



CAMBRIDGE HISTORICAL COMMISSION

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E-mail: histcomm@cambridgema.gov URL: www.cambridgema.gov/Historic

RECEIVED

FEB - 9 2022

CAMBRIDGE HISTORICAL COMMISSION

APPLICATION FOR CERTIFICATE

1. The undersigned hereby applies to the Cambridge Historical Commission for a Certificate of (check one box): Appropriateness, Nonapplicability, or Hardship, in accordance with Chapter 40C of the Massachusetts General Laws and/or Chapter 2.78 of the Municipal Code.

2. Address of property: 10 Frost Street, Cambridge, Massachusetts

3. Describe the proposed alteration(s), construction or demolition in the space provided below: (An additional page can be attached, if necessary).

We are adopting more climate-friendly energy and heating solutions at our home by installing (a) heat pumps powered by electricity (vs our current gas fired system) and (b) rooftop solar to provide zero-carbon renewable electricity. The solar panels will be located on the south-facing portion of our hip roof, and the conduit and outdoor condensers for the heat pumps will be located on the north-facing side of the house, which faces away from the direction of traffic on our one-way street. Please see attached details.

I certify that the information contained herein is true and accurate to the best of my knowledge and belief. **The undersigned also attests that he/she has read the statements printed on the reverse.**

| | |
|--|--------------------------------|
| Name of Property Owner of Record: Peter and Mary Jeanne Tufano | |
| Mailing Address: 10 Frost Street, Cambridge, MA 02140 | |
| Telephone/Fax: 617-947-6981 | E-mail: peter.tufano@gmail.com |
| Signature of Property Owner of Record: <i>Peter Tufano</i> | |
| (Required field; application will not be considered complete without property owner's signature) | |
| Name of proponent, if not record owner: | |
| Mailing Address: | |
| Telephone/Fax: | E-mail: |

| | | |
|-----------------------------------|-------------------|----------------------|
| (for office use only): | | |
| Date Application Received: 2/9/22 | Case Number: 4736 | Hearing Date: 3/3/22 |
| Type of Certificate Issued: | Date Issued: | |

Instructions for Completing this Application:

An application must be filed with the Cambridge Historical Commission (CHC) before work begins. Twelve (12) copies of the application should be attached to twelve (12) copies of supplementary material such as sketches, scale drawings, site plans, specifications, or photographs sufficient to enable the CHC to understand the details of the work proposed and to make a determination on the application. Plans no larger than 11" x 17" are preferred. Please submit reduced copies of plans if originals are of a larger dimension. Do not use spiral bindings, plastic covers, or heavy stock (these will be removed prior to mailing). Double sided copies are encouraged to save paper and postage. See our website or call for a list of meeting dates and deadlines.

The CHC staff welcomes advance inquiries for interpretations or advice. Please call 617/349-4683.

An application is considered incomplete without accompanying plans and drawings. The CHC reserves the right to determine an application incomplete at the time of hearing the application if it determines that the plans, drawings and other information submitted are not sufficient to enable it to determine whether to grant or deny a certificate.

Owners are urged to appear before the CHC in person or to designate an agent to act for them. The CHC will deem the agent to be authorized by the owner to make decisions regarding the extension or waiver of the period within which the CHC is otherwise required to make a determination on the application.

All meetings are open to the public.

Administration of Historic Districts, Landmarks, and Protected Properties:

The administration of historic districts and landmarks is guided by the provisions of Ch. 40C of the Mass. General Laws and by Ch. 2.78 of the Code of the City Of Cambridge. Other properties may also be subject to CHC jurisdiction including properties with conditional variances and properties governed by individual preservation restrictions.

Any new construction, alteration of exterior architectural features, or demolition within an historic district or on the premises of a protected property or a designated landmark must be reviewed by the CHC. No building permit for such work on a protected property, designated landmark, or property within a historic district may be issued by the Inspectional Services Department until a certificate has been issued. The CHC must approve the alteration or construction of all structures, including signs, fences, walls, terraces, walks, driveways, light fixtures and the like, which are "open to view from a public street, public way, public park or public body of water," whether or not a building permit is required, and must approve changes in exterior color for properties within a historic district or as otherwise agreed.

Prior to each hearing, the CHC staff will take slides or digital photographs of the subject property in daylight with ordinary camera equipment for the purpose of documenting the publicly visible conditions of buildings and exterior architectural features for the CHC and the public to view at the hearing. More information can be provided on request.

The CHC issues three types of certificates. A Certificate of Appropriateness will be issued when the CHC has determined that the construction or alteration will be appropriate for or compatible with the preservation or protection of the historic district, designated landmark, or other protected property. A Certificate of Nonapplicability may be issued when an application does not involve an exterior feature, or when the exterior feature is not then subject to CHC review. A Certificate of Hardship may be issued when failure to approve an otherwise inappropriate project would involve substantial hardship to the applicant and the CHC determines that the project can be accomplished without substantial detriment to the purposes of the district, preservation restriction, or landmark designation.

The CHC considers each application on its own merits, and does not apply specific architectural guidelines. Landscaping with plant materials is not subject to CHC review unless it is planned in conjunction with alterations or new construction. The CHC must approve projects that are not incongruous with the historic aspects or the architectural characteristics of the protected property, landmark, or historic district.

Print Form

Peter and Mary Jeanne Tufano
10 Frost Street
Cambridge, MA 02140

We are adopting more climate-friendly energy and heating solutions at our house by installing (a) heat pumps driven by electricity (vs our current gas fired system) and (b) rooftop solar to provide zero-carbon renewable electricity. The solar panels will be located on the south-facing portion of our hip roof, and the conduit and outdoor condensers for the heat pumps will be located on the north-facing side of the house, which faces away from the direction of traffic on our one-way street.

Rooftop solar

The solar panels and inverters we propose to install are shown in **panel A** and the proposed design is shown on **panel B**. The solid black panels will be located on the south-facing shallow hip roof, as seen in **panel C**. Neither the hip roof nor the panels are visible except from further down Frost Street. The panels will be attached to the existing roof with a low-profile installation, within 4" of the existing roof with no visible rails and at the same angle as the existing roof. There will be a ¾" electric wire that runs down the North side of the house to a set of three additional meters and emergency shutoff which will be adjacent to our existing electric meter. See **Panel D** for the approximate format of the additional meters and shutoff.

Heat Pumps

We will be installing a pair of heat pumps on our second floor of the house. The mini-splits sit inside of the house, but conduits will be installed on the north side of the house (**Panel E**) and largely run alongside current downspouts. The covers of the heat pump cabling are approximately the same size and shape as existing downspouts. There will be two outdoor condensers located on the north side of the house, away from the street and tucked behind the small one story "extension" at the ground level. See **Panel F** for images and specs on the condensers. **Panel G** shows the locations of the conduits and condensers.

Panel A: Solar panels and inverters

SOLARS MOST TRUSTED

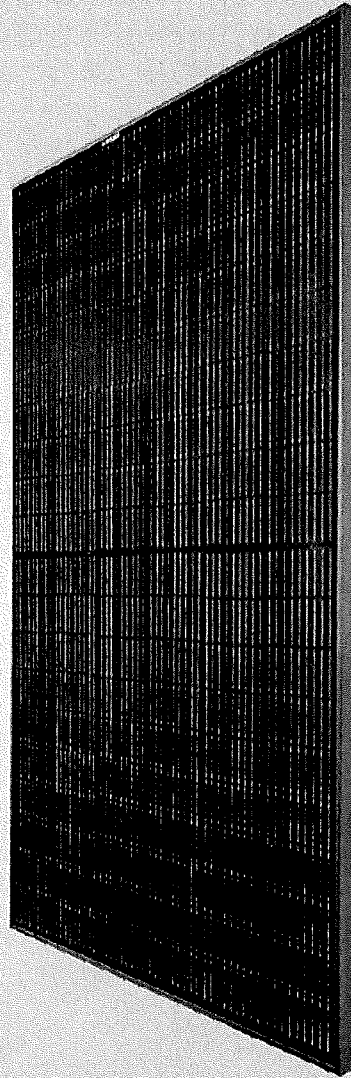


REC TWINPEAK 4 BLACK SERIES

PREMIUM SOLAR PANELS WITH SUPERIOR PERFORMANCE

REC TwinPeak 4 Black Series solar panels feature an aesthetically-pleasing full-black design with high panel efficiency and power output, enabling customers to get the most out of the space used for the installation.

Combined with industry-leading product quality and the reliability of a strong and established European brand, REC TwinPeak 4 Black Series panels are ideal for residential and commercial rooftops worldwide.



**MORE POWER
OUTPUT PER M²**



**FEATURING REC'S PIONEERING
TWIN DESIGN**



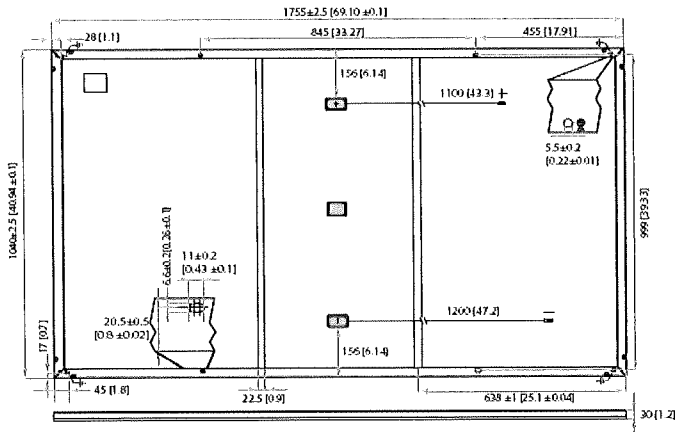
**100%
PID FREE**



**SUPER-STRONG
FRAME**



ELIGIBLE



Measurements in mm [in]

GENERAL DATA

Cell type: 120 half-cut mono c-Si p-type cells
 6 strings of 20 cells in series
 Glass: 3.2 mm solar glass with anti-reflection surface treatment
 Backsheet: Highly resistant polymeric construction (black)
 Frame: Anodized aluminum (black)
 Junction box: 3-part, 3 bypass diodes, IP68 rated in accordance with IEC 62790
 Cable: 4 mm² solar cable, 1.1 m + 1.2 m in accordance with EN 50618
 Connectors: StaUBL MC4PV-KBT4/KST4 (4 mm²) in accordance with IEC 62852 IP68 only when connected
 Origin: Made in Singapore

MECHANICAL DATA

Dimensions: 1755 x 1040 x 30 mm
 Area: 1.83 m²
 Weight: 20.0 kg

ELECTRICAL DATA @ STC

Product code*: RECxxxTP4 Black

| | | | | |
|--|-------|-------|-------|-------|
| Nominal Power - P _{max} (Wp) | 355 | 360 | 365 | 370 |
| Watt Class Sorting - (W) | 0/+5 | 0/+5 | 0/+5 | 0/+5 |
| Nominal Power Voltage - V _{MPP} (V) | 33.5 | 33.9 | 34.3 | 34.7 |
| Nominal Power Current - I _{MPP} (A) | 10.60 | 10.62 | 10.65 | 10.68 |
| Open Circuit Voltage - V _{oc} (V) | 40.5 | 40.6 | 40.8 | 41.0 |
| Short Circuit Current - I _{sc} (A) | 11.19 | 11.26 | 11.32 | 11.38 |
| Panel Efficiency (%) | 19.4 | 19.7 | 20.0 | 20.3 |

Values at standard test conditions (STC: air mass AM1.5, irradiance 1000 W/m², temperature 25°C), based on a production spread with a tolerance of P_{max}, V_{oc}, I_{sc} ±3% within one watt class. *Where xxx indicates the nominal power class (P_{max}) at STC above.

ELECTRICAL DATA @ NMOT

Product code*: RECxxxTP4 Black

| | | | | |
|--|------|------|------|------|
| Nominal Power - P _{max} (Wp) | 269 | 272 | 276 | 280 |
| Nominal Power Voltage - V _{MPP} (V) | 31.4 | 31.7 | 32.1 | 32.5 |
| Nominal Power Current - I _{MPP} (A) | 8.56 | 8.58 | 8.60 | 8.63 |
| Open Circuit Voltage - V _{oc} (V) | 37.9 | 38.0 | 38.2 | 38.4 |
| Short Circuit Current - I _{sc} (A) | 9.04 | 9.10 | 9.15 | 9.19 |

Nominal module operating temperature (NMOT: air mass AM1.5, irradiance 800 W/m², temperature 20°C, wind speed 1 m/s). *Where xxx indicates the nominal power class (P_{max}) at STC above.

MAXIMUM RATINGS

Operational temperature: -40 ~ +85°C
 Maximum system voltage: 1000 V
 Maximum test load (front): +7000 Pa (713 kg/m²)
 Maximum test load (rear): -4000 Pa (407 kg/m²)
 Max series fuse rating: 25 A
 Max reverse current: 25 A

* See installation manual for mounting instructions. Design load = Test load / 1.5 (safety factor)

TEMPERATURE RATINGS*

Nominal Module Operating Temperature: 44.6°C (±2°C)
 Temperature coefficient of P_{max}: -0.34 %/°C
 Temperature coefficient of V_{oc}: -0.26 %/°C
 Temperature coefficient of I_{sc}: 0.04 %/°C
 *The temperature coefficients stated are linear values

CERTIFICATIONS

| |
|--|
| IEC 61215-2:2016, IEC 61730:2016, UL 61730 |
| IEC 62804 PID |
| IEC 61701 Salt Mist |
| IEC 62716 Ammonia Resistance |
| ISO 11925-2 Ignitability (Class E) |
| IEC 62782 Dynamic Mechanical Load |
| IEC 61215-2:2016 Hailstone (35mm) |
| ISO 14001:2004, ISO 9001:2015, OHSA S16001:2007, IEC 62941 |



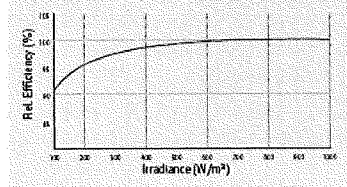
WARRANTY

| | Standard | REC ProTrust | |
|--|----------|--------------|----------|
| Installed by an REC Certified Solar Professional | No | Yes | Yes |
| System Size | Any | < 25kW | 25-500kW |
| Product Warranty (yrs) | 20 | 25 | 25 |
| Power Warranty (yrs) | 25 | 25 | 25 |
| Labor Warranty (yrs) | 0 | 25 | 10 |
| Power in Year 1 | 98% | 98% | 98% |
| Annual Degradation | 0.5% | 0.5% | 0.5% |
| Power in Year 25 | 86% | 86% | 86% |

See warranty documents for details. Some conditions apply.

LOW LIGHT BEHAVIOUR

Typical low irradiance performance of module at STC.



Specifications subject to change without notice.

Ref: PM4D5-07-20 Rev. B 07/21

Founded in 1996, REC Group is an international pioneering solar energy company dedicated to empowering consumers with clean, affordable solar power. As Solar's Most Trusted, REC is committed to high quality, innovation, and a low carbon footprint in the solar materials and solar panel manufacturers. Headquartered in Norway with operational headquarters in Singapore, REC also has regional hubs in North America, Europe, and Asia-Pacific.



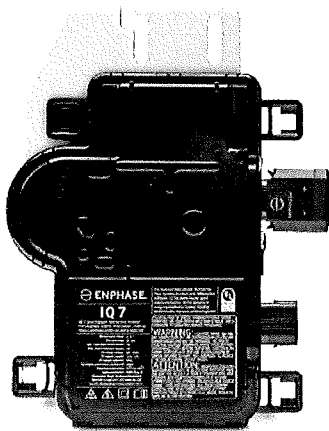
www.recgroup.com

Enphase IQ 7 and IQ 7+ Microinverters

The high-powered smart grid-ready Enphase IQ 7 Micro™ and Enphase IQ 7+ Micro™ dramatically simplify the installation process while achieving the highest system efficiency.

Part of the Enphase IQ System, the IQ 7 and IQ 7+ Microinverters integrate with the Enphase IQ Envoy™, Enphase IQ Battery™, and the Enphase Enlighten™ monitoring and analysis software.

IQ Series Microinverters extend the reliability standards set forth by previous generations and undergo over a million hours of power-on testing, enabling Enphase to provide an industry-leading warranty of up to 25 years.



Easy to Install

- Lightweight and simple
- Faster installation with improved, lighter two-wire cabling
- Built-in rapid shutdown compliant (NEC 2014 & 2017)

Productive and Reliable

- Optimized for high powered 60-cell and 72-cell* modules
- More than a million hours of testing
- Class II double-insulated enclosure
- UL listed

Smart Grid Ready

- Complies with advanced grid support, voltage and frequency ride-through requirements
- Remotely updates to respond to changing grid requirements
- Configurable for varying grid profiles
- Meets CA Rule 21 (UL 1741-SA)

* The IQ 7+ Micro is required to support 72-cell modules.



To learn more about Enphase offerings, visit enphase.com



Enphase IQ 7 and IQ 7+ Microinverters

| INPUT DATA (DC) | IQ7-60-2-US / IQ7-60-B-US | | IQ7PLUS-72-2-US / IQ7PLUS-72-B-US | |
|--|--|----------------|-----------------------------------|----------------|
| Commonly used module pairings ¹ | 235 W - 350 W + | | 235 W - 440 W + | |
| Module compatibility | 60-cell PV modules only | | 60-cell and 72-cell PV modules | |
| Maximum input DC voltage | 48 V | | 60 V | |
| Peak power tracking voltage | 27 V - 37 V | | 27 V - 45 V | |
| Operating range | 16 V - 48 V | | 16 V - 60 V | |
| Min/Max start voltage | 22 V / 48 V | | 22 V / 60 V | |
| Max DC short circuit current (module I _{sc}) | 15 A | | 15 A | |
| Overvoltage class DC port | II | | II | |
| DC port backfeed current | 0 A | | 0 A | |
| PV array configuration | 1 x 1 ungrounded array, No additional DC side protection required; AC side protection requires max 20A per branch circuit | | | |
| OUTPUT DATA (AC) | IQ 7 Microinverter | | IQ 7+ Microinverter | |
| Peak output power | 250 VA | | 295 VA | |
| Maximum continuous output power | 240 VA | | 290 VA | |
| Nominal (L-L) voltage/range ² | 240 V / | 208 V / | 240 V / | 208 V / |
| | 211-264 V | 183-229 V | 211-264 V | 183-229 V |
| Maximum continuous output current | 1.0 A (240 V) | 1.15 A (208 V) | 1.21 A (240 V) | 1.39 A (208 V) |
| Nominal frequency | 60 Hz | | 60 Hz | |
| Extended frequency range | 47 - 68 Hz | | 47 - 68 Hz | |
| AC short circuit fault current over 3 cycles | 5.8 Arms | | 5.8 Arms | |
| Maximum units per 20 A (L-L) branch circuit ³ | 16 (240 VAC) | 13 (208 VAC) | 13 (240 VAC) | 11 (208 VAC) |
| Overvoltage class AC port | III | | III | |
| AC port backfeed current | 0 A | | 0 A | |
| Power factor setting | 1.0 | | 1.0 | |
| Power factor (adjustable) | 0.7 leading ... 0.7 lagging | | 0.7 leading ... 0.7 lagging | |
| EFFICIENCY | @240 V | @208 V | @240 V | @208 V |
| Peak CEC efficiency | 97.6 % | 97.6 % | 97.5 % | 97.3 % |
| CEC weighted efficiency | 97.0 % | 97.0 % | 97.0 % | 97.0 % |
| MECHANICAL DATA | | | | |
| Ambient temperature range | -40°C to +65°C | | | |
| Relative humidity range | 4% to 100% (condensing) | | | |
| Connector type (IQ7-60-2-US & IQ7PLUS-72-2-US) | MC4 (or Amphenol H4 UTX with additional Q-DCC-5 adapter) | | | |
| Connector type (IQ7-60-B-US & IQ7PLUS-72-B-US) | Friends PV2 (MC4 intermateable) Adaptors for modules with MC4 or UTX connectors: - PV2 to MC4: order ECA-S20-S22 - PV2 to UTX: order ECA-S20-S25 | | | |
| Dimensions (WxHxD) | 212 mm x 175 mm x 30.2 mm (without bracket) | | | |
| Weight | 1.08 kg (2.38 lbs) | | | |
| Cooling | Natural convection - No fans | | | |
| Approved for wet locations | Yes | | | |
| Pollution degree | PD3 | | | |
| Enclosure | Class II double-insulated, corrosion resistant polymeric enclosure | | | |
| Environmental category / UV exposure rating | NEMA Type 6 / outdoor | | | |
| FEATURES | | | | |
| Communication | Power Line Communication (PLC) | | | |
| Monitoring | Enlighten Manager and MyEnlighten monitoring options Both options require installation of an Enphase IQ Envoy. | | | |
| Disconnecting means | The AC and DC connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 890 | | | |
| Compliance | CA Rule 21 (UL 1741-SA) UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC-2014 and NEC-2017 section 690.12 and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according manufacturer's instructions. | | | |

1. No enforced DC/AC ratio. See the compatibility calculator at <http://enphase.com/news/compatibility>

2. Nominal voltage range can be extended beyond nominal if required by the utility.

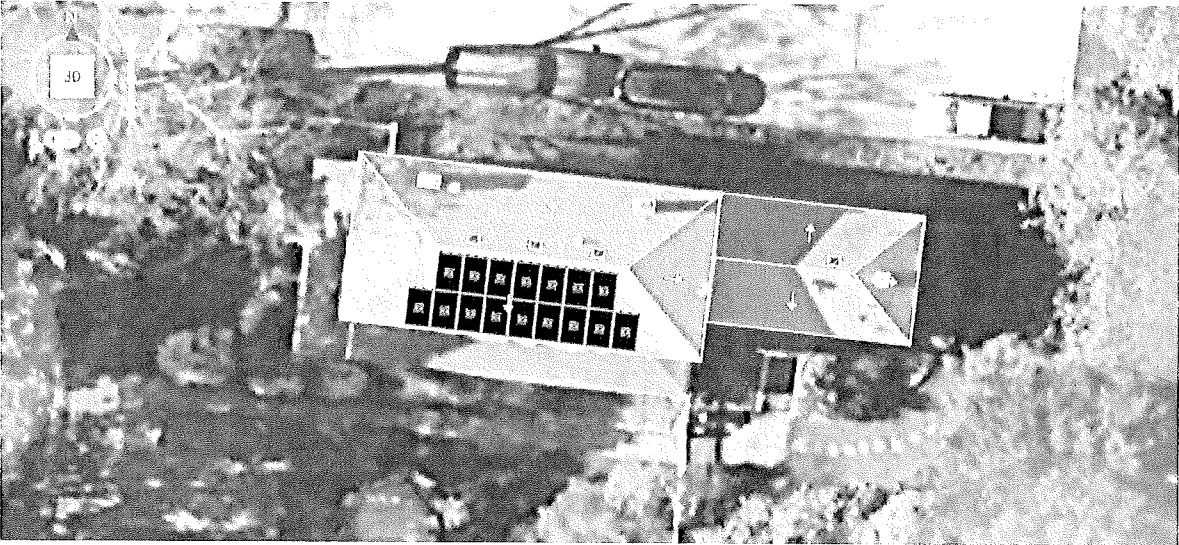
3. Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

To learn more about Enphase offerings, visit enphase.com



Panel B: Location of panels

This 16 panel design using the panels specified in A (each approx 40"x69") will leave approximately 4 to 6" spaces between the panels and the ridge line and gutters (top and bottom below). At the narrowest point (the ridge line) the distance to the East and West "triangle" side roofs will be approximately 7" on each side, but nearest to the gutters, the distance to the side roof will be approximately 7' on either side.



Panel C1: 10 Frost Street, south elevation from the street



Panel C2: 10 Frost Street, west elevation from the street.

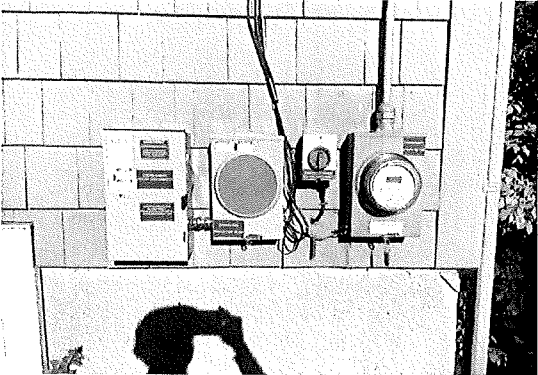


Panel D: Existing electric meter and proposed additional meters/emergency shutoff

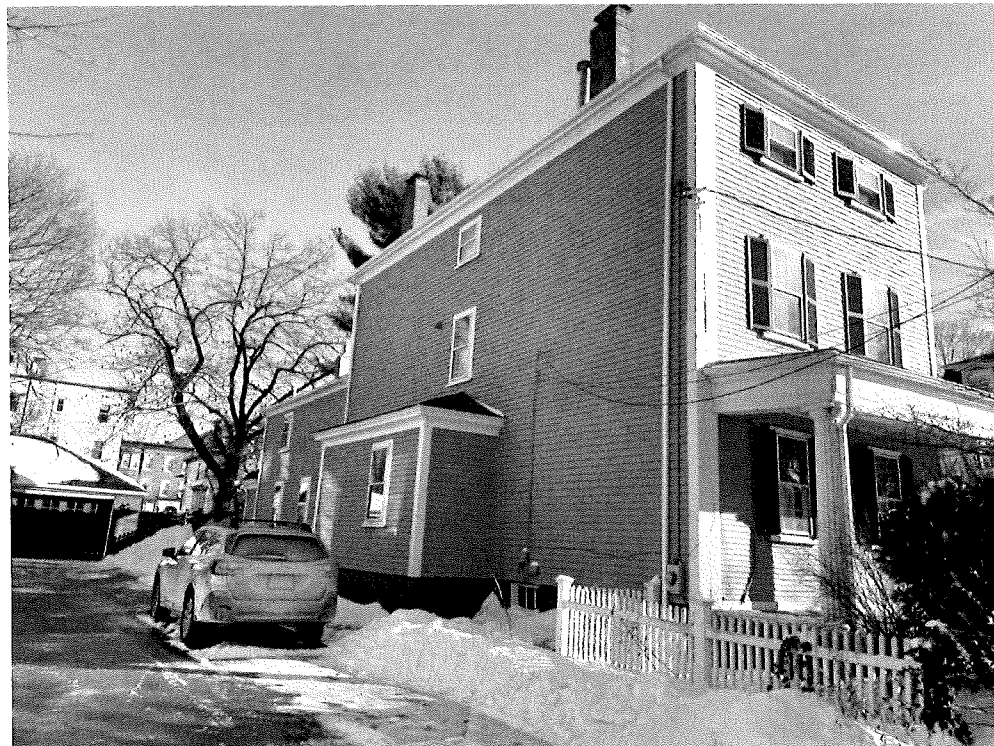
Existing electric meter (on North west side of house, far to the right of the picture, to the right of existing downspout.)



Proposed additional meters and emergency shut off (three to left on diagram). Would be to the left of the existing downspout (see above). Photo from another installation by contractor.

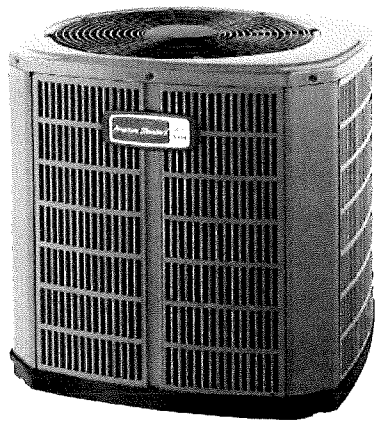


Panel E: 10 Frost Street, North Elevation and plot plan
Note: North side of house is adjacent to driveway and parking.



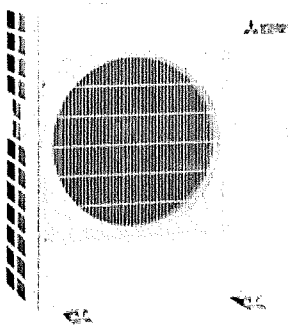
Panel F: Specifications of Outdoor Compressors (2). There will be two outdoor compressors for the system, as shown below.

Condensor 1: Outdoor Condenser: 4A7A6036J1000A



| | |
|-----------------------|----------------|
| ERP ID | 359596 |
| Weight | 193.000000 |
| Phase | Single |
| Full Load Amps | 0.77 |
| Package Height | 42.000000 |
| Package Length | 38.700000 |
| Package Weight | 246.000000 |
| Package Width | 35.100000 |
| Product Family | 4A7A6 |
| Inverter | No |
| Maximum Piping Length | 150' |
| Locked Rotor Amps | 79 |
| Liquid Line Size (OD) | 3/8" |
| Rated Current Amps | 18 |
| Liquid Line Fitting | Sweat or Braze |
| Number of Fan Blades | 1 |
| Length | 37.250000 |
| Height | 37.125000 |
| Rated Load Amps | 13.6 |
| Voltage | 208-230 VAC |
| Warranty Offered | Yes |
| Width | 34.250000 |
| UOM | EA |
| Sound Level (dBA) | 71 |
| Refrigerant | R-410A |
| SEER | 16 |
| UL Listed | Yes |
| Stage | Single |

Outdoor Condenser 2: MXZ5C42NAHZ2-U1



OVERVIEW

The Mitsubishi MXZ-5C42NA2-U1 is a heat pump condenser designed to be used in multi zone system setups. As one air handler is needed per room that you are trying to heat and cool, multiple single zone condensers can take up a lot of space in your yard, making a multi zone unit more practical in many applications.

FEATURES

- 42,000 BTU multi zone heat pump condenser
- Variable speed Inverter-driven compressor
- Quiet operation
- Supports enhanced comfort down to -4°F

42,000 BTU

The Mitsubishi MXZ-5C42NA2-U1 is rated at 42,000 BTU, which generally should be the same or greater than the total BTU count across all air handlers that this unit is paired with. In some instances, a certified pairing will have a higher BTU count total than this condenser's rating. This is intentional, as the condenser can easily handle more, however anything higher than this rating can potentially lower the speed that the unit can heat and cool, as well as limit the functional outputs of each air handler if they are all running at the same time.

Please note that in order to function, this heat pump condenser must be installed with compatible air handlers, controllers, and other installation equipment, available at an additional cost

Warranty

Mitsubishi offers a 5 year parts and 7 year compressor warranty on all of its products. When the unit is registered online through the manufacturer after an installation that follows your state and local codes, the warranty is upgraded to a 10 year parts and compressor warranty.

Enhanced Comfort

With its variable speed compressor, the MXZ-5C42NA2-U1 can provide more precise adjustments to the covered spaces with the right air handlers. This also slightly improves electrical efficiency by ramping the compressor up and down based on the unit's air handlers' needs, as well as providing a more stable temperature output from the connected air handlers to provide superior comfort.

Intelligent Control

For ease of control, many air handlers that are compatible with the MXZ-5C42NA2-U1 can use any Mitsubishi-brand thermostat or adapter. The most convenient to control—[the Kumo cloud WiFi adapter, found here](#)—allows each air handler to be accessed from anywhere that you have Internet. Please note that in most applications, you will need one thermostat or adapter per indoor air handler that you want to be able to control with it.

42,000 BTU Ductless Mitsubishi Mini-Split Multi Zone MXZ-C Series - Heat Pump Condenser

| | |
|---|----------------------------------|
| Weight (in lbs) | 189.000000 |
| AHRI Certificate Number | 201754913, 201754914, 201755021 |
| Manufacturer | Mitsubishi |
| Additional Information | Heat Pump |
| Additional Information | Maximum Line Set Length: 82' |
| Additional Information | Maximum System Line Length: 262' |
| HSPF | 10.3 |
| Cooling BTU | 40,500 |
| Heating BTU | 45,000 |
| Decibel Level (dBA) | 56-58 |
| Energy Star | No |
| Refrigerant | R410A |
| Refrigerant Charge | Pre-Charged For: 98' |
| SEER | 19 |
| EER | 9.2 |
| Liquid Line | 1/4" (5) |
| Suction Line | 1/2" (1), 3/8" (4) |
| Electrical | 208/230V 1 Phase 60 Hz |
| Phase | Single Phase |
| Max Breaker Size | 40 |
| Min. Breaker Size | 32.5 |
| Tonnage | 3.5 Ton |
| Min/Max Outdoor Temp for Heating | 5°-65° |
| Min/Max Outdoor Temp for Cooling | 14°-115° |
| Zone Compatibility | Multi Zone |
| Operating Mode | Cooling, Heating |
| Height | 41-9/32" |
| Width | 37-13/32" |
| Depth | 13" |

Panel G: Approximate location of conduit for heat pumps as well as the two outside condenser units (See pictures on Panel F); also shows location of new solar meters (Panel D) and 3/4" wire from roof. Wires and conduit run downward alongside of existing downspouts. (See photos on Panel E.)

