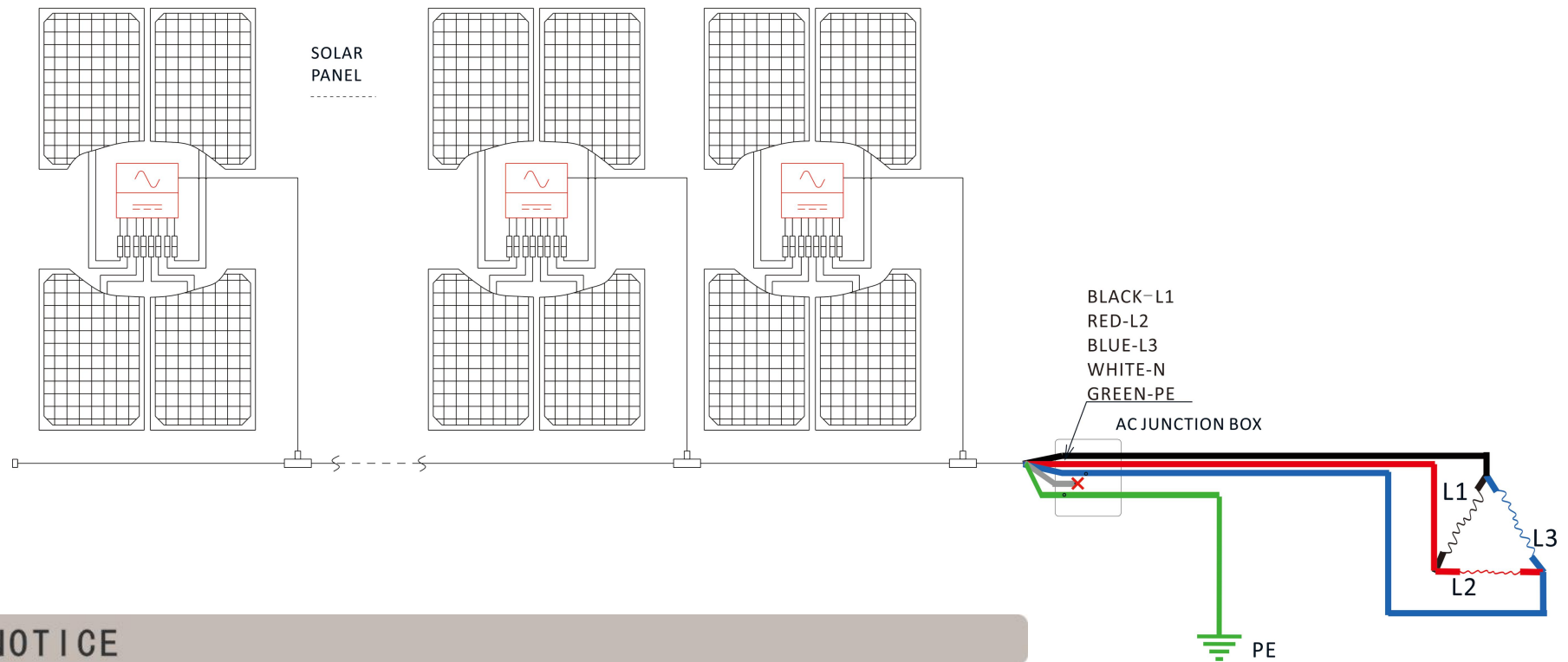
Model	QT2-208	QT2-480
Region	USA/Canada	
Input Data (DC)		
Operating Voltage Range	26V-60V	
Maximum Input Voltage	60V	
Maximum Input Current	20A x 4	
Maximum input short circuit current	25A per input	
Output Data (AC)		
Maximum Continuous Output Power	1728VA	1800VA
Nominal Output Voltage/Range ⁽¹⁾	208V/183V-229V	480V/422V-528V
Adjustable Output Voltage Range	166V-240V	385V-552V
Nominal Output Current	4.8Ax3	2.17Ax3
Maximum Output Fault Current (ac) And Duration	L-L:85.4Apk, 13.6ms of duration, 4.967Arms	L-L:35.1Apk, 13.9ms of duration, 2.199Arms
Nominal Output Frequency/ Range ⁽¹⁾	60Hz/58.8Hz-61.2Hz(HECO:57Hz-63Hz)	
Adjustable Output Frequency Range	55Hz-65Hz	
Power Factor(Default/Adjustable)	0.99/0.8 leading...0.8 lagging	
Maximum Units per 30A branch ⁽²⁾	5	11
AC Bus Cable	10AWG	
Efficiency		
Peak Efficiency	96.5%	
CEC Efficiency	96%	95.5%
Nominal MPPT Efficiency	99.5%	
Night Power Consumption	80mW	200mW
Mechanical Data		
Operating Ambient Temperature Range ⁽³⁾	-40 °F to +149 °F (-40 °C to +65 °C)	
Storage Temperature Range	-40 °F to +185 °F (-40 °C to +85 °C)	
Dimensions (W x H x D)	14" x 9.5" x 1.8" (359mm X 242mm X 46mm)	
Weight	13 lbs (6kg)	
DC Connector Type	Stäubli MC4 PV-ADBP4-S2&ADSP4-S2	
Cooling	Natural Convection - No Fans	
Enclosure Environmental Rating	Type 6	
Features		
Communication (Inverter To ECU) ⁽⁴⁾	Encrypted ZigBee	
Isolation Design	High Frequency Transformers, Galvanically Isolated	
Energy Management	Energy Management Analysis (EMA) system	
Warranty ⁽⁵⁾	10 Years Standard ; 25 Years Optional	

(1) Nominal voltage/frequency range can be extended beyond nominal if required by the utility.
(2) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.
(3) The inverter may enter to power de-grade mode under poor ventilation and heat dissipation installation environment.
(4) Recommend no more than 80 inverters register to one ECU for stable communication.
(5) To be eligible for the warranty, APsystems microinverters need to be monitored via the EMA portal. Please refer to our warranty T&Cs available on usa.apsystem.com.

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Specifications subject to change without notice please ensure you are using the most recent update found at web : usa.apsystem.com or canada.apsystem.com

9. QT2 - Wiring Diagram

9.1 QT2 Connected to Delta Type 3-Phase Grid



NOTICE

- Neutral wire could be floating for delta grid.

Figure 14

9. QT2 - Wiring Diagram

9.2 QT2 Connected to Wye Type 3-Phase Grid

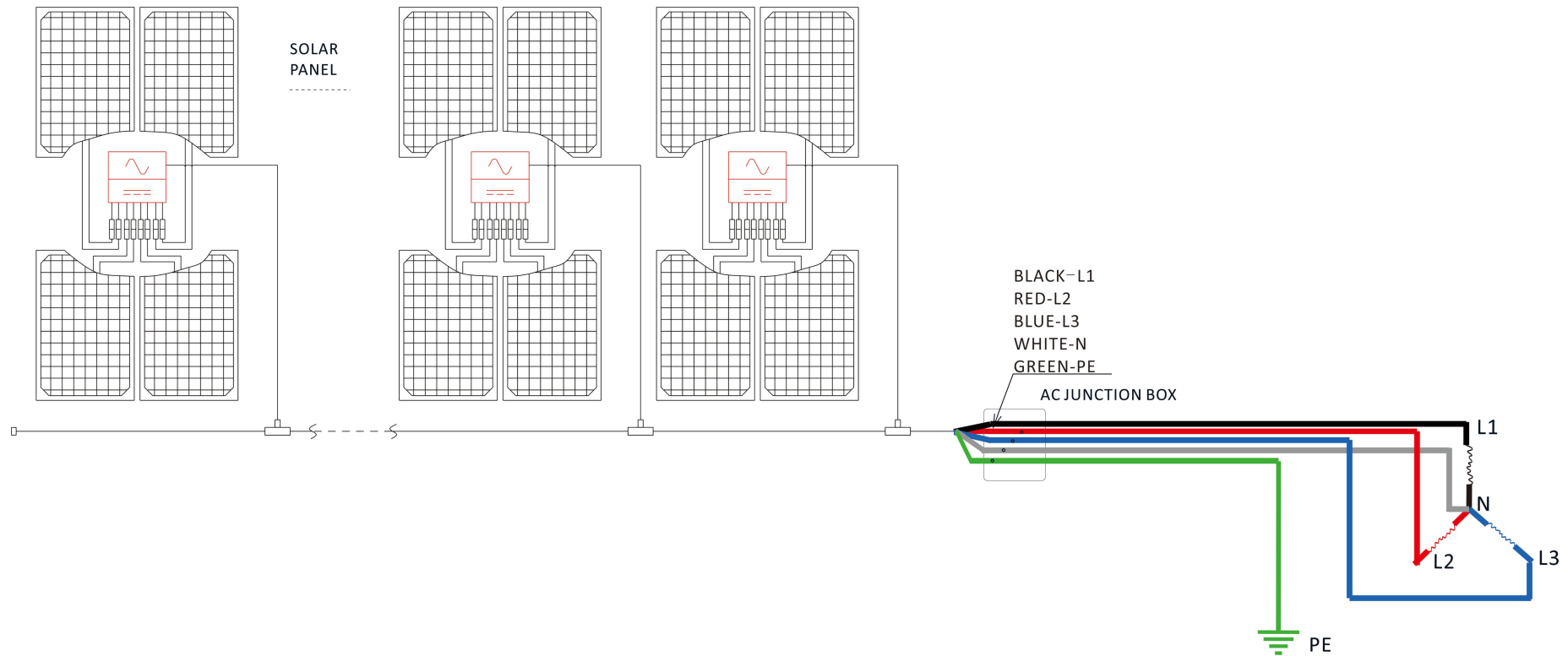


Figure 15

10.QT2 Accessory

10.1 Dimensions

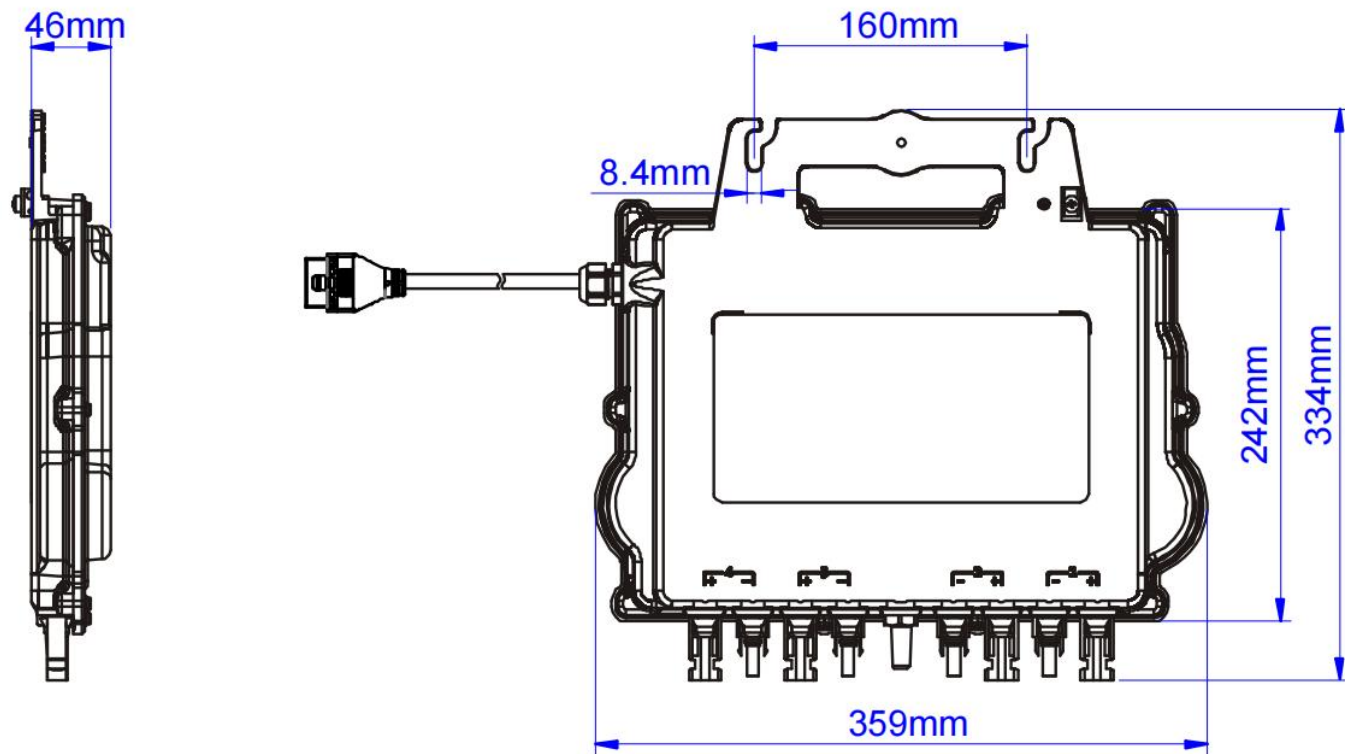


Figure 16

10.QT2 Accessory

10.2 Wiring Diagram

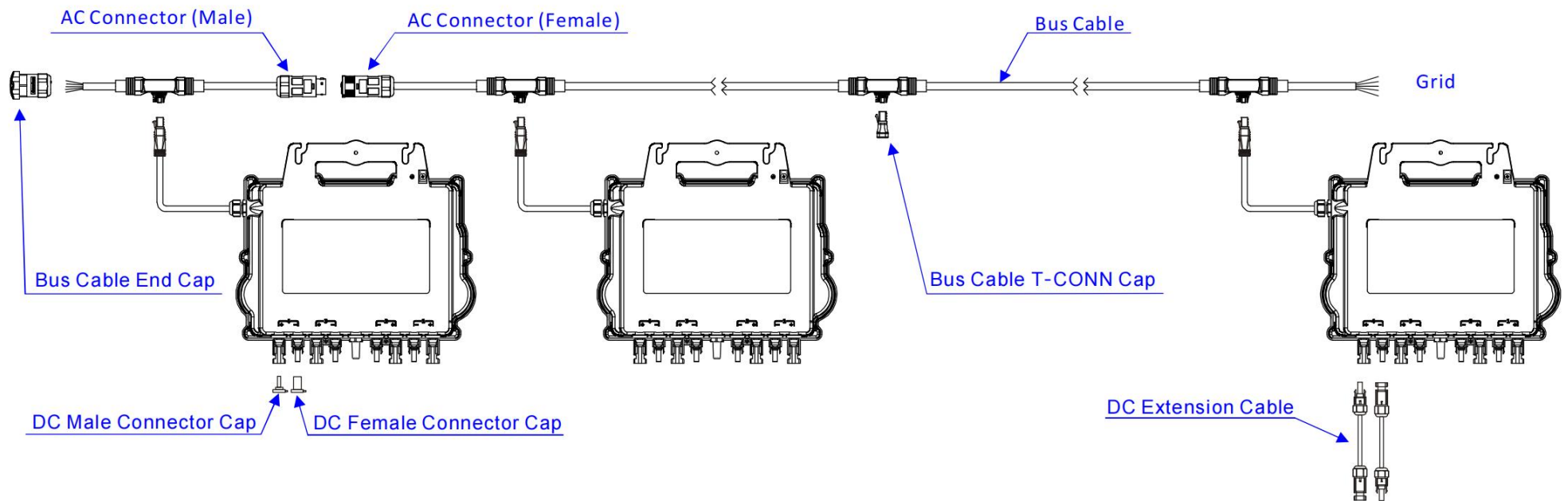
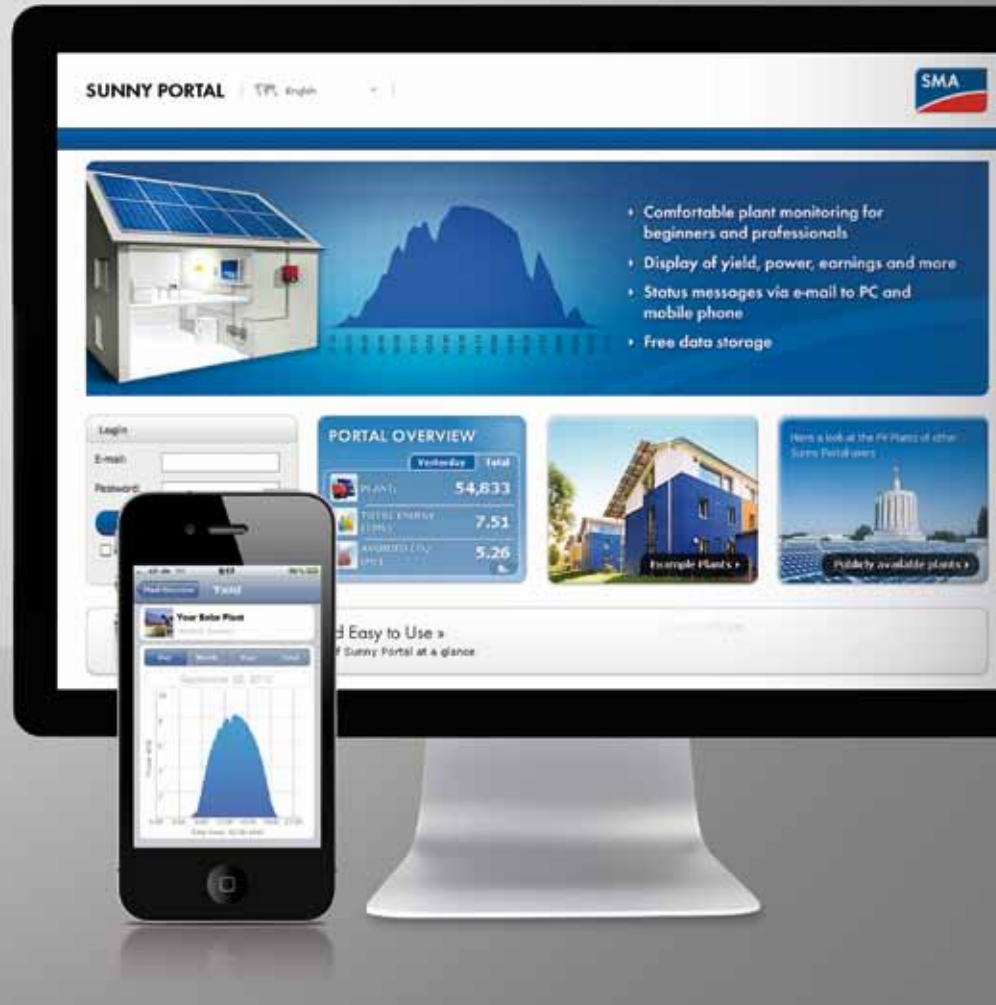


Figure 17

11.APsystems Microinverter Installation Map

The APsystems Installation Map is a diagram of the physical location of each microinverter in your PV installation. Each APsystems microinverter has two serial number labels. Peel the one label and affix it to the respective location on the APsystems installation map.
 Installation Map Template

Installer:		PV module type:		Qty:		Sheet ___ of ___	 N
Owner:		Microinverter type:		Qty:			
	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
Row 1							
Row 2							
Row 3							
Row 4							
Row 5							
Row6							
Row 7							
Row 8							
Row 9							
Row10							



User-friendly

- Central management of all customer and plant data
- Easy to understand reporting

- World-wide access via the Internet - via PC and mobile phones

Personalization

- Personalized configuration of pages and diagrams
- Individual yield and event reports sent via e-mail

Informative

- Fully automatic yield comparison of plant devices
- Professional integration into personal website

SUNNY PORTAL

Professional management, monitoring and presentation of PV plants

Whether for small residential systems or a large PV farm, centralized management and system monitoring saves time and money. Through the Sunny Portal, plant operators and installers have access to key data at any time. Pre-configured standard pages can be easily customized or supplemented. Whether as a data table or as a diagram: SMA solutions allow almost infinite options for analyzing measured data or visualizing yields. The yields of all inverters in a plant are compared automatically, allowing for the detection of even the smallest deviations. The powerful reporting functions also provide regular updates via e-mail to help ensure yields.

Technical Data	Sunny Portal
Languages	
Available languages	German, English, Italian, Spanish, French, Dutch, Portuguese, Greek, Korean, Czech, Chinese
System requirements	
Supported operating systems	All / optimized access for mobile devices
Plant information	
Plant description	Overview of the key properties of the PV plant
Annual comparison	Quick yield overview of the entire operating period
Energy balance	Overview of purchased and fed in power and self-consumption, if applicable (power meter integration via Meter Connection Box or Sunny Home Manager required)
Plant log book	Access to messages regarding plant events
Device overview	Properties and parameters of the devices in the PV plant
Software	
Recommended browsers	Firefox, Internet Explorer, version 7 and later, Safari
Other	JavaScript and cookies enabled
Supported data logger	Sunny WebBox, Sunny Home Manager
Access	
Website	www.sunnyportal.com
Smartphone	www.sunnyportal.mobi, Sunny Portal App for iPhone and Android
Plant management	
Sunny Portal Account	One password for all your plants in Sunny Portal
Page design	
Standard pages	Automatic standard pages for the most common plant monitoring and presentation needs
Personalized pages	A variety of templates for page construction
Page modules	Tables, diagrams, custom images, free text, plant overview (CO ₂ , remuneration, energy)
Visualization of yield and measured values	
Diagram types	Selection of six diagram types for optimum presentation of yield & measured values, bar graphs, area charts, and line charts (with, without, or only tags), as well as XY diagrams
Tables	Individual configuration of charts for all yield and measured values
Time periods	From 5 minutes to 1 year, various time intervals selectable (depending on provided data)
Monitoring	
Inverter comparison	Fully automatic and ongoing inverter yield comparison and e-mail alarms
Communication monitoring	Ongoing monitoring and, when necessary, alarms for the connection between Sunny Portal and Sunny WebBox, the Sunny Home Manager and the Power Reducer Box
Status reports	
Information reports	Daily or monthly reports on energy yield, maximum output, remuneration, CO ₂ reduction via e-mail; a self-defined page can also be sent from Sunny Portal
Event reports	Hourly or daily reports on information, warnings, faults and errors, with personalized content and recipients
Report format	Text, PDF, HTML
Individual access	
Publication of specific pages	Access via the public area on Sunny Portal by all Internet users, ideal for personalized presentations on personal Web sites
User roles	Assign roles of "guest", "standard user", "installer" and "plant administrator" to easily determine who has which viewing and configuration rights
Type designation	Sunny Portal

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Management of several PV plants from one central location



Monitoring without having to be on-site



Quick overview of measured and yield values of the PV plant



Easy diagnostics through display of measured values and event log



High-performance reporting to help safeguard yields



Personalized access to screen options and functions



Flexible page design for individual presentation of the PV plant



Standard pages for the most common display options